THE UNIVERSITY OF YAOUNDE I

UNIVERSITE DE YAOUNDE I

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THE QUALITY OF MULTIMEDIA BASED PEDAGOGY AND STUDENTS' PROFESSIONAL DEVELOPMENT:

THE CASE OF SELECTED HIGHER EDUCATION INSTITUTIONS IN CAMEROON

THESIS DEFENDED ON 17TH JUNE 2023 TO OBTAIN DOCTORATE/Ph.D IN CURRICULUM AND EVALUATION (EDUCATION QUALITY SPECIALIST)

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ABSTRACT

This work was inspired by *Law No. 005 of April 16, 2001, to guide higher education in Cameroon*. In Section III, Articles 32 and 33, the issue of evaluation for quality in the higher education sector is addressed, which correlates with the strong desire of the researcher to enable higher institutions and partners to understand the role quality multimedia based pedagogy plays in enhancing students' professional development in this digital age and the urge to propose a model to enhance the evaluation of multimedia based pedagogy qualities.

The study seeks to give students, lecturers, school administrators, parents, the educational community, policymakers, and the government information on evaluating the quality of multimedia based pedagogy in relation to professional development. This information will contribute significantly to the achievement of the fourth Sustainable Development Goal of Quality Education by ensuring equitable quality education, promoting lifelong learning opportunities for all, and resolving the difficulties faced in evaluating multimedia-based pedagogy and graduate employability. We therefore ask to what extent the quality of multimedia based pedagogy influences students' professional development.

This study is focused on investigating the extent to which the quality of some multimedia based pedagogy variables influences students' professional development in selected higher education institutions in Cameroon. A main hypothesis was stated to guide the investigation as follows: The quality of multimedia-based pedagogy has a significant influence on students' professional development. To this end, a study was carried out using quantitative and qualitative research methodological approaches, with a questionnaire and focus group discussion questions, respectively, used as tools for data collection. The study consisted of four institutions with professional orientation and 439 students as the sample, all in their third (or last) year of their degree programme. These students were administered the questionnaire, and eight (8) of them also participated in the focus group discussions. Data collected from the field were descriptively and inferentially analysed using the mean, standard deviation, and Pearson correlation.

Therefore, the results obtained from the analysis of the questionnaire show that the academic, pedagogical, didactic, and technical qualities of multimedia based pedagogy significantly influence students' professional development at a significant level of 0.01, respectively. These results, which correlate with those obtained from the focus group discussions, indicate that the quality of multimedia based pedagogy significantly influences students' professional development. Therefore, recommendations have been made to all the stakeholders. A proposed model for evaluating the qualities of multimedia based pedagogy was inspired by these findings.

The work is thematically confined to the evaluation of multimedia based pedagogy qualities (academic, pedagogic, didactic, and technical) and professional development variables (addressing students' needs, digital learning support, and classroom assessment); geographically limited to four regions of the Republic of Cameroon; the study took place from 2018 to 2019; The focus of this study is on 439 third-year students in the Departments of Curriculum Studies and Teaching, Journalism, Engineering Economics, and the Universities of Buea, Bamenda, and Maroua, respectively; and ICT University, Yaounde Campus.

Key words: Evaluation, multimedia based pedagogy, quality, and professional development

RESUME

Cet ouvrage s'est inspiré de la loi n°005 du 16 avril 2001, portant orientation de l'enseignement supérieur au Cameroun. Dans la section III, articles 32 et 33, la question de l'évaluation de la qualité dans le secteur de l'enseignement supérieur est abordée, ce qui est en corrélation avec le fort désir du chercheur de permettre aux établissements d'enseignement supérieur et aux partenaires de comprendre le rôle que joue la pédagogie par multimédia de qualité dans l'amélioration du développement professionnel des étudiants à l'ère numérique, et l'envie de proposer un modèle pour améliorer l'évaluation des qualités de la pédagogi

Cette étude vise à fournir aux étudiants, aux enseignants, aux administrateurs scolaires, aux parents, à la communauté éducative et aux décideurs politiques, ainsi qu'au gouvernement des informations sur l'évaluation de la qualité de la pédagogie par multimédia en relation avec le développement professionnel. Ces informations contribueront de manière significative à la réalisation du quatrième objectif de développement durable d'une éducation de qualité en garantissant une éducation de qualité équitable, en promouvant les opportunités d'apprentissage tout au long de la vie pour tous et en résolvant les difficultés rencontrées pour évaluer la pédagogie par multimédia et l'employabilité des diplômés.

Nous nous demandons donc dans quelle mesure la qualité de la pédagogie par multimédia influence le développement professionnel des étudiants. Cette étude se concentre sur l'étude de la mesure dans laquelle la qualité de certaines variables de la pédagogie par multimédia influence le développement professionnel des étudiants dans des établissements d'enseignement supérieur sélectionnés au Cameroun. Une hypothèse principale a été énoncée pour guider l'enquête comme suit: La qualité de la pédagogie basée sur le multimédia a une influence significative sur le développement professionnel des étudiants. A cette fin, une étude a été réalisée en utilisant des approches méthodologiques de recherche qualitative et quantitative; avec un questionnaire et des questions de groupe de discussion respectivement utilisés comme outils pour la collecte de données. L'étude comprenait quatre établissements d'orientation professionnelle et 439 étudiants comme échantillon, tous à la troisième (dernière) année de leur programme d'études. Ces étudiants ont reçu le questionnaire, tandis que huit (8) d'entre eux ont également participé aux discussions des groupes. Les données recueillies sur le terrain ont été analysées de manière descriptive et inferenciale à l'aide de la moyenne, de l'écart-type et de la corrélation de Pearson.

Par conséquent, les résultats obtenus à partir de l'analyse du questionnaire montrent que les qualités académiques, pédagogiques, didactiques et techniques de la pédagogie par multimédia influencent de manière significative le développement professionnel des étudiants à un niveau significatif de 0,01 respectivement. Ces résultats sont corrélés à ceux obtenus lors des discussions de groupe de discussion et indiquent que la qualité de la pédagogie par multimédia influence considérablement le développement professionnel des étudiants. Par conséquent, des recommandations ont été faites pour tous les acteurs. Un modèle sur l'évaluation des qualités de pédagogie par multimédia a été proposé inspiré des résultats.

Le travail se limite thématiquement à l'évaluation des qualités pédagogiques multimédias (académiques, pédagogiques, didactiques et techniques) et des variables de développement professionnel (répondre aux besoins des étudiants, soutien à l'apprentissage numérique et évaluation en classe); géographiquement limité à quatre régions de la République du Cameroun ; l'étude s'est déroulée de 2018 à 2019 ; Cette étude porte sur 439 étudiants de troisième année dans les quatre départements de orientation professionnel dans quatre universités Camerounais.

Mots clés: Évaluation, pédagogie par multimédia, qualité et développement professionnel

ABBREVIATIONS AND ACRONYMS

A. ABBREVIATIONS

AQ: Academic quality

B.C: Before Christ

CBA: Competency Based Approach

CBM: Curriculum-Based Measurement

CDs: Compact Discs

CKT: Content Knowledge for Teaching

CMS: Course Management System

CMS: Content Management System

CTML: Cognitive Theory of Multimedia Learning

Dev.: Deviation

df: degree of freedom

DLS: Digital learning support

DQ: Didactic quality

DVDs: Digital Video Disc

DV-I: Digital Interactive

E.N.S; Ecole Normale Supérieure

F: Frequency

G.C.E: General Certificate Examination

H.T.T.C: Higher Teacher Training College

HDTV: High-definition TV program

ICT: Information Communication Technology

ICTs: Information Communication Technologies

IDLS: Instructional Development Learning System

LMS: Learning Management Systems

MBP: Multimedia based pedagogy

MCMT: Medical College Admission Test

MRC: Multimedia Research Renters

NRTVB: Statistical Analysis Software

NTCTM: National Council of Teachers of Mathematics Teachers

OECD: Organization for Economic Co-operation and Development

P: Probability

PCK: Pedagogic Content Knowledge
PD: Professional development
Ph.D.: Doctorate of Philosophy Degree
PL: Phonological loop
PN: Professional needs
PQ: Pedagogic quality
PTA: Parents Teachers Association
r: Pearson correlation
SCLT: Social Cognitive Learning Theory
SLT: Social Learning Theory
SPN: Students professional needs
SPSS: The Statistical Package for Social Sciences
Std.: Standard
TQ: Technical quality
U.N.: United Nations
U.S: United States
UB: University of Buea
UBa: University of Bamenda
UK: United Kingdom
UNDP: United Nations Development Program
USB: Universal Serial Bus
W.W.W: World Wide Web
WW1: World War One (First World War)

B. ACRONYMS

ADDIA: Analysis, Design, Development, Implementation and Assessment
ADDIE: Analysis, Design, Development, Implementation, and Evaluation
APA: American Psychological Association
AQIP: Academic Quality Improvement Program
BCIT: British Columbia Institute of Technology
CAI: Computer-Assisted Instruction
CAT: Computer Assisted Teaching
CED: Committee for Economic Development

CEEB: Achievement Test

CIPP: CONTEXT, INPUT, PROCESS, PRODUCT

CIS: Classroom Interaction Sheet

Ha: Alternative Hypothesis

Ho: Null Hypothesis

ICTs: Information and Communication Technologies

ITU: International Telecommunication Union

JAVEA: Japan Audio-Visual Education Association

JAVEA: Japan Audio-Visual Education Association

JCSEPT: Joint Committee on Standards for Educational and Psychological Testing

MBIESD: Multimedia Based Instructional and Evaluation System Design

MEXT: Ministry of Education, Culture, Sports, Science and Technology

MINEDUB: Ministry of Basic Education

MINEDUC: Ministry of National Education

MINESEC: Ministry of Secondary Education

MINESUP: Ministry of Higher Education

MOOCs: Massive Open Online Courses

RAM: Random Access Memory

RSQC2: Recall, Summarize, Question, Comment and Connect

SAT: Scholastic Aptitude Test

SEAL: Social, Emotional and Academic Learning

SEL: Social-Emotional Learning

STEP: Sequence Test of Educational Progress

UNECA: United Nations Economic Commission for Africa

UNESCO: United Nations Educational Scientific and Cultural Organization

UNICEF: United Nations Children's Fund

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GENERAL INTRODUCTION

Professionalisation and digitalisation are current developments in higher education institutions. Higher education students are expected to be equipped for their future employment in this professionalised society. Without opportunities to break free from their regular school schedules, these students cannot be adequately prepared for the labour market or serve as engines for regional, societal, and global development. They require chances to practise professional realities and get oriented. Therefore, the modern mission of higher education institutions in Cameroon and around the globe is to support students' professional development.

Professional development as an essential tool for higher education graduates is acknowledged by the *Draft Document of the Sector-Wide Approach to Education* (2006). The document attests that only 37% of graduates from higher education intitutions in Cameroon successfully integrate and gain employment. This is a result of professional development problems in higher institutions resulting from the balance between training and the job market. Students' professional development fills the gap in the increasing demand for qualified jobs. The *Draft Document of the Sector-Wide Approach to Education* employs higher education institutions in its professional development drive to enhance professional training and match students training opportunities with employment opportunities. This is a strong indicator that students' professional development is an essential factor for graduate employability and the fight against unemployment, and it projects the efficiency of higher education institutions.

According to Germuth (2018), students' professional development is a necessity in education because it ensures the transfer of learning to practise. This is to curb unemployment after graduation and increase productivity in the professional arena. The only way students can gain career-oriented knowledge, skills, competences, and abilities is through professional development. Furthermore, Mizell (2010) affirms that high-quality professional development enables students to learn more, whether they are low, average, or high achievers. Also, professional development in the instructional and learning process improves students' effective learning, reflection, and practise. This is also reflective in administration, as professional development in an institution engages students, lecturers, and support staff, making the institution a centre of professionalisation.

Also, Jayaweera, Karunathilake, and Weligamage (2021) affirm that the importance of students' professional development with respect to quality has in recent years been acknowledged by both trainers and trainees. Professional development guides administration, staff, lecturers, and students in understanding and achieving training objectives and goals while considering future perspectives (Grogan & Andrews, 2002; Jayaweera et al., 2021). Professional development can only be achieved with improved instruction and learning. In this digital age, multimedia-based instruction is invariably the tool to be used in attaining the goals of professional development. Furthermore, professional development has resulted in a professional learning community that has helped individuals and students develop professionally through improved knowledge, skills, competences, and abilities (Jayaweera et al., 2021). Also, professional learning communities greatly improve the professional development of instruction and learning systems.

Students' professional development is a critical mission of higher education institutions, especially universities, which have as a crucial mission professionalisation for employability. De la Harpee et al. (2000) in Doh & Doh (2016) hold that it is a worldwide concern that higher education programmes are not efficiently structured to produce graduates endowed with professional skills that will make them successful in their respective future careers. Therefore, Doh & Doh (2016) conclude that the primary purpose of professionalisation in higher education and universities in particular is employability, which is motivated by the economic performance component of human capital theories. Therefore, the role of universities is human capital development. To effectively fulfil this role, professional development is indispensable. Therefore, universities are supposed to invest quality human and material resources in quality students' professional development.

The level of graduate employability stems from the level of students professional development and is a determining factor as well as an indicator exploited in measuring programme performance and university quality (Atem, 2023). Furthermore, Atem (2023) holds that quality education is a critical requirement for career development and sustainability, which in turn eradicates poverty. This is why UNESCO (2005) holds that the main goal of higher education institutions and universities is to train highly qualified graduates who will become productive citizens and sufficiently meet human needs in all human endeavours. This can only be possible through effective students' professional development, which exploits, among other things, multimedia-based pedagogy or instruction.

Since the 1993 higher education reforms, the concept of professionalising the higher education sector in Cameroon has been consistent. Therefore, Doh & Doh (2016) consider professionalisation to be the activeness with which universities and higher education institutions prepare their students for employment. Furthermore, Hillage & Pollard (1998) in Doh & Doh (2016) state that the employability mission of higher education is the capability of their graduates to gain and maintain employment as well as obtain new employment, as the trends indicate. Furthermore, Yorke (2001) and Doh & Doh (2016) affirm that the conception of employability in education has as its foundation the ability of university programmes to tackle "graduate" jobs. This can only be achieved through students' professional development. Professional development gives graduates opportunities to acquire and maintain jobs with respect to their fields of study, practise, and qualifications.

The Government of Cameroon has taken a number of efforts towards the professional development of students through the professionalisation of the higher education sector. These steps include, among others, the 1993 higher education (university) reform (Biloba & Ndoh (2016) assert that the 1993 reforms were carried out through a number of presidential decrees signed between April 1992 and January 1993 (Decree No. 93/026, Decree No. 93/027, Decree No. 93/034, and Decree No. 92/074), Law No. 005 of April 16, 2001, to guide higher education in Cameroon, the Poverty Reduction Strategy Paper (2003), Draught Document of the Sector Wide Approach to Education (2006), and the Employment Strategy Paper (2009).

According to Njeuma et al. (1999), one of the primary goals of the 1993 university reforms was the professionalisation of university studies. Professionalisation was intended to produce university graduates who could productively serve the Cameroonian private and public sectors and the nation as a whole. This mission was highlighted in its objective 3, which stated that '*make programmes more varied, professional, adapted, and responsive to the needs of the job market by providing more programmes that would enable graduates to find employment in the private sector as well as create self-employment*' (Njeuma et al., 1999). This reform did bring the expected changes, with one of the factors being fewer efforts and investments in students' professional development.

In emphasing professionalisation and graduate employability law N^{o} 005 of 16th April 2001, article 6, sub (1), states that *the basic mission of the Higher Education realm stipulated in article 2 above shall have the following goals: the mission for excellence in all domains of knowledge; the promotion of science, culture and social progress; social promotion, with the*

participation of competent national bodies and socio professional circles, especially as concerns the drawing-up of programmes as well as the organisation of theoretical courses, practical and internships; assistance to development of activities; the training and further training of senior staff; the deepening of ethics and national consciousness; the promotion of democracy and the development of a democratic culture; and the promotion of bilingualism. According to this reform, the main mission of the higher education sector and universities is to produce graduates who have been professionally trained to adapt not only to local but global job market.

The Poverty Reduction Strategy Paper (2003) focused on strategies for fighting poverty through the professionalisation of education and preparing graduates for the job market. Also, the Draught Document of the Sector-Wide Approach to Education (2006), in the same direction, commissions higher education towards professionalisation and employability. Furthermore, the Growth and Employment Strategy Paper (2009) commissioned the higher education sector to focus on students' professional development and employment under the guise of six programmes: Professionalism and Entrepreneurship, University maps and Higher Education Training, Research and Innovation, Development of ICTs, Assistance to students, and Managerial Governance. These are the fundamentals for efficient students' professional development for employability in higher education.

It is important to note that irrespective of the professionalisation reforms and strategies put in place by the government and the ministry of higher education, professionalisation of higher education programmes still remains the watchword (Atem, 2023). However, a lot of investments, support, and adequate human and material resources are required for the effective transformation of higher education in its professionalisation drive. This transformation can only be effected through the professionalisation of programmes and ensuring effective student professional development.

Most university graduates in Cameroon are either unemployed or underemployed. According to the International Labour Organisation's 2013 Report, Cameroon has an unemployment rate of 30% and an underemployment rate of 70%, and it further states that there are 4-6 million youths, mostly university graduates, who are ready to work (Penn, 2016). The worry is: what programmes do these university graduates study? How professional were these programmes, and what nature of professional orientation and support did they have in the cause of their study? Were these graduates prepared for the job market or for

certificates? How do employers view university products? The answer to these questions lies in the nature of professional development.

If higher institutions of learning and universities don't treat students' professional development as a matter of urgency, then graduate unemployment will continue to be on the rise, resulting in devasting socio-economic consequences. On the other hand, if higher education institutions give students' professional development the attention and resources it needs, the impact will be positive and lasting. Effective student professional development will greatly motivate instructional and learning processes, which will improve students' performance. This will increase student and institutional productivity, which will prepare graduates for the job market and greatly increase graduate employability. Some factors of students' professional development to be considered by higher institutions in this digital age are: addressing students' needs, digital learning support, and classroom assessment. These factors are enhanced by multimedia based pedagogy quality variables of academic, pedagogical, didactic, and technical nature.

Quality education is a primary consideration when examining students' professional development, which is determined by the quality of multimedia based processes and resources. According to Bernard (1999), as cited in the United Nations Children's Fund (2000), when referring to quality education, the focus or purpose of learning (instruction and learning process) is the strengthening of learners capacities to progressively act independently in the aspects of relevant knowledge acquisition, exploiting acquired and developed skills, and cultivating the appropriate attitudes. This quality creates an environment of safety, security, and healthy academic, social, and professional interactions.

Furthermore, the EFA Global Monitoring Report (2005) holds that, though the international community has engaged through a number of treaties with respect to quality education, such as the United Nations Millennium Declaration and its commitment to achieve at least Universal Primary education, which is a prerequisite to higher education, the policy is more focused on quantity and neglects explicitly referencing quality. Quality education, especially at the implementation and product level, enables learners to be regular and stay in school until completion, are motivated to further their studies, develop emotional and creative skills, be very active professionally, and be productive citizens when they complete their educational cycles (EFA Global Monitoring Report, 2005). For Cameroon to emerge by the year 2035, as is President Paul Biya's vision, the country has to greatly improve its quality of

education so as to achieve a higher quality educational outcome by making educational processes and outcomes qualitative.

Multimedia based pedagogy, otherwise known as multimedia based instruction, is one of the key factors that enhance students' professional development in digital-age higher education institutions. According to Mayer (2001) and Gilakjani (2012), multimedia creates opportunities for a complex-sensory experience in the instruction and learning processes through the presentation of data through text, images, graphics, audio, and video, which increases the capacity of learners to integrate large amounts of complex information. Multimedia-based pedagogy enables efficiency in the presentation of well-structured information, using multiple presentations to improve memory, motivate active processing of information, and present multiple pieces of information at once (Larkin & Simon, 1987; Penney, 1989; Ainsworth, 1999; Sweller, 1999; Gilakjani, 2012). Multimedia-based pedagogy is therefore a major factor that enhances students' professional development. For this reason, its components are supposed to be of standard quality to effect quality education.

Multimedia based pedagogy has a sensitive role to play in students' professional development. According to Mustafa (2012), multimedia-based pedagogy is proficient because it has great opportunities for improving students' learning achievements, which in turn will lead to their professional development. The role of multimedia-based pedagogy in learning is enormous. Zachmann (1999) and Mustafa (2012) identify the following: increases students' motivation and attitude towards knowledge building; creates opportunities for students to acquire and develop critical learning experiences by observing and manipulating real products; the use of technology provides opportunities for students to explore; multimedia-based pedagogy stimulates active participation in learning activities and strengthens students' practicality. It is because of the role multimedia-based pedagogy plays in enhancing students' professional development that its quality attracts the attention of the researcher.

The world has evolved radically when it comes to technology. ICTs in Educational technology have equally followed the technological trend of evolution and innovation by not only making education technology-oriented but by actively using technology in educational processes. Technology is used to improve the academic, pedagogic, didactic, and technical qualities of the instructional and learning processes. Also, ICTs, of which multimedia is a key component, are today at the centre of educational instructional technologies. It is absurd to talk about the teaching and learning process today, especially in higher education, without

mentioning multimedia because it covers all teaching and learning environments, such as classrooms, offline, and online. Electronic education (e-education), such as electronic learning (e-learning), distance education, and blended learning, are the current trends in education today and are facilitated by multimedia-based pedagogy (instruction) programmes.

Also, with respect to students' professional development, Doh (2012) in Doh & Doh (2016) sees professionalisation in the Cameroonian context as a strategy to adapt higher education programmes and their related technologies to socio-professional needs and applicability. Also, Maharasoa and Driekie (2001) in Atem (2023) hold that universities that do not empower graduate employability are not only wasting students' time and energy but, most importantly, are wasting state resources. This is why the Sector-Wide Approach (2006) acknowledged that Cameroon's Higher Education sector is suffering quality inadequacies in a number of elements, including instructional resources. Therefore, it is imperative to examine multimedia-based pedagogical qualities in relation to their influence on students' professional development for quality purposes.

Additionally, Section 3 of the 2001 Higher Education Law, which focuses on the assessment of higher education components for quality purposes (Law No. 005 of April 16, 2001), is compliant with analysing the relationship between multimediabased pedagogy and students' professional development.Therefore, the main purpose of this study is to evaluate the relationship between the quality of multimedia based pedagogy and students' professional development. This study was carried out on third-year students of the Department of Curriculum Studies and Teaching in the Faculty of Education, University of Buea; the Department of Journalism, Faculty of Economics and Management Sciences, University of Bamenda; the Department of Engineering Economics, Faculty of Petroleum Industries and Mines (Faculté des Mines et des Industries Pétrolières); and the Information and Communication Technology (ICT) University, Yaounde Campus. They contain all the variables under study (academic quality, pedagogic quality, didactic quality, and technical quality), and they are also professional development-oriented.

PART ONE

BACKGROUND TO THE STUDY

This part of the work examines the historical background, contextual background, conceptual background, theoretical background, formulation of the problem of the study, and definition of key concepts of the study.

Chapter one (1) focuses on the background trends of the problem under study from the perspectives of historical, contextual, conceptual, and theoretical backgrounds. Firstly, the historical background section presents the trends of quality education in higher education, the historical evolution of teaching machines, the trends of using ICTs in the Cameroonian educational system**,** multimedia in education, the history of pedagogy, and the evolution of professional development. Secondly, the contextual background section presents the evolution of Cameroon as a nation, the evolution of higher education in Cameroon towards quality, information and communication technologies (ICTs), evaluation and assessment for quality in higher education in Cameroon, and professionalization of the higher education sector.

Thirdly, the conceptual background section provides a brief definition and insights into the concepts multimedia, pedagogy, multimedia-based pedagogy or instruction, evaluation, quality, professional development, and assessment. And the theoretical background section focuses on the brief presentation of theories exploited in the work, which include the cognitive theory of multimedia learning (instruction inclusive), the ADDIE model, the CIPP (context, input, process, product) evaluation model, Kirkpatrick's four-level evaluation model, and the social learning theory of Albert Bandura from a professional development perspective.

Fourthly, the chapter focuses on establishing the problem statement for the study. Presenting the purpose of the study by stating the general and specific objectives of the study; the research questions are also presented in this chapter in the form of general research questions and specific research questions. Also, the research hypotheses are presented in the form of general hypotheses and research hypotheses. Another component examined in this chapter is the scope of the study. This section also presents the thematic limitations, geographical limitations, temporal, and spatial delimitations; and the significance of the study. The chapter concludes with the definition of key concepts from the study.

CHAPTER ONE
BACKGROUND TO THE STUDY

1.0. INTRODUCTION

This research work focused *on* evaluating *the relationship between the quality of multimedia-based pedagogy and students' professional development*". In this section of the work, the trend of the problem under study is examined from four main dimensions, which are: the historical background, contextual background, conceptual background, and theoretical background of the problem under examination. This chapter also focuses on establishing the problem of the study on the topic "*The quality of multimedia-based pedagogy and students' professional development*". This section of the work presents the statement of the problem, the purpose of the study, the research hypothesis, the scope of the study, the significance of the study to various stakeholders, and the definition of key terms in the work.

1.1.0. HISTORICAL BACKGROUND

The historical background section examines trends in higher education quality, the historical evolution of teaching machines, trends in using ICTs in the Cameroonian Educational System, the evolution of multimedia in education, the history of pedagogy, and trends in professional development.

1.1.1. Trends of Quality in Higher Education

For many academics and authors, the notion of quality in education, particularly in higher education and evaluation, has presented a variety of challenges (Sunder, 2016). According to Leonard & Sasser (1982) and Seth et al. (2005) in Sunder (2016), "quality" has drawn the interest of researchers and practitioners in recent decades because it has a significant impact on how well institutions and organisations perform, lowers costs, satisfies customers, and fosters customer loyalty, all of which contribute to the profitability of the institution or organisation. Quality is therefore discussed in light of the institution and context. Furthermore, Haseena & Mohammed (2015) confirm that the knowledge-driven nature of 21st-century society extends to its educational institutions and organisations, particularly higher education. 'Quality' is used as a defining characteristic of this knowledge-driven society and its educational institutions.

In the views of Sunder (2016), which supports those of Haseena and Mohammed (2015), 21st century researchers and practitioners have not focused on defining quality in education, but rather have scientifically come up with quality parameters prescribed for higher education institutions. These parameters, which include examination results, the external reputation of the institution, and the employment rate of their students upon graduation, are used to rate higher education institutions on the basis of performance. However, 21st century educators believe the focus of the century is on equity and quality in education. Ensuring that all learners experience equality in education is referred to as equity, while exploiting the right methodology in the instructional process results in quality (Haseena & Mohammed, 2015).

According to Sunder (2016), by the end of the 21st century, the foundation for evaluating quality in education had been laid by Crosby and Juran. They focused on constructs of quality in education rather than defining quality in education. Therefore, they believed that quality should be determined through a measuring activity rather than focusing on the concept. From this perspective, Crosby (1979) and Sunder (2016) hold that quality excellence in higher education refers to the conformance of an entity, institution, or organisation to correctly elaborated requirements, identified through a measuring activity based on tangible targets. On the other hand, Juran (1983) examines quality excellence from a managerial breakthrough background, which, in his opinion, could be achieved by using the quality trilogy. Furthermore, Krishnaiah and Rao (1988) in Sunder (2016) advised that a key to quality excellence is educating institutional leadership on the importance, principles, methods, and obligations of quality in their institution.

Furthermore, Minazheva (2020) noticed that in recent years, public views on quality in higher education have drastically changed and are continuously changing at a rapid rate. This has resulted in quality being the main complex, simultaneous, and crucial problem of 21st century higher education institutions. Minazheva (2020) further states that the 20th century was marked by the activities of universities and higher education systems being evaluated using mainly quantitative indicators such as student-to-inhabitant ratio, allocated budget for higher education, and teacher-to-student ratio. While evaluation of higher education in the 21st century focused qualitatively on employability through school and job market relations, quality education assurance, evaluating the effectiveness of higher institutions of learning, meeting modern requirements, and considering the paramount importance of international indicators of quality in higher education,

Also, towards the end of the 20th century and the beginning of the 21st century, there has been an emphasis and a series of studies on quality excellence through the building of theories on the foundations of Crosby, Juran, and Krishnaiah (Sunder, 2016). Sunder (2016) further affirms that the last two decades have experienced an incessant effort by higher education researchers to understand quality perspectives in the higher education sector. In this direction, since the 1990s, higher education has evolved from the Total Quality Concept (TQM) to Lean Six Sigma (LSS).

According to Minazheva (2020), the European countries and the European Union have a clear trend towards addressing quality issues in higher education. As a result of quality assurance challenges, the attention of most European countries was pulled towards the concept of quality in the educational process in the early 1980s. In 1984, the United Kingdom expressed the need for Higher education evaluation to be focused on quality and investment, while in that year Greece instituted a National Quality Committee. In 1985, the Netherlands commissioned and committed to autonomy and quality in higher education. This move was followed by other European countries and other nations. The result was the 1991 European Union Memorandum on Higher Education, which was later resonant with some of the provisions of the Sorbonne and Bologna Declarations. In 1995, UNESCO (the United Nations Commission on Education, Science, and Culture) came up with a programme entitled "*Reform and Development of Higher Education*" with a focus on quality assurance (Minazheva, 2020).

With the UNESCO programme, the assessment and evaluation of the quality of education, which started in the 1980s, progressively acquired public and international functions. Furthermore, there was the adoption of the World Declaration of Higher Education for the 21st Century by the Conference of Higher Education under the auspices of UNESCO. According to Minazheva (2020), the declaration affirmed that "*Quality in higher education is a multidimensional concept that should cover all its functions and activities: educational and academic programmes; research and scholarships; staffing; students; building; material and technical base; equipment; work for the good of society and the academic environment*". This declaration had as an underlining factor the need to provide quality training to professionals.

Minazheva (2020) also states that the declaration for European countries was not the end, as on May 25, 1998, the French, Italian, British, and German ministers of higher education signed the Sorbonne Tied Declaration on the Harmonisation of the European Higher Education System Architecture based on the concept of quality. This declaration was

aimed at creating a single European education space by 2010. This resulted in the European higher education sector creating an independent association for quality assurance. These associations or civil society institutions made up mechanisms for feedback in society students, employers, universities, and state interests through examination of higher education learning activities exploiting assessment, audit, and accredition.

Also, the crown of quality education in the 21st century, though focused on elementary education, gives an insight into Quality Education in Article 4.1 of the Sustainable Development Goal (Derek et al., 2015). However, it is important to note that quality assurance has not evolved in higher education, neglecting technological evolutions and innovations. The 21st century is known as the age of technology, with digital technology dominating but not being the only factor that influences quality in 21st-century higher education institutions. However, according to Kasozi (2014), in the 1980s, most of the African countries located in the sub-Saharan region installed government-funded semiautonomous higher education sector regulatory agencies for quality in higher education.

In the view of Kasozi (2014), these agencies have over the years facilitated government engagement and processes in establishing, managing, and supervising higher institutions of learning. These agencies ensured that quality education was given to the citizens by the higher education sector in general and institutions of higher learning in particular through the generation of new knowledge, innovation of higher education systems, and economic development. Kasozi (2014) holds that the agencies have greatly reduced direct government micromanagement because they act as broker bodies between the respective governments and the higher institutions of learning, especially as far as quality education and quality assurance are concerned in the higher education sector.

1.1.2. Teaching machines as instruments of quality teaching and learning (education)

Over the years, educational technology has evolved, increasing the interest in the use of technology in the learning and teaching processes for improvement and efficiency purposes. This evolution has gone through a number of phases and stages, from machines to the digital appliances used today, which facilitate and are components of multimedia-based pedagogy. Benjamin (1988), quoting *Contemporary Psychology*, stated that Skinner himself expressed his doubts or uncertainty in identifying the originator of teaching machines, but he identified Pressey as the first psychologist who was involved with teaching with or by

machine. He further explains that the United States Patent Office recognised Pressey's invention and issued a patent in 1866 to Halcyon Skinner for producing a device that aided in teaching spelling. Benjamin cites three authors (Mager, 1959; Cook, 1962; and Holland, 1960) who give credit to Halcyon Skinner for having invented the first machine used in teaching.

According to Benjamin (1988), the desire to obtain educational device patents was difficult until a patent by Sidney Pressey surfaced in 1928, and this device was called the "*Machine for Intelligence Tests*" Pressey (1946) stated that by 1915, Pressey had gotten the notion of a teaching machine and was thinking of ways to score objective tests using a machine, but the work was delayed by the persistence of the First World War (WW1). It was only in 1924, after the First World War, that he succeeded and exhibited a functioning model of his machine in an American Psychological Association (APA) meeting in Washington, DC. After some technical modifications, he again exhibited it in the following American Psychological Association session in Ithaca, New York.

MACHINE FOR INTELLIGENT TESTS: TWO DIAGRAMMATIC REPRESENTATIONS

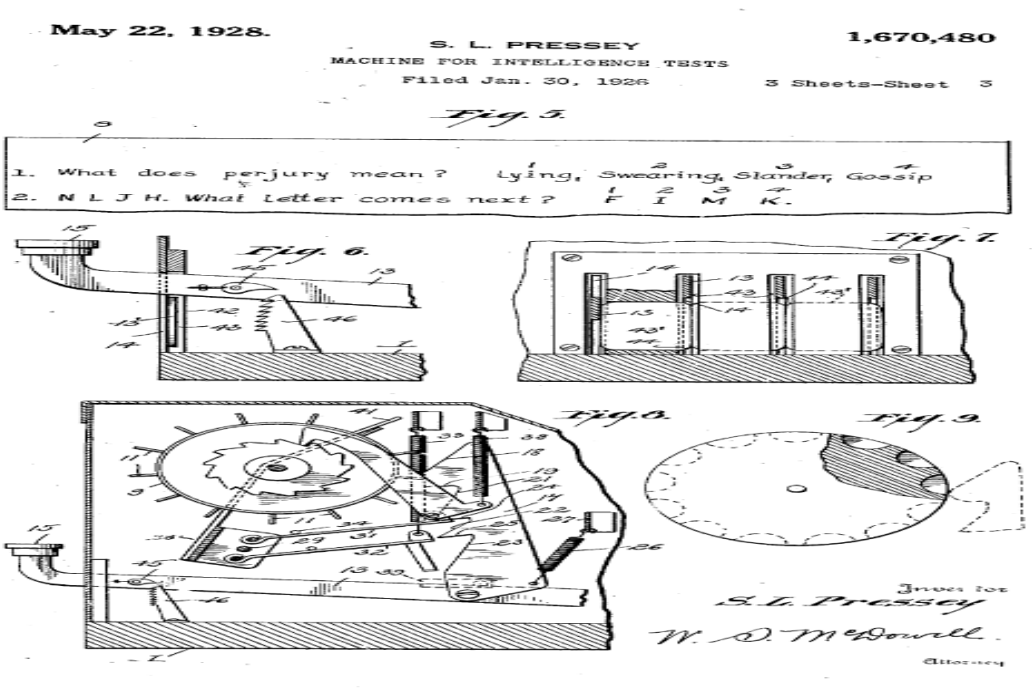

Figure 01: Machine for Intelligent Tests

Source: Pressey (1946)

The merit of the programme was its ability to prevent or reduce abusive overlearning in order to proportionately apportion concentration to each problem with respect to its difficulty (Pressey, 1946). Pressey intensified his research on teaching machines, getting his students involved in testing the efficacy of his machines as compared to traditional methods of teaching. He advocated for technological solutions to the numerous educational problems and predicted the coming educational industrial revolution. He foresaw educational sciences merging with educational technology to modernise conventional education, where work in schools will be more organised and will take individual characteristics and learning differences into consideration in the learning process.

After Pressey, there was the emergence of B. E. Skinner in the domain of teaching machines. He was inspired to build teaching machines in 1953 when he visited his daughter in a fourth grade class and observed that in the course of an arithmetic (mathematics) assignment, all the learners proceeded together (at the same pace), and secondly, it was only after 24 hours that the learners could get the accuracy of answers (responses) to the problems posed earlier. Shortly after that observation, he constructed a machine (considered primitive) for the teaching of arithmetic. The machine was designed to present a problem, and when the learner moves the right levers, the right numerical answer is created and shown by the appearance of light. This machine was presented in 1954 at the University of Pittsburgh during a conference on the *practical application of behavioural science.*

SKINNER'S SPELLING TEACHING MACHINE

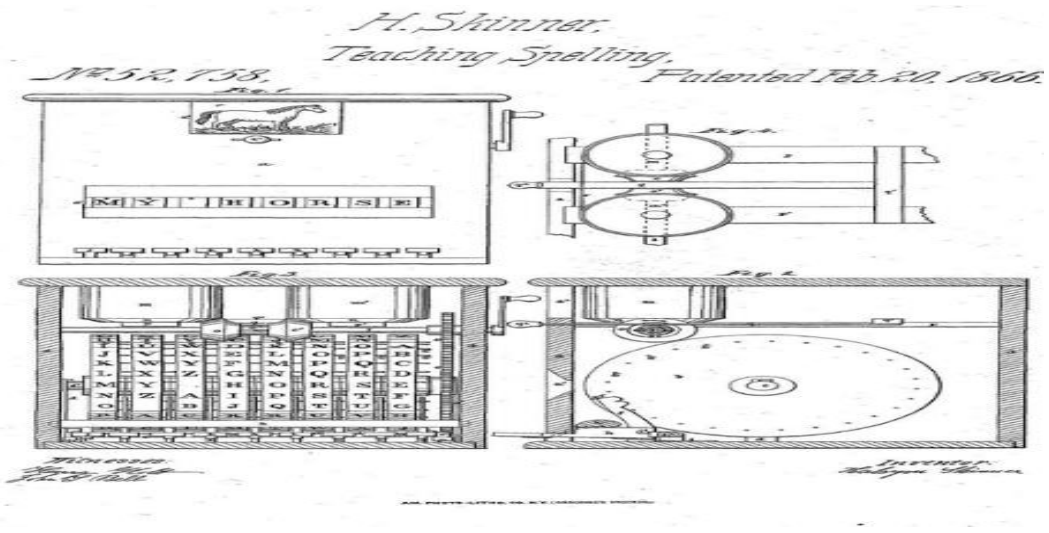

Figure 02: Skinner's Spelling Teaching Machine

Source: Benjamin (1988)

Benjamin (1998) holds that teaching machines, by the 1960s, were making much news as quality enabling tools in education. This led to the holding of conferences in the United States of America and internationally to discuss and examine the issue of new educational technology. Popular scientific and educational journal journals published articles on the emerging applications and research. And by 1960, "*teaching machine*" was used for the first time as an index term in twelve (12) entries of the *Psychological Abstracts*. However, on the other side, write-ups came up that were sceptical about the use of machines in teaching and pointed out a number of potential disadvantages. Such write-ups included Gilmore's 1961 "*Will Robots Teach Children?"* and *Boehm's 1960 "Can People Be Taught Like Pigeons*?".

Furthermore, Benjamin (1988) holds that these crises push professional organisations to be concerned about these existing problems with teaching machines and other problems affecting the educational system. They examined the situation critically and came up with guidelines to facilitate the use of teaching machines. Such was the case with the American Psychological Association, the National Educational Association, and most importantly, the Educational Research Association, which in 1961 came up with "*Self-Instruction Materials and Devices,*" which was a joint statement on the use of educational machines.

Later in 1963, they came up with a more detailed report known as the "*1962 Interim Report*". This report reiterated the key role of excellent programmes in making machine teaching effective and efficient, and it further elaborated criteria to be used in evaluating how effective a programme is in the teaching and learning process. The committee also recommended that research be carried out to establish the relative effectiveness of different types of teaching and learning programmes. This, however, did not unite the opinions of the educators. Boehm (1960) holds that Thomas Gilbert of the University of Alabama, after the work of the committee, still discourages the use of teaching machines in his statements.

Computer-assisted instruction was the outcome of a project on teaching machines in the late 1950s at the IBM Research Centre. IBM experienced the development of two (2) successful initial computer-assisted instruction programmes in the 1960s and early 1970s. Researchers at Stanford University developed the IMB 1500 Instructional System, and those at the University of Illinois cooperated with Data Control Corporation and developed the Programmed Logic for Automatic Teaching Operations (PLATO) (Atkinson, 1968; Pagliaro, 1983).

In the 1970s and 1980s, classroom computers came into existence for quality improvement purposes. Benjamin (1988) holds that computers in the classroom faced the problem of cost; they were expensive as compared to other teaching machines, and the programmes were not very easy to use. However, evolution and innovation in classroom computers were so fast in its components, especially microprocessors, were developed, leading to the existence of microcomputers, which were at the disposal of the public as of the late 1970s. According to Pagliaro (1983), the technological problems that accompanied the use of computers as teaching machines included insufficient quality educational software, transferring programmes from one system to another, grading learners from individual recordings and responses in the classroom, and how to keep the electronic records.

According to Raiser (2001), the 1990s and 2000s were years of rapid development and innovations and inventions with regard to computer, digital, and internet technologies, which greatly attracted and influenced their massive use in education in general and instruction in particular. Also, there has been a sharp increase in those enrolling in distance learning in higher education, with courses delivered using the internet, intranet, and CD-ROM, with computers as the main tool. In recent times, with the rapid advances in computer, information and communication, digital, and internet technologies, there has been a close to obligatory trend for the use of these advanced technologies in the instruction and learning process, especially in higher education. They have also brought about types of education such as Electronic Education (e-education), Electronic Learning (e-learning), and Blended Learning.

1.1.3. Trends of using ICTs in the Cameroonian Educational System for quality education purposes

According to Billa (2017), *Cameroon is a central African country that has put in a lot of efforts to make multimedia, or Information and Communication Technology (ICT), functional and development-oriented in society and increase students' performance in schools and the educational sector as a whole*. Also, the Education and Training Sector Strategy Paper, 2013-2020 (2013) holds that 50 percent (50%) of Cameroonians are of youthful age; this makes the demand for education in general and higher education in particular very high, being a push force that influences the creation and opening of more schools and higher institutions, their improvement, and the provision of equipped infrastructures, and serving as the basis for the provision of professional human, quality material, and sufficient financial resources by the government and its partners.

Furthermore, the sector of education has been structured into five ministries: the Ministry of Basic Education, the Ministry of Secondary Education, the Ministry of Higher Education, and auxiliary ministries, of which the Ministry of Employment and Vocational Training, Youth's Socio-professional Integration, and the Ministry of Youth Affairs and Civic Education (Education and Training Sector Strategy Paper, 2013-2020, 2013 as cited in Billa 2017). The ministry of higher education develops professional skills, while the other auxiliary ministries mainly focus on job orientation and helping school dropouts. The Paper further reiterates that the bi-cultural heritage (English and French) of Cameroon makes room for a multi-faced educational system that is diverse, leading to diverse instructional methods (of which multimedia-based pedagogy is one) and order in the curriculum implementation process. However, it is important to note that the Cameroonian educational system is centralised in terms of legislation and regulation. This makes the state a major actor and factor in determining the quality and standards of education.

The Ministry of Basic Education (2007) affirms that Information and Communication Technologies (ICTs) are at the focal point of changes in educational quality trends around the world these days. Digital media is leading, as it has revolutionised Cameroonian society from the perspective of information and ICTs, which in turn is bringing great quality changes into the instruction and learning process due to how it has advanced the educational sector as a field. This has given room for the creation of new opportunities in instruction and learning as well as facilitates access to a series of quality educational resources. For school products to be professional and competitive in the global economy, they require a certain aptitude and skills (professionalisation) in the professional application of Information and Communication Technologies to everyday and professional life. This has to be a result of professional development.

Tchinda (2007) holds that ICT in education was introduced in Cameroon in the 1990s, mostly by private schools, and back then the state had no particular official policy stating or defining the introduction of ICT or multimedia-based instruction in the Cameroon educational system. It was not until the year 2001 that the president of the Republic of Cameroon got fully involved by signing a presidential decree making ICT official in the whole educational system, with much focus on higher education, secondary, and tertiary education, while primary schools were only included six years later, in 2007. There was the construction and establishment of multimedia research centres (MRC) in all state universities, professional and

technological schools, and some secondary schools. However, the project experienced some difficulties because it overdepended on foreign funding, which made sustainability complex, as well as because materials were not produced locally.

Also, the then Minister of Basic Education, Her Excellency, Madam Haman Adama, in Ministry of Basic Education (2007) holds that His Excellency, Mr. Paul Biya, in his capacity as the president of the Republic on the 10th of February 2001, in his usual address to the youths on the eve of the National Youth Day celebrations, while discussing the educational system, laid emphasis with much promise on the importance of integrating ICTs into the Cameroonian educational system. The promise was concretized in less than ten (10) months with the inauguration of the first two multimedia resource centres. This took place in two (2) high schools in the Capital city of Yaoundé on November 30, 2001. This great action was multiplied in other secondary schools across the nation, hence the need to get down to the basic education level.

The use of Multimedia and Information and Communication Technology (ICT) in the Cameroonian educational system is virtually similar in meaning due to the fact that they are classified as educational technology components. The elements of multimedia in education are classified as a component of ICTs in education, especially in the instructional process, and treated in that manner. The National Information and Communication Technology Policy Document (NAICT, 2007 as cited in Billa, 2017) in Cameroon has a presenting sentence that states as follows: "*Today, there is consensus on the fact that the information society, in which ICTs constitute one of the most powerful vectors, opens entirely new opportunities for reaching higher levels of development."* Therefore, if ICTs with multimedia as a major and important component can be given an important role with regards to the instruction and learning processes in lecture halls and class rooms, constitute a major factor in leading to new opportunities, and act as a catalyst of educational productivity, professional development, and the development ofsociety, it is therefore imperative, especially at the level of higher education.

According to the Cameroon Information and Communication Infrastructure (NICI, 2004 as cited in Billa 2017), key strategies for effectively integrating and using ICTs as instructional and content tools in schools have been outlined in Cameroon with the facilitation and support of the United Nations Development Programme (UNDP) and United Nations Economic Commission for Africa (UNECA). The Cameroonian government acknowledged in

this document the priority nature of ICTs in education. The government in the field of education planned to: introduce and implement ICT in schools as an instructional and content tool, so as to modernise the educational system; introduce and implement ICT application modules of training in national or state universities; prepare a sectorial ICT policy meant for the education sector; train teachers on the use of ICTs in research and instruction; and provide and facilitate support in the production processes of ICT teaching.

Tchinda (2007) affirms that, in June 2005, the Prime Minister of Cameroon signed a Prime Ministerial Decree creating and organising a sub-committee for the integration of Information and Communication Technology (multimedia) in the entire education system in Cameroon. Also, in 2002, the then minister of national education further signed a ministerial decision that defined the creation of MRCs in government schools at the secondary level, and in 2003, he signed another decree that made ICT a subject obligatory beginning in September that year.

According to Mbangwana (2008), as cited in ERNWACA Cameroon (2005), efforts have been made and are continuing with respect to integrating ICTs, of which multimedia is a key component in schools. Most of the efforts today are above the pilot stage. However, they have been able to facilitate the movement of pedagogic and administrative culture from traditional teacher-ccentred pedagogies, which also contain memorization, to those that are more constructivism-oriented and pupil-centred in approach. This has enabled pupils and students to assume more responsibility with the motivation of improving their skills in the processes of problem solving through ICT and multimedia-based pedagogy.

Also, Mbangwana (2008) makes proposals with respect to conditions to be fulfilled in Cameroon to facilitate the use of multimedia (multimedia-based instruction) as well as ICTs and make them more effective and efficient. This will, in turn, have a positive evolutionary impact on the instruction-learning process in lecture halls and classrooms. They include: effective leadership from school administrators, lecturers (teachers), and learners, with a focus on financial and resource management, materials, and equipment maintenance; Developing, constructing, and carrying out renovations. This is because most lecture halls and classrooms were built when technology in general and multimedia devices were not adopted for the teaching and learning processes. Therefore, these lecture halls and classrooms have to be equipped electrically and space created to facilitate the application or implementation of multimedia in lecture halls and classrooms.

According to Billa (2017), Cameroon is experiencing the stage of full integration of multimedia technology in schools, starting with multimedia halls while lecture halls and classroom processes are closing in slowly but steadily. One of the main challenges facing the Cameroonian educational system is greatly related to policies on ICTs and multimedia in schools and the educational sector in general. With this, the history of ICTs and multimedia in education has been reduced in Cameroon to a focus on computers and the internet, thereby neglecting many components and elements of technologies or educational technologies that play a key role in the Cameroonian educational system. These policies are experiencing crisis with explicit programme design, professional teacher training, modern equipment acquisition, updated school demographics, teacher (lecturer) numbers, professional training opportunities, and sustainability.

Furthermore, Billa (2017), between 2004 and 2012, the government of Cameroon placed Teacher Training Colleges under the patronage of the Ministry of Basic Education. The Ministry of Basic Education, with respect to ICTs, saw their needs and importance and engaged in reforming the school curriculum (programme) to include ICT as an instructional and learning material, with the purpose of developing skills that will enable tutors and teachers to better prepare students and pupils to respond to the high demands and expectations of the information society. It was in the year 2007 that this project was implemented in the Primary Schools and the Teacher Training college Curriculum in Cameroon (the MINEDUB school curriculum), following Order No. 5592/B1/780/MINEDUB/CAB of September 24, 2007 (Ministry of Basic Education, 2007). In 2012, the Teacher Training Colleges experienced their placement under the Ministry of Secondary Education.

With these new developments in the Teacher Training Colleges in the Ministry of Secondary Education, the ministry deemed it necessary to develop a new curriculum (programme) with ICT as a great priority. Following Decision No. 495/B/MINESEC/CAB/30th August 2013 elaborating the implementation of the new T.T.Cs (Teacher Training Colleges) curriculum, in the forward, the then minister made it very clear that Teacher Training ceases to be a simple classical training; it has been transformed into a vocational training with great focus on the practise of the teacher trade. This practise was considered in its entirety as follows: the educator and, as a guide, a teacher after due training should be capable of teaching, communicating (using modern technological tools), educating,

analysing, and regulating his practises by getting involved and taking appropriate innovations and positive changes (Ministry of Secondary Education, 2013).

Billa (2017), further affirm that one of the striking innovations of this programme was the addition of a practical technological course to ICT as a subject. There was the introduction of Didactics of Educational Technologies as a course with the following orientation: to facilitate student teachers in solving problem-situations, which in turn makes proper use of educational technologies tools and materials in school; using Potential manual and cognitive tools; and also integrating educational technologies in the instructional and learning processes with respect to contexts; Prepare and present lessons using educational technologies in the context of a competency-based approach (CBA). Methods, procedures, techniques, style, model, and lesson notes Effectively and efficiently evaluate student teachers learning using educational technologies in the CBA context; Evaluation of learning with educational technologies (Ministry of Secondary Education, 2013).

Ngome (2012) holds that the Cameroonian educational system in general and higher education in particular are being modernised with the aid of Information and Communication Technology (ICT), of which multimedia-based instruction is a component when it concerns ICT in education, responding to the demands of globalisation. He emphasises that Cameroon is one of the countries in the sub-Saharan region that is progressing significantly in the use of ICT in the school curriculum, both as a tool and as a course.

Furthermore, in 2001, under the "Cyber Education Project," according to ICT in Cameroon (2007), as cited in Ngome (2012), the president of the Republic officially instituted Information and Communication Technology (ICT) in the Cameroon education system as a whole. All the then-state universities experienced the creation and installation of multimedia centres; state technological and professional institutions were not left out, as even secondary schools were included in the project. This showed the determination of the government to bring the youth of the nation into line with technological evolution and globalisation. This has grossly changed the mode of instruction in some higher education institutions.

In addition, Ayoo (2009) and Chiafie (2011) reiterate that there is massive interaction online between teachers and students, teachers and students, and researchers without physical contact. In addition to this, studies in contemporary times have gone digital due to the innovations in ICTs; some higher institutions, universities, and libraries are digital. There are

today a series of digital (virtual) higher education institutions that offer off-campus programmes ranging from bachelor's to doctorate levels in diverse settings and environments. This is thanks to new technologies impacting the education sector. Information and Communication Technologies (ICTs) exploitation, inventions, and innovations in the educational sector have resulted in what is known today as distance learning, e-learning, and blended learning, which are very present in the Cameroonian higher education sector.

Therefore, Cameroon has gradually but steadily evolved in the use of technology, especially ICTs, in education in the primary, secondary, and higher education sectors, and it is relevant to note that the sector with the highest level and speed of evolution is the higher education sector. This is evident today through multimedia-based pedagogy and e-learning.

1.1.4. Trends of multimedia in quality learning and teaching

The age of computers in classroom teaching and learning processes came into effect effectively in the 1980s, and it was coupled with the first educational multimedia material (the origin of multimedia-based pedagogy) in the world (Hamano, 1988). Hamano (1988) and Iiyoshi (1989) hold that the first multimedia material in the world was produced by a school in the United States of America and was called the *Voyage of the Mimi;* the school was known as the Bank Street College of Education. It was done with the aid of the United States Department of Education, which played a great role in selecting a multimedia scheme from multiple numbers of applicants in 1981 for the development of multimedia schemes for mathematics and science. It was after forty (40) months and a total expenditure of about seventy million dollars ($70.000.000), which came as subsidies during the development process, that in 1984 the project saw its completion.

Between 1985 and 1987, the Bank Street College went into serious research, and the final product was the production of "*Palenque*" and a second *voyage of the Mimi*. This was done with the help of financing from the United States Department of Education and the National Science Foundation for a cost of about $10.000.000 (ten million dollars). In this production, while the Television drama maintained its place as the key or main material, the story line was changed.

According to Iiyoshi (1989), the aspect that was new with the production of the *Second Voyage of Mimi* was the element of the introduction of the experimental '*Palenque*'.

The Palenque, structured as video-disc material, was a prototype that was produced using funds or with financing from a private organisation. It was built to contain a recording system that supported an hour of animated images with the aid of a DV-I (Digital Interactive); it also constructed multimedia data using a compression technique that facilitated the search for important elements or aspects of interest to learners. Furthermore, there was the possibility to retrieve all still, textual, or animated images by using a personal computer monitor. The functions of *Palenque* included Exploration mode, museum mode, game mode, and simulation tools.

In the 1960s, introduction and implementation learning were programmed, and in the 1970s, this programmed learning was associated with computer technology to make it accessible. This accessibility was very instrumental in the development of CAI (computer-assisted instruction). The invention of interactive digital tools in the 1980s in the information technology industry greatly affected the use of multimedia devices and materials in the teaching and learning process. *Palenque* was completed in 1987, and the aid of digital technology was very instrumental in the production of multimedia materials that were contemporary (Gayeski, 1996).

The next country that, in the 1980s, got very interested in and engaged in educational technology in general and multimedia in the teaching and learning process was Japan. The Japanese also created a virtual museum in 1988–89 through the Japan Audio-Visual Education Association (JAVEA). The project benefited from funds from a number of Japanese ministries (Education, sports, culture, science, and technology, otherwise known as MEXT). JEVEA's project resulted in the realisation of the Bunkyo Literature House, which focused on multimedia-oriented development and research. It had the vision to develop Palenque-like teaching and learning multimedia materials.

In 1990, the Japanese carried out a test production known as *Hito to Shinrin* (humans and forest). This project was realised with the support and collaboration of the Japanese Apple Computer and a department known as the School Broadcasting Programme. It was made up of HDTV (a TV programme), which was the main material and was of high-definition; HDTV images were supported or accompanied by a text book that was digital in nature; and the retrieval of the library shots programme was equipped with a multimedia learning system (Hidi, 1990). *Humans and forest* were organised and structured with respect to materials and functions in *The Voyage of Mimi* from the point of view of Kihara and Mizukosi (1992).

Looking at multimedia in quality education from the perspective of *Jintai* (1995), it has to do with the combination of a number of educational bidirectional hypertext simulation technology equipment, which includes printed materials, slides, and cassette tapes. It also has to do with encyclopaedias, movie and radio-programmed learning material, computer-aided learning material, database technology with audio-visual characteristics, Television, video recorders, and voice and image, which are produced by a computer-controlled communication system to create, accumulate, convey, and search an information network for characters, graphics, and voice.

According to Gayeski (1993), Bunkyo Literature House in 1988 came up with bidirectional videodisc material with communication ability, digitalization of information, internal CD-ROM, telephone, and telegram. The Human Forest (1990) brought the internet and DVDs into multimedia in education, which was multimedia material with computer graphics and random access network technology.

In 1996, *Multimedia Jinta,* a multimedia anatomy material, was produced in Japan by converting into CD-ROM data a TV programme, *Prodigious Microcosm: Human Body*. It was named "rescue Da Vinci" and included five different types of navigation cells on human cells, health maintenance and a coordination system, and disease diagnosis. Its documents were also found on another CD-ROM, which was an encyclopaedia, which functions in such a manner that it enables children to develop different ways of retrieval, understanding, and communication. In order to introduce the development and concept of *Jinta,* a book was attached to it entitled Multimedia Design Theory (Iiyoshi and Kikue, 1996).

Murdock (2007) discusses the early 1990s as the period that brought the beginning or birth of modern media technology such as CD-ROMs and the invention of new modern presentation software, amongst which is Microsoft PowerPoint 3. Others include electronic whiteboards and laptop computers that became available for teaching and learning for teachers and students. Many governments around the world saw the effectiveness of the ‘all student laptop’ policy instituted by Methodist Ladies’ College in 1990 and began mobilising finances to increase the number and use of laptop computers in schools and institutions of learning. In 1996, President Bill Clinton of the United States of America made available over 2 billion US dollars to the *Technology Literacy Challenge Fund* to enable schools to make computers available to every learner, connect them to the outside world, and enable engagement in the teaching and learning process. This was a stimulus that led to a mass

increase in the demand for computers and computer multimedia technology in many school systems around the world (Johnstone, 2003).

With the development of modern computer operating systems such as Windows 98 and Windows XP and huge and constant funding from governments, the use of computers and other multimedia devices in classrooms for quality education purposes has experienced a boom. This period saw the creation in schools and institutions of learning of specialised classrooms or multimedia halls with the aim of providing students and teachers with access to the most modern technology available for educational and social purposes. Further, in America, in 1999, Georgia Tech built classrooms equipped with computers, audio, and video devices designed to replace traditional note-taking by capturing detailed recordings of lectures. These classrooms were called "Classroom 2000". And by the year 2000, the student-computer ratio in America had been reduced to 5 students per computer (Suggs, 1999).

Brown and Jinkins (2010) state that more and more classroom environments have become collaborative with the use of multimedia devices such as computers. With its mainstream direction, many more schools began investing in faster Internet connections and a powerful network. Further, Kembel (2010) emphasises that computers as a teaching and learning tool have significantly changed teaching and learning methods to a more collaborative method through exchange. Also, Richardson (2007) confirms that due to the increased awareness of the value and importance of communication among teachers and learners and the use of multimedia devices such as laptops, projectors, webcams, and the internet, Instructors can broaden lectures and begin collaboration with one or more classrooms, leading groups of learners to share ideas and coalesce online. The experience is difficult to replicate in a physical environment.

When discussing the recent trends of educational technology, Bozkurt (2020) affirms that online technologies facilitated by computers, the internet, and the web have not only become a global issue but have penetrated daily human lives. This has made them considered the global brain, which distributes cognition across a series of networks and has been a catalyst for this digital knowledge age. Furthermore, Win (2002) in Bozkurt (2020) holds that online technologies have a greater influence on education today than they ever have. Also, Kinshuk (2013) in Bozkurt considers the computer knowledge growth explosion in academics along with the emergence of resources in mainstream education as synonymous with online education and computer-based education. The 1990s experienced the growing influence of

telecommunications, specifically the Internet. The internet has made educational technology, of which multimedia is a component, the focal point of quality education.

1.1.5. History of Pedagogy

Saviani (2006) presents a vivid history of pedagogy from ancient to modern times. He holds that western civilization over time has developed pedagogy as a link to education and has tried to establish pedagogy as a means of applying or implementing the educational process. Saviani further states that it is not easy to distinguish the origins of pedagogy from human origins because education is an inseparable component of human society and is as old as human existence. In an effort to understand education and its interventions, man has evolved expertise from the days of Greek Paideia, the Roman Empire, the Middle Ages, and modern times, resulting in the term pedagogy. Pedagogy evolves as educational practises evolve into forms of science, whether practises or theories for providing education. Over centuries, pedagogy has succeeded in establishing or reinforcing education practises through rich theories and solidifying a tradition that is scientific with consistency in evolution. It also faces a number of objections in human history.

Since the time of Ancient Greece, pedagogy has been dominated by two concepts: It has been considered by one school of thought as a component or branch of philosophy that focuses on ethical purposes that guide educational activities. And the other school of thought which is highly related to Paideia and holds that it is all about preparing (educating) the younger generation for life, is of the view that pedagogy could be considered from an empirical or practical view. Therefore, pedagogy strengthens methodological elements, indicating the etymological meaning of pedagogy (path), which is concerned with guiding children. Comenius in the 17th century put in a lot of energy and efforts to demonstrate that the two schools of thought meant one thing and these thoughts on pedagogy were unified and consolidated. Comenius did this by confronting the issue of methodology in pedagogy (Saviani, 2006).

Also, Saviani (2006) states that Comenius attempted to project and establish a pedagogical system articulated on the basis of aims, goals, or objectives (he called them ends in education) of education as the foundation for its methods (means), which were considered in didactics as the art of teaching all elements (everything) to all persons. However, it was later established by Herbart that, as far as pedagogic traditions are concerned, the elements are

different but are simply being united due to the coherent nature of the system. That is, the ends of education are entrusted to pedagogy to construct on ethical bases, while the means of education are constructed on psychological bases, so the two elements or components of education are both constructed (developed) by pedagogy.

This pushed and endorsed pedagogy to become a discipline studied in the university as an academic field of study and research in the schools (faculties) of education. The idealism school of thought saw pedagogy as an integral part of philosophy; it was considered the practical component of philosophy and was seen from the perspective of the philosophy of education. This is seen from both its strengths struggling to override its weaknesses, which led Gentile to see pedagogy as a source of displeasure to teacher education, pushing to be a source of displeasure to universities, not leaving out future teachers because pedagogy teaches them what, according to him, cannot be taught (Saviani, 2006).

Furthermore, Saviani (2006) narrates that Herbart's explanations of the relationship between ethics and psychology are ruthlessly rejected by Gentiles. As a die-hard idealist, Gentile holds that pedagogy most closely identifies with philosophy because it is an integral component of philosophy. To Gentiles, education refers to developing the human spirit, and teaching is just a theory that is used in the process or action. He sees the instructor or teacher as the method itself, which does not have the ability to respect a didactic programme because there is no possibility of teaching methods. Therefore, he went into history as one of those who vehemently refused to identify or approve the relationship between pedagogy and didactics or teaching methodology.

There came the positivists (scope positivism) in pedagogics, who saw pedagogy as an integral part of education and its practise. Durkheim (1965) in Saviani (2006) sees pedagogy from the perspective of a practical theory that focuses on attaining educational ends (phenomenon), establishes a counterpoint to scientific theories focusing on educational facts and knowledge, and however, is a task in the domain of sociology of education. Positivism scope later worked hard and attempted to place pedagogy as a scientific character or component instead of considering pedagogy as autonomous. What simply happened was that pedagogy was relieved of being considered an integral part of philosophy in favour of the empirical sciences. This was accepted as such, and hence it was established as the model for pedagogy to follow.

According to Saviani (2006), in the 20th century, precisely from the 1970s on, pedagogy went down history lane as it attained the level of scientific autonomy. This means that it was considered and studied as a scientific field on its own; it was no longer open to future objections, as acknowledged by Schmied, Frabboni, and Genovesi. Schmied-Kowarzik (1983) and Saviani (2006) affirm that in the tradition of practical sciences, pedagogy can be said concretely to be among the richest. While Franco Frabboni tried articulating pedagogy and education in the context of new paradigms that, since the 1990s, have not only gained great popularity but also experienced the height of their usage in the 20th century and got into the 21st century, He further accepts without reservations that pedagogy is a science with an independent or autonomous statute (Frabboni and Minerwa, 1994; Saviani, 2006).

Also, Genovesi (1999) in Saviani (2006) makes it very clear that pedagogy as a science is autonomous due to its possession of its own language and has a mastery of how its language is used in accordance with its method (means), ends (aims, goals, and objectives) to make this language powerful enough to generate constructive knowledge, conduct a series of experiments, and develop techniques. These are what have led to the construction of models in education. Therefore, pedagogy has a role as a science to construct, test, and apply models in education that have been proven and are logical in the guidance and construction of an individual or group of individuals to be useful to themselves and society as a whole. These pedagogic models serve the purpose of interpreting and making crucial decisions or propositions on educational issues and events.

1.1.6. Evolution of Evaluation as a Tool in determining Educational Quality

According to Hogan (2007), recounting the historical evolution of evaluation is not only an uneasy task but almost impossible, given that it is as old as human history, not to mention that of programme evaluation, which dates back to human civilization. There has been a lot of evolution towards maturity in the field of evaluation in the last three decades. Corner et al. (1984) in Hogan (2007) hold that today evaluation is said to be an established field of study and practise and has gone through a number of transitions but is at the moment making its move towards adulthood. This means that the evolution of evaluation is going towards its peak. According to Hogan (2007) and Madaus et al. (2000), the history of programme evaluation has been classified into seven evolutionary periods: Prior to 1900 (reform age), 1900 to 1930 (efficiency age), 1930 to 1945 (age of Tylerian), 1946 to 1957

(Innocence age), 1958 to 1972 (development age), 1973 to 1983 (professionalisation age), and 1983 to the 2000s (expansion and integration age).

The first phase runs from 1792 to the 1900s and was christened the Reform Age. According to Hoskins (1968) and Hogan (2007), in line with documented evaluation, the first evaluation to be recorded was in 1792 by William Farish, who assessed the learners' performance in a field of study using a quantitative mark. It enables him to do objective ranking of participants by calculating averages and aggregates of scores. Quantitative marking went into history as an important fact of history because it will be a catalyst or the seed of programme evaluation in a field of study, as it was the first step in the eventual development of psychometrics and the questions were constructed to measure technical competences in domains of study or fields of study.

The second phase runs from 1900 to 1930 and was christened the Testing and Efficiency Age. According to Worthen et al. (1997), educators during this period never saw the difference between the terms '*measurement*' and '*evaluation*'. To educators, these terms were synonyms and could be used interchangeably, with the only slide difference being that evaluation could be used to refer to assigning grades to learners or summarising a learner's performance in a test. Biddle and Ellena (1964) and Russell and Talor (1998) in Hogan (2007) consider Fredrick Taylor to be one of the names of this period who focused his works on management that was scientific with procedures to follow as you first of all observe, measure, and analyse being efficient in all the elements or steps; this thereby greatly influenced educational administrators during this period. Tests were objective and were used to determine teaching quality as well as the effectiveness of a school district.

The third phase from 1930 to 1945 was named the Tylerian age due to the activities and remarkable contributions of Ralph Tyler when it concerned educational evaluation; he was seen as the father. He coordinated a study on an assessment of school product or outcome for eight years, from 1932 to 1940, and the studies focused on traditional high schools (15 in number) and progressive high schools (15 in number). Tyler (1975) holds that by the end of this study he had discovered that it would be better if teaching objectives were stated in behavioural terms, as these objectives would later serve as guidelines for evaluating teaching effectiveness. Tylerian evaluation had to do with internally comparing the outcome of an instruction programme with its set objectives, while Worthen et al. (1997) consider the work

of Tyler as a criterion-referenced testing basis, and it was seen to be less costly as compared to experimental comparative studies in programme evaluation.

The fourth phase in the history of programme evaluation runs from 1946 to 1957, shortly after the Great Depression and the Second World War, and was known as the Innocence Age." There was great prosperity, especially in the United States of America, with much investment in educational activities, facilities, and personnel. There was little attention paid to the accountability of educational expenditures. This was the period when Tyler's views were quickly adopted by the early 1050s (Madaus and Stufflebeam, 1984). In the view of Stanley and Hopkins (1978), one of the events in this era was the 1956 publication of '*The Taxonomy of Educational Objectives*' by Bloom et al. and later a focus on the affective domain by Krathwohl et al. in 1956. These taxonomies enormously impacted the quality of educational programme evaluation construction, especially in classrooms.

The fifth phase of programme evaluation from 1958 to 1972 was greatly influenced by the launching of the Sputnik in 1957 by the Russians, and the period was known as the development age. This successful launch, according to Stufflebeam et al. (2000) in Hogan (2007), pushed the United States Congress to enact the NDEA National Defence Educational Act with the purpose of heavily financing developmental projects that were new in the curriculum as well as introducing new educational programmes in sciences, mathematics, and foreign languages. The role of evaluations in these huge funding schemes was to measure the level of output of these new curricula. Criterion-reference testing emerged in the early 1960s and was considered an important turn in the history of programme evaluation and evaluation in general as it focused on measuring the performances of individuals using well-established criteria.

The sixth phase of the history of programme evaluation from 1973 to 1983 was referred to as the professionalisation Age, because there was the emergence of evaluation as a programme. This period experienced a tremendous upshot in the number of evaluation journals such as '*Studies in Educational Evaluation*', '*Evaluation Review*', '*Evaluation and Programme Planning*', and *New Directions for Programme Evaluation,* just to name a few. This led a great number of universities to start appreciating and recognising the important role played by evaluation, and a number of universities, such as Minnesota, Illinois, and Stanford, designed and started offering courses in evaluation focusing on methodology (Stufflebeam, 2000; Hogan, 2000).

The seventh phase elaborated by the historians of programme evaluation runs from 1983 to date and is called the Expansion and Integration age. The 1980s were not very good years for evaluation in the United States of America, as the Reagan administration cut down on a number of evaluation funding schemes. It was also experienced on social initiatives; however, in the 1990s, when the economy was back on the rise, so was evaluation. This period experienced great expansion and more integrated approaches to evaluation and programme evaluation in particular. There was a great rise in evaluation standards as well as the creation of evaluation professional associations, and particular criteria for personnel evaluation were developed by the Joint Committee on Standards on Educational Evaluation (Weiss, 1998; Hogan, 2007).

Hogan (2007) holds that the 21st century has experienced more evaluation and programme evaluation approaches ranging from suggestions to prescriptions. These approaches involve discussed in management oriented (CIPP), CIRO, Kirkpatrick, and Phillip's, classified by Worthen et al. (1997) into the following categories: i. Objectives oriented evaluation approach; ii. Management oriented evaluation approach; iii. Consumer oriented evaluation approach; iv. Expertise oriented evaluation approach; v. Adversary oriented evaluation approach; vi. And participant oriented evaluation approach. Evaluating educational programmes, especially in the teaching and learning component, has become more of a routine activity for educational evaluators as the quest for quality (efficacy and efficiency) is on the top agenda in this contemporary time.

1.1.7. Trends of Professional Development

Professional development around the world has experienced strategic evolution, especially in the United States of America. According to Elliot (2017), as far as the importance of professional development is concerned, citing the NSDC (National Staff Development Council) statement in 2001 requesting that teachers (lecturers) and educators in general dedicate at least twenty-five percent (25%) of their professional time to activities concerned with learning and collaboration, These are the basis for developing students professionally, but on the contrary, Hill (2009) and Elliot (2017) hold that the time educators put into professional development is far lower than the 25% recommended by the NSDC. The guide is meant to keep teachers and lecturers current on effective and efficient educational practises as well as develop students' knowledge and skills to suit contemporary trends.

There has been a great change in the political and professional influence on the thoughts and trends of professional development over the past fifty (50) years, with respect to meeting educational needs that are most important and pressing (Elliot, 2017). These changes in thoughts, according to Katz (2010) and Elliot (2017), stem from or originate from governmental efforts, especially in America, to resolve existing shortcoming and inefficiency in the educational system, irrespective of the opinion of the affected populations or communities. This was done with the underlining objectives of these innovative initiatives being the provision of equitable educational opportunities for all citizens and raising the general quality of education through the educational system as a whole (Elliot, 2017).

Furthermore, Zemke and Zemke (1995) in Elliot (2017) also establish the influence of learning theories on the evolution of professional development in the educational sector, which is defined as the acquisition of knowledge and skills through study or instruction. The definition of Zemke and Zemke (1995) according to Berg-Sorensen et al. (2010) in Elliot (2017) applies to a number of learning approaches that are of a broad spectrum, beginning from essentialism to constructivism theories of learning. While this view is strongly supported by Haythornthwaite and Andrews (2011), who state that a sound, effective, and efficient education has as its basis a sound, effective, and efficient learning theory, irrespective of whether it is in a traditional classroom or online, This follows the trends of professional development in the educational sector with the exploitation of modern technologies, especially digital.

Also, this is why the modern trend of professional development programmes more often takes or should take into consideration professional needs during the design and implementation (delivery) processes, as recommended by Arends (2014) and Elliot (2017). Also, Desimone and Garet (2015) and Elliot (2017) hold that the best and most effective and efficient instructional practises are based on the most effective and efficient learning theory or theories exploited in the processes of selecting and designing professional development programmes, especially for those in the instructional field in education. This is because the quality of the product of the educational system in terms of professional development is determined by the professional quality of the teachers and lecturers. This is why most countries in the world have evolved to the point of making use of teachers and lecturers with an instructional professional background.

Effective professional development features have been considered to be very instrumental in the evolution of professional development in the educational sector. For this reason, Hein (2008) and Elliot (2017) argue that lecturer's (teacher's) attitudes and skills are influenced by the effectiveness of professional development, which will result in an improvement in the quality of education from a professional development perspective. On the other hand, Beavers (2009) and Elliot (2017) examine the evolution of professional development from the perspective of giving lecturers a giant opportunity for collaborating and developing new experiences, ideas, and approaches from their peers on developing students professionally, irrespective of being significantly separated by lecture halls.

In this digital age, professional development in the educational sector has not been left out of the evolutionary process. For this reason, Elliot (2017) considers six (6) qualities of professional development effectiveness that guide Models of online professional development, which is one of the key factors in professional development evolution trends. These qualities are: interactivity, collaboration, continuous, differentiated, and interest-driven; resource provision; and implantation in every instruction (teaching). Also, he recommends the Community of Inquiry model (CoI) as a framework that could be useful and instrumental in designing and selecting professional development options online.

COMPONENTS OF COMMUNITY OF INQUIRY MODEL (CoI)

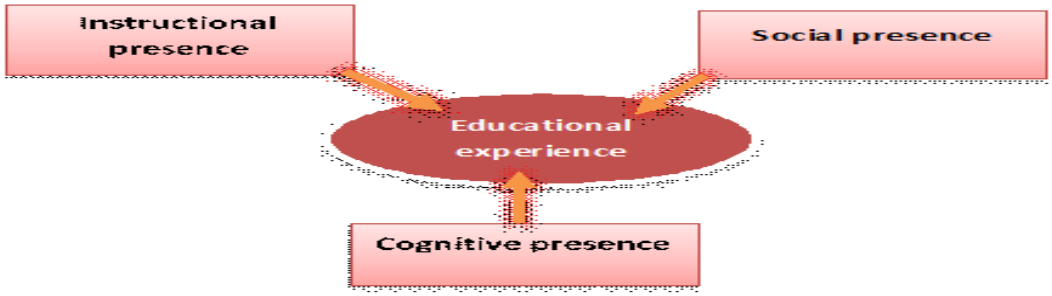

Figure 03: Components of Community of Inquiry Model
Source: Adapted from Elliot (2017)

CoI model according to Mehta et al. (2016) Elliot (2017) has to do with the process of developing an in-depth and meaningful learning experience that is collaborative-constructivism in orientation by developing three interdependent elements. These elements, according to Pollard (2014) and Elliot (2017), are social presence, cognitive presence, and

instructional (teaching) presence, which determine the effectiveness of online learning experiences and are key components of the CoI model. Educational professional development experience (knowledge and skills) is built through the exploitation of modern information and communication technologies through the interaction of social, cognitive, and instructional presence. It is important to note that people have come to the understanding that an unprofessionally developed digital programme is more catastrophic than no experience.

The general features of professional development effectiveness have to do with the contributions of interactivity, collaboration, differentiation, interest-drivenness, continuity, availability of resources, and implementation to professional development. After which, in return, professional development improves instruction and student learning processes. All these result in results guided by professional development that conforms to the CCSS standards and 21st century skills (Delta-driven), which in turn empowers professional development in both lecturers (teachers) and students (learners) as structured (aimed) by CCSS standards and 21st Century skills (Delta-driven). The general features or elements of effective professional development that have influenced the evolution of professional development in the field of education can be better described in Figure 4.

GENERAL ELEMENTS OF EFFECTIVE PROFESSIONAL DEVELOPMENT

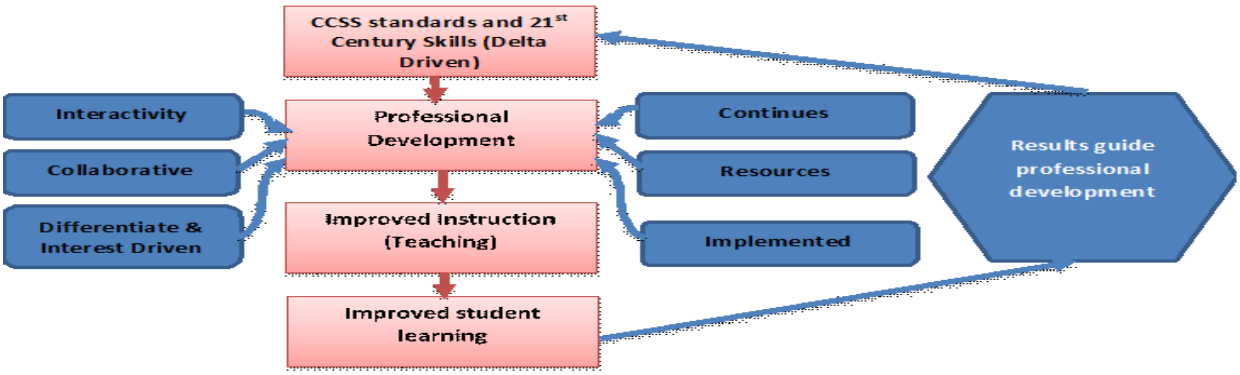

Figure 04: General elements of effective professional development
Source: Adapted from Elliot (2017)

1.2.0. CONTEXTUAL BACKGROUND

To ensure and secure its existence and progress, Cameroon has undergone a lot of evolutions. Has this also been the case with the Cameroonian higher education sector, which began in 1960 with a university centre and eventually grew to include a university and five

university centres? The 1993 reform of higher education also saw the creation of six state universities, and the doors to private universities and other higher institutions of learning were also opened. Today, Cameroon can boast eleven (11) fully-fledged state universities, a sizable number of specialised institutions, and hundreds of private higher education institutions thanks to the 2001 reform of higher education, which was implemented to correct any errors or weaknesses and strengthen the gains of the higher education reform of 1993. The higher education system in Cameroon is continually changing to fulfil quality standards, keep up with technological programmes being evaluated for students' professional growth within the higher education system, and keep up with the times.

1.2.1. Cameroon

According to Ngome (2012), the World Fact Book describes Cameroon as an African country that is located in the southern part of the Sahara and has a land surface of 475.440 square kilometres in total. Cameroon has over two hundred and fifty (250) ethnic groups, each with its own language, but the constitution of the Republic of Cameroon makes provision for two (2) official languages, English and French, inherited from its colonial heritage (Tchamabe, 2010). It can be situated between west and central Africa, with Nigeria as a neighbour to the west, the Central African Republic to the east, Chad to the north, and Congo-Brazzaville, Gabon, and Equatorial Guinea to the south. Cameroon has been cited as being very richly endowed with human and natural resources such as petroleum, iron, bauxite, timber, cocoa, rubber, coffee, bananas, tobacco, and many more (Ngome 2012). With its multicity in ethnicity and diverse resources, both flora and fauna, Cameroon can be called "Africa in miniature", because almost all African features are found there.

Ngoh (1996) holds that the Germans annexed Cameroon in 1884 after the signing of the Germano-Douala treaty, after which they named the territory 'Kamerun. In 1916, the Germans were defeated in the First World War in Cameroon by the British and French coalition. At the peace treaty of Versailles, the Germans lost the territory, and with the creation of the League of Nations, the German Kamerun was placed under the tutorship of Britain and France as a mandated territory. Divided and administered as two distinct territories by the British and the French. With the creation of the United Nations (U.N.) in 1946, it became a United Nations Trusteeship. In 1960, French Cameroon became independent and was reunited with British Southern Cameroon in 1961 to form the federal Republic of Cameroon. In 1972, through a referendum, the federal system was abolished and

the United Republic of Cameroon was born. By 1985, the name was changed again to the Republic of Cameroon (Ngome, 2012). This explains the bilingual nature of the country.

Furthermore, Ngome (2012), still citing the World Fact Book, reiterates that the political and economic capitals of Cameroon are separated; Yaounde is the political capital, with Douala being the economic capital. The rate of literacy amongst the adult population stands at 79%, with a labour force of six point sixty-eight percent (6.68%); thirty percent (30%) of this labour force is unemployed, and the currency used is the Francs CFA (Coopération France Afrique). The infant mortality rate stands at sixty-six (66) per thousand (1000) births with a birth rate of thirty-five (35) per hundred (100), and the life expectancy has been established at fifty-two point nine (52.9) years. As of 2006, the Gross Domestic Product (GDP) stood at forty-two point two (42.2) billion U.S. dollars, with two thousand four hundred (2.400) U.S. dollars, with a four point one (4.1) percent Gross Domestic Product (GDP) Real Growth, while forty-eight (48) percent of the population lives below the poverty line. The economy is constituted by thirteen (13) percent commerce, seventy (70) percent agriculture, and seventeen (17) percent others.

It can be seen that the description of Cameroon as Africa in miniature is due to the diverse nature of the country, which contains almost every characteristic and feature of the African continent. The multiplicity of ethnic groups that are over two hundred and fifty (250) in number enriches its cultural diversity, especially in terms of language. Also, the two official languages most spoken in Africa (English and French) are her official languages. These languages are the official medium of communication in education. The Cameroonian educational system, while using French and English in the teaching and learning process in the whole educational system, strives to meet the challenges of the constantly changing economy, demographic features, and society in general by reforming and adapting the educational system through its programmes and courses to meet up with the rapidly changing times.

1.2.2. Evolution of Higher Education in Cameroon towards Quality Education

Higher education in Cameroon has gone through various stages of change, from one federal university in 1961 to hundreds of higher education institutions today. Amongst these institutions is a great rise in the integration of information and Communication technologies for professional development purposes in the Cameroonian higher education sector. And

recently, there has been much focus on the creation and establishment of technology-based higher education institutions, with a greater focus on Information and Communication Technologies in universities for professional development effectiveness.

Contextualising Higher Education in Cameroon towards Quality Education

The educational system in Cameroon has experienced a series of events and innovative evolutionary phases for quality purposes. That of the higher education sector has not only been unique but has been consistently calling for concern so as to effectively and efficiently attain its goals and objectives and improve on its quality. According to Njeuma et al. (1999), before the advent of independence for French Cameroon in 1960 and subsequent reunification with British Southern Cameroon in 1961, the Cameroons never had a university. To further their studies at the university level, Cameroonian students had to study at foreign universities where programmes did not take into consideration Cameroon's developmental needs or desires. This element is affirmed by Ngu and Kwanbam (1992), who state that the post-independence era brought with it the urgency of preparing civil servants for public service through training in practically all aspects of national life. This was due to the fact that the colonialists had left and the development of the new nation was a matter of urgency.

Njeuma et al. (1999) further hold that this is why, with this urgent and pressing need to train quality civil servants, there was the creation of the Federal University of Cameroon in 1961. That is, the National Institute for University Studies was converted into a full-fledged university. As the years went by and the history of the nation evolved, the Federal University of Cameroon was later named the University of Yaounde. Its main mission was to meet the needs of quality human resources needed in the development of the new nation. For this reason, the programmes were designed and organised to meet these urgent needs. With time, the request for a variety of programmes and the desire to meet up with increasing unemployment made higher education reforms eminent and inevitable. They continued that the 1993 reforms had as their mission or orientation to professionalise the Cameroonian higher education sector, which will prepare graduates for societal service both in the public and the increasing private sectors.

The 1993 reform originated from the desire of the state to fight unemployment and guarantee employment for graduates. With this in mind, university centres were converted to full-fledged universities, resulting in the creation of five new state universities in decree No.

93/034 of January 19, 1993, which, amongst others, included the University of Buea, the University of Yaounde II, the University of Dschang, the University of Ngaoundere, and the University of Douala, with missions to develop new fields of study and professionally oriented programmes and courses. In contemporary times, Cameroon has eight (8) state universities, more than 300 Private universities, and many higher institutes with a variety of professional-oriented programmes (Ngwana, 2001). These institutions are meant to promote quality, professional, and affordable higher education. This is to curb unemployment and experience creativity and innovation through quality excellence. However, changing times brought about new challenges, which demanded another reform in 2001.

In the view of Ngwana (2001), the 1993 university reform was necessary because, by then, the University of Yaounde was the lone university in the country, though bilingual. He further states that the growing enrollment pushed the state in the 1970s to create university centres in Buea, Douala, Dschang, and Ngaoundere to improve the teacher-student ratio. By 1984, it was clear that the problem had not been solved because enrollment stood at eighteen thousand (18000), and by 1990, it was already at thirty-two thousand (32000) and by 1993, it was already at forty-five thousand (45000). This growth in enrollments was not matched with an increase in human and material resources, meaning there was high competition for entrance into the university centres and specialised institutions because they were the gateway into the public service. This is why the enrolments in these institutions were limited by the state, even if there was a possibility for more students to enrol.

Furthermore, he holds that the 1993 university reform was brought about, among other things, to broaden and actively involve different stakeholder groups and ensure their participation in the financing and management of institutions in the higher education sector for quality improvement purposes. This was to be effective through the institution of tuition fees supported by state funding and was operationalized as follows: i. Grants more management and academic autonomy to universities; ii. Make university education available to all Cameroonians; iii. Making higher education programmes more professional with respect to labour market demands, thereby increasing and diversifying opportunities; iv. Making university education more accessible to local (regional and national) and international communities by decongesting the Yaounde over crowded university by upgrading the university centres to full-fledged universities with specificities in mission towards national

development; v. maximise the usage of services, facilities and infrastructure, and to ensure that inter university and international university co-operations are revived and maximised.

Furthermore, Ngwana (2001) states that these specialised institutions and university centres experienced underutilization of infrastructure and facilities. He presents the situation in the university centre in Buea, where, with a capacity for two thousand (2000) students, only sixty (60) students were effectively enrolled and were studying there. This resulted in problems and difficulties such as: Effective bilingualism was not maximised because the majority of the courses were in French and not fifty (50) percent for both French and English; Infrastructure was not increased in 1970 to 1991 when the enrolments increased from seven thousand (7000) to forty-five thousand (45000) respectively to meet the needs of the growing higher education enrolments; The recruitment of staff (lecturers and support staff) did not correspond with the increase in student enrolments; The scientific fields, programmes, and courses faced a more complicated problem due to the gross insufficiency in laboratory facilities and equipment; and library facilities were insufficient with respect to students' enrolments and needs.

Ngwana (2001) reiterates that these factors negatively influenced students' motivation and efforts, which led to catastrophic academic performance (very low academic performance) with a thirty percent (30%) success rate in annual examinations. The budgetary allocation was also a problem in that only fifteen percent (15%) was allocated for laboratory facilities and research. Also, by the 1990s, the higher education curricula developed in the 1960s could no longer meet the demands of the growing private sector of the time. The trend of market and employment forces was changing as the government, due to the economic crisis, was on a retrenchment programme, resulting in a drastic increase in the number of unemployed graduates in the nation.

The outdatedness of the curricula could be explained by the fact that knowledge and skill development in the university did not correspond with labour market demands. Which is a result of the absence of a professionally defined career profile for staff, overload in teaching under precarious conditions, a lack of objective criteria to ensure meritorious promotions, inadequate research facilities, and difficult and insufficient opportunities for study leave. With all these shortcomings, the higher education system was in desperate need of reforms, hence the 1993 university reforms.

The reforms of 1993 did not fully meet the expectations of society and graduates (quality insufficiency) with respect to job creation and unemployment. The higher education system was criticised for not equipping graduates with the necessary skills to meet their aspirations and fully contribute to community development through job creation and employment. This gave rise to higher education reform manifested in Law No. 005 of April 16, 2001, and is considered the Higher Education Guide, which will make its institutions more productive.

Furthermore, the law went through parliamentary deliberations, after which the Head of State, President Paul Biya, promulgated it into law (*Law No. 005 of April 16, 2001*). This reform was very important because, in the view of Tambi (2016), the malfunctioning of the educational system, of which the state and the educational community have become victims and targets, respectively, has ridiculed them. Therefore, the higher education sector, with continued changes in the trends of life and activities, needs reforms to meet up with the rapid changing times and quality excellence.

Ngwana (2001) holds that it was not only the shortcoming of the 1993 reform that brought about future reforms but also its outcome, which was that it brought in international bodies and partners such as ADEA (Association for the Development of Education in Africa) and WGHE (Working Group on Higher Education), which was commissioned by the World Bank to carry out a study on reforming higher education for quality improvement purposes with Cameroon as the case study. The findings presented strengths and weaknesses and revealed reform opportunities. The study showed that the main challenges of the 1993 reforms were quantitative successes. Therefore, the weaknesses almost outnumbered the successes, with one major obstacle being quality implementation.

The problem of making higher education accessible and creating opportunities for local, regional, national, and international communities was resolved with the creation of five new state universities across the nation. According to Ngwana (2001), a study was carried out, and it indicated that about fifty percent (50%) of students enrolled in the University of Ngaoundere in the 1995/96 academic year were residents and natives of the region constituting three provinces, and only three percent (3%) of the residents in those regions came to the University of Yaounde. Before the advent of the 1993 reform, four percent (4%) of the students at the University of Yaounde were from the three northern provinces of Adamawa, North, and Far North.

Also, the English-speaking higher education students were given an opportunity by the provision of the reform to study in an Anglo-Saxon university where the language of instruction was English. The University of Buea was created with a full Anglo-Saxon orientation for curriculum design, development, implementation, and evaluation, bringing relief to thousands of English-speaking students and stakeholders in and out of the country. As many English-speaking students took courses for the first time with English as the main language of instruction,

Some of the factors leading to the 2001 higher education reform in Cameroon were factors of quality education. According to Njeuma et al. (1999), the massive increase in student enrolments does not correspond with an improvement or increase in skilled academic staff, meritocracy, facilities, or infrastructure. This assertion was later confirmed by UNESCO (2003). This phenomenon was seriously affecting the quality of education offered by higher institutions of learning. The ever-increasing student enrollment rates, according to Shabani (1995), led to a student-lecturer ratio that was very high, which was not effective in improving the quality of higher education. This resulted in poor quality in the higher education sector. The consequences were low rates of graduate employability.

According to Teal (2011), with the advent of globalisation, the quality of instruction and research has greatly been affected, and all contemporary universities are preoccupied with meeting the standards and quality of their publications to meet up with the global competition and standards. With the universities and higher education institutions created and authorised by the 1993 higher education reform in Cameroon still suffering from the problem of sufficient funding, sufficient funding policies were put in place to make these universities and institutes of higher learning self-sufficient so as to improve standards. This hampered their capacity to acquire upgraded pedagogic materials and equipment, well-equipped modern libraries with internet-connected computers, white boards, books, and diverse specialist journals (Ngwana, 2001). Therefore, the 2001 higher education reform was very necessary to address these issues.

The quality of higher education in Cameroon was still greatly affected by staffing problems after the 1993 reforms. According to Njeuma et al. (1999), the quality of the teacher, level of education, and acquired experience are key determinants of the productivity of higher education. To get quality teachers, higher institutions of learning need suitable finances to carry out research. Ngwana (2001) holds that Cameroonian higher education

institutions face the problem of publicising and sharing the results of research conducted in these institutions. This affirmation is supported by UNESCO (2003), which refers to research works and theses as '*grey literature* occupying libraries.

This means that they are not maximised for the improvement of neither the higher education system nor society. Curriculum implementation is a very important component of the curriculum process in higher education because modern curriculum implementation requires personnel that are not only qualified and experienced but can also use modern technological methods such as multimedia-based instruction (pedagogy) to effectively and efficiently implement the curricula.

Furthermore, Njeuma et al. (1999) examine the problem of brain drain in the higher education sector. Even after the 1993 higher education reform, many potential, qualified, and experienced university lecturers are leaving to the west in search of greener pastures. This can be explained by poor funding of pedagogical requirements for effective and efficient teaching and learning in the higher education setup to be productive and job-satisfying, and the high rate of unemployment even among doctorate degree holders.

The phenomenon of brain drain caused Cameroon's higher education to lose credible higher education teachers to the west. Fonkeng and Ntembe (2009) examine the role of higher education in economic development in Cameroon. In the absence of qualified personnel, higher education cannot effectively impact economic development positively. With the need to improve the quality of education so that it can positively impact the economy, the 2001 higher education reform was put in place to solve some of the prevailing difficulties after the 1993 reform.

2001 Higher Education Reforms in the Direction of Quality Education

The 2001 higher education reform in its general provision states very clearly that the law provide the legal framework and key guidelines for the functioning of the Cameroonian higher education sector; the programmes to be implemented in higher education institutions, both public and private shall be approve by the state; higher education institutions shall have the responsibility of producing, organising and publicising or sharing (disseminating) scientific, cultural, professional and ethical knowledge (skills inclusive) for the development purposes of the nation; makes higher education a priority of the state, as it shall be organised

and supervised by the state; welcomes the contribution of private partners to Cameroon's higher education system; and guarantee bilingualism in higher education for purposes of national unity and integration (law N^{o} 005 of 16 April 2001). The general provision shows the determination of the state to overcome the difficulties faced after the 1993 reforms.

To meet the challenges of the 1993 reform as presented by Njeuma et al. (1999), Ngwana (2001), and UNESCO (2003), the 2001 reform elaborated the following objectives for the Cameroonian higher education sector: Knowledge excellence in all domains; science, culture, and social progress promotion; Social promotion engaging competent national bodies (socio-professional circles included) with respect to programme development, theoretical courses, practise, and internship organisation; Development activities assistance; training of staff and further training of senior staff; Deepening of national and ethical consciousness; Democratic culture development and democracy promotion; And the promotion of bilingualism.

These goals of the higher education system in Cameroon clearly indicate its readiness to address issues related to quality education, such as research and laboratory facilities, quality of teachers and staffing, and quality of instruction, as presented by Njeuma et al. (1999), Ngwana (2001), and UNESCO (2003).

To achieve these goals, according to the 2001 Higher Education Reform Law (Law No. 005 of April 16, 2001), the higher education institutions in Cameroon have to put in place certain measures, such as: Inform secondary school and higher education students to be aware of the organisation of studies, professional offers, and reorientation from one course to another; Provide initial and continuous training for their students (other learners included) in intellectual, moral, and physical domains; make provision for training trainers; In technical and scientific domains, train both senior and intermediate staff; In the domain of letters, arts, techniques, and science facilitate innovation as well as collective and individual creativity; Culture, national languages, and bilingualism promotion National consciousness strengthening Promote citizens law-abiding behaviour by creating awareness of the culture of respect for human rights, freedom, and justice; Contribute to eliminating discrimination in all its ramifications and promoting peace and dialogue; Within the national and international cultural and scientific communities, contribute to discussion, cultural exchange, and the advancement of research; Promote co-existence and national integration; develop and

strengthen gender equality; and contribute to the culture of tolerance, peace, and development as well as the emergence of a democratic culture.

One of the important reforms in the 2001 Higher Education Reform Law is quality evaluation and assessment. The 2001 Higher Education Law takes evaluation into consideration. Section three (3) focuses on evaluation in higher education. It stipulates that higher education courses (programmes inclusive) shall be subject to evaluation (assessment) periodically. This is to inculcate and establish the culture and practise of assessment and evaluation and to use the results of evaluation to improve the quality, relevance, and efficiency of the Cameroonian higher education system (law No. 005 of April 16, 2001).

Furthermore, it includes the composition of higher education evaluation, which includes higher education policy, institutions, research, training, and governance. Evaluation of higher education courses and programmes is very important in determining the quality of higher education in Cameroon and gives information to be exploited by experts so as to improve policy, training (courses and their implementation), research, and institution governance, thereby improving the professional development of students.

1.2.3. Information and Communication Technologies (ICTs) in Cameroon's Higher Education as Quality Improvement Tools

Ngome (2012) holds that the Cameroonian educational system in general and higher education in particular are being modernised with the aid of Information and Communication Technology (ICT), of which multimedia-based instruction is a component when it concerns ICT in education, responding to the demands of globalisation and quality education. He emphasises that Cameroon is one of the countries in the sub-Saharan region that is progressing significantly in the use of ICT in the school curriculum, both as a tool and as a course. In 2001, under the "Cyber Education Project," according to ICT in Cameroon (2007) and Ngome (2012), the president of the Republic officially instituted Information and Communication Technology (ICT) in the Cameroon education system as a whole.

Also, Chiafie (2011) affirms that higher education institutions (Cameroon), international organisations, and governments have put a lot of resources and emphasis on the relevance of Information and Communication Technologies (ICTs) in contemporary society, while their instruction (teaching), training, and integration in societal life and development

rest on the shoulders of higher education institutions and universities in particular. Some authors, such as Oliver (2003) and Chiafie (2011), hold that the educational system as an entity (field of study) has not experienced the impact or effects of Information and Communication Technologies as compared to economic education, health education, engineering education, and military education, as they are more advanced in the use of modern ICTs for quality communication, research, and exploitation of research results.

On the contrary, Ayoo (2009) in Chiafie (2011) argues that ICTs are constantly impacting the entire components of contemporary education quality, imposing on universities, higher education institutions, and their stakeholders the obligation to be involved in ICTs by being linked and exploiting advanced network systems connecting the global village. Furthermore, Ayoo (2009) and Chiafie (2011) reiterate that there is massive interaction online between teachers and students, teachers and students, and researchers without physical contact. In addition to this, studies in contemporary times have gone digital (virtual) due to the quality innovations in ICTs, and some higher institutions, universities, and libraries are today online.

Also, there are digital or virtual higher education institutions that offer off-campus programmes ranging from bachelor's to doctorate levels in diverse settings and environments. This is thanks to new technologies impacting the quality of education. Information and Communication Technologies (ICTs) exploitation, inventions, and innovations in the educational sector for quality have resulted in what is known today as Distance learning, e-learning, and Blended learning, which are exploited in the Cameroonian higher education sector.

The quality of Higher Education in Cameroon is directly and indirectly influenced by ICTs. This is because they exercise functions, research, and instruction, taking into consideration the notion of information and Communication Technologies as a tool for contextualising globalisation for quality education. Marginson et al. (2007) and Chiafie (2011) attest that it is not possible for universities or higher educational institutions to completely seal themselves because they already belong to a global network environment, which makes every university or higher educational institution visible and quality-oriented.

Bekele (2004) in Chiafie (2011) discussed the importance of ICTs on facilitating, communication, teaching, learning and information management, however it is perceive that

ICTs ruin privacy, bring stress, misuse intellectual resources, and drastically reduce physical and social contact; to Keogh (2001) in Chiafie (2011) the threats posed by ICTs to the society and school as a social milieu is creating social exclusion with technological society of haves and haves not, and the competition between higher education institution which force them to re-orientate their visions, profiles, roles, position, identify and make new alliances; And Wende and Beerkens (1999) in Chiafie (2011) states that ICTs devices are cultural imperialism and very expensive for higher education. Physical activities in instruction and learning are still very important for the quality process, especially in Cameroon, where the majority of the assessments are classroom-based.

1.2.4. Quality Evaluation and Assessment in Higher Education in Cameroon

The 2001 higher reform law makes provision for quality evaluation and assessment. The 2001 higher education law takes into cognisence in its section three (3) focuses on evaluation in higher education. It stipulates that higher education courses (programmes inclusive) shall be subject to evaluation (assessment) periodically. This is to inculcate and establish the culture and practise of assessment and evaluation, and to use the results of evaluation to improve the quality, relevance and also the efficiency of the Cameroonian higher education system (law N^{o} 005 of 16 April 2001). Therefore, these periodic assessment and evaluation may focus on the entire course (programme) or a component of it such as implementation. Evaluating programme implementation using multimedia based pedagogy helps in improving the quality (academic, pedagogic, didactic and technical), information relevance and also the efficiency of the courses (programme) and system.

Njeuma et al. (1999) hold that quality of higher education evaluation (assessment) in Cameroon requires taking into consideration the challenges confronting the policy makers and their stakeholders as they work towards meeting international norms concerning teaching staff, research, curriculum (curricula), teaching conditions and its products, and pedagogical material and equipment. This assertion is strongly supported and affirmed by Ngwana (2003) who hold that all these elements need to be taken into consideration when assessing or evaluating a course, programme or its component and the system as a whole.

The product of evaluation (assessment) is determined more often by classroom, online or offline assessment, which is learner and teacher centred. The pedagogic material and equipment used in implementing the curriculum today which contain technological

component and facilitate teaching and learning, making professional development classroom assessment more valid and reliable, is the multimedia based pedagogy.

1.2.5. Professionalization of Higher Education in Cameroon

According to Njeuma et al. (1999) the one of the main objective of higher education in Cameroon after independence was to develop local human resources to manage the affairs of the for a newly independent nation. Njeuma et al. (1999) further hold that enormous efforts were put in place to prepare university graduates for integration into the camerooniam public service as well as public corporations and paratestals such as ministeries and the national radio and television corporation respectively. Also, Sup Infos (Septembern, 2011) in Atem (2023) affirm that the professional training focus of university education or higher education in the 1960s and 1970s literary studies, health, management and agriculture . Furthermore, Njeuma et al. (1999) state that professional programmes were developed through professional schools of agriculture, administration, and military academy. These schools operated along side the 1961 created National institute for University.

In the desire to meet the human resource needs of the country, between 1962-1967 general educations was the focus but after 1967 there was the creation of professional and technological schools (Njeuma et al., 1999). Furthermore, Njeuma et al., (1993) hold that Camroon's higher education institutions were structurally of two types; fundamental education obtained from the university and technical/professional education obtained from specialised institutions and schools. By 1970 and 1971, Cameroon higher education took an international professionalisation dimension with the creation of An international (inter-African) dimension was added to the University of Yaounde with the creation under the patronage of the university of Yaounde, International School of Journalism and the Institute of International Relations respectively. In the desire to develop human resources especially for thr public service higher education was free accompanied with monthly allawances, while professionalisation was given an insignificant attention. This was a fundamental mistake as acknowledged by Ngwana (1993) and Doh (2012), because it would later lead the grevious graduate employment crisis that manifested in late 1980s and early 1990s.

Furthermore, according to Atem (2023) government adopted an anti professionalisation policy in the higher education sector because while professional or specialised schools and institutions had strict admission policy, universities had an open

policy. These professional and specialised schools could not produce the required skilled labour for public offices. At this point the government understood that it was imperative to increase the number of enrolment as well as graduates from professional and technological schools. University of Yaounde became very crowded with inadequate staff and infrastructure; more and more graduates became unemployed. Therefore, a reform university or higher education reform was inevitable. Njeuma et al. (1999) affirm that professionalisation of education was one of the major content of the 1993 university and higher education reform.

The first step towards profesionalisation of the higher education sector in Cameroon was, the creation of the ministry of higher education was in 1992 (Decree of 27th November 1992). This was followed by the signing of decree N° 92/074, decree No. 93/026, decree No. 93/027, and Decree No. 93/034. These decrees culminated in what was known as 'the 1993 unversity reforms'. Njeuma et al. (1999) affirm irrespective of decongestion of the then University of Yaoundé being a major push factor, professionalisation of university and higher education was the pull factor. This was to ensure that graduates gain employment and are productive in the both in the public and private sectors of the country. Alos, Njeuma et al. (1999) in Doh & Doh (2016) note that the 1993 reforms were intended and driven by desire to develop professional programmes, professionally reorientate existing programmes to be adapted and responsive not only to the needs of the government but to that of the job market. With this the focus was on graduates either getting employment or creating employment.

The 1993 reforms did not meet the the professionalisation needs of the growing Cameroonian society and economy. Therefore, according to Doh and Doh (2016) the government of Cameroon engage a number of professionalisation shaping policies and reforms in the higher education sector such as: the Bologna Process, the Education Sector Strategy and the Global Reform of higher education launched by the 1999 UNESCO Conference in Budapest , the 2001 law on the orientation of higher education in Cameroon, the New University Governance policy, The 2003 Poverty Reduction Strategy Paper, and the 2009 Growth Employment Strategy Paper. Furthermore, the BUN (2008) in Doh & Doh (2016) hold that the main aim of these reforms was to enable the universities and higher institutions of learning produce graduates who are capable of adapting and succeeding in the ever changing society socially and economically in a globalised dispensation. This golobalized dispensation is a knowledge-based economy.

According to the Buea University Newsletter (2008) and Sup Infos (2011) in Doh & Doh (2016) the New University Governance in Cameroon emphasised professionalisation from the perspective of expanding technical and professional education opportunities. Furthermore, they state that the head of state the head of state and memebrs of government have been constant in echoeing and emphasising the role of professionalisation of higher education. The President of the republic His Excellency Paul BIYA in his Youth day eve message to the youths in 2007 stated that "*various actions are envisaged or ongoing as part of a professionalisation and diversification programme*"; in 2012, "*professionalisation or training, as the case may be, is a prerequisite to resolving the problem of youth employment*"; in 2014, "*Our educational system at its different levels had already opted for professionalisation. We will soon witness its impact, which you will find remarkable*", just to cite a few. This shows the engagement of the Cameroonian government in the process of professionalising higher education studies.

In its drive towards effective professionalisation BUN (2008) in Doh & Doh (2016) hold that universities and higher education institutions need professional support and empowermnent through consyltancy services and internships. This was responded to with the University-Industry Partnership Charter which according to MINESUP (2010) universities was added two missions: students counselling and students' professional integration. These missions can only be effectively executed through quality students' professional development facilitated by quality multimedia based pedagogy. The 2035 emergence vision of the Head of State can only be attained if students' professional development is efficient, thereby producing employable and productive graduates.

1.3.0. CONCEPTUAL BACKGROUND

Saad (2001) in Yarmohammadiana et al., (2011) quality evaluation is considered as one of the most powerful tools in higher education institutions in the world for strategic development. Yarmohammadiana et al., (2011) hold that in this contemporary era it is incumbent for higher education institutions to evaluate their respective courses (programmes). This should be done with the aim of quality improvements and increments of higher educational courses then programmes. Dramatic and spontaneous changes in higher education demand new orientation in planning, implementing, assessment and evaluating of higher education courses and programmes. In this light, the concepts under examination are multimedia, pedagogy, multimedia based instruction, evaluation (programme evaluation),

academic quality, pedagogic quality, didactic quality, technical quality, and professional development.

1.3.1. Quality in Education

According to UNICEF (2000) and Haseena & Mohammed (2015), it is difficult to define quality; however, quality in higher education can be experienced without a standard definition. Therefore, quality has been observed and examined as a relative concept that is used to satisfy the priorities of the respective groups of beneficiaries. Also, Haseena & Mohammed (2015) hold that in higher education; these groups refer to students, lecturers, administrative and technical staff, parents, employers, the society, and funding agencies. However, in higher education, quality can be measured using performance indicators or constructed parameters such as assessment results, facilities and resources, curriculum implementation approaches and processes, students' construction of knowledge and development of skills, participation in co-curricular activities, and prospects of employment. Therefore, it can be input, context, process (teaching and learning), output, or product.

Furthermore, George, Victoria, and Monica (2018) affirm that quality education: inputs refer to the resources that ensure the smooth functioning of educational processes; context examines the relationship between the educational system and society as they influence each other; the process that involves the teaching and learning processes is the major element for human development and change; therefore, the output (result) and product should be assessed in the context of establishing objectives and standards (quality). This work focuses on the process component of quality assessment and evaluation. Quality process evaluation, according to Bess et al. (2004), focuses on the nature of how a programme or instruction was implemented, is being implemented, or operates. Quality process evaluation plays the role of identifying the procedures followed and decisions made in designing a programme or lesson and describing their nature of operation, delivery, and function execution.

1.3.2. Multimedia

'Multimedia' is described by a series of authors as referring to putting together 'multiple' and 'media, which when combined into a compound word become "multimedia, meaning more than one medium (Scheweir and Missanchuk, 1983). Multimedia is seen by

some authors, such as Gayeski (1993), as a computer-driven interactive communication system exploited for the purpose of creating, storing, transmitting, and retrieving textual, graphic, auditory, and visual networks and audio-visual networks of information. Furthermore, WebCrawler (2013) examines multimedia from the perspective of educational multimedia, which refers to channels of communication that transmit messages for instructional purposes. Amongst which are: a. the print media; b. non-print media and projected media; and c. electronic media.

Furthermore, visual is more related to visible elements such as computers, whiteboards, and television, and audio-visual media refers to materials used in instruction and learning processes that combine audio and video or images and present them simultaneously to serve the sight and sound senses at the same time. e. hardware and software; hardware represents machines or equipment exploited in the teaching and learning process, while software refers to the intangible materials that are exploited in the instruction and learning process and enable the functioning of an electronic machine. It is best illustrated in Figure 5, adapted from Bog (2012) in Billa (2017).

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the functioning of an electronic machine. It is best illustrated n figure 05 adapted from Bog (2012) in Billa (2017).

EDUCATIONAL MEDIA TO MULTIMEDIA

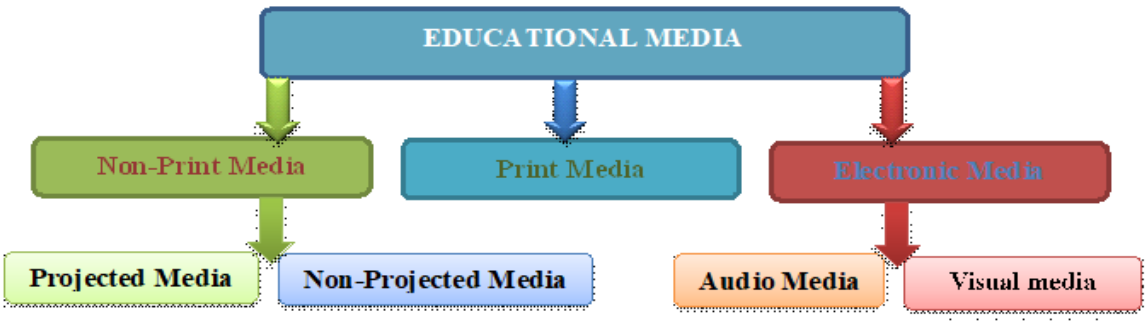

Figure 05: Educational media to multimedia
Source: Adapted from Blog (2012) in Billa (2017)

Blog (2012) in Billa (2017) concludes that to define multimedia in the instruction and learning process (education), educational media must first be examined.

1.3.3. Pedagogy

According to Child Australia (2018), pedagogy refers to a term used to express all that a teacher or a lecturer does with the intention of influencing learning in students or others. Child Australia (2018) goes further to present a number of definitions of pedagogy by different authors around the globe, which amongst others include: pedagogy refers the profession or function of teaching, that is the science or arts of teaching, or methods of instruction in education (DEEWR, 2009a); while Siraj-Blatchford et al., (2002) view pedagogy as instructional strategies and techniques that facilitate learning, interactive processes that occur between a practitioner, teacher or lecturer and the students (learners)which involve the provision of certain elements concern with a learning environment; and Education Scotland (2005) argue that pedagogy is based on teaching and learning which lead to development which is influenced social, cultural, and political values the society has programme for learners.

1.3.4. Multimedia based Pedagogy (instruction)

Multimedia-based pedagogy, otherwise known as multimedia-based instruction, with regards to multimedia-based instruction (pedagogy) Ghode (2012) holds that information or

learning material presented through multimedia tools, gadgets, and materials may sometimes be new and stimulating as compared to information or learning material presented using the traditional classroom lecture method. Ghode supports this assertion with empirical studies from a series of researchers, such as Clark (1983) and (1985), Kulik et al. (1983), Clark and Craig (1992), Khalili and Shashaani (1994), and more than forty research studies on multimedia, which all affirm that learning was more effective in groups when multimedia-based instructions were applied as compared to traditional classroom lectures.

1.3.5. Professional Development

According to Kennedy (2017), it is imperative in defining professional development to state the kind of activities that will enhance professional development, the context, how learning will take place in this context, and how these activities affect teacher's instruction and students learning in a learning environment. Holloway (2006), citing Barry Fishman and colleagues, holds that professional development refers to the process in the educational sector of building new concepts and skills in instructors that are directly related to their profession. Therefore, professional development has to do with building new concepts and skills in students that are directly related to their chosen profession. This is done by improving students' acquisition, learning, and achievement skills, which are applied first of all in a classroom setting and later in practise (the workplace). Furthermore, Cambridge Assessment International Education (2017) holds that professional development focuses on developing professional mental processes and field practise in teachers and, subsequently, students by enhancing the instruction and learning process.

1.3.6. Assessment

According to Hanna and Dettmer (2014), assessment refers to the data gathering process that has to do with the various ways teachers exploit to collect data with respect to the teaching and learning process, specifically students' learning. The purpose of the provided data is to indicate diverse forms of assessment, which may include observation, pre-test, and examination, and the data is used to evaluate the level of students' performance. It is difficult to discuss assessment without evaluation setting in, as it is exploited to pass judgement and determine the value of the results (outcome) with respect to the information or data collected from assessment. This leads to concrete decision-making, in which there are routes, design bases, and strategies to improve identified gaps, weaknesses, and deficiencies. The systematic

process that involves assessment, evaluation, and finally decision-making is best represented by figure 06 below.

Systematic process from assessment, to evaluation and then decision-making

Figure 06: Systematic process from assessment, to evaluation and then decision-making
Source: adapted from Hanna and Dettmer (2014)

The data or results obtained from assessment, be it observation, examination, self-reflection, or essays, are usually evaluated, with the basis being data or results judging; which is after the judgement of the results or data obtained from assessment that the instructional, administrative, managerial, and policy decision-making processes are engaged.

1.4.0. THEORETICAL BACKGROUND

This work exploits a series of models and theories. The work examines Richard E. Mayer's cognitive theory of multimedia learning (instruction inclusive), the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model, the CIPP (Context, Input, Process, Product) Evaluation model of Daniel Stufflebeam, Kirkpatrick's four-level evaluation model, and the social learning theory of Albert Bandura from a professional development perspective. These models and theories guiding this work will be briefly presented in this section.

1.4.1. Cognitive Theory of Multimedia Learning (Instruction inclusive)

The theoretical foundation for the cognitive theory of multimedia learning (CTML) draws inspiration from a number of cognitive theories, such as the Theory of Cognitive Load. According to Moore, Burton, and Myers (2004), the cognitive theory of learning belongs to the larger framework of cognitive science and the information processing model of cognition. Mayer (2003) holds that the main focus of multimedia learning is promoting learner comprehension through a combination of words (sounds) and pictures (visuals), with respect to the nature and manner of learning in humans. The existence of dual channels in multimedia learning holds as an assumption that humans in general have visual and verbal information processing units, which by nature are separated (Baddeley et al., 1998).

1.4.2. ADDIE Model

This is a model that focuses on a systematic instructional design approach that is structured to do Analysis, Design, Development, Implementation, and Evaluation of instructional and learning activities and materials (McGriff, 2000). It is learner-centred; therefore, it is governed by learner outcomes, determined after an objective analysis of learners' needs. Furthermore, Danks (2011) holds that in addition to outcomes and objective analysis of needs, the ADDIE model focuses on developing systems perspectives, is intended to add value, and puts in much effort to ensure that all components of designing interventions and solutions are systematic.

1.4.3. The CIPP (Context, Input, Process, Product) Evaluation model

Stufflebeam and Shinkfield (2007) reaffirm Daniel Stufflebeam as the creator of the CIPP model, in which he gives vivid explanations of his approaches to evaluation through the CIPP set. He had the intention of focusing the CIPP evaluation on improving programmes rather than examining programmes, and there has been enough documentation on its usefulness in a number of educational as well as non-related education programme evaluation settings. The CIPP model is considered for usage in educational programme evaluation depending on the understanding of the educational evaluator with respect to educational programmes dynamism and complexity elements. This is because, more often, in determining the nonlinear relationship between educational programmes, the context, input, process, and product (CIPP) model is considered the most appropriate evaluation approach for evaluating quality educational programmes.

1.4.4. Kirkpatrick's Four Level Evaluation Model

Kirkpatrick developed an approach with four levels for evaluating programmes related to learners' outcomes. Kirkpatrick (1996) acknowledges that this evaluation model has gone viral and has become very popular as a programme evaluation model. This is confirmed by Wang (2009), who holds that Kirkpatrick's model has not only witnessed worldwide recognition but has been widely used in evaluating programmes in training because of its focus on reaction, learning, behaviour, and results. Reaction has to do with the manner in which participants in a training programme react to the programme; learning has to do with the level of change in attitudes and the development of knowledge, skills, and competencies

of participants in a training programme; behaviour is related to the level of change in behaviour as a result of the activities of the training programme; and results refers to the final outcome, result, or product of the training programme.

1.4.5. Social Learning Theory of Albert Bandura in Professional Development Perspective

Bandura's theory of social learning has been proven by Borko (2004) and Watson (2013) to be closely related to professional development theories by stating that professional development theories require both cognitive and social learning elements and components. According to Watson (2013), the cognitive dimension is focused on the notions that change students and instructors' knowledge and beliefs, while according to Lave and Wenger (1991), the social dimension takes into consideration students and instructors' participation as a key component in professional learning that brings about students' professional development.

1.5.0. FORMULATION OF PROBLEM TO THE STUDY

The problem to be addressed through this work is establishing how students' professional development is influenced by quality components of multimedia based pedagogy. Cameroon has taken a number of steps towards the professionalisation of higher education programmes and institutions for graduate employability and high productivity purposes. In this digital age, multimedia resources are used in the instructional and learning processes for purposes of enhancing students' professional development, which is one of the major factors influencing the professionalisation of higher education institutions and graduate employability.

The researcher therefore observed that there has been an increase in the use of multimedia resources, tools, and devices in teaching and learning processes in Cameroon's higher education institutions of learning. However, when he asked a number of lecturers if they could state the elements that determine the quality of multimedia in the teaching and learning process, which can effectively enhance students' professional development, an absolute majority could not identify the qualities that qualify multimedia and its resources in the teaching and learning process. Therefore, the absence of knowledge on the indicators that determine the quality of multimedia usage in the teaching and learning processes

(multimedia-based pedagogy (MBP)) makes it difficult to render quality multimedia based pedagogy services that will effectively enhance students' professional development.

A crucial requirement for students' professional development that will lead them to gain employment and sustain careers is quality. If the main objective of higher education institutions is to produce highly qualified graduates that will contribute to all sectors of human activity (UNESCO, 2005), then multimedia-based pedagogy, which is the tool of the time, should be of standard quality to enhance students' professional development. The Sector-Wide Approach (2006) acknowledges that the Higher Education sector in Cameroon has quality issues. Therefore, Maharasoa and Driekie (2001) in Atem (2023) hold that universities and higher institutions that do not ensure graduate employability are not only wasting students' time and energy but government resources as well. For professionalisation to be efficient in universities and lead to graduate employability, the instructional method (multimedia based pedagogy) components used in students' professional development have to be of the highest quality.

The Cameroon government acknowledges that assessing the quality of multimedia-based pedagogy delivered in higher institutions remains problematic (Castel-Branco, 2020). It is because of the pressing need for quality assessment of the technologies used in the instructional and learning processes, such as multimedia based pedagogy, that the Ministry of Higher Education, from 2000 to 2018, created structures for quality assessment and evaluation in higher education and its institutions (Castel-Branco, 2020). This is because quality is reflected in the employment rates of graduates.

Chiafie (2011) and Mbakwa (2019) affirm that barriers to quality exploitation of ICTs (multimedia-based pedagogy) in Cameroon universities' curriculum implementation processes are because of: insufficient training and capacity building (only 14.28% of lecturers are trained in the use of multimedia in instruction), insufficiency of equipment, quality and suitable software and hardware, and out-dated technological facilities. These are facilitators of poor MBP quality and subsequent insufficient students' professional development because presenting content using multimedia resources and processes poses a problem for students' comprehension. This problem is manifested in poor students' professional development, which is manifested through graduates low employability rates. These explain the reason for the about 30% rate of unemployment amongst graduates from higher institutions or universities in Cameroon (Education Reference, 2020).

The study will therefore assess the relationship between the quality of multimedia-based pedagogy and students' professional development in selected higher education institutions in Cameroon. This will enable the work of promoting the assessment of multimedia's academic, pedagogic, didactic, and technical qualities and examining how they enhance students' professional development by addressing students' academic needs, improving digital learning support, and improving assessment qualities. The work will also propose a model for assessing the basic qualities of multimedia based pedagogy and students' professional development. Therefore, the principal question is: To what extent does the quality of multimedia based pedagogy influence students' professional development?

1.5.1.0. PURPOSE OF THE STUDY

The purpose of the study presents the general and specific objectives of this study.

1.5.1.1. General Objective

The main purpose of this study is to evaluate the relationship between the quality of multimedia based pedagogy and students' professional development.

1.5.1.2. Specific Objectives

1. To investigate whether the academic quality of multimedia based pedagogy influences students' professional development.
2. To find out whether the pedagogical quality of multimedia based pedagogy influences students' professional development.
3. To investigate whether the didactic quality of multimedia based pedagogy influences students' professional development.
4. To find out whether the technical quality of multimedia based pedagogy influences students' professional development.

1.5.2.0. RESEARCH QUESTIONS

The research questions of this study are divivided into general research question and specific research questions.

1.5.2.1. General Research Question

To what extent does the quality of multimedia based pedagogy influence students' professional development?

1.5.2.3. Specific Research Questions

1. To what extent would the academic quality of multimedia based pedagogy influence students' professional development?
2. To what extent would the pedagogical quality of multimedia based pedagogy influence students' professional development?
3. To what extent would the didactic quality of multimedia based pedagogy influence students' professional development?
4. To what extent would the technical quality of multimedia based pedagogy influence students' professional development?

1.5.3.0. RESEARCH HYPOTHESES

This research work was directed and guided by the research hypotheses which were tested. The research hypotheses are structure into general research hypothesis and research hypotheses.

1.5.3.1. General Hypothesis

The quality of multimedia based pedagogy has a significant influence on students' professional development.

1.5.3.2. Research Hypotheses

1. The academic quality of multimedia based pedagogy has a significant influence on students' professional development.
2. The pedagogical quality of multimedia based pedagogy has a significant influence on students' professional development.
3. The didactic quality of multimedia based pedagogy has a significant influence on students' professional development.
4. The technical quality of multimedia based pedagogy has a significant influence on students' professional development.

1.6.0. SIGNIFICANCE OF THE STUDY

At a time when the international and national communities are concentrating on achieving quality education for all by the year 2030, a study of this nature will give students,

teachers, school administrators, parents, educational policymakers, and the government information that will significantly contribute to the achievement of the fourth Sustainable Development Goal of Quality Education by ensuring Inclusive and equitable quality education and promoting lifelong learning opportunities for all.

Article 4.1 of the Sustainable Development Goal of Quality Education states that by 2030, all girls and boys should complete free, equitable, and *quality* primary education leading to relevant and effective learning outcomes (Derek et al., 2015). And this can only be possible when the effective and efficient use of diverse technological materials and gadgets in students' professionalisation is evaluated and amendments are made. In this light, this study will be of great help to students, teachers and tutors, school administrators, parents, policymakers, and the state.

1.6.1. To students/ student teachers

This study focuses on bringing consciousness and awareness to students' minds about the importance of multimedia-based instruction qualities and the role they play in making professional development more consistent with standard qualities and norms. This, in turn, facilitates mastery while improving the quality of education through quality performance. They will understand that the evaluation of the instruction process, especially the tools and materials used, is a prerequisite to improving programmes, teaching, and learning processes. They will understand the role of multimedia in the teaching and learning process, the qualities involved in its evaluation, and how it influences professional development in terms of addressing students' needs, digital learning support, and classroom assessment (validity, reliability, motivation, and performance in classroom assessments).

1.6.2. Teachers / lecturers or tutors

In today's educational system, there is much talk and focus on the use of quality technology in instruction, and multimedia is one of the key components being emphasised and frequently used. The study will enlighten teachers, lecturers, or tutors not only on how to use multimedia gadgets and materials in instruction but also on how to evaluate their quality as well as their effect on instruction in general and professional development in particular. They will understand the basic factors involved in evaluating the quality of multimedia-based

pedagogy, such as academic quality, pedagogical quality, didactic quality, and technical quality.

1.6.3. To university and school administrators

Through this study, university and school administrators will understand the importance of not only using quality multimedia in instruction but, at the end of the day, will be able to evaluate the quality of multimedia-based instruction. This will serve the purpose of strategizing ways of improving the quality of multimedia-based instruction in this technological age to better the quality and standards of students' professional development. With the material that will be presented in this work, they will see the need to equip study halls or classrooms with modern multimedia gadgets (materials and devices) and ensure instructors use them. They will also see the need to empower lecturers with quality multimedia-based pedagogy and programme evaluation knowledge and skills so as to improve the quality of education in the country.

1.6.4. To the parents/ community

This study will help parents comprehend how quality evaluation of the use of multimedia can influence the professional development of students and the contributions they can make to render evaluating a programme's quality easier while supporting quality multimedia usage in professional development so as to improve students' performance in classroom assessment as well as field work. The parents will discover how strategic their role is in supporting institutions of higher learning in the improvement of the quality of education through investing in and sponsoring quality programme evaluation, quality multimedia usage, and quality professional development schemes. This will help the community in particular and the nation at large attains the sustainable development goal of quality education by 2030.

1.6.5. Educational community

This work will enlighten educational partners especially local associations such as the Parents Teachers Association, national and international Non-governmental organisations and governmental organisations such as United Nations Educational Scientific and Cultural organisation (UNESCO), and CONFEMEN Education System Analysis Program, known in French as Program d'Analyses de System Educative de CONFEMEN (PASEC) respectively to understand the technical, financial and material aid they could offer to encourage quality

program assessments and evaluations for quality in the Cameroonian Education system and the Higher Educational System in particular, and reinforce quality educational technology (multimedia) usage in the instruction (teaching), learning and evaluation processes so as to make the Cameroonian educational system more professionally productive and efficient.

1.6.6. Policy makers and the state

This study will enable the government to comprehend the importance of quality evaluation, the use of quality multimedia in instruction, and the role multimedia-based pedagogy plays in professional development, thereby impacting education quality. This will motivate the government to encourage, organise, or programme quality evaluation programmes in universities and educate lecturers and teachers on the need for quality evaluation in the use of multimedia-based pedagogy in lecture halls and class rooms. The 1995 National Forum on Education in Cameroon, in Section 4 of the general provision, stipulates the purpose of education as "*to train children for their intellectual, physical, civic, and moral development and their smooth integration into society bearing in mind prevailing economic, socio-cultural, political, and moral factors*". This can only be achieved through quality education.

Section 4 of the general provision cannot be realised in this digital age of multimedia (technology) if the quality of classroom and lecture hall instructional technologies (multimedia) is not assessed and evaluated in relation to their impact on professional development and if reforms are not made to improve technological usage in instruction and assessment standards. Therefore, the government and all its stakeholders concerned with quality education, through the respective ministries of education, have to ensure the effective and efficient assessment and evaluation of multimedia-based pedagogy quality. They also have to improve students' professional development quality and standards for a quality and productive higher educational system.

1.7.0. SCOPE OF THE STUDY

The scope of this study presents the thematic delimitation, georaghical delimitations, temporal delimitation, and spatial delimitation of the research work "*The quality of multimedia based pedagogy and students' professional development*".

1.7.1. Thematic delimitations

The delimitation of this study involves the evaluation of multimedia-based pedagogy (multimedia-based instruction) from the perspective of its academic quality, pedagogic quality, didactic quality, technical quality planning, its relationship with students' professional development in terms of addressing students' needs, digital learning support, and classroom assessment. The work can be situated under the field of Curriculum and Evaluation and the specialty of Quality Evaluation.

1.7.2. Geographical delimitations

This research is carried out in four regions of the Republic of Cameroon, three regional headquarters cities, and one divisional headquarters town in Cameroon. In the Centre regional headquarter Yaounde which doubles as the political head quarter of the Republic of Cameroon, we have the Information and Communication Technology (ICT) University Campus; In the South West regional Chief town of Buea, we have the University of Buea located in Molyko neighbourhood; In the North West regional Chief town of Bamenda, we have the University of Bamenda located in the Bambili neighbourhood; and in the Extreme North chief town of Maroua, we have the University of Maroua with Faculty of Petroleum industries and Mines (Faculté des Mines et des Industries Pétrolières) located in Kaele (divisional headquarters of Mayo-Kani) some sixty seven (67) kilo metres from Maroua.

1.7.3. Temporal delimitation

The study was carried out during the 2018/2019 and early 2019/2020 academic year.

1.7.4. Spatial delimitation

The focus of this study is on the third-year students in the Department of Curriculum Studies and Teaching in the Faculty of Education, University of Buea; the Department of Journalism, Faculty of Economics and Management Sciences, University of Bamenda; the Department of Engineering Economics, Faculty of Petroleum Industries and Mines (Faculté des Mines et des Industries Pétrolières); and the students of Information and Communication Technology (ICT) University, Yaounde Campus. This University is one of the few in Cameroon that focuses mainly on ICT studies and is greatly engaged in using Multimedia in instruction, both online and offline.

The categories of students in the study were: 245 students from the Department of Curriculum Studies and Teaching in the Faculty of Education, University of Buea; 30 students from the Department of Communication and Development Studies, Faculty of Arts, University of Bamenda; 97 students from the Faculty of Petroleum Industries and Mines (Faculté des Mines et des Industries Pétrolières), University of Maroua; and 67 students from the Information and Communication Technology (ICT) University, Yaounde Campus. A sample of 439 students in the third year of the bachelor's level was used as the sample for the study.

1.8.0. DEFINITION OF KEY CONCEPTS

Quality: Mizikaci (2006) examines quality from the perspective of improving or enhancing; when improvement is consistent and continuous, the potential of attaining academic quality at one point in time is imperative.

Multimedia: Sankey, Birch, and Gardiner (2010) refer to multimedia as a means or tool with a multiplicity of elements used in the transmission of multimedia (diverse forms of) information (knowledge, skills, and competences).

Pedagogy: Pedagogy has to do with educational approaches that are tilted towards empowering learners to be active participants in democratic society by using educational practises that connect learners own experiences to addressing issues immediately and directly to transform structures and systems (Bradshaw, 2017).

Multimedia-based pedagogy (instruction): Ghode (2012) refers to multimedia-based instruction or pedagogy as instructional information or learning material presented through multimedia tools, gadgets, and materials.

Professional development: Cambridge Assessment International Education (2017) refers to professional development as the process of improving professional practises through training and many other activities such as addressing needs, exploiting digital learning support, and assessment.

Higher Education: "*Education Beyond the Secondary Education Level*" (Sunder, 2016)

Academic quality: Lewis and Smith (1994) refer to academic quality as quality principles and concepts that have been established to be in line with best practises and traditions of higher education from the perspectives of information relevance, information validity, and information reliability.

Pedagogical quality: Lisa Lind (2005) in Hornung and Jakob-Haringerstrasse (2006) refers to pedagogical quality as the nature of learning material (content) features that enhance learning and ensure the applicability of the learning material in the instruction and learning process. This is effectively done through pedagogical planning, implementation, and assessment methods.

Didactic quality: According to Koper (2000) and Padrón et al. (2005), didactic quality refers to aids (activities included) of all types and kinds that facilitate educational actors in achieving their planned objectives in the course of the teaching and learning process. The focus of this study is on learning content, learning activities, and learning materials.

Technical quality: Rengkung et al. (2017) refer to technical quality as the perception students develop from a technological service interaction that results from the instruction (service) process. In multimedia-based pedagogy, this perception is influenced by multimedia design, browsing for data, and technological ingenuity.

Assessment: According to Rotenberg (2005), assessment is research carried out in the classroom to provide constructive feedback for the improvement of instruction and learning processes.

2.8.0. CONCLUSION

For the subject under consideration, this chapter has provided historical, contextual, conceptual, and theoretical contexts. The historical background portion covered the growth of teaching aids over time, ICT trends in Cameroonian schools, the evolution of multimedia in the classroom, the development of pedagogy, and the development of professional development. The historical developments of Cameroon as a country and its higher education system have been the main topics of the contextual background section. The conceptual background portion, on the other hand, gave a brief overview of the ideas of multimedia, pedagogy, education using multimedia, evaluation, quality, professional development, and

assessment. Additionally, the theoretical background part gave a brief overview of each theory that was applied to the study.

The problem of this study has also been established in this chapter. Additionally, the general and specific study objectives have been stated, which has helped to clarify the study's intended purpose. In this chapter, the research questions were also presented in the form of both general and specialised research questions. Additionally, both general and research hypotheses were used to present the research hypotheses. Additionally, the study's significance, its purview, and the definitions of its important topics were offered. As a result, the problem of this study and its foundational components are established in this chapter.

PART TWO

LITERATURE REVIEW

This section displays, analyses, and analyses the writings, opinions, and works of various writers in relation to factors in high quality multimedia based pedagogy, professional growth, authors' research projects, and findings not to mention theories associated with the work. Theoretical Review and Conceptual Review are the two chapters that make up the structure.

The introductory ideas, thoughts, and points of view of many writers and publications are presented and discussed in Chapter 2 with regard to the effectiveness of multimedia based instruction (pedagogy). The thoughts, opinions, and publications of various writers are also presented and examined in chapter two (2) with regard to the quality of multimedia based pedagogy from the perspectives of academic quality, pedagogic quality, didactic quality, technological quality, and professional development. Pedagogic planning, pedagogic implementation, and assessment methods are examined as elements of pedagogic quality. Learning content, learning activities, and learning materials are reviewed as components of didactic quality. Browsing, design, and technological ingenuity are examined as components of technical quality. Addressing students' professional aspirations is also examined.

The theories used in the work are discussed in Chapter 3. These theories include the social learning theory of Albert Bandura from a professional development perspective, the context, input, process, and product (CIPP) evaluation model, the ADDIE model, the cognitive theory of multimedia learning, and kirkpatrick's four level evaluation model. The empirical review presented in this chapter includes the authors' research projects as well as findings from related studies, as well as how these findings connect to the various study factors. This chapter also includes a presentation of the study's variables.

CHAPTER TWO
CONCEPTUAL REVIEW

2.0. INTRODUCTION

The writings, opinions, and publications of a variety of authors are presented in this chapter for analysis from the perspectives of academic quality, pedagogic quality, didactic quality, technical quality, and professional development with regard to quality education and the quality of multimedia based pedagogy. Learning content, learning activities, and learning materials are reviewed as components of didactic quality, while browsing, design, and technological ingenuity are examined as elements of technical quality. Information relevance, information validity, and information reliability are reviewed as components of academic quality; pedagogic planning (construction), pedagogic implementation (methods and strategies), and assessment method are examined as elements of pedagogic quality; Examining learning content, learning activities, and learning materials as didactic quality components; browsing, design, and technological ingenuity as technical quality components; and addressing students' professional needs, digital support, and assessment as professional development components.

2.1.0. Quality Education and Multimedia Based Pedagogy (Instruction)

Higher education strives for quality education through the use of multimedia-based pedagogy.

2.1.1. Quality Education

According to Bernard (1999), as cited in the United Nations Children's Fund (2000), when referring to quality education, the focus or purpose of learning (instruction and learning process) is the strengthening of learners capacities to progressively act independently in the aspects of relevant knowledge acquisition, exploiting acquired and developed skills, and cultivating the appropriate attitudes. This quality creates an environment of safety, security, and healthy academic, social, and professional interactions. Furthermore, the EFA Global Monitoring Report (2005) holds that, though the international community has engaged through a number of treaties with respect to quality education, such as the United Nations Millennium Declaration and its commitment to achieve at least Universal Primary education,

which is a prerequisite to higher education, the policy is more focused on quantity and neglects explicitly referencing quality.

Quality education, especially at the implementation and product level, enables learners to be regular and stay in school until completion, are motivated to further their studies, develop emotional and creative skills, be very active professionally, and be productive citizens when they complete their educational cycles (EFA Global Monitoring Report, 2005). For Cameroon to emerge by the year 2035, as is President Paul Biya's vision, the country has to greatly improve its quality of education so as to achieve a higher quality educational outcome by making educational processes and outcomes qualitative.

United Nations Children's Fund (2002) focuses on the importance of quality in education, this is examined from the perspectives of: healthy learners, well-nourished and who are prepared to actively participate and learn; have a healthy environment that is protective, safe, gender sensitive as well as having facilities and resources that are adequate (such as ICTs); the content taught and didactic materials for basic skills acquisition should be reflected in a relevant curricula, focusing especially on life skills and numeracy; teachers should be trained to apply learner centred instructional methods (approaches) or processes, manage the teaching and learning processes effectively and efficiently, facilitate learning through skilful assessments; The outcome of quality education should be focused on building knowledge, developing skills, and developing attitudes guided by national educational goals of the vision for positive societal participating.

In September 2015, with the expiration of the Millennium Development Goals, the United Nations General Assembly, in a plenary sitting, voted on seventeen (17) Sustainable Development Goals. According to the United Nations Development Programme (UNDP) (2015), the fourth Sustainable Development Goal focuses on education and states that "*Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all*". It is important to note that all the other sixteen (16) goals can only be attained or achieved if goal four (4), and especially the component of quality education from elementary up to higher education, is attained. The United Nations Development Programme (2015) acknowledges that children from poor households have higher chances of dropping out of school than children with rich backgrounds. School enrolment, especially in developing countries, stands at over ninety-one percent (91%), but the biggest problem posed is that of quality, which can secure access to higher education, and the higher education level is all

about quality that can develop students professionally and make them more productive in society after graduation.

Ngome (2012) argues that the Cameroonian educational system in general and higher education in particular are being modernised with the aid of Information and Communication Technology (ICT), of which multimedia-based instruction is a component when it concerns ICT in education. This is in response to the demands of globalisation and meeting universal goals. He emphasises that Cameroon is one of the countries in the sub-Saharan region that is progressing significantly in the use of ICT in the school curriculum, both as a tool and as a course. In 2001, under the "Cyber Education Project," according to ICT in Cameroon (2007), as cited in Ngome (2012), the president of the Republic officially instituted Information and Communication Technology (ICT) in the Cameroon education system as a whole. This was aimed at preparing Cameroonian youths to meet the technological challenges of globalisation and employability.

With the "Cyber Education Project," all the then-state universities saw the creation and installation of multimedia centres. State technological and professional institutions were not left out, as even secondary schools were included in the project. This showed the determination of the government to bring the youth of the nation into line with technological evolution and globalisation. This has grossly changed the mode of instruction in some higher education institutions. This is also justified by the fact that the government of Cameroon is encouraging stakeholders to get into the digital economy (Ayesi Eteme et al., 2016), and this will not be effective in the future unless young Cameroonians are equipped with ICT skills using multimedia in the teaching of learners.

The government also had to instill in secondary school students the ICT skills that they will need in the future to excel in higher education and go global. It is for this reason that the Cameroonian head of state, His Excellency President Paul Biya, on the 10th of February 2001, while addressing the youths on the eve of the occasion of the National Youth Day celebrations and talking of the educational system, emphasised with much promise the importance of the integration of Information and communication technologies (ICT) in the Cameroonian educational system (Ministry of Basic Education, September 2007). In that same year, the Cameroonian head of state signed a decree making Information and Communication Technologies official in the Cameroonian educational system, and in 2002, the minister of the then national education, Professor Joseph Owona, signed a ministerial decision defining the

creation of Multimedia Research centres in government secondary schools. In 2003, the minister signed a decree making ICT a subject obligatory from September that year (*Tchinda*, 2007).

Ngamo and Karsenti (2007) hold strongly that the pedagogic integration of Information and Communication Technology in the Cameroonian context involves the incorporation of Information and Communication Technologies (of which multimedia is a component) in the teaching and learning processes in classrooms, lecture halls, and schools for the purpose of facilitating the process. Therefore, it is normal that we talk of educational technology and multimedia as key elements because it is not only important to train the students on the use of educational technology in the classrooms and school milieu theoretically, but as the minister for secondary education stated, it should be practical. Therefore, it should be used in lecturing or instruction and its manner of usage and impact on the professional development of students have to be evaluated to establish its quality. This will enable the institutions and their lecturers or teachers to adopt better and more productive educational technologies in their lecture halls or classrooms, which will lead to a great improvement in the professional development of students that will first be indicated in school by assessment results.

Billa (2019) affirms that the contemporary world is seen as a global village, and Africa, of which Cameroon is an integral part, is not left behind. The irony of it is that Africa as well as Cameroon have not invested hugely enough in this field to significantly exploit the technological components of globalisation, such as Information and Communication Technologies (ICTs), as they have the full potential to educate and develop Cameroonians and Africans in general greatly in knowledge, skills, and competences. This will result in the cultural, economic, and socio-political development of Cameroon and Africa as a whole. Furthermore, according to Billa and Makoge (2019), the curriculum exists as the only roadmap to be properly implemented to attain exceptional levels and dimensions of educational, political, sociocultural, economic, and developmental goals that are based on the philosophy, concept, and practise of multimedia-based pedagogy. Multimedia-based pedagogy is a key component of the curriculum's implementation, as highlighted in the 2001 reform.

2.1.1.1. Quality Education Approaches / Processes in Higher Education

There are a number of approaches and processes involved in determining quality education, and they differ from country to country and institution to institution. According to Matei & Iwinska (2016), the rationale or objective for putting in place a national education quality assurance approach or system is to contextualise its processes. The quality assurance approach or process has to be contextualised because there are a number of factors that influence or determine the appropriateness and structure of the quality assurance approach or system in meeting contextual aims, goals, and objectives. Multimedia used in classroom instruction in Cameroon's higher education institutions is being contextualised to reflect local realities.

These factors are more often internal and closely linked to history, political, economic and cultural realities and traditions, as well as reflecting the interests of the respective higher education stakeholder groups. This framework should be dynamic and make provision for changes over time. In the case of the qualities of multimedia-based pedagogy, the researcher took into consideration the current technological trend in the implementation of higher education curricula or programmes. ICTs and other forms of technology are highly recommended and are used today in lecture halls in the Cameroonian higher education sector. Therefore, ensuring that this approach to instruction is exploited in a standard fashion in higher education is of paramount importance. Therefore, institutions select evaluation approaches based on their ability to provide correct judgement, change-effect recommendations, and conclusions.

It is for this reason that the Higher Education Quality Council (2018) holds that assessment and monitoring systems constitute part of quality assurance and internal evaluation approaches or processes for an institution's verification of mission and objective attainment. Therefore, each higher institution of learning is supposed to have a quality policy that defines and determines the quality assessment and evaluation process, mission monitoring and improvement instruments, vision, strategic objectives, and above all, performance indicators. Amongst many others, universities should design targets and performance indicators to attain their internalisation strategy and establish their institutional experiences in ongoing or completed external evaluations, accreditations of programmes or laboratory and system standards, and the results of these experiences.

Therefore, there are external and internal quality assessment and evaluation approaches and processes under the quality assurance system in higher education. However, UNESCO (2005), in George, Victoria, and Monica (2018), comes up with a framework for quality education understanding, monitoring, and improvement. This UNESCO framework emphasises five components to be assessed or evaluated in quality assurance: inputs with human, financial, and material as well as information resources as content; learners' characteristics; the teaching and learning process; the output of the processes; and the context. It is important to note that this work focuses on the teaching and learning processes component of the quality education assessment and evaluation system in higher education, known as quality assurance.

Process assessment and evaluation in quality assurance, according to Bess et al. (2004), focus on the nature of how a programme or instruction was implemented, is being implemented, or operates. Process programme evaluation functions by identifying the procedures followed and decisions made in designing a programme or lesson and describing their nature of operation, delivery, and functions it executes, as well as the resources used. Above all, it assesses the reasons or facts for success, failure, or mediocre performance and provides data for amelioration or replication. Multimedia-based pedagogy is a process of instruction in higher education. Therefore, it falls under the teaching and learning process specialty of quality education assessment and evaluation.

Rubin and Babbie (1993) see process programme evaluation as a set of research methods that seek to bring out an in-depth understanding of human experience, further generate theories, and present observations that are not often easy to reduce to figures, thereby terming process evaluation a qualitative method of data collection for improvement or replication. Multimedia-based pedagogy is similar to a programme or project that has to be evaluated from the planning stage to the end in order to ensure that the process is effective enough to produce output that enhances the professional development of students by addressing their professional needs, providing digital learning support, and enhancing classroom assessment by making it valid, reliable, motivating, and increasing students' performance.

Furthermore, according to Jain & Prasad (2018) in George, Victoria, & Monica (2018), there are two key elements to be taken into consideration in quality assessment and evaluation processes: the quality of the whole educational system, which has to do with

elements of national and local education, institutions of learning, teaching and learning environments, and educational policies and strategies; and the quality of educational services, which has to do with modernization and continuous improvement of the curriculum and programmes, the teaching and learning process, and the quality of educational resources. This study happens to combine the quality of teaching and learning processes, which is multimedia-based pedagogy, with the quality of educational resources, which are the ICT tools or resources used in executing multimedia-based pedagogy in some of Cameroon's higher education institutions.

It is for this reason that George, Victoria, and Monica (2018) argue that education service is not a product and therefore cannot be measured in the assessment and evaluation process mainly by its output. Therefore, its quality should reflect its service delivery process, which in this case is the teaching, and learning process and educational resources. Also, the quality of human resources, material resources, information resources, and financial resources should be considered determinants of quality education in the quality assessment and evaluation processes. However, Grisay and Mahlck (1991) consider quality education from a three-dimensional perspective, which includes input, processes, and output (result).

On the other hand, Yarmohammadian et al. (2011) consider the Academic Quality Improvement Programme (AQIP) as a modern tool designed for accreditation to guide higher education institutions with quality assessment (evaluation) programmes and services. The purpose of AQIP is to ensure students success in higher education institutions. According to Brua-Behrens (2003) and Yarmohammadian et al. (2011), AQIP has nine (9) scales to evaluate and improve the quality of programmes: helping students learn, understanding students' needs, accomplishing objectives, leading and communicating, valuing people, supporting institutional operations, measuring effectiveness, building collaborative relationships, and planning continuous improvement. Therefore, a successful quality assessment or evaluation should be able to improve strengths and eliminate weaknesses as it influences decisions.

Furthermore, Aas et al. (2009) present different types of quality assessment and evaluation in the higher education sector: accreditions, which has to do with an academic assessment to determine whether an institution or study programme corresponds with stated standards and defined criteria and is carried out by external experts; programme assessment or evaluation, where the focus is on a specific educational programme and the aim is to verify if

the programme or some of its constituents contain an acceptable academic standard; discipline assessment or evaluation, similar to programme evaluation but limited to academia (an exclusive academic object); and evaluations or assessments of quality assurance systems, this has to do with an assessment or evaluation of internal quality focused on the institution's quality assurance system in general and its role as a quality steering and management tool. Therefore, the evaluation process should have a product-transparent result (Dodd, 2004; Yarmohammadian et al., 2011).

According to Zagoruiko (2014), the quality of educational activities in its assessment and evaluation process in a higher institution of learning can be classified into three (3) criteria: the quality of the staff (degree of lecturers and researchers qualification, teaching process, scientific research, and meeting public demand); students training (diversity of education programmes, closing the secondary school and higher education gap, mechanisms of training, professional orientation, and motivation); and the infrastructure and physical learning environment (computer network, modern libraries, and adequate funding). In all these, quality is always the primary concern.

Also, Zagoruiko (2014) concludes that quality assessment and evaluation in higher education settings do not occur by coincidence. It must undergo a scientific process of planning known as the 'concept of quality'. Therefore, goals are constructed, policies are developed and defined, facilities are provided, and every task must be coordinated. Therefore, Zagoruiko (2014) presents components of quality assessment and evaluation as follows: context, having as indicators service quality standard, vision, mission, value, goal, and development plan; input, having as indicators university students, educators, and academic staff, educational facilities, and financing; process, with learning activities and decision-making as indicators; and product, with academic achievement and non-academic achievement as indicators.

Therefore, globally, quality assessment and evaluation in higher education from the perspective of quality assurance have five main approaches: context, input, process, output, and product. This study focuses on the quality process approach of multimedia-based pedagogy. Therefore, it examines the teaching and learning component of multimedia-based pedagogy quality from the perspectives of academic quality, pedagogic quality, didactic quality, and technical quality, with each quality having its own indicators. The quality components of multimedia-based pedagogy are examined with respect to students'

professional development components of professional needs attainment, digital learning support, and classroom assessment.

2.2.1. Multimedia Based Pedagogy

Multimedia-based instruction, otherwise known as multimedia-based pedagogy, has to do with using multimedia tools in the instruction and learning process. The world has evolved radically when it comes to technology. Educational technology has equally followed the technological trends of evolution and innovation by not only making education technology-oriented but by actively using technology in educational processes. Technology is used to improve the academic, pedagogic, didactic, and technical qualities of the instructional and learning processes.

At the centre of educational instructional technologies are ICTs, of which multimedia is a key component. It is absurd to talk about the teaching and learning process today, especially in higher education, without mentioning multimedia because it covers all teaching and learning environments, such as classrooms, offline, and online. Electronic education (e-education), such as electronic learning (e-learning), distance education, and blended learning, are the current trends in education today and are facilitated by multimedia-based pedagogy (instruction) programmes. This is why it is important to evaluate the quality of multimedia-based pedagogy.

Onguene Essono (2008), in the *News Letter of the Pan African Research Agenda on the Pedagogical Integration of ICTs,* while presenting a report on Cameroon's evolution in the field of Information and Communication Technology (ICT), stated that the Cameroonian educational system has greatly involved ICT in the instructional process, which has resulted in a significant improvement in the teaching and learning process. The use of ICTs in the teaching and learning process is considered a pedagogic innovation in the instructional process, which is the basis for multimedia-based pedagogy, especially in higher education.

Also, Mbangwana (2006) and Onguene Essono (2006) in Onguene Essono (2008) affirm that another major problem or difficulty faced in the implantation of ICT (multimedia) in instruction by lecturers is inadequate time, inappropriate methodologies, overcrowded lecture halls, and a focus and attention not on educational or instructional technological

activities but rather on email. With these obstacles, even if all the technological equipment were available, there would not be room for effective and quality instruction.

Furthermore, Emails are limited in their exploitation for quality instruction and cannot, in isolation, improve the teaching and learning process, especially in higher education. For this reason, Onguene Essono (2006) holds that it is an urgent issue for lecturers and students to be trained on the pedagogic-technology first being generalised with ICT. This will facilitate lecturers and students' comprehension of the differences between the use of ICTs (multimedia) and the internet in the teaching and learning process and the use of ICTs as a subject for general application. For this reason, an evaluation of its application in education is necessary for effective instructional practises.

UNESCO-UIS (2015) in Moluayonga et al. (2017), when presenting the role of ICT, of which multimedia is a component, stated that the role of ICT (multimedia) in the construction of knowledge as well as feeding the society with information improves societies through e-education and digital economies as it facilitates the development and delivery of services and attains diverse goals and objectives in education, employment, healthcare, and social development. Also in education, ICT has enabled education to reach the poor and the disenfranchised that were unable to access education.

Furthermore, Issa et al. (1999) in Yamauchi (2008) cite a number of reasons that make multimedia-based instruction (pedagogy) a more effective and efficient method of educational implementation: It facilitates individual pace learning to permit a student to conveniently study out of an instructional setting based on group; There is the use of videos, audios, and audio-visual production in the instruction and learning process, which facilitates student interactions; and multimedia-based instruction also creates opportunities for autonomy for students in the learning process as the consciousness of auto-regulated instruction responsibility is being transferred from the lecturer to the students.

In the views of Bartlett and Strough (2003) and Yamauchi (2008), multimedia in instruction offers a number of advantages in instruction, from lecture content uniformity to teaching courses in multi-section. Also, ICTs, of which multimedia is a component, according to Moluayonga et al. (2017) ICT, or multimedia, in education has facilitated the construction of knowledge and the development of skills highly needed by the 21st century labour market, as well as social mobility through adaptability. Instruction through technology has rendered

people very dynamic so as to adapt to the technological era, where things are moving very fast and changes are frequent, as well as technological innovation and invention.

These studies come to reinforce the idea and fact that when ICT tools and computers (multimedia) are used in lecture hall instruction, the quality of instruction is higher, results in standardised and quality instruction, facilitates time management, increases knowledge and skill comprehension, and increases retention. The content can always be exploited by both the students and lecturers. This is the reason why multimedia-based instruction programmes should be evaluated more often so as to ameliorate these elements, thereby making them instrumental in both students and teachers professional development.

On multimedia and network technologies as components of multimedia-based instruction, Barzega et al. (2012) hold that network technology and multimedia refer to a computer application that is new with respect to the characteristics of the older technologies, and this application highly influences instruction, especially in higher education. Furthermore, there is the possibility of instruction media transfer via network, and a number of websites on education offer various instructional activities o nd l lessonson network.his has greatly strengthened multimedia-based pedagogy and, hence, should be evaluated for purposes of amelioration. Barzega et al. (2012) conclude that multimedia-based instruction has, in recent times, been greatly exploited in instruction.

Multimedia-based instruction is a component of modern education that has come to stay. Therefore, it is important for its usage in all educational sectors, especially higher education, to be constantly evaluated in relation to professional development so as to improve academic, pedagogic, didactic, and technical qualities of multimedia-based education and render students' professional from the dimensions of addressing students' needs, digital learning support, and classroom assessment (valid, reliable, motivating, and increasing performance). Multimedia as a concept can be constituted of four basic components: visuals, audio, audio-visuals, and animation. Existing both in printed, non-printed (projected), electronic, or digital form.

2.2.1.1. Visuals as a component of multimedia based pedagogy

Visuals as a multimedia tool must be of good or standard quality to enhance students' professional development. This is done by meeting the academic needs of respective learners

and gaining digital support through the exploitation of digital resources, which in turn improves students' professional development. Students' professional development is constructed through their learning capacity, which, according to Mayer (2009), is enhanced when visuals are combined with speech during instruction. Lane and Wright (2011) affirm that visuals such as texts, charts, pictures, graphs, and graphics stimulate and capture students' attention in the teaching process. This stimulation and attention capture result in an increasing retention rate. Visuals exist both in physical, printed, and digital forms.

Printed visuals as a visual element of multimedia-based pedagogy

Printed material and the reader are two key elements and actors, respectively, in reading and instruction with traditional multimedia, which enhances literacy skills acquisition, and strategies in text treatment, which are very instrumental in students' professional development (Rasinski and Padak, 2016). Printed materials such as texts, pictures, and images therefore constitute the basis of multimedia-based instruction, especially at the higher education level. These multimedia materials (texts, pictures, and images) should be carefully identified and selected for multimedia-based instruction because they facilitate the construction of knowledge, the development of skills, and the consolidation of competences. These are the basis of students' professional development, especially in higher education. However, there are a series of elements to be taken into consideration in the course of preparation and during the presentation of multimedia-based pedagogical instruction. The key element is the quality of the printed material. Quality has a great role to play in the progressive professional development of students.

Digital visuals are a visual element of multimedia-based pedagogy.

In this digital age, multimedia as well as technology cannot be mentioned without their digital components. Digital text in the teaching and learning process enhances learners' developments of contextual understanding, grammatical knowledge, and critical analysis, which are strategic components of comprehension and skill development resulting in professional development (Board of Studies NSW, 1998; Billa, 2017). Digital resources or material can be presented with the aid of a projector or the internet.igital materials in multimedia-based pedagogy are very flexible and permit students to search, encode, store, and retrieve these materials. Digital multimedia instructional materials should be carefully and scientifically chosen, respecting quality digital material tips and criteria. Identifying and

selecting multimedia digital material, according to Billa (2017), can be very challenging for instructors today. However, they should be chosen taking into consideration the opportunities they will provide the students for professional development.

2.2.1.2. Audio as a component of multimedia based pedagogy

Aamtzen (1993) in Billa (2017) states that audio in multimedia-based pedagogy is a motivating factor that helps the instructor captures the attention of students by tilting attention to the most crucial elements. Audio production in the instructional process has in recent years become a force to be reckoned with in multimedia-based instruction design packages. Billa (2017) considers audio in the multimedia-based pedagogy process as sophisticated sound systems constituted by a series of electronic and electrical modern equipment, ranging from sound cards and generators to synthesisers. Also, a series of computer multimedia software and hardware of higher multimedia quality have greatly enhanced audio usage in the instructional process, especially in Cameroonian higher education with large halls and hundreds of students. Audio enhances the professional development of students through motivation, the development of cognitive abilities, and interactivity. In multimedia-based instruction, audio can either be speech or sound.

Speech as an audio element of multimedia-based pedagogy

Speech has been defined differently by different authors with respect to multimedia-based pedagogy. According to Winn (1993), human speech is an expressive medium that is powerful to the extent that it is the basis for the disposal of instructional content by designers. It is important to note that speech, with its varying qualities of tone, pitch, pace, and loudness, is a natural expression that is often recorded as an audio resource or tool in multimedia-based instruction (Beccue, 2001). Its role is to motivate students to acquire knowledge, develop skills, and enhance their competences for classroom performance as well as professional development purposes. Beccue (2001) focuses on three audio components that are frequently used in multimedia-based pedagogy. These components include, amongst others, speech, sound, and music; they deliver information, capture attention, convey emotions, and give feedback in a multimedia-based pedagogy process.

Sound as an audio element of multimedia-based pedagogy

According to Alten (2002), sound is a multimedia-based instruction tool that is a physical set of vibrations with compressed and rarefaction longitudinal motion waves propagated through structures that can be gas, liquid, or solid (molecular). According to psychologists, sound refers to a phenomenon that contains detachable capacity when it comes into contact with the hearing organs (American Heritage Dictionary, 1982). Sound can be said to be the oldest form of human communication, especially in instructional and learning situations. An instructional resource such as print was only added later. According to Unwin and McAleese (1988) in Billa (2017), the 19th century saw the invention of a series of technologies that facilitated the storage of radio waves as well as their duplication and delivery. This shows the primary role of sound or audio in the internalisation of knowledge that will result in the development of skills as a pathway to professional development.

2.2.1.3. Audio-visuals as a component of multimedia-based pedagogy

Audio-visuals have been in the educational instructional process as multimedia-based instructional tools, resources, and gadgets for a while now, especially in the Cameroonian educational setup. According to Akram et al. (2012), audio-visuals were advocated for in the instructional process by philosophers like Jean Rousseau and J. Pestalozzi. They advocated for the use of play and visual materials in the instructional process. On the other hand, the Webster dictionary in Billa (2017) considers audiovisual from the perspective of didactic aids such as recordings, films, projectors, and computers that are used in the classroom multimedia-based instructional process to stimulate the sight and hearing senses. There exist a number of audio-visual gadgets and devices that are used in the lecture hall for multimedia-based instruction to facilitate the multimedia instructional process.

Audio-visual resources and devices that are used in multimedia-based pedagogy to facilitate comprehension, the acquisition of skills, and the perfection of competences for professional development purposes include slides, PowerPoint, projected oral materials, tape recordings, and microforms. These days, the world as well as education have gone digital. This explains why Bozkurt (2020) holds that online technologies facilitated by the internet, web, and computers are so deeply rooted in modern life to the extent they are considered a global brain with distribution of cognition across networks. Further, Winn (2002) and Bozkurt (2020) attest to the fact that online technology is today greater than it has ever been,

especially in the quality of the teaching and learning processes, as a series of studies have indicated.

In this digital age, therefore, multimedia-based instruction exploits digital multimedia resources, materials, and devices for professional development purposes. Billa (2017) holds that the multimedia resources, materials, and devices used today in multimedia-based pedagogy include the internet, educational television series and DVDs, social media forums (WhatsApp, Facebook, etc.), and many other online resources. The use of all these audio-visual multimedia resources in instruction is to render teaching and learning more effective and realistic so as to facilitate comprehension and the development of skills because the academic needs of the learners must have been met, which in turn will result in professional development through quality digital learning support.

2.2.1.4. Animation as a component of multimedia based pedagogy

Multimedia cannot be discussed today as a multimedia-based pedagogy resource or tool in multimedia-based instruction. Animations are exploited in the instructional process in the lecture hall, offline, and online. Animation has been at the forefront of multimedia-based pedagogy for about two decades (Dunbar, 1993). This means that animation is a key component of the multimedia components in multimedia-based instruction. Mayer and Moreno (2002) refer to animation as a pictorial presentation in which computers generate motion pictures to establish associations or relationships between drawn figures. Animation is all about three elements: picture, motion, and simulation, which reflect reality through the motion of these drawn objects.

Computer animation as an animation element of multimedia-based pedagogy

Multimedia-based pedagogy and education in general, especially at the higher levels, exploit animation in instruction more frequently, especially in the sciences and engineering. Musa et al. (2013) and Billa (2017) recall that animations are used in this digital age to enhance students' productivity as a result of professional development brought about by effective and efficient learning. To them, animation has to do with the movement of drawn objects through a simulated motion, presented using a computer. Weiss et al. (2002) appreciate animation as a multimedia tool in multimedia-based pedagogy that provides feedback to the instructional and learning processes. These feedbacks motivate and orient the

students towards knowledge acquisition, skill development, and competency perfection for professional development purposes.

PowerPoint animation as an animation element of multimedia-based pedagogy

PowerPoint animation has been used for decades now as an animation component in multimedia-based instruction. Billa (2017) affirms that PowerPoint animation can effectively and efficiently serve as a multimedia tool in instruction. This is because it combines a series of media like sound, visuals, and video, making it a very efficient presentation multimedia tool that thereby increases student productivity, which is reflected in professional development. Renynolds (2008) hold that PowerPoint animation resources enable miniscule attention from students which results in active cognitive processes that provoke and consolidate learning and skill acquisition to enhance professional development for employability purposes.

2.3.0. Academic Quality in Multimedia Based Pedagogy

Mizikaci (2006), while referring to higher education quality systems, asserts that the interest in quality systems in higher education has taken a popular twist due to their relevance to accountability and accreditation in higher institutions of learning. Therefore, approaches and conceptions relevant to the quality of higher education are constantly under various reviews for the purpose of contextualising them for both national and international relevance.

Irrespective of the several definitions of quality in education, Campell and Rozsnayi (2002) in Mizikaci (2006) refer to it as ‘excellence’. This definition has been said to be considered an academic view that is traditional in perspective, looking at quality from the perspective of the best; some approaches even see quality from the perspective of financial value, which is effectiveness and efficiency in accountability in higher institutions (Mizikaci, 2006). This makes academic quality a key component that impacts students’ professional development.

Several authors such as Sun (2008), Yarmohammadiana et al. (2008), Yarmohammadiana and Haeri (2003), and Yarmohammadiana et al. (2011), have been consistent in stating that the definition of quality in higher education or higher institutions of learning has not reached consensus. They hold that it is only through evaluation that educational administrators and managers can obtain valid data or valuable information that

concern the level of efficacy and efficiency of academic programmes and pedagogic implementation through their strengths, successes, failures, or weaknesses.

Also, quality is seen from the perspective of threshold. This is due to the fact that it sets specific norms and criteria that, when attained by an institution, It is said to be of high quality. And quality is also defined from the perspective of improving or enhancing; when improvement is consistent and continuous, the potential of attaining academic quality at one point in time is imperative (Mizikaci, 2006). For this reason, the evaluation of quality is imperative in multimedia-based pedagogy. Furthermore, these corrective measures can improve the quality of programme planning, implementation, learners' assessment, and higher education evaluation itself. However, the issue of quality in higher education has been contextualised for different academic purposes by different authors, such as Harvey and Green (1993), El-Khawas (1998), Birnbaum and Deshotels (1999), and Campell and Rozsnayi (2002). The academic quality of a multimedia-based pedagogy programme is very instrumental in students' professional development.

According to Mizikaci (2006), quality as a term is used more often to express standards in businesses and industries and therefore has to be redefined to make it relevant in the educational or higher educational sector (context). On this, he states that a great job has been done by Lewis and Smith (1994) using Ohio State University's (U.S.A.) quality principles implementation. They hold that quality principles and concepts have been established to be in line with best practises and traditions in higher education. This is based on the philosophy, norms, and values that indicate the quality systems that are applicable and usable in higher education.

Furthermore, These philosophy, norms, and values have to do with qualities such as standards in services, planning and attaining goals and objectives of the constituents, identifying and ameliorating institutional transformation processes and systems, implementing collaboration and teamwork, instituting leadership-based management systems (knowledge-based and involvement decisions), problem solving through systematic fact identification, feedback usage and applications of statistical tools and methods, and the development of human resources in higher education institutions.

Malcolm Baldrige came up with a programme evaluation model that became very popular and widely used in the higher education arena. *Malcolm Baldrige Quality Award*, of

which quality improvement is a major component of the model that is usable in businesses, services, and manufacturing. The model focuses mainly on customer satisfaction, which Moore (1996) and Mizikaci (2006) present in the following classes: leadership, strategic quality planning, information analysis, developing human resources and management, process quality management, quality and operational results, and customer focus and satisfaction. These qualities are very applicable in the higher education sector because, at the end of the day, society expects exceptional leadership skills from university administration. Higher education has to be strategically planned to meet the needs of the institution, the individual, and society.

Furthermore, Yarmohammadiana et al. (2011) hold that, given that the world is constantly changing, it is the responsibility of higher institutions or education to make provisions for meeting social needs conveniently in this age of uncertainty. The quality of university education has greater chances of improving society. Therefore, higher education has to be modernised to improve academic quality and meet the challenges of this rapidly changing society, especially in the dimension of development. This can only be done if the higher education system, institutions, programmes, courses, and methods of pedagogic implementation and assessment are constantly evaluated so as to use acquired data for strategic reformation that will increase quality and meet the needs of a fast-changing society. And one of these programmes to be constantly evaluated is the multimedia-based pedagogy programme.

Therefore, its quality is judged by the satisfaction provided to all its stakeholders (students, lecturers, industries, employers, the government, and the nation as a whole). To state the quality level of these components in higher education, Ostroth and Turrentine (2000) in Mizikaci (2006) state that these components are evaluated by accredited quality assurance systems through programme reviews. Programme reviews can also be used to evaluate the academic quality of multimedia-based pedagogy programmes with respect to students' professional development.

This model in its implementation has been seen to be effective in higher education in assisting in the development of cross-departmental and establishment of cross-institutional standards, raising expected performance, and facilitating communication and collaboration within and out of higher institutions of learning due to mutual understanding and interest in concepts and values. A lot of collaboration on standards and values has been done on

leadership, learning-centred education, faculty and staff participation, continuous improvement, development and design quality, development of partnerships, statistical data, and results-oriented management, with a lot of focus on their processes. It is important to state that most of the quality systems being used in the higher education sector are adapted from industrial and business operations, though they need reorientations so as to focus higher education on educational practises (Mizikaci, 2006).

Shrestha (2010) and Yarmohammadiana et al. (2011) hold that in relation to academic quality, there exist seven dimensions that, when graduates are employed, their employers use to evaluate the academic quality of the faculty, programme, course, and even the educational administrators. It involves leadership skills in teaching (pedagogy), leadership skills in research, skills in fair and efficient management, visionary spirit and strategic skills, participative leadership skills, development orientation, and the ability to recognise and manifest interpersonal skills. Furthermore, Yarmohammadiana et al. (2011) see the AQIP (Academic Quality Improvement Programme) as an accreditation design that is very up-to-date or modernly structured to aid the higher education sector in the quality assessment activities with respect to programmes, courses, and services that contribute to making a student successful during and after studies.

Multimedia-based pedagogy is an educational practise that is being enshrined in the higher education sector not only in Cameroon but around the world. To make higher education systems of high quality, the effectiveness of these systems and their components must be evaluated. This is with respect to the concepts and norms of educational evaluation activities (assessment). Evaluation activities are meant to bring about judgements that will facilitate and guide the decision-making process on quality improvement or maintenance. The irony is that most educational quality evaluation and assessment systems do not take into in-depth consideration practises such as instructional implementation, methods, programmes, design, courses, students, and faculty components (Mizikaci, 2006). He also states that higher education quality systems that have been put in place more often disregard principles of programme evaluation.

Saad (2001) in Yarmohammadiana et al. (2011) is in conformity with this view as he states that the strongest tool at the disposal of higher education for its strategic development is evaluation. Evaluation is the key tool for increasing or improving the academic quality of higher education programmes, courses, and pedagogic implementation. There have been

drastic changes going on in Cameroonian society these days, and as such, the demand for new lines of thinking and ideas on the training of future quality professionals is inevitable. The world has been overtaken by information and communication technologies, which are being considered today in higher education as a strategic tool for developing students' critical thinking, problem-solving skills, information collection and management, effective communication skills, and motivating them for further studies (AHIMA, 2010; Yarmohammadiana et al., 2011).

According to Brua-Behrens (2003), the Academic Quality Improvement Programme (AQIP) has nine (nine) scales used to evaluate programmes so as to improve them. With these scales, programmes and courses are classified. They include: i. facilitating learning in students; ii. Attainment of set objectives; iii. Comprehension of students needs; iv. Valuing others; v. skills in leading and communication; vi. Efficiency in supporting institutional operations; vii. Efficiency in measuring effectiveness; viii. Consistency in planning continuous improvement; ix. Efficiency in building collaborative relationships.

The role of higher education or universities cannot be underestimated in a society that desires to develop sustainable scientific, economic, cultural, social, and human resources while meeting the rapid changes taking place in society. Therefore, it is incumbent on higher education in the world and in Cameroon in particular to use professional higher education programme planners and programme evaluators to evaluate higher education programmes and courses. After which, they will establish the weaknesses and strengths of each programme and course and propose necessary steps to strengthen and accelerate scientific innovation in terms of productivity in the higher education sector. Globally, academic quality depends on how effectively and efficiently higher education programmes and processes, such as multimedia-based pedagogy, are continuously planned, implemented, evaluated, and reviewed.

The Academic Quality Improvement Project Criteria (principles/academic quality)

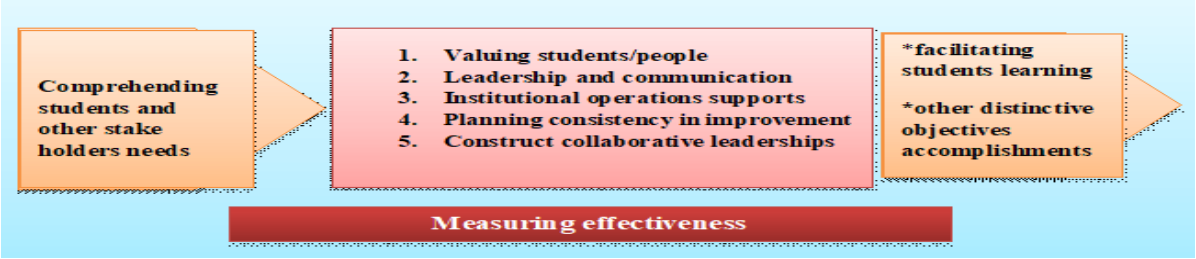

Figure 07: The Academic Quality Improvement Project Criteria

Source: Adapted from Academic Quality Improvement Project (2002)

The Academic Quality Improvement Project Criteria (AQIP) make it very clear with emphasis that an institution, especially a higher education institution, should be direct and lucid in stating their missions and be certain in identifying the target population on which the processes are being implanted to expand qualitatively its energies and capital. Therefore, these institutions need to create systems that can identify with precision the changing needs of the students and the stakeholders to create better standards of academic quality.

Also, Academic Quality Improvement Project Criteria (AQIP) hold that academic quality is further improved according to Figure 8 by aiding core processes that highlight learning, which involve instructional design such as multimedia-based pedagogy and delivery by students. This greatly enhances students' learning, thereby attaining the principal aim and ends of a higher education institution. However, for academic quality to be met, higher education institutions need to attain a good number of objectives so as to show diversity in the processes implemented by higher education institutions to pursue secondary goals in the fields of endowment fund development, research, community services, and sports competitions such as the university games in the Cameroonian higher education system. These criteria are focused on examining the major processes put in place by a higher education institution to improve academic quality through the creation of value for both students and the educational community.

Furthermore, figure 7 brings out the understanding that higher education systems exist or function because of the processes that the institution has put into practise to meet academic and other goals. This is to ensure that the institution impacts the lives of both students and stakeholders in a positive manner. This explains why the centre of figure 8 illustrates the internal system's order, which facilitates and uplifts the processes that impact students, stakeholders, and community lives directly. Communicating and learning, valuing people, persistent development planning, institutional operations support, and constructing collaborative relationships determine the main activities and systems used by an institution as a means to attain its missions or goals owed to students and partners. These systems, with respect to academic qualities, are facilitators of educational delivery, and the respective services of the institution are not noticeable to students, partners, or other stakeholders.

The Academic Quality Improvement Project Criteria are very concerned with identifying and examining the internal support processes and systems in an institution that are hidden. The criteria also seek ways to independently review operating schools, departments,

divisions, and offices and also make provisions for comprehending critical systems that have the obligation to be connected and organised in a manner that fosters the institution's capacity to maximise the ability to instill in the students qualitative knowledge and skills while meeting the services and needs of the educational community and, why not, other partners.

Quality assessment and evaluation are key to determining academic quality; it is important to measure effectiveness and efficiency so as to ensure the sustenance of other higher education institutional systems. This is done by effectively and efficiently collecting data, storing the information, retrieving it later, and interpreting the result of the analysis so as to use the information to improve a component or the institution as a whole.

AQIP acknowledges and places emphasis on the role of resources and inputs in improving academic quality. Evaluation is a necessity in this criterion because it is when institutions measure with accuracy the performance of the main processes, such as the method of instruction, to verify whether its delivery is actually meeting the needs and aspirations of the students and partners. The development and usage of performance metrics are crucial and important at this stage to help the institution verify its effectiveness and efficiency in using resources, accountability to funders, and support. Where there are loopholes in relation to the current level of performance and prospective results, new strategies are developed and implemented to improve the processes and systems so as to improve performance and obtain the prospective or planned results.

In fact, nine criteria are presented by AQIP for the interrelationship amongst higher education systems for the effectiveness of academics. These serve the purpose of advancing the main mission of higher education institutions by taking into consideration the definition and ensuring the evaluation of the main or major processes and systems within higher education institutions with respect to learning. AQIP also recommends concrete indicators for measuring the effectiveness and efficiency of these processes and systems. Among these indicators, one of the most important, especially when it comes to multimedia-based pedagogy programme evaluation, is information relevance and reliability.

2.3.1. Information Relevance in Academic Quality Assessment

According to Mizikaci (2006), information relevance in higher education or institutions of learning is closely linked to quality. Higher institutions of learning are

organised or planned in such a manner that they are open, flexible to change (adapt to changing times), interactive, and holistic. The relevance of its features is highly considered in developing higher education programmes and courses to make it a quality s ystem.he organisation of such systems in terms of information relevance is an essential component of the system's input and transformation processes, which result in quality output and make the system whole. For the relevance of the information to be established, there has to be a comprehensive and systematic evaluation system or approach in higher education institutions that reviews the relevance of information in its programmes and their function when it comes to practise. This evaluation approach determines and enhances education quality.

Furthermore, Mizikaci (2006) holds that this evaluation approach should make use of theories of programme evaluation with a holistic approach because it takes into consideration all elements of a programme with its information relevance components. The information should have interactive and impactful components to make it relevant in higher education. This is because higher education studies are global while taking into consideration local realities and are designed taking into consideration universal norms and adaptability, as they are liable to accreditation quality systems that are international or external. It is also because higher education institutions and their products are bound to relate to external systems in which society and the labour market are key or major stakeholders. The relevance of the information and adaptability of higher education institution programmes and courses enable them to obtain new properties from these stakeholders and others.

Mizikaci (2006), in this light, holds that implementation and internal interaction with systems are very important in determining quality in higher educational systems. Therefore, for the products of higher education to be productive, it has to put in place quality implementation (instruction or teaching) measures that will be interactive and transferable. This is done by taking into consideration students' entry characteristics in relation to course qualifications. Furthermore, there should be a match between these two to facilitate the implementation of relevant information and skills in the programme. This includes skills in adapting to multimedia-based instruction, which results in higher graduation rates and a higher quality of graduates, respectively. This will also improve assessment in higher education to be more effective and efficient, giving rise to increased performance and making the end product more effective and useful.

The quality of implementation (instruction) when information is considered relevant is very important in reflecting quality in the higher education institution's products. Higher education grossly influences or impacts the functioning of subsystems. This influence or impact is determined by the nature of the programme objectives set and the relevance of the information inserted during the programme planning phase or process, which in turn determine the effectiveness of programme implementation, of which multimedia-based pedagogy is a key component in contemporary education, and the output, which has to do with the quality of the products in terms of creativity, productivity, and usability. This is established by the fact that the educational policies of a higher education institution determine its internationalisation, which in turn impacts the behaviour of the institution (Mizikaci, 2006).

Furthermore, with respect to information relevance, Ljubojevic et al. (2014) hold that modern processes in teaching contain as their basis the exploitation of multimedia instructional materials as well as the internet. Therefore, the cognitive theory of multimedia learning gives insights and establishes the basis for educational multimedia content presentation. This theory focuses on giving a vivid explanation of the role of the modality principle when it comes to the process of learning in an effort to effectively and efficiently facilitate the processing of multimedia information. This is done by ensuring that the information selected is relevant and that the information is structured into a sound (verbal) and visual (pictorial) model.

The goal of every teacher is that information should be processed; this information is processed through a dual channel, which, after the reception of verbal and pictorial information, goes into the working memory as an audio and visual model of information. According to Mayer (2001) and Moreno and Mayer (1999), to make information relevant, rationality in the exploitation of resources when designing multimedia-based instruction is of utmost importance. Consider this key factor for the outcome of the learning process. All of this is in an effort to improve the quality of relevant information, which in turn will improve students' professional development.

De Jong (2010) and Ljubojevic et al. (2014) further hold that the cognitive theory is much related to the cognitive theory of multimedia learning when it concerns the relevance of information in multimedia instructional design and educational research. Therefore, they should be applied and analysed together to effectively attain instructional and learning goals

and objectives through excellent performance. Furthermore, Valle et al. (2003) and Ljubojevic et al. (2014) affirm that previous research indicates that learning process efficiency is closely linked to the interaction between cognitive and motivational variables.

Therefore, information is rendered relevant when it provokes cognitive, affective, and psychomotor processes through motivation, which is one of the functions of multimedia in pedagogy. In evaluating programme implementation, the extent to which an instructional method is motivational in provoking cognitive processes is a key component taken into consideration. This is because an effective interaction between motivation and cognitive processes will facilitate the attainment of instructional goals and objectives by projecting the relevance of instructional information, resulting in standard academic-quality multimedia-based pedagogy.

Higher institutions of learning, such as universities, need to accommodate the international or external influence imposed by the assurance and accreditation quality systems. This is because the institution or system has a number of external elements to interact with so as to attain certain levels of quality and standards. Some of these institutions, especially in the developing world, try to get attached to higher education institutions in the developed world, such as Oxford University and Cambridge University in the United Kingdom (UK), Harvard in the United States of America (U.S.A.), and the Sorbonne in France.

These institutions have gained international reputations in terms of quality and standards, and they are often referred to as ‘super institutions, which give rise to super systems that determine the functioning and togetherness of higher education systems. These supersystems incarnate in the form of ministries of higher education, or simply ministries of higher education, or international structures of higher education. They determine standards and quality through programme evaluation, and information relevance is strongly taken into consideration.

Gates et al. (2002) and Mizikaci (2006) hold that evaluation of a system or programme, including the nature and relevance of the information transmitted to the students, is very important in determining issues stakeholders need to identify, review, and make the system more efficient by upgrading the existing programmes to a higher level of efficiency. This cannot be done without the presence of international systems of higher education, which

help higher institutions meet up with contemporary higher education challenges, especially in terms of mobility, competitiveness, and evolution with international trends.

One of the main goals of programme evaluation systems is to assess the relevance of academic information through the quality of programme implementation. That is why multimedia-based instruction or pedagogy is growing in popularity in the higher education sector because it is said to improve the quality of instruction and facilitate comprehension and the development of skills using relevant information. The quality of implementation, especially when using multimedia-based pedagogy, greatly influences professional development, which is crucial in higher education.

2.3.2. Information Validity in Academic Quality Assessment

According to Messick (1989), validity has to do with the degree to which information, facts, data, and theory prove the interpretation of scores from a test (assessment) obtained from subjects who participated in the assessment. Furthermore, he states that the process of validation has to do with the accumulation of evidence for a solid scientific basis for score interpretations. In other words, it has to do with the interpretation of scores from a test for diverse evaluation purposes.

Also, Shillingburg (2016) holds that the key factor in test development is to create an assessment that will enable appropriate inferences of information with respect to the performance of a learner on a particular content material and to be confident of allocating or indicating the contribution of the teacher, method, technique, or strategy to the performance. Multimedia-based pedagogy makes it easy to determine the validity of information because it is carefully planned, well structured, organised, and accessible. This should in line on how validity in the academic and information processes in particular can be measured.

For this reason, Covacevich (2014) holds that the validity of information through an assessment instrument has no chance of being measured using an absolute scale. This is because, in the views of Cohen and Swerdlik (2009), validity is considered the dividing tool between acceptable (standard) information, especially in higher education, and weak information. This is with respect to the extent to which the information constructs the knowledge, skills, and competences it is designed to measure. Also, they hold that most

authors agree with the classification of validity into strong, average (moderate), and weak, which is very applicable to information.

This is justified by Darr (2005) and Covacevich (2014), who state that the relationship between validity, inferences, and made decisions for a particular group with respect to a given context is such that in order for the validity of an information to be judged objectively, it demands collecting a large or huge quantity of data. In this light, different types of validity result in different approaches to designing test instruments or tools, which in their diversity collectively contribute to information validity irrespective of their differences in levels of importance.

Kane (2006) believes that information validity has to begin by making a clear statement on the purpose, predictive interpretations, and what the information will be used for. Furthermore, Cronbach (1980) shares the view that validity with information validity included has a tough job of thoroughly attempting to validate an instrument as well as the information gotten, and if the efforts do not succeed to show that the assessment instrument or information covers content matter, then the assessment (instrument) and information can be said to be invalid, but if it covers content, then it is said to be valid and can serve the intended purpose. AERA (2008) concludes that validity refers to the degree of support gotten from all accumulated evidence on the interpretation of a score from an assessment (test) for an intended purpose.

Also, for an assessment to indicate information taught as valid, the instruments and tools used in measuring or evaluating the validity of the said information have to be valid themselves. Therefore, validity can be classified or grouped into multiple classes depending on the purpose of the assessment exercise. According to Covacevich (2014), some authors classify validity into content, construct, and criterion validity, be it in information or assessment, while Wilson (2005) in Covacevich (2014) holds that some authors classify validity into construct, item, content, facial, concurrent, criterion-referenced, predictive, amongst many others, which to him simply shows that it is not obligatory to exploit all validity at the same time or for the same purpose.

According to JCSEPT (Joint Committee on Standards for Educational and Psychological Testing) (1999) and Wilson (2005) in Covacevich (2014), their approach emphasises the purpose of validity with respect to evidence or its lines, test content, processes

of response, relationships with existing variables, its internal structure, and essentially its consequences rather than types of validity, especially when information validity is concerned. Multimedia-based pedagogy quality cannot be established without information validity.

Covacevich (2014) concludes by declaring that an assessor or pedagogue (teacher, lecturer, instructor, or evaluator) should consider assessment of information validity as obligatory to differentiate consequences related to decisions on instructional or educational policy from those that are not directly related to information assessment instrument or tool validity. However, the evidence based on consequence can certainly be directly related to validity if construct under-representation or irrelevance of construct is concerned (JCSEPT, 1999; and Wilson, 2005 in Covacevich, 2014).

Furthermore, Test content-based evidence, response process-based evidence, internal structure-based evidence, and consequences of testing-based evidence are purpose-based evidences of information validity that can be professionally exploited in multimedia-based pedagogy. Classroom assessment instruments and tools with exactitude indicate information qualities and standards to be ameliorated by policymakers, educational administrators, other stakeholders, lecturers, and students for the purposes of facilitating professional development.

2.3.3. Information Reliability in Academic Quality Assessment

Tworek is one of the authors who have written enormously on reliability and information from a technological perspective. According to Zahedi (1987) in Tworek (2018), reliability as a theoretical concept in relation to information is a measurable component that is relevant in controlling, managing, determining quality, and indicating potential problems. In higher education, information reliability is very important in making the courses, programmes, and whole system effective and efficient. Tworek (2018) holds that its components cannot be separated from those of efficiency.

Information reliability can be said to be built based on factors from different theories, of which TAM (1985) and Tworek (2018) came up with the technological acceptance model. In fact, in today's higher education, it is difficult to verify the reliability of information, especially in multimedia-based instruction programmes, if technology is not accepted and exploited.

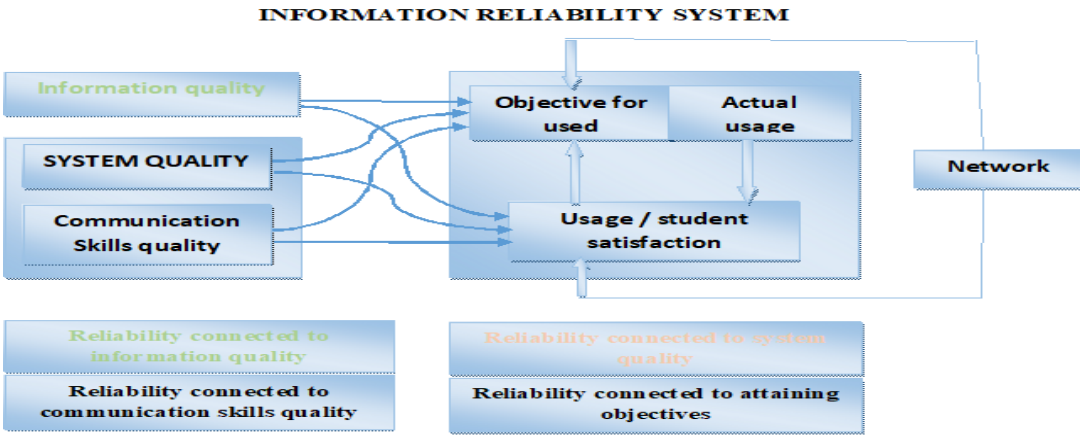

Figure 08: Information reliability system

Source: Adapted from Tworek (2018)

She further holds that reliability in an information system is made up of four components, which include reliability of information, reliability of support services, reliability of the information system itself (reliability of system usage), and usability, which determines the reliability of information and its system (Palmius, 2007; Tworek, 2018). Furthermore, according to her, information reliability is a main factor that determines and establishes the main differences with respect to the results obtained from the analysis of two groups. In higher education, information reliability is a key factor in determining the quality of information transmitted to students in the course of curriculum implementation, especially when using multimedia-based pedagogy. This is because the reliability of the information will determine the productivity of the course or programme under study because it is closely related to accuracy and accessibility (Tworek, 2018).

According to Hutchinson and Warren (2003), information systems with fixed characters do influence information technologists not to focus on or to give very little attention to a factor such as the portability of information. However, portability of information in relation to information reliability is very important, especially in multimedia-based pedagogy, because one of its purposes is to make information transmitted or developed through instruction portable. Information cannot be said to be reliable if it is not portable so as to be comparable. Also, for information to be reliable, it needs to respond accurately to the needs and objectives of the course, programme, students, lecturers, institution, stakeholder groups, and society as a whole. The role of multimedia-based pedagogy is to ensure that the instruction design meets requirements such as course and programme objectives, students and

teachers aspirations, the goals of the institution, the expectations of the stakeholders, and societal demands.

2.4.0. Pedagogical Quality in Multimedia Based Pedagogy Quality Evaluation

Onguene Essono (2008) examines the role of multimedia resources in education in Cameroon's educational system. According to Onguene (2008), the installation or creation of multimedia resource centres in private structures, high schools, and universities is a contributing factor to the pedagogic quality of these structures, schools, and higher education institutions. Furthermore, he emphasises that it is an indicator of political or government efforts in improving the quality of instruction and learning, facilitating the attainment of national educational aims, goals, and objectives, thereby closing up the gap created by the unemployment of graduates.

Also, Onguene Essono (2008), citing Yarmohammadiana, Mozaffaryb, and Esfahanic (2011), hold that in today's changing world, which is accompanied by high uncertainty, it is imperative that higher education institutions all over the world be at the forefront of providing concrete solutions to social, economic, political, and social needs. This can only happen when the pedagogic quality of higher education institutions is of high standard.

According to Weber (2003) and Yarmohammadian (2004) in Yarmohammadiana, Mozaffaryb, and Esfahanic (2011), it has been proven by experience that higher education can provide effective and efficient services to communities when they are constantly improving the quality of their services through quality pedagogy. The basis of education and higher education in particular that determines the end product is the pedagogical process. The various methods, techniques, strategies, and styles used in a higher education institution for the development of students' knowledge and skills determine the quality of knowledge and skills these students will build as well as the quality of services they will render for the development of society.

Therefore, it is an educational and moral duty to evaluate the pedagogic quality of higher education institutions so as to make recommendations on improvement and sustenance strategies. It is more important in this technological age to evaluate multimedia-based pedagogy programmes, which are rapidly taking over instruction in higher education.

2.4.1. Pedagogical Planning (Construction) in Pedagogic Quality

According to Cole (1990), planning is the activity of making decisions on activities to be realised, such as objectives, resources, expected behaviour, awaited results, and evaluation. Furthermore, planning has to do with preventing adverse effects, focusing on set objectives, making provisions for the functioning of a system or programme, and creating opportunities for control and regulation of activities. Touré (2008), in the *News Letter of the Pan African Research Agenda on the Pedagogical Integration of ICTs*, firmly states that outcomes (from instructional to educational) are greatly influenced by planning quality. She cites the case of Zambia with its Information and Communication Initiative, which aided in its planning through cooperation with e-schools and communities based in Ireland, and the result has been effective, especially on issues of planning processes and policies.

For a multimedia-based instruction programme to indicate excellent qualities and standards when evaluated, it has to be effectively and efficiently planned so as to also positively impact students' professional development and classroom assessment in particular. Koontz and Weihrich (1994) see planning as a process that creates opportunities by setting objectives, developing a plan of action, and determining means of realisation. In instruction planning, the facilitator or teacher plans three key components: 1. Delivery: which involves components such as topics, objectives, presentations, methods, objects, and content, just to name a few; 2. Content: lesson planning (topics are sequenced), selecting tutorial strategy (presentation and assessment strategy), and execution (relevant knowledge sources); 3. Execution: methods, strategies, and materials

This view is upheld by Cornell University (2014a), which holds that problem-based and project-based methods of instruction and learning facilitate designing and establishing solutions to day-to-day problems and situations. That is why, when planning multimedia-based instruction, the method to be used has to be carefully elaborated to ensure that the goals and objectives of the lesson or programme are attained. This makes professional development possible through addressing students' needs, providing digital learning support, and making classroom assessment valid, which gives greater chances of establishing reliability.

According to LSIS (Learning and Skills Improvement Service) (2010), active learning is the best for instruction and learning today as it encompasses about ten (10) pedagogic approaches that positively impact learning and instruction. It facilitates learners' development

of profound and deep learning experiences. These approaches include co-operative learning for learning assessment, language and numeracy, differentiation literacy, multi-sensory learning modelling, and binding theoretical conceptions and practises making use of Information and Communication Technologies (ICTs). Tchamabe (2010) critically examines the impact of using ICT (multimedia inclusive) in the teaching and learning process for quality improvement.

2.4.2. Pedagogic Implementation (methods and strategies) in Pedagogic quality

According to Smith et al. (2014), implementation has to do with the processes used to enable the widespread and massive use of new practises. Furthermore, McGriff (2000) refers to implementation as the phase of actual practical delivery of instruction. It ensures learners understanding of taught material, supports learners' mastery and attainment of objectives, and secures the building of knowledge or skills in the learning and teaching process. In conformity with this view, Jabbarifar (2009) holds that instruction practises should include, amongst others, good strategies, instructional activities and practises, tasks, and didactic materials to be exploited by both facilitators and students in the teaching and learning process in the classroom or any other instructional forum or medium.

Genesee and Upshur (1996), in Jabbarifar (2009), on the contrary, hold that it is important not to always couple classroom practises with plans because more often than not, the situation or activities during instruction may not always correspond or occur as planned, especially in classroom instruction. This is due to a number of reasons, such as poor mastery or comprehension of the plans, plans that can be poorly constructed in relation to content objectives and activities, avoiding ambiguity in implementation, and also the fact that students do not react as prescribed or indicated by the plan. They further state that it is necessary for classroom assessment to be based on the actual happenings in the instruction process in or out of the classroom rather than what was planned or prescribed. Therefore, students' assessments of their progress and achievement should not be based on instructional objectives and plans but rather on instructional reality. However, the focus here is on the actual application of methods, strategies, and materials.

Peadogic Implementation Methods

Methods have to do with content knowledge, quality instruction, teaching climate, classroom or forum management, the teacher's beliefs, and professional skills.

Content knowledge in Peadogic Implementation Methods

According to the Praxis Client Conference (2011), content knowledge for teaching (CKT) has its bases in a practise-based model that presents a vivid description of the role played by content knowledge in the teaching of a particular subject, course, or discipline. The construction of the theory is based on job analysis, where there is identification of certain recurrent content-based teaching activities, which are inferred by analysing the content demands that teachers encounter in executing or implementing these activities. In the same line, Shulman (1986) makes recommendations introducing a distinct knowledge of the teacher domain, which they call pedagogic content knowledge (PCK). Pedagogic content knowledge is considered to be that knowledge that links content knowledge with practical teaching or instruction knowledge for quality achievement.

Therefore, depending on the multimedia or technological materials and gadgets a teacher or instructor is using in the teaching and learning process, they need practical teaching knowledge with multimedia technology. If not, the instruction or teaching will become less motivational and less interesting, which will affect professionals negatively. A teacher needs to first master the content to be taught and then be able to teach the content using multimedia pedagogical skills.

Quality of instruction

Li and Kang (2014) affirm that multimedia technology in instruction has captured the world's attention not only in education but has also been applied in other fields of life. Therefore, multimedia has a great influence on patterns of teaching and learning, life, and work style in general. According to Li and Kang (2014), the use of multimedia devices in instruction or classroom teaching has led to the diversification of information in the teaching-learning process, reinforced interaction or interactivity, and above all, enriched and empowered the teaching and learning content.

Therefore, it promotes and reinforces pedagogic effectiveness in and out of the classroom, offline and online. According to Olson and Wisher (2002), the online aspect of multimedia instruction or pedagogy, which is known as web-based instruction, has a great impact on the efficiency of training and educational domains in general in terms of learning outcomes, learners' satisfaction, motivation, and performance. This has been preceded by a massive interest in academic research, especially on the use of video materials for instruction. This has had a great positive impact on classroom assessment in particular and students' professional development in general.

Furthermore, Kay (2012) states that using video materials in instruction has significantly increased learners' activities, which has further led to effectiveness and efficiency in the teaching and learning process. Multimedia pedagogy has brought about both auto-study and interactive study, especially with those doing distance education who do not have to always displace themselves physically but have frequent contact with study materials or content and study mates. Thanks to the internet and other ICT tools.

Quality teachers or lecturers will result in quality instruction, which is a key element considered by programme evaluators when evaluating the pedagogic quality of a programme. Multimedia-based instruction makes great use of Information and Communication Technologies (ICTs) for the use of both teachers and students in and out of the teaching and learning situation or condition. According to Ngoungouo (2017), ICTs in multimedia-based instruction have inspired and contributed enormously to the auto-learning of both lecturers and students. Therefore, ICTs have influenced the evolution of traditional methods of teaching through a number of systems, such as Massive Open Online Courses (MOOCs) and Learning Management Systems (LMS), with MOOCs being very contemporary in improving instruction quality as a pedagogic quality element for quality investigation.

Teaching (instructional) climate

Rubio (2009) holds that in recent times, it has been easy for anyone to become a teacher, which is not a problem because the problem lies in the type of teacher or instructor they will become. Because a teacher is not only he or she who facilitates learning for an audience but also he or she who effectively facilitates the learning process by creating a convenient environment for learning to take place. Efficacy and efficiency in teaching do not simply require mastery of content knowledge; they also require good mastery of some basic

skills such as communication skills, management skills, and organisation skills. Furthermore, they should be able to plan and organise teaching or instructions, construct and execute objective assessments, and carry out fair evaluations.

These are professional skills that are reinforced and improved by multimedia pedagogy through a mastery of the use of multimedia devices and materials in the teaching and learning process so as to have an objective assessment. This is because multimedia enables the lecturer or teacher to create a comfortable learning climate for learners through motivation, building enthusiasm, and constructing a warm environment for learner-teacher interaction and relationship. These are very essential in developing contemporary professional knowledge, skills, and competencies.

Classroom and forum management

Lopez (2011) has discussed a lot about Modular object-oriented developmental learning environments, also known as Moodle, Learning Management systems (LMS), Course Management systems (CMS), and Virtual Learning environments (VLE). These are synonyms that express web applications that teachers, instructors, or educators in general might use to develop and manage an effective online learning site, and they are cost-free. They have open source, which makes it flexible for adjustments, modifications, and adoption to suit specific needs in the instruction and learning process. They are easily installed on many servers at a cost; they do not also have maintenance and upgrade costs. There are no obligations as to upgrades, the buying of tools, or the number of users on the platform.

Furthermore, this is done through its efficiency in creating, organising, communicating, delivering, collaboration, and assessment. Etoundi Asta et al. (2016) argue that ICT, of which multimedia is a component, is a good instrument to use to manage personnel. This is no different from classroom management, as multimedia when used in teaching makes classroom management very easy as learners' attention is easily gotten. Capturing and retaining attention is crucial to constructing professional development-oriented knowledge and skills.

Teachers' beliefs

Teachers' beliefs on teaching and learning are very important, especially when using multimedia-based pedagogy, be it online, offline, in a classroom, or out of the classroom.

OECD (2009) presents two components of teachers' beliefs on teaching and learning from a study report. They include "Direct transmission" and "constructivist" beliefs on instruction and learning. These components or dimensions of beliefs are rooted and firmly established in Western educational research and have been supported by other countries and continents (OECD, 2009; Kim, 2005). With direct transmission belief, learners learning are viewed as a process in which the teacher's or instructor's role is to communicate and transmit knowledge, skills, and competences in a well-structured manner, explaining solutions, and giving learners precise and resolvable problems while ensuring concentration and calmness during instruction in the classroom.

On the other hand, constructivists' beliefs hold that learners are active participants and not recipients in the process of knowledge, skill, and competence development. Teachers who belong to this belief consider themselves as facilitators and are more likely to use multimedia as a tool and a method of instruction. Therefore, the view of a teacher will determine the method to be used for instruction. Staub and Stern (2002) hold that with constructivist belief, thinking, and reasoning, developmental processes focus on and emphasise specific knowledge acquisition. In this belief, the pedagogical tradition likely to be applied in instruction is multimedia pedagogy, which will result in objectively addressing students' needs, providing digital learning support to students, and facilitating classroom assessment, hence concrete professional development.

Professional skills

Gibbs (2002) holds very strongly that lecturers, teachers, or instructors are supposed to constantly be meeting demands of the time, surviving threats, and outsmarting challenges in diverse circumstances and through diversity in instruction. To him, an effective teacher should have the capacity to be flexible, persistent, and above all, innovative in instructional approaches. According to Killen (2006), an effective teacher develops clear objectives and has his own goals of teaching, which make an instructor develop and implement an objective-oriented lesson using the right tools, amongst which are multimedia, addressing students' needs, providing digital learning support, and making classroom assessment easy to administer, correct, and analyse.

Nkwenti Ndongfack (2015) established the role technology plays in developing teachers' competency in the teaching and learning process. In this light, teachers'

development programmes should be modelled to meet up with the changes in educational technology as schools strive to upgrade technologically as technology evolves. According to Gurney (2007), in line with teachers' professional skills, effective teachers have to facilitate interaction by promoting interaction factors. These factors include, among others, knowledge, responsibility, and enthusiasm for learning. Also, activities and assessments planned and implemented by a professional teacher should motivate learning and provide engaging feedback; he should also create a warm relationship and environment with and for learners, respectively, in which mutual respect will prevail and facilitate learning.

Len-Kibinkiri (2018) projects a number of communication techniques to be used by a lecturer or teacher in the teaching and learning process to ensure learners' participation in every activity in the curriculum. Also, Andrew (2011) believes that engaging learners in learning improves retention and mastery of content, improves learners' attitudes, lengthens their attention spans, increases the length of time spent on a task, and develops skills such as communication, critical thinking, interaction, reading, and writing, just to name a few. The development of these skills is facilitated by the use of multimedia in the teaching and learning process, which results in a classroom assessment that is skills development-oriented. Skills-development-oriented assessments greatly enhance student professional development.

Genesee and Upshur (1996) in Jabbarifar (2009) affirm that teacher and student roles determine the relationship between pedagogic activities, practises, and materials, which have a great implication on valuable classroom assessment and evaluation. When these relationships between objectives, roles, and pedagogic materials are close and effective, it lays an excellent basis for assessment to verify the attainment of instructional objectives and avoid ambiguities.

2.4.3. Assessment Method in Pedagogic Quality of Multimedia Based Pedagogy

Evaluating the pedagogic quality of a multimedia-based pedagogy in higher education requires taking into account a key element such as the assessment method. Assessment methods involve a range of activities to be carried out, and they vary in techniques, strategies, instruments, and tools used in collecting data (information) to determine or establish the extent to which participants or students demonstrate learning outcomes with respect to set objectives or goals. Assessment enables the facilitator to verify the level of learning that has taken place on a particular subject among individual participants, the course, and the class.

These assessment techniques, strategies, instruments, and tools used in collecting data (information) can be direct or indirect demands on the medium and environment of instruction.

Assessment strategies

According to Tambo (2003), strategic in the instruction process refers to the global manner lecturers (teachers) behave during instruction when interacting with learners or students and can be applied to all aspects of the curriculum. This includes assessment, because assessment is an integral part and key component of the curriculum process; however, the interaction at this point is to obtain data on knowledge and skills taught and acquired. Many authors have exhausted the assessment strategies involved in multimedia-based pedagogy; however, Queen's Printer for Ontario (2005) presents a serious set of multimedia-based pedagogy assessment strategies in a more elaborative manner (identify, define, and explain). These strategies include:

1. Firstly, we have Classroom presentations; ii. Secondly, conferences strategy; iii. Thirdly, Essays strategy; iv. Fourthly, demonstration and exhibition; v. Fifthly, interview; vi. Sixthly, they present learning log unfolds; vii. Seventhly, observation as an assessment strategy; viii. Eighthly, performance tasks as an assessment strategy; ix. As the ninth strategy, Queen's Printer for Ontario (2005) presents portfolios, which have to do with a student's sample work collection that is selective, focused, collaborative, and reflective and makes provision for the student's visual demonstration or show of knowledge, capabilities, particular skills, weaknesses, and strengths in diverse contexts over time; x. The tenth strategy is verbal questions and answers, in which the lecturer verbally asks questions and is responded to by students verbally, not in writing. These strategies are great determinants of the quality of multimedia-based instruction, which positively impacts students' professional development.

Assessment techniques

Assessment in multimedia-based instruction has multiple techniques and can take place on a platform or in a typical classroom setting. BCIT (British Columbia Institute of Technology) (2010) holds that assessment technique depends on the nature of assessment, if it

is classroom assessment or traditional evaluation, because while classroom assessment techniques are meant to evaluate an instructor's or lecturer's instructional method with respect to students reactions and learning, traditional methods of evaluation end up with grading students more often at the end of the course, semester, or term. Furthermore, they affirm that classroom assessment has the purpose of helping lecturers and students improve the learning process mutually.

Cross and Angelo (1988) in BCIT (2010) discuss five (5) guidelines in choosing assessment techniques: i. The chosen technique should appeal to the lecturer's intuition and judgement experiences; ii. Self-inflicted burden or chore should not be the basis for choosing an auto assessment technique; ii. Take into consideration the usefulness of the chosen technique to both the lecturer, and your students; iii. Any assessment technique to be exploited by the students should have been used and mastered by the lecturer; iv. And the lecturer or instructor should always bear in mind that administration and analysis of assessmentechniques have the possibility of consuming more time than originally planned or estimated. This is because of the differences in instructional methods, techniques, strategies, and styles.

Classroom assessment in an online environment

According to BCIT (2010), there are two ways that are not complicated for a student to give or get information (feedback) in a multimedia-based instruction to or from their lecturers in an environment that is mainly for online courses. This is done by using discussion boards or e-mails. Assessment techniques such as A-Z of Moersch (2008), which at times seem to be functional only in a traditional classroom, have the possibility of being transferred to a virtual classroom (online classroom). Examples are muddiest point and one-minute paper due to their straight-forwardness. They further state that these assessment techniques might be applied at the end of week one, a module, or a part of the course, depending on how public the lecturer desires his or her students' responses to be. He or she can choose between e-mail and a discussion board.

Assessment tools and instruments

Assessment in multimedia-based instruction cannot take place without assessment instruments and tools. Chu et al. (2018) affirm that in the recent decade, instruction and

learning have greatly evolved as they focus on the school skills of the 21st century curriculum. According to Hilton (2010) and Chu et al. (2018), while these skills have been inserted by most countries to make up the standards of their national education systems, these models have not taken special consideration of assessments as integral components of educational standards. Furthermore, Cachia et al. (2010) and Chu et al. (2018) emphasise the recent move towards interventions of inquiry and project-based instruction and learning, which are comprised of research and technology and demand assessment methods that are compatible with these new models of education to promote and facilitate students' development and progress. Assessment can only facilitate and promote students' development and progress, thereby increasing standards, if the right assessment tools and instruments are constructed and applied in the teaching and learning process.

Also, Chu et al. (2018) discuss assessment with respect to 21st century skills, recommending evidence-based assessment tools for assessing the different components of 21st century skills. In line with this assertion, Covacevich (2014) presents the types of assessment instruments and tools to be used in assessing skills in the 21st century, especially in technology-based instruction. Therefore, these assessment systems need to be classified. Cueto (2007) and Covacevich (2014) hold that results implications should be one of the criteria for classifying systems of assessment. Some systems generate low implications; as a result, they develop training orientation information. This information more often than not does not impact those involved directly. On the other hand, there are systems with high implications that exploit results from tests to directly impact those involved, which, amongst others, include the definition of incentives for students and making available to the general public the academic performance of students (Covacevich, 2014).

Furthermore, Covacevich (2014) holds that instruments can be classified according to their technical characteristics, which include their nature of measuring learning, which can either be direct or indirect. Observation of students' knowledge tests and research projects is considered direct, whereas when it is based on lecturers, students, and stakeholders' perceptions, indirect testing, there exist the following assessment instruments: criteria-reference and norm-referenced, open and closed-ended, parametric and non-parametric measurement tools and instruments, including value-added tests and adaptive tests (Covacevich, 2014). In evaluating the quality of multimedia-based pedagogy and its impact

on classroom assessment, both indirect and direct assessment instruments and tools are used. However, direct tools and instruments are more valid and reliable.

Pre-tests, post-tests, and value-added assessment instruments and tools are often very important in a multimedia-based instruction assessment, especially if they are experimental or quasi-experimental in design. According to Covacevich (2014), assessment is not only focused on students demonstrating learned knowledge and developing skills at the end of school years, programmes, or courses, but also on how learning took place. Also, a value-added test instrument or tool is a highly specialised test that is administered at the start and end of a course or programmes to identify the level of learning that has taken place with respect to the influence of the lecturers or institution. All these assessment instruments and tools are exploited for quality multimedia-based instruction and classroom assessment.

2.5.0. Didactic Quality in Multimedia Based Pedagogy Quality

Didactic quality is determined by methods, techniques, strategies, and, most importantly, the didactic aids used in the course of instruction. According to Koper (2000) and Padrón et al. (2005), didactic tools (materials) refer to aids of all types and kinds that facilitate educational actors in achieving their planned objectives in the course of the teaching and learning process. He examines two types of didactic aids with respect to the views of some educational actors in the educational and instructional process. These two didactic aids are separate in that one is used in instruction and the other is used in learning, resulting in instructional aids and learning aids.

Instructional aids in this context refer to those aids that provide teachers with diverse resources to guide, facilitate, and support students' learning processes. They may include, among many others, books, photos, images, and devices (such as multimedia gadgets). Learning aids refer to resources and assets that facilitate or support students' learning in the course of the learning process. These aids may include, among many others, books, photos, images, games, devices (such as multimedia gadgets), and worksheets. Therefore, it is important for both to be assessed or evaluated to determine their quality with respect to set objectives in multimedia-based pedagogy.

It is important to note that at the end of the 20th century and in the 21st century, the rapid evolution, innovation, and inventions in the Information and Communication

Technologies (ICTs) sector have greatly changed the orientation of didactics and didactic aids. The development of ICTs has not only greatly influenced education but also different spheres of contemporary society. Hummel et al. (2004) and Padrón et al. (2005) strongly affirm that the advent of new technologies has brought about numerous opportunities to integrate instruction and learning into every aspect of an individual's daily life, has improved the globalisation of education, and has greatly promoted life-long learning through higher didactic quality. Koper (2000) and Padrón et al. (2005) lay emphasis on the fact that the advances in ICTs have provided the educational process with the most needed and effective tools to overshadow problems related to the geographical location of teachers and students and the synchronisation of learning and instruction activities.

According to Ghode (2012), modern technology has rendered didactic practises and aids easier, more effective, and more efficient, as teachers and students can easily access and examine information and material on the content to be taught and learned. Also, trainers and lecturers can record audio or video of their lessons for other teachers or students to access and exploit when the need arises. This can only be effective in the pedagogic process with the help of good planning, taking into consideration the didactic quality, as it facilitates the reduction of instruction load while still ensuring the coverage of the programme on time while maintaining pedagogic standards and quality.

The views of Koper (2000) and Ghode (2012) are strongly supported by Fallon and Brown (2003), who hold that ICTs introduction, innovations, and inventions in education h havebeen expressed through terms, and the most popular of these terms is the term e-learning. E-learning, or electronic learning, is considered by Fallon and Brown (2003) as education, training, or learning that is structured to be facilitated by standard computer technologies, most importantly the internet and network technologies. E-learning, according to Padrón et al. (2005), has brought a giant revolutionary move in the field of education that has enabled the digitalization of traditional didactic aids.

The perspective of technology-supported didactic materials in an educational context holds that such didactic materials have the features of reusability, embedded semantics, collaboration, and many other features. For instance, in a systematic novel like "*Algirdas Julien Greimas et la science des signes*" by Mbala Ze (2012), script scenes can be developed into a video or visual and audio aids in general to improve didactic material quality and facilitate instruction and comprehension. These features of technology-supported didactic

materials manifest through content and instructional design. The process of developing technology-supported didactic materials in an educational context has to do with components of an instructional design that, when put together, make the development of didactic materials supported by technology a reality or visible, as shown in figure 10.

Also, Padrón et al. (2004) and Padrón et al. (2005) consider e-learning and its materials, techniques, and technology as didactics that facilitate and improve students' comprehension and mastery of presented knowledge or information. There are a number of advantages related to e-learning with respect to didactic quality, such as: e-learning facilitates flexibility and accessibility in the exploitation of didactic materials and aids; pedagogic methodologies are greatly supported by e-learning; resources are optimised; students individual work is improved by e-learning; relationships between students and academic staff are greatly enriched by e-learning; and e-learning also develops and improves students attitudes related to collaborative work and responsibility. E-learning operates mainly on the basis of multimedia-based pedagogy and, therefore, should be evaluated to determine its didactic quality and its relationship with classroom assessment from the perspective of professional development.

TECHNOLOGY SUPPORTED DIDACTIC MATERIALS CONTEXT

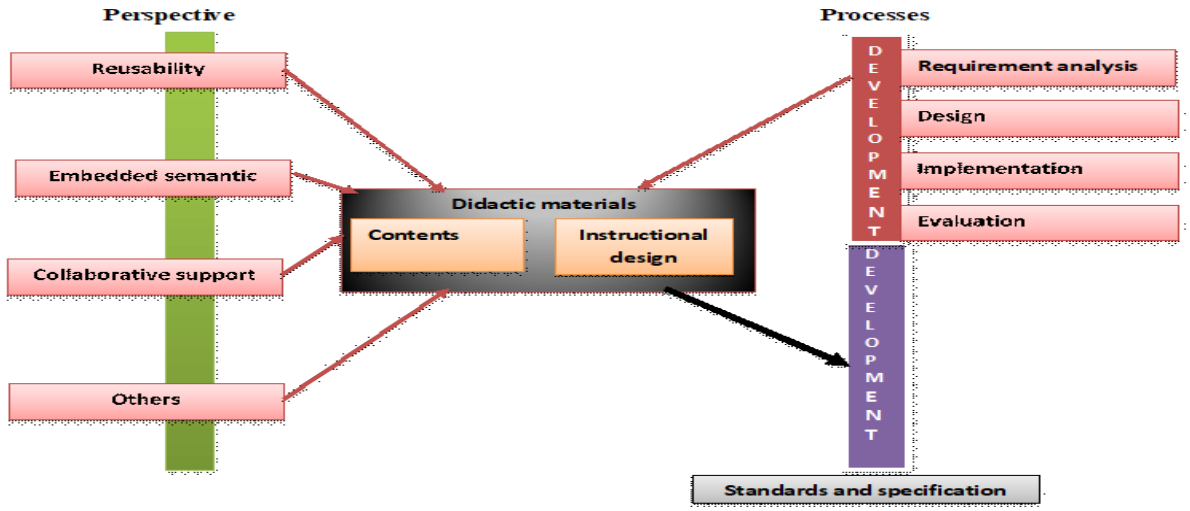

Figure 09: Technology Supported Didactic Materials Context

Source: Padrón et al. (2005)

With respect to didactic quality in multimedia-based instruction, Kedzierska and Wnek-Gozdek (2015) argue that modern ICTs and multimedia tools support educational processes in schools and play a great role in promoting institutions in the web space. They

further hold that educational administrators have seen and understood the important didactic role of ICTs and multimedia tools and methods in the educational process and are equipping not only teachers but also the administrative staff with information and technological tools accompanied by skills and competences through hybrid or predefined remote training. Academic institutions, especially in higher education, are more than ever willing to actively digitise their programmes to enable access to resources and the usage of multimedia equipment by teachers and students in the teaching and learning process so as to attain an effective didactic level with standard didactic practises and modern (technological) didactic materials.

New technologies are used by teachers or facilitators in classes to improve the attractiveness of lessons due to their awareness of the role played by network platforms, multimedia learning software, and simulation applications in attracting and returning students' attention as well as motivating them to be more interactive as they are called 'digital natives' (Kedzierska and Wnek-Gozdek, 2015). They further state that the better term to express the use of ICTs or technology in the educational process in school is '*modern technologies in the didactic processes'.*

This can be explained by the fact that modern didactics focuses mainly on multimedia tools and internet technologies in the educational process. It focuses on educational goals, methods, and forms of education w thatare inscribed i inmedia.odern didactics takes technology into consideration in the didactic process, making didactics to be seen as focusing on objectives, methods, and the developed forms of education for human cognitive processes. When examining knowledge from the perspective of linear structure, when revolutionary tools are added, information is transferred through hypertext, thinking and learning are modified, and the focus of didactic quality is therefore on media (multimedia) content and the internet.

Feinstein et al. (2005b) in Yamauchi (2008) strongly affirm that multimedia presentation, online courses, simulation methods, and computer-assisted instruction are taking centre stage in the instructional process. These are today's key determinants of didactic quality, which is why multimedia-based instruction programmes have to be subjected to evaluation in relation to their impact on professional development.

Furthermore, Crosby and Stelovsky (1995), who examined the effects of technology-based instruction on the learning of students in relation to lecture-type traditional instruction, Two groups were created (the experimental and control groups), and they were both administered a pre-test to determine the minimum level of the participants. The experimental group was taught using multimedia technology while the control group received lectures traditionally, and at the end, both groups were administered the post-test. Their findings were clear after analysis: multimedia-based instruction through multimedia courseware enhances students' learning in computer science instruction and renders the course accessible to a large student population of heterogeneous nature. This is to establish the role of didactic quality in classroom assessment; therefore, it is essential for it to be evaluated so as to improve on its elements.

Furthermore, Taratoukhina (2014) examines multimedia-based CD-ROMs effects on student improvement in learning during lessons compared with classrooms in the traditional format. In terms of didactic quality, an educational process that takes into consideration multiculturalism in structuring the environment of e-learning, methods of instruction, and its organisational forms leads to multimedia didactics that are cross-cultural, which can be said to be more productive with respect to classroom assessment. Cross-cultural multimedia didactics is constructively discussed by Hofstede (1980) in Taratoukhina (2014) using the ethnometric approach, taking into consideration three contextual parameters:

1. Take into consideration both pedagogic and psychological features in the designing and development of the didactic (education) process in a context (classroom, forum, online, or offline);
2. Ergonomic design of electronic media and manuals should take into consideration features that are culturally conditioned.
3. Cognitive characteristics include interconnection, optimal methods of teaching choice, and the most preferable multimedia technology types.

Didactic quality also greatly depends on communication and information, which, according to Kedzierska and Wnek-Gozdek (2015), the revolutionary development of information, communication, and telecommunication technologies has made communication and information in social processes as well as educational processes the most important forces to reckon with. These technologies have greatly facilitated access to communication and information, promoting the globalisation of education, culture, the economy, and many other

key sectors of society. Given that education is a societal instrument for the development of both individuals and the nation as a whole, empowering individuals to attain a quality life makes it a priority in this technological era.

Another measure taken by teachers to improve the didactic process in higher education, according to Ghode (2012), is by actively taking part in online activities such as project planning, debates, and discussions on improving the didactic process in education. This sharing, which is very advantageous, occurs on forums with members of the group having a common academic or pedagogic interest. Live exchanges have been proven to be more honest and sincere, giving rise to realistic didactic outcomes as doubts are often cleared before arriving at a conclusion. It also grossly reduces the gaps and confusion that usually exist in communication because it is direct. Most teachers and educationists or educators who are participants in such forums are often exposed to different educational content forms and their accepted didactic processes, which helped them, ameliorate or adapt their didactic processes to meet the objectives of the content and the professional needs of the students.

According to Tan (2000) and Barzega et al. (2012), controlling information is one of the factors that facilitate understanding input. Also, the effectiveness of the internet is greatly influenced by multimedia, as portrayed by research (Dong et al., 2011; Barzega et al., 2012). Technology in general and in educational technology in particular is key factors to reckon with in determining the didactic quality of multimedia-based instruction through evaluation and establishing its relationship with classroom assessment.

Teaching in a network environment has been proven to have a number of advantages when it comes to didactic quality. Most teaching models are based on network environments and multimedia, such as lecturing, independent learning, and group learning (Rogers, 2003; Barzega et al., 2012). Therefore, the role of technology in developing and improving didactic processes is inalienable because, in return, it improves the didactic quality of multimedia-based pedagogy.

2.5.1. Learning Content in Didactic Quality of Multimedia Based Pedagogy

Learning content in multimedia-based instruction is a component of didactic quality that is influenced by a number of factors, one of which is quality. Hornung and Jakob-Haringer Strasse (2006) affirm that multimedia production quality perception takes its roots

from cognitive theories of instructional design as well as cognitive theories of multimedia production, which act as the basis for the concept of producing quality content in multimedia instructional production. Cognitive theorists have conducted a number of studies, and their findings showed that computer-based teaching and online learning have a place in the teaching and learning process, but the structure of the content must be efficient if learning is to be maximised.

Furthermore, in relation to multimedia-based instruction content as a component of the didactic quality, Ghode (2012) holds that learning Content in multimedia-based instruction is effectively managed in instruction using the Content Management System (CMS), which is a system that enables and facilitates diverse e-content, e-libraries, e-books, video lectures, and tutorial storage and retrieval. It also makes it possible during storage to arrange e-content with respect to lesson plans and courses (subjects) to facilitate retrieval for learning purposes.

On learning content as a didactic element, Hornung and Jakob-Haringerstrasse (2006), citing Mayer and Moreno (1998, 2003), focus on multimedia-based instruction content that has as its main objective to bring about learning that is meaningful and useful; therefore, developers and users should be guided or oriented on how to assess or evaluate the quality of multimedia-based instruction's learning content. This assertion is influenced by dual encoding theory, ACT-R production system theory, cognitive load theory, theory of the working memory, and cognitive theory of multimedia learning, making cognitive theories of great importance in content learning in the didactic process.

Mayer and Moreno (1998, 2003), in Hornung and Jakob-Haringerstrasse (2006), discussed a series of quality dimensions or principles to be used in the process of producing online content that will significantly impact diverse learning outcomes. The ten principles include: Principle of modality, principle of continuity, principle of multimedia, principle of personalization, principle of coherence, principle of redundancy, principle of pre-training, principle of signalling, and principle of pacing. While these principles focus on online instruction and learning, they are very applicable to improving multimedia-based pedagogy.

Furthermore, educational boards have come up with a number of guidelines that are comprehensive as criteria for online materials (content) for educational purposes. There have also been a number of theoretical approaches. According to the Northern E-Learning Partnership (2004) in Hornung and Jakob-Haringerstrasse (2006), it is important for e-content

quality to be of a high standard and be designed to meet the needs of the e-learner (e-student) or purpose as it provides quality experiences. What are examined in the online curriculum feature is the relevance as well as the specification of the curriculum and the role it will play in improving standards while striving for excellence.

This is done by: clearly presenting the learning goals and objectives intended in the curriculum; avoiding bias; establishing an integrity format; Accessibility and presentation of content should be designed in a uniform structure (clear, precise, and concise); its rigour should be comparable; there should be a clear breadth and depth of methods of off-line delivery; they should have the capacity to accommodate diverse learning styles and often assess students while making provision for remediation; practise active learning while encouraging interaction; and the exploitation of technology that fosters interaction and should be re-usable; accessible, interactive, and discoverable (RAID principles); presentation should be consistent and respect standards; Progress through content should be clearly demonstrated; activities and curricula should be in conformity with technical standards universally accepted for indexing; the curricula and activities should be open to adaptability, flexible, and open to modification; and measures should be taken for content to be copyright-free (LIISA LIND, 2005 in Hornung and Jakob-Haringerstrasse, 2006).

Liisa Lind (2005) in Hornung and Jakob-Haringerstrasse (2006) emphasise four of these guidelines as done by a Finish Education Board working group on the production of high-quality content for educational purposes: pedagogical quality, which is examined from the perspective of learning material (content) features that enhance learning and ensure the applicability of the learning material in the instruction and learning process; usability, which is examined from the perspective of the interface design and the technical structure of the learning content (material) and how easy these features can be exploited by students. Usability is determined by the user's experience; accessibility, which is examined from the perspective of the availability of online learning content (materials) to all potential exploiters irrespective of health or disabilities, mental or physical capacity, and age; and production quality, which is examined from the perspective of online learning materials or content production that respect the quality criteria and are done in a documented and controlled way, guided by knowledge, based on skills, learning-oriented goals, and the assurance of the final product meeting professional and international standards.

2.5.2. Learning Activities in Didactic Quality of Multimedia Based Pedagogy

Learning activities are keys to determining the didactic quality of multimedia-based instruction, and their impact on classroom assessment should therefore be given special attention. According to Cabero and Salinas (2000) and Barzega et al. (2012), teaching and learning processes (activities) in educational institutions and establishments are being adapted to meet up with technological advances in the field of education. This is due to the great advances in terms of innovation and invention in learning technology in the educational field.

These advances in educational technology have been accompanied by revolutionary learning tools such as multimedia and Web pages, which have greatly changed the orientation of learning activities. There has been a great increase in instructional tools such as text, images, graphics, sound, animation, and video that facilitate learning activities. These activities have in turn attracted students' attention and interest in learning while actively participating in the learning process because comprehension, knowledge, and skill development are facilitated.

The effectiveness of the internet has been greatly influenced by multimedia, as portrayed by research (Dong et al., 2011; Barzega et al., 2012). Multimedia gives the opportunity for learning activities to be attractive and interesting. Technology in general and educational technology in particular is key factors to reckon with when executing learning activities in multimedia-based instruction. Teaching in a network environment has been proven to have a number of advantages when it comes to didactic quality in general and learning activities in particular. Most teaching models based on network environments and multimedia give priority to lecturing teaching models, independent learning teaching models, and group learning teaching models (Rogers, 2003; Barzega et al., 2012). These teaching models focus on learning activities and making learners more involved in the learning process. Therefore, the role of technology in developing and improving learning activities is very strategic because, in return, it will improve didactic quality.

According to Zhang (2010) and Barzega et al. (2012), network and multimedia instruction have the potential of reconstructing and treating the structure of information with respect to teaching and learning materials in the course of designing learning activities to be flexible in accepting or rejecting some teaching and learning activities and material content. Furthermore, Barzega et al. (2012) acknowledge the diversity in students learning models of

network and multimedia-assisted learning with learning activities full of innovations that facilitate learning in the classroom by bringing learning closer and in stages. However, with recent evolution and innovations in educational multimedia technology, students have created a number of forums for exploiting digital media in their learning activities to acquire, develop, and share quality knowledge, skills, and competences.

Learning activities are a key component in the didactic process, especially in higher education. Kedzierska and Wnek-Gozdek (2015) carried out a study on *selected innovative activities integrated with ICT*. Their focus was on learning activities carried out using interactive whiteboards, e-journals, multi-text books, multimedia interactive white boards, e-textbooks, multi-text books, students and parents MOODLE platforms (platforms for parents and students to work together), implementing online student MOODLE platform projects through the internet, Facebook, GG, blog creation, as well as school blog maintenance, and galleries.

Also, there was a promotion of the school's virtual tour and presentation that is interactive on the school's blog and website, the development of the school's Facebook page, contacting students through the internet and SMS (Short Message System), using the MOODLE platform to contact students, under the Digital Excluded project, internet access was free, the school's Digital programme was implemented using Wi-Fi, the school's multimedia library blog and library website creation and maintenance, and the school information system.

Furthermore, there were a number of modern technologically based audio-visual gadgets and equipment involved. These items were multimedia classroom equipment such as computers, cameras, scanners, multimedia projectors, laptops, and high-definition televisions. Learning activities were structured and carried out using the blended learning method, which exploited internet usage, audio-visual aids, and information and communication technology. The Internet was used by students to exchange ideas and share materials, carry out presentations, engage in language learning activities, study history using multibooks, participate in mathematics digital competitions, read e-books, and use an e-learning platform. Excellent performance by students in learning activities was rewarded for motivational purposes. A series of online exercises were presented to students to execute during the learning process, making learning with multimedia very interactive and qualitative (Kedzierska and Wnek-Gozdek, 2015).

2.5.3. Learning Materials in Didactic Quality of Multimedia Based Pedagogy

Learning materials in multimedia-based pedagogy that enhances involve e-material, e-books, and audio-visual materials and tools.

E-materials

The revolution in computer and internet technologies has made e-learning, which has as a component online multimedia instruction and learning, one of the most important methods of learning in this era. According to Vichuda et al. (2001), the main feature of e-Learning is its multimedia nature, because it integrates different media such as pictures, text, animation, audio, and video to come up with a multimedia material of instruction, motivating and capturing the willingness of the learner. However, Neumann (1998) expresses a worry over the cost of designing multimedia material for instruction and the insistency on enabling comprehension through attractive and motivational content.

Furthermore, some authors, such as Van and Paas (1998) and Mayer et al. (2001), hold that some research has proven that unessential multimedia instructional materials sometimes have the possibility of distracting learners and reducing focus and learning performance. In this light, developing cost-effective instructional multimedia materials with respect to instructional content properties is a very recent and important issue in e-learning and multimedia instruction material development. However, multimedia instruction through e-learning materials stands as the learning tool of today, and instructors and learners need to adapt to these innovations to ensure a credible classroom assessment.

E-books

Carty (2000) and Tan (2009) hold that there have been a number of studies on e-books usage in classrooms as a medium for instruction and learning. A majority of these studies present and analyse the effective role of e-books in facilitating learning and instruction processes. With the fast expansion, innovation, and inventions in technology, e-book usage in classrooms is becoming very common these days. According to Wilson (2001), an e-book has software, hardware (the reader), and e-book files, with each having a particular function. E-book readers, or hardware, are electronic devices that are portable and are designed with the function of reading e-books and related publications. They have the capacity to store a number of books, with accessibility from any location possible.

Furthermore, Pereus (2000) states that e-book-based software readers refer to programmes that have the potential to display data meant for an e-book device. Also, excellent e-book readers will perform a number of tasks such as printing, interactive touch, audio-visual communication, and wireless communication. Also, Lynch (2001) states that software-based readers have an advantage in addition to the functions they perform: they perform extra functions such as wide screen sizes and keyboards. Software book readers enable access to personal computers or recent computer technologies, such as Adobe Acrobat Reader, Microsoft Reader, and Adobe Acrobat E-Book Reader.

Visual, audio, and audio-visual

Dike (1993) refers to audio-visual as materials that go beyond only reading to convey meaning and message, and this can be in the form of hearing (audio resources), sight (visual resources), or a combination of hearing and sight (audio-visual). On the other hand, Webster's Encyclopaedia Unabridged Dictionary of English Language refers to audio-visual as educational or training materials that focus and capture both the senses of hearing and sight, amongst which are recordings, films, and photographs, which are used in instructions, especially in classrooms or library collections. Len (2014) strongly established how the use of multimedia telephones significantly enhances teachers' professional development as it gives them access to sources of information. This goes better for student teachers, as multimedia phones facilitate research and access to information, which facilitate comprehension in the course of the teaching and learning process.

Furthermore, Len (2018) establishes that visual education, or the use of visuals in the teaching and learning process in the classroom, has a significant impact on developing learners' socio-cognitive skills. This, therefore, makes visual material a very key element in multimedia-based teaching. Anzaku (2011) sees the term audio-visual materials as often used to refer to instructional materials mainly used for conveying meaning. Some of these materials are in motion picture form, and their latent value is released by a device or piece of equipment, while others are in print form. With this audio-visual component in multimedia instruction, include both materials and devices that facilitate instruction so as to make classroom assessment valid.

Instruction in multimedia-based pedagogy with the internet is a very important and sensitive part of multimedia-based pedagogy, especially in higher institutions of learning in

Cameroon. Chiafie (2011), referring to Cameroon's higher education institutions, states that lecturers exploit the internet in instruction more often by guiding students to obtain additional information and material for their courses. More often, lecturers orient students to the internet to facilitate them solving or doing their home assignments; some lecturers guide students through links or web sites. The lecturers also more often browse the internet, using it as a forum in which they improve their skills and acquire additional material for enriching their lessons.

However, Chiafie (2011) consistently holds that the use of the internet in multimedia-based instruction in higher education in Cameroon has a number of challenges, among them the speed and cost of the internet connection. While internet connections are considered to be very slow, at the level of students, they are considered very costly. The Internet is considered by the University of Buea to be the most explicitly and regularly used information and communication technology.

This is because lecturers and students can access the internet at their convenience, anywhere and anytime on campus, and it is well equipped with relevant materials in terms of literature on recent academic and scientific work and much material to which lecturers and students still have room to add. This makes the internet a very powerful and inevitable component of multimedia-based pedagogy tools, gadgets, materials, and devices, as it is exploited to address students' needs, provide digital learning support, and render classroom assessment more valid, reliable, motivational, and performant.

2.6.0. Technical Quality of Multimedia Based Pedagogy Quality Evaluation

Rengkung et al. (2017) refer to technical quality as the perception a client develops from a service interaction that results from the service process. Therefore, technical quality in multimedia-based pedagogy can be said to be the perception of the students (clients) or an assessment response to the multimedia-based instruction method offered by an institution, and higher education institutions in particular. As an indicator, it presents students perceptions of professionalism in multimedia-based instruction from the perspectives of design and browsing; however, elements such as teachers professionalism and skills, physical resources available, and the operational system used to meet students' academic, pedagogic, and didactic needs as well as address instructional and learning difficulties (Tjiptono, 2014; Rengkung et al., 2017)

Taking into consideration the technical quality as provided by the institution, a positive perception is influenced by students or stakeholders expectations and what they actually experience. The quality is known after an assessment or evaluation, with the respondents being the clients or consumers (students and stakeholders). As such, programme evaluation is very important in determining the quality of multimedia-based pedagogy.

This can only be the case in multimedia-based instruction when the student is a consumer and is therefore able to assess and evaluate multimedia based pedagogy programmes with respect to students' professional development from the perspective of the output or outcome criteria or approach. Technical quality, especially in multimedia-based pedagogy programmes, is very important because, according to Kang and James (2004), service quality and technical quality affect each other simultaneously, which in turn influences satisfaction.

When the interaction in the course of multimedia-based instruction is satisfactory with respect to students' perception, then multimedia-based pedagogy can be said to be of good quality, but if vice versa the technical quality is poor. Evaluation of multimedia-based pedagogy's technical quality is very important in higher education or universities to determine students' expectations, perceptions, and satisfaction levels. This will help school administrators and teachers or lecturers put in place professional and technical measures to improve the technical quality of multimedia-based pedagogy, especially with respect to design and browsing.

2.6.1. Design in Technical Quality of Multimedia Based Pedagogy

The quality of design is a very important element in evaluating the technical quality of multimedia-based instruction in higher institutions of learning. According to Ghode (2012), many instructors or lecturers use PowerPoint in instruction or training students, but they never take time to judge the quality of the slides. This results in a situation where instead of multimedia-based instruction facilitating learning; it is making learning tiring for the participants, which greatly negatively affects the learning process in instruction. He sees as key issues in designing presentations by teachers that are not captivating: the overcrowded nature of slides with much text, the insufficient content of slides, or the total absence of visual elements. Most seriously, slide development is not guided by any slide design principles. Therefore, the presentation and learners activities design, be it in classroom instruction,

online, or offline, has to respect standard principles to make the design productive in the teaching and learning process with respect to course content and objectives. These give methods of instruction good standards after assessment.

Furthermore, Ghode (2012), in a quest to solve the problem of poor and unprofessional multimedia-based instruction design, recommends online authoring and presentation tools such as moviemaker, vuvox, animoto, visio, sliderocket, empress, and viddix, which could serve as good guides for instructional design development and make the teaching and learning process interesting. He further cautions teachers against using these tools and more in developing multimedia-based instruction design by simultaneously developing and engaging content, taking into consideration the design and its learning theory or theories. Theories and models like the cognitive learning theory of Bloom and Benjamin, the analysis, Design, Development, Implementation, and Evaluation (ADDIE) model, the instructional development learning system (IDLS) model, and the System Approach model by Dick and Carey, just to name a few, should be the bases of a multimedia-based instructional design. This will lead to effective and efficient instruction and learning, which will reveal high standards after evaluation.

Also, Gagne, Briggs, and Wagner (1992) in Ghode (2012) present a theoretical framework with its foundation or basis being examining learning from the cognitive point of view and focusing greatly on rendering an instructional design effective. The theory correlates nine key events or activities of instruction, associating them with mental processes that are internal, and formulates the activities or events as components of a good lesson that result in effective learning. It is important to note that the main purpose of instruction and its activities is to facilitate learning. Multimedia-based pedagogy or instruction is oriented to facilitate both the instruction and learning processes so as to improve students' learning, technical quality and validity, reliability, motivation, and above all, performance in classroom assessment. Instructional design is the key to obtaining good results and indicating high standards at the end of the evaluation process. Therefore, teachers with basic design knowledge and skills can also design the lecture halls stunning lecture presentations to improve quality.

2.6.2. Browsing in Technical Quality of Multimedia Based Pedagogy

Müller-Kalthoffa and Möller (2006) affirm strongly that a major reason explaining why multimedia systems in general and hypertext systems in particular are rapidly gaining

importance is their ability to guarantee learners' possibilities of optimal comprehension in the processes of knowledge (and skill) instruction. It is difficult to discuss multimedia and hypertext systems without their activity, which is browsing. Müller-Kalthoffa and Möller (2006) carried out a study with students using reduced and free browsing for studying a two-part hypertext, and the results indicated that browsing in general facilitates deeper-level comprehension, often referred to as structured knowledge. This occurs with the help of previous knowledge while facing difficulties in the simple retention of facts. It was also discovered that the more time spent browsing on a version with restricted access, the higher the comprehension and retention of facts due to the reduced influence of disorientation.

Furthermore, they state that in the browsing study exercise, it was noted that those students with computer concepts, knowledge, abilities, and experience who were also interested in the course experienced little or no disorientation on the subject under study. In fact, the major implications of this study on educational practises are adapting multimedia, hypertext learning, and instructional systems to enhance successful learning. Whalley (1993) and Müller-Kalthoffa and Möller (2006) hold that hypertext in particular was not in its design oriented for education but was designed for the organisation of much and diverse information in databanks. However, its usage these days is increasing from the perspective of contextual teaching and learning. This is because the information in hypertext and multimedia systems is structured in a non-linear manner to contain information units (nodes) connected to network links that are dynamic in a self-contained manner. This method is said to be very beneficial for learning in an instructional process.

Studying through browsing or instruction based on hypertext permits students to auto-exploit learning material using their own selected methods, strategies, and styles (Pass et al., 1998; Müller-Kalthoffa and Möller, 2006). This enables students to engage in auto-learning activities, making the teacher a facilitator or guide. The students also have the possibility of adapting the learning process to meet their needs, thereby working independently of classic print media and computer-based systems that are conventional. Considered either non-linear (non-sequential) or multi-linear in structure by Nielsen (1995) and Bolter (1998) in Müller-Kalthoffa and Möller (2006), so as to distinguish hypertext from texts with structures that are predetermined. There have been a number of studies investigating instructional design or features of the system, such as systems of interactive learning and their potential for

facilitating knowledge construction globally. With respect to browsing in multimedia-based instruction, the studies have been favourable.

Also, browsing as a multimedia-based instruction technical element, especially through hypertext, has been discussed by some authors as having negative effects on the instruction and learning process. These effects can be classified as cognitive overload and disorientation, which make concentration difficult. Chandler and Sweller (1991) attest that learning impediments can result from browsing (navigating) hypertext, which demands much more from the cognitive system than linear text, and has also been discovered to consume more (much) resources, as well as struggling to return to a particular unit for clarifications. Its consumption of many resources is what impedes learning in the course of instruction. According to Müller-Kalthoffa and Möller (2006), the effects of disorientation occur when a student finds difficulties in establishing an overview of the environment of a hypertext, when there is confusion about what unit leads to the next or how the current unit is related to the hypertext, and when there is an inability to decide on the next unit.

However, multimedia-based pedagogy or instruction is a carefully and technically designed instruction that, through hypertext systems, does not only transmit knowledge but also responds to its own difficulties to make it better. Müller-Kalthoffa and Möller (2006) address the problems brought on by Chandler and Sweller (1991) with cognitive overload by stating that navigation aids have been designed and inserted in a hypertext environment to function as graphical overviews or maps of the content or document under study.

Also, these graphical or map aids in some hypertext are too complicated for students to easily study because they do not give insights. This can be solved by creating restrictions on certain parts of the hypertext environment; movements are restricted to substructures. Evaluating multimedia-based pedagogy demands that the flexibility of browsing and its quality be assessed or examined, because the key to multimedia-based instruction in higher education today is network links. This has been facilitated by the availability of internet access in most Cameroonian higher education institutions.

2.6.3. Technological Ingenuity in Technical Quality of Multimedia Based Pedagogy

Technological ingenuity in multimedia-based pedagogy as a technical quality has a lot to do with available facilities and infrastructure. According to Ghavifekr and Rosdy (2015),

ICT (multimedia) facilities and infrastructure are great needs for institutions of learning; this is because facilities and resources such as computer laboratories or multimedia halls and ICT tools and equipment are very influential factors in the technical quality of using ICT (multimedia) in the instruction and learning process.

The availability of these facilities and resources facilitates teachers and students access to the multimedia or ICT materials, tools, and gadgets (Hennessy et al., 2005; Ghavifekr and Rosdy, 2015) needed for quality instruction and learning. That is why Ghavifekr and Rosdy (2015) further hold that in a situation where these facilities are insufficient and there is an absence of access to the internet, a lack is said to have been established. This lack is a negative input to the technological ingenuity in the instructional and learning processes in the institution, hence the necessity for an evaluation programme to establish its impact on classroom assessment.

Multimedia and educational media technology with respect to technological ingenuity in multimedia-based pedagogy, according to Omodara and Adu (2014), refers to information transmission channels to students, which also include machines and gadgets that are exploited in the process of information transmission to students (learners). They state that multimedia and educational media technology exploited in the instruction and learning process in today's world exist in varied types, which include, amongst others, multimedia computer systems, multimedia mobile devices, pod-cast, interactive white board, microphone, digital video-on-demand, digital games, and online streaming media.

Multimedia computer systems in the instruction and learning process permit lecturers, when presenting a new lesson, to demonstrate, present new materials, animate, present new websites, and, as far as new programmes are concerned, illustrate how they are used. As a consequence, WebCrawler (2013) and Omodara and Adu (2014) affirm that irrespective of whether the class is large or noisy, students will be able to hear clearly and comprehend, especially when microphones are exploited.

Furthermore, Ghavifekr and Rosdy (2015) hold that in most institutions of learning, technical problems or difficulties become the main source of frustration for students and lecturers because they interrupt the instruction and learning process. This problem becomes a major indicator of poor technical ingenuity during multimedia-based pedagogy programme evaluation. Also, Jamieson-Proctor et al. (2013) in Ghavifekr and Rosdy (2015) feel that the

lack of technical assistance results in no repair, which in turn frustrates students and lecturers in the instruction and learning process.

The reason for frustration is that lecturers and students develop a fear of exploiting multimedia computers or technological devices and gadgets. This can be explained by difficulties in maintenance or repair if it gets bad or a sudden failure due to insufficient or lack of maintenance and repair assistance. More often, in Cameroon, institutions experience virus attacks, low or poor connectivity, poor or non-functional equipment due to poor maintenance, and inadequate or absent technical repair. The results of multimedia-based pedagogy are of poor technical quality.

Also, on the contrary, in some advanced countries, such as the United Kingdom and the Netherlands, institutions of learning acknowledge the essential role of technical assistance or support to lecturers in multimedia-based pedagogy or ICT-based classrooms and instruction (Yang and Wang, 2012; Ghavifekr and Rosdy, 2015). The result of this technical assistance to lecturers in the instruction and learning process using multimedia and educational media technology is good-quality technological ingenuity in multimedia-based pedagogy and programme evaluation. The role of the lecturer's multimedia and educational technology skills and preparedness to use them in the instructional and learning process is an added advantage to technical quality. This is because these confident, high-level skills are used in an instructional and learning setting to motivate learners and keep them focused. This increases technological quality during programme evaluation.

According to Hennessy et al. (2005) in Ghavifekr and Rosdy (2015), lecturers without confidence in Canada are less interested in using multimedia (ICT) for instruction because they will be embarrassed due to the level of students' knowledge of multimedia or technological technologies. This fear certainly negatively impacts the quality of technological ingenuity in the course of evaluation. In addition, when lecturers cannot effectively and efficiently use multimedia, ICT, or educational media technologies in the instructional and learning process, the students turn to sufficient knowledge of their (multimedia, ICT, or educational media technology) technology. If a lecturer happens to have done an ICT course, he or she is more at ease, effective, and efficient in their use in his or her instructional process. This increases the technical ingenuity quality in the course of evaluation, especially when all the materials, devices, and gadgets are up-to-date and functioning.

2.7.0. Professional Development and Quality of Multimedia Based Pedagogy

According to Kennedy (2016), programmes for professional development are backed up by diverse student and teacher learning theories. Programmes are often sorted with respect to design characteristics, which, amongst others, may include the duration of the programme, its intensity, and specific technique usage (online lessons and coaches). He further states that professional development (PD) has higher chances of improving instruction, be it a virtual class or a lecture class. However, professional development becomes more demanding with virtual teaching or instruction (multimedia-based pedagogy).

On the other hand, Cambridge Assessment International Education (2017) holds that professional development should focus on developing professional mental processes and field practise in teachers and subsequently students by enhancing the instruction and learning process. The enhancement of the instruction and learning process in higher education is facilitated by programme evaluation. Professional development can only be attained by taking into consideration evidence-based and ongoing reflective practises and activities.

Furthermore, Cambridge Assessment International Education (2017), making reference to professional development in the educational sector, states that professional development has to do with improving professional practises through training and many other activities. They summarise professional development as professionally changing thoughts, knowledge, sensitivity, and know-how or skills. The goals of professional development are elaborated exploring a taxonomy with behavioural, attitudinal, and intellectual components (Evans, 2011 in Cambridge Assessment International Education, 2017). Furthermore, Kennedy (2017) affirms that it is important in defining professional development to state the kind of activities that will enhance professional development, the context, how learning will take place in this context, and how these activities affect teacher's instruction and students learning in a learning environment.

From the perspective of Holloway (2006), citing Barry Fishman and colleagues, professional development refers to the process in the educational sector of building new concepts and skills by instructors that are directly related to their profession. Therefore, professional development has to do with building new concepts and skills in students that are directly related to their chosen profession. This is done by improving students' acquisition,

learning, and achievement skills, which are applied first of all in a classroom setting and later in practise (the workplace).

Furthermore, these bases are justified by Kennedy (2016) by stating that professional development programs are divergent and can only be identified through their features, of which many authors focus on content. While Sher and O'Reilly (2009) in Kennedy (2016) focus on students learning subject matter and pedagogy, Kennedy (1999) in Kennedy (2016) focuses on curriculum and pedagogy, specific subject teaching practises, teaching practises that are generic, and processes of student learning, while other authors and evaluators concentrate on programme design components, such as Blank and de las Alas (2009) in Kennedy (2016), who focus on more effective programme elements such as monitoring, active learning methods, how specific content is learned by students, and collective participation in instructional and learning activities.

On the contrary, Holloway (2006) holds that not all experiences or programmes of professional development should be considered effective in students learning and capacity building, but only those that are tactfully conceived and delivered with their basis being research results. These programmes scientifically select their issues or elements and master how their content and practises will influence learning and skill development in the professional world. For this reason, Temperley et al. (2007) and Kennedy (2016) consider professional development programmes to have eighty-four (84) components, among which are four key components: content and implementation (process), characteristics of the institution, and the prospective working social context. On the other hand, Guskey (2005) and Holloway (2006) evaluate the impact of professional development on the learning of students. His findings showed that solid professional development facilitates the acquisition of strategies based on scientific research and procedures needed to attain stated professional development goals and objectives. This is greatly facilitated by multimedia-based pedagogy.

Furthermore, Mbala Zé et al. (2019), in the publication "*L'encadrement de la recherche en milieux universitaires, Ethnographie des conceptions d'encadrement des thèses et mémoires*", holds that management of dissertation relationships is meant to optimise success conditions and create opportunities for personal as well as professional development. In this light, the lecturer's role of coaching should play a mutual role in professional development at the higher education level through the self-development of both the lecturer and the student, as completion for one is completion for both. This clearly shows the

importance of professional development in higher education and the use of multimedia pedagogy or modern technology in attaining personal as well as professional development for employability purposes.

In this era of technology and specialisation, professional development, according to Cambridge Assessment International Education (2017), has a series of benefits ranging from improving learning through principles, improved instruction and learning, which results in quality knowledge acquisition and creative skill building or development, to increasing the participation of students, teachers, and stakeholder groups as learning professional institutions become popular and respected (2008, TALIS in Cambridge Assessment International Education, 2017). Professional development orientation makes teachers more dynamic as they take part in professional learning forums with a focus on self-efficacy and are appreciated and given frequent feedback on their instructional activities and practises, such as multimedia-based instruction. Multimedia-based pedagogy in a professional development institution facilitates the instructional and learning processes in attaining the set objectives, goals, and aims by the end of the training. Therefore, it should be evaluated in order to improve.

On the contrary, Southwest Educational Development Laboratory (2005) focuses on the pitfalls to be avoided in order to maintain or improve the success rate in professional development. Also, they consider technical preparation and planning beneficial to professional development. To make educational institutions or establishments more professional development-oriented, Sparks and Hirsh (1997) in Southwest Educational Development Laboratory (2005) and Southwest Educational Development Laboratory (2005) present a series of elements (pitfalls) to avoid in the professional development process.

Motivation in professional development Grand-Clement (2017) holds that technology is a lucrative asset in education that makes professional development scalable, efficient, and accessible. Providers of professional development training and learning reach more isolated students and structure training and learning to meet the needs of such individuals. Furthermore, technologies in professional development establish coordinated collaborative networks, improve the value of money, and innovate to meet specific objectives as well as demand. Technology is also seen as the motivating element behind leadership and political involvement in the professional development drive. This is because a good number of employers and businesses have realised ethical awareness with respect to professions and are

striving to close gaps by developing employees' knowledge and skills, which have the potential to help them survive in the competitive market in an advantageous manner.

2.7.1. Addressing Students Professional Needs

According to Gysbers et al. (2000), Hess and Richard (1999), Nader (1990), and Seffrin (1990) in Thiry et al. (2008), the adulthood transition process these days is accompanied by rapid changes, which in turn bring about a massive increase in choices. In this age, Hess and Richard (1999) and Thiry et al. (2008) find that the adolescents who make up the majority of students in higher institutions of learning and universities are faced with a variety of problems such as family unit changes, poverty, diseases, negative media, violence, sexual themes and sexually transmitted diseases, drug abuse, technology, conflicts, and conflict resolution. Furthermore, Rice (1996) and Thiry et al. (2008) focus on the technological advances of modern society, which are a daily phenomenon and pose the problem of the ability to secure finances for a better future. The professional needs of students in higher education are changing as the days pass, especially in a country like Cameroon. This calls on these institutions to structure their programmes to meet changing professional and student needs.

The Centre for Teaching (1993), developing a positive learning environment has to do with starting with preventing or avoiding disruptive behaviour to secure professional development. For this to concretize, lecturers and students need to be drilled on professional behavioural expectations and norms through the courses being offered in the respective professional programmes. This is comfortable before classes start for lecturers and during the first classes or courses for students. These expectations can be better transmitted to the students through the use of multimedia-based pedagogy. Multimedia-based pedagogy can be used to educate the students appropriately on the norms and expectations of their future profession. This is done through sharing responsibilities and control measures through multimedia forums or mediums and collectively drawing a contract for behaviour (Centre for Teaching, 1993).

Furthermore, Cameron et al. (1991) and Mainous et al. (1996) in Thiry et al. (2008) hold that by not meeting the needs of students, there are high possibilities for poor academic performance, high rates of school dropout, or manifestation of destructive behaviours of self-defeat, which is catastrophic for professional development. Also, Thiry et al. (2008) state that

as institutions of learning have the aim of preparing and developing students' knowledge and skills and meeting the challenges of an ever-changing society and environment, they should look beyond academic achievements and structure the educational system to be comprehensive. For the educational system to be comprehensive so as to meet students' needs, the programmes and courses offered should be responses to the varying professional needs of the student as they are developed professionally.

According to Morrow (2000) and Thiry et al. (2008), scientific processes contribute enormously to professional development in education. Through technology, of which multimedia is a major component in education, scientific processes excite students, facilitate the presentation and exploitation of stories that are true, provide facilities and data for meeting students' professional development needs, and expose lecturers and students to role models in their varying fields of specialisation. Technology can also be used to meet students' professional development needs in the instructional process by facilitating swift actions to prevent disruptive behaviour through efficient mediums of communication, avoiding a hostile environment for learning and professional development. Multimedia-based pedagogy has to be evaluated to make it more constructive in meeting students' academic and professional needs.

Furthermore, in order for students' professional needs to be addressed, the Centre for Teaching (1993) recommends a series of strategies in the instructional process that are very compatible with multimedia-based pedagogy. They involve putting students into groups and teams; making classroom, forum, or lecture hall discussions open and honest, giving every student the opportunity to participate and freely express their opinion; obtaining from students their goals and measures to attain them; obtaining from them possible opportunities of maximising time while meeting their academic and professional needs; adjusting the structure and instructional methods, techniques, strategies, and styles to address or attain the academic and professional development needs of the students; and taking into consideration all types of students (visual, audio, audio-visual, and kinaesthetic). With multimedia-based pedagogy, all these are possible, as it is possible to address the individual, academic, and professional needs of diverse learners. That is the reason it has to be evaluated to see how it affects professional development.

Also, Thiry et al. (2008) go further to examine the content needs of the students that have to be addressed to realise professional development from the perspective of knowledge

and skills. Multimedia-based pedagogy is good at creating convenient opportunities for the needs of content, its appropriateness, and effectiveness to be attained by building in the students the desired and required knowledge, skills, and experiences. Furthermore, Thiry et al. (2008) argue that students' knowledge and skill needs must be discussed with them; 29% of information can be obtained through observations, while 47% can be obtained through interviews. They also emphasise the concentration on teaching methods as well as effective presentation measures to meet the skills and technique needs of the student in professional development. They also reiterate the professional development benefits that come with designing effective instructional presentations and practical pointers for addressing the content needs of the students in professional development. The place of multimedia-based pedagogy here is very glaring and hence should be examined.

According to Thiry et al. (2008), students' needs are not just supposed to be addressed for addressing purposes but for relevance in the context of professional development. The students should apply the knowledge, skills, and professional experiences of professional development to their own work. Therefore, they should be involved in professional development courses, workshops, publications, coaching, and other resources related to activities in their different fields of interest and specialisation. One of the key components, according to Thiry et al. (2008), is transferability. Transferability is considered, especially in the sciences, a very critical component of addressing the needs of professional development. That is why there is an emphasis on the practical exploitation of knowledge and skills in individual projects.

Also, collaboration cannot be left out of professional development (Thiry et al., 2008). This is because all specialists in all fields of professional life need to collaborate with educators for the benefits of designing lessons, teaching, scientific processes, and technological support. It is for this reason that the evaluation of multimedia-based pedagogy, which facilitates collaboration between specialists in other fields and educators, lecturers, and students, the educational system, and society, is of the utmost importance when it comes to addressing students' professional needs and fostering professional development.

2.7.2. Digital Learning Support and professional developement

In the developing world and Cameroon in particular, digital learning support cannot be discussed without the mention of Information and Communication Technologies (ICTs) as its

base. With this view, Sousa et al. (2017) examine ICTs as a digital learning resource that significantly influences the instructional and learning processes as well as the digital literacy of lecturers and students. This is because they consider that there is a significant relationship between students' exploitation of ICTs as a digital learning support and a lecturer's level of confidence in digital competencies. On the other hand, digital learning support is being examined by Grand-Clement (2017) from the lecturer's disruptive role and support perspective. Furthermore, Ross (2018) views technology in relation to education and instruction as an effective tool that is replacing low-level instructional duties. One of the key components of multimedia-based pedagogy is digital learning support, which is a great tool today for realising professional development.

In establishing the relationship between digital learning support and professional development, Sousa et al. (2017) hold that for educators (lecturers) to exploit digital learning support effectively and efficiently for professional development, they also require continuous ICT capabilities and professional development training. This view is given more impetus by the Committee for Economic Development (CED) (2013), which considers students in this age as "*digital-age learners*", because of their technological orientation and approach to learning, which is free-agent. Students are more comfortable learning with digital learning and multimedia support tools like computers, iPhones, iPods, computer games, text messaging, social media pages, and online and offline forums. Professional development in this digital age is being facilitated by multimedia-based instruction, which facilitates instructional and learning knowledge and resource access beyond lecture halls, institution infrastructure and facilities, and traditional lecture hall practises.

Furthermore, CED (2013) holds that digital learning resources and technology have not only been expanded in education but have been brought into the lecture hall (classrooms) to facilitate professional development and prepare students for a full potential realisation transition. This is facilitated by multimedia-based pedagogy, which enables lecturers and students to fully exploit available digital resources for effective instruction and learning, respectively. Digital technology is exploited for instruction, learning, measurement, evaluation, and student mastery through the use of instructional methods that are not data-driven. This has resulted in a shift in role for lecturers, even though CED (2013) argues that most lecturers (teachers) are insufficiently proficient in technology. This can pose an obstacle to professional development in multimedia-based instruction.

This view is contradicted by Burns (2013) and Sousa et al. (2017), who state that a skilled lecturer exploits a poorly digitally or ICT-equipped instructional and learning environment to still perform better and obtain good results. In support of this view, Grand-Clement (2017) argues that digital technologies apparently have a disruptive role for lecturers (educators). This is because most lecturers and educators are not familiar with or comfortable with exploiting new instructional and learning technological tools to render instruction and learning more effective and efficient. This is because, in the view of Grand-Clement (2017), physical lecturers (teachers) are considered to be motivating, build trust, and inspire students in physical lecture halls. Therefore, technology goes hand in hand with instructional skills to obtain excellent results in professional development using multimedia-based instruction and learning.

Furthermore, Grand-Clement (2017) presents the argument that digital technologies and learning support in the classroom replace, change, or disrupt students' manner of accessing information, navigation of information, and accessibility to pedagogy in diverse settings. Therefore, Grand-Clement (2017) considers the insistence on increasing digital technology in education to have certain risks, such as teachers becoming more like administrators as students can search, retrieve, and examine information without the aid of a teacher. In this light, a number of professional development elements will be lacking, as well as effectiveness. However, he finally arrives at the conclusion that lecturers (educators) should exploit digital technology as an instruction and learning mass stimulation weapon. This is because knowledge content can be shared digitally in advance with the students, enabling lecturers to efficiently exploit their contact time with the students. The lecturer also has enough time at his disposal to focus on professional development coaching and monitoring.

Furthermore, Ross (2018) examines digital technology from the perspective of assessment, especially multiple-choice, for dozens, hundreds, and even thousands of students in lecture halls or online at the same time or simultaneously. Also, it facilitates the lecturer's ability to obtain quick snapshots of up-to-date progress and the ability to easily forward students' progress reports to them and their families from the comfort and safety of their home. As it concerns instruction, Ross (2018) strongly contrasts the views of Grand-Clement (2017) that technology is disruptive by stating that no educator (lecturer) can express the patience manifested by digital technology in repeating presentations over and over. This can

be done by presenting text content, visual content (pictures or images), audio content, audio-visual (video, film), animation interactions, or exploiting different media sources to enable the students to view and review for mastery and internalisation. Ross (2018) actually expresses one of the numerous advantages of multimedia-based pedagogy as a tool for effective and efficient professional development.

This view is highly supported by Pounsford (2007) in Sousa et al. (2017) as they consider ICTs support of which digital tools are one of key elements that facilitate (support) the instructional and the learning process through the availability of text, images, audio, video and animation. With all these resources, students can get involved in in-depth learning. Furthermore, Robin (2008) presents digital story telling as a technology application that can be properly exploited for user-directed content and facilitates instructors use of digital technology as a more productive tool in their lectures and lecture halls. Furthermore, Ross (2018) reiterates technology through its instructional activities which is more often low-level has significantly orientate educator (lecturers) potentials on what to do, with whom, when and how with respect to learning, and in relation to instruction. Digital technologies have served as a great learning support, especially in multimedia-based pedagogy, which serves as a tool in students' professional development.

Also, Cennamo et al. (2018), Bundick et al. (2014), and Gurung and Rutledge (2014) in Ross (2018) emphasise that, as frequently reviewed by the technology integration literature, the manner in which digital technology is used in the instructional and learning process is more essential than just using it for exploratory reasons. It is important to note that how effectively and efficiently technology in general and digital technology in particular is exploited in the instruction and learning process for professional development purposes depends on the skills of the lecturer in using technology for instruction (Darling-Hammond et al., 2014; McDonald, 2016; Ross, 2018). Furthermore, CED (2013) holds that students these days are no longer very dependent on education institutions with a traditional orientation as far as knowledge acquisition is concerned. They are more and more exercising self-reliant behaviour through their mastery of internet skills with respect to aggregated data and information. These skills and information are instrumental in supporting their academic achievements and professional development.

Furthermore, Grand-Clement (2017) reiterates the increasing rate at which the digital world is engaging with the educational system. Technology and digital technology are being

used today innovatively in educational implementations like multimedia-based pedagogy, delivering education, and building skills for professional development purposes. These digital learning support innovations are motivated by the possibilities of changes in the future with respect to working mode and pattern, influenced by current economic and political trends in accordance with rapid digital technological changes. These digital changes have given rise to rapidly changing technologies being applied in work places, demanding new digital skills and a new work force as bases for professional development. This view is supported by Yang and Wu (2012) and Sousa et al. (2017), who examined digital story telling as a learning support that enhances learning motivation and critical thinking, of which the end result is academic achievement enshrined with good qualities of professional development.

Also, CED (2013) holds that the increased use of digital technology and even technology by educators and lecturers in institutions is influenced by the ever-evolving characteristics of the students. This is because digital learning resources and support create opportunities for institutions to adapt and develop students professionally to meet up with the ever-changing work challenges and environment. In this direction, higher education institutions are these days striving to address issues such as resources and access, training (students and educators), professional development, and modernising their delivery methods (multimedia-based pedagogy), structures, and infrastructures to meet the needs of a rapidly changing society.

All these issues are addressed thanks to the support provided by digital learning resources for the acquisition of knowledge and the development of skills. This knowledge and skills will help students meet 21st century expectations and job demands professionally. Digital learning support, according to Sousa et al. (2017), stimulates cooperation in activities of learning through script reviews, storyboarding, image selection, and the exploitation of interactivity, privacy, and online communication for professional development.

CED (2013) holds that digital technologies provide learning support in multimedia-based pedagogy in a number of ways: firstly, they facilitate individualised instruction by permitting students choices and differentiation. Irrespective of the tool used, such as web-based or desktop applications, digital technologies have enabled students to create, design, organise, and experiment better than pen, pencil, and paper could permit. This serves the purpose of professional development empowerment and a catalyst for motivation for learning; also, digital technology has greatly facilitated learning assessments for instruction

strengthening purposes (CED, 2013). This has been the case with using polling digital technologies for formative assessment by lecturers. This is to verify online tools and lecture hall performance systems so as to adjust instruction to immediate data access based on real-time, which results in immediate feedback for academic and professional development.

Nam (2016) and Sousa et al. (2017) examine digital learning support as an influence on students' social presence and attitudes towards online collaboration and learning environments. While Sousa et al. (2017) affirm with all certainty that digital learning support technologies are relatively more motivating when it comes to discussions amongst students from the point of view of constructivism, Furthermore, Grand-Clement (2017) holds that digital technologies have enabled digital skills to meet up with day-to-day professional activities such as appointment booking and personal banking (e-banking). Therefore, students need to be professionally developed to be able to adapt to the ever-increasing digital society. This is done through developing skills in knowledge management, change management, agile management, lifelong learning, self-learning, going beyond technological barriers and limits, developing basic skills of writing and communication, literacy (especially digital literacy), typing, critical thinking and judgement, personal resilience, problem solving, and soft skills that are necessary for professional and personal development in today's society.

The biggest question being asked today in Africa and in Cameroon in particular is whether the educational systems, which focus mainly on quantity-based performance-based measures, take into consideration soft skills for professional development. This is because with the notion of soft skills, today's performance focuses on the intangible elements, as more is to be added to the technical expertise of students to equip them for future career growth and successes. (Grand-Clement, 2017) In this light, Ross (2018) views digital learning resources as creating opportunities for mastery demonstration by students. There exists a vast variety of digital resources and tools to support instruction, learning, and all forms of assessment (diagnostic, interim, formative, and summative). Developing, implementing, scoring, analysing data, and reporting findings have greatly been facilitated by digital technology. Digital tools and resources have greatly improved the efficiency of the assessment process for learning, which has resulted in professional development.

Also, Ross (2018) affirms that learning progressions describe a model that is well-defined on the expectations of how students should learn, and learning progression-based instructions facilitate students in acquiring transfer skills, which is considered a goal in

learning that is ultimate. On the other hand, a backward design approach facilitates the identification of assessments that are relevant and can primarily provide guidance for curriculum, unit, and lesson development. For this to be effectively done, support skills and digital technologies as types of resources have to be determined. Assessment is considered to be closely related to instruction and is often designed to facilitate decision-making and many other specific purposes, as many of these may negatively affect its validity and reliability. It is also critical for standardised assessments to incorporate digital technologies in order to capture and report data on student performance. Digital technologies and digital learning supports combined with the use of multimedia-based pedagogy will greatly foster lecturers' and students' professional development.

2.7.3. Assessment as a Catalyst for Professional Development

Assessment as a professional development component has a very important role in instruction, especially in multimedia-based instruction programmes. Ysseldyke and Bolt (2007) hold that assessment provides data or information collected for the purposes of formative or summative evaluations, which are catalysts in the instructional process, be it multimedia-based or not, by improving learning outcomes. Assessment is based on content, referred to by some authors as curriculum-based measurement (CBM) and also seen as a synonym of formative evaluation (Deno, 1985; Silberglitt and Hintze, 2005). In multimedia-based instruction, assessment is done diagnostically, formatively, and summatively while respecting the norms of validity and reliability and taking into consideration motivational factors so as to improve students' performance.

According to Jabbarifar (2009), in classroom assessment, teachers or lecturers by themselves design and develop test items, administer them, and do question analysis so as to use the information or results gotten to make decisions that will improve their teaching. The role of assessment at this stage is to provide feedback on how effective and efficient instruction was and to update students on their level of progress. The teacher's assessment indicates the level of learning or incomprehension of the learners and the level of effectiveness or ineffectiveness of his or her teaching (instruction), so as to ameliorate where necessary. Furthermore, Jabbarifar (2009) presents four major components of assessment, which are: i. Overtime improvement or change measurement; ii. acting as a tool for motivation and study purposes; iii. Including the evaluation of methods of instruction

(teaching methods); iv. At the end of the assessment process, ensure students are ranked according to their capabilities or performance in classroom assessment or evaluation.

Jabbarifar (2009), affirm that the purpose or importance of classroom assessment is to create an opportunity for students to express or show acquired knowledge or skills without surprising or embarrassing them by requesting what has neither been taught nor learned. It focuses on the diverse issues or components of the teaching and learning process, if not all elements. It involves content taught in the classroom, including text books, online and offline studies, instructional materials, teacher efficacy and effectiveness, student achievement, and the instructional programme as a whole. The focus of this study, however, is the impact of multimedia instruction on classroom assessment. Be it whether instruction was online, offline, or facilitated with multimedia gadgets in the classroom, the focus is on how it influences the validity, reliability, motivation, and performance of classroom assessment, irrespective of whether it is diagnostic, formative, or summative.

According to Ngoungouo (2017), ICTs (Information and Communication Technologies) have greatly influenced and 'tele-guided human life and activities everywhere in the world, including Cameroon. Also, ICTs, of which multimedia is a component, have not only influenced but greatly imposed themselves on human existence and the functioning of human systems such as education, communication, commerce, finance, engineering, medicine, music, sports, architecture, and cinema, just to name a few. In education, the role of Information and Communication Technologies cannot be underestimated, as they are used in the classroom, online and offline, by teachers and students for a number of intellectual activities during the teaching and learning process and during classroom assessment.

These activities, among others, include content multiplication, typing, automatic assessments or examinations, research, marking, and correcting. With some online courses, all assessments, marking, corrections, and even delivery of attestations or certificates are done electronically. And more often, the test tools are said to be in compliance with the principles of validity, reliability, motivation, and performance. As well, at times it is difficult to determine its respect for basic assessment principles.

It is important to note that classroom teachers (online and offline teachers included) are the most rigorous workers in the educational system as far as assessment activities are concerned. This is because they are consistently (continuously) actively involved in

assessment activities, which they carry out on a daily basis before instruction or lectures, during lectures, at the end of lectures, and midway into the course outline, considering students as key actors in the assessment process (Jabbarifar, 2009), as illustrated below.

NEEDS ASSESSMENT TO CLASSROOM ASSESSMENT

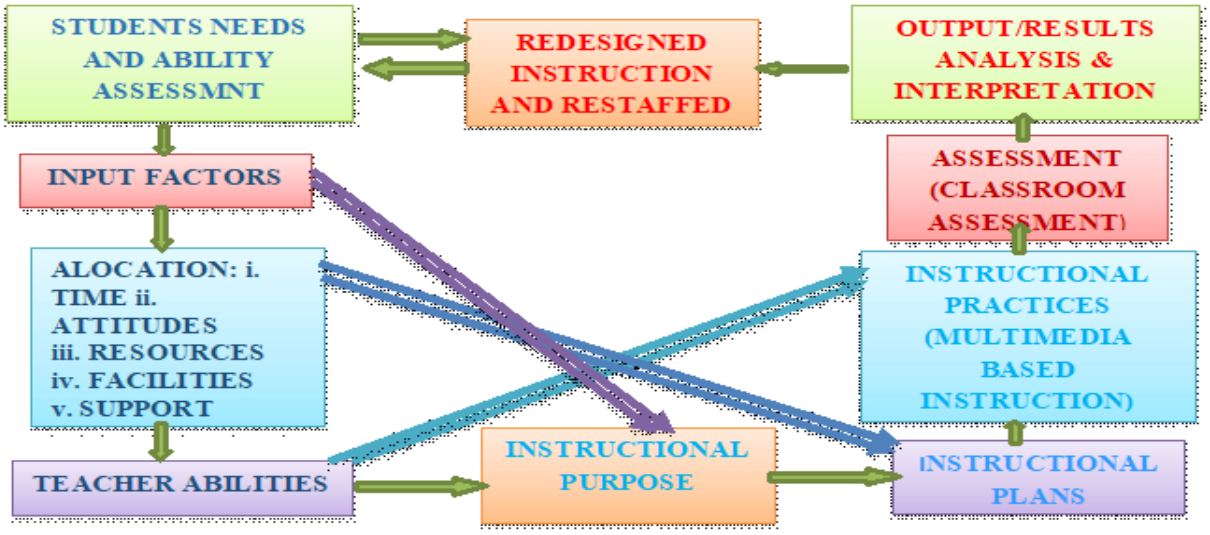

Figure 10: input to output in instruction

Source: Adapted from Jabbarifar (2009)

Figure 10 shows the processes involved in instruction that lead to the redesigning of instruction so as to meet the needs and abilities of learners (students). The start point of curriculum implementation (instruction) is the assessment of students' needs and abilities; this can be done using a diagnostic test instrument or tool that serves the purpose of diagnostic assessment (needs and ability assessment).

Furthermore, when the needs and abilities of the students have been established, input factors to meet these needs and build on the existing abilities are determined. When these input factors have been determined, there is an allocation of time, identification of attitudes to be developed, establishment and acquisition of resources (human, material, and financial) to be used, the necessary facilities are put in place, a teacher with the abilities to meet the needs and exploit the abilities of the students for their development is allocated or recruited, and the necessary support contacts are established.

From the input factors, the instructional purpose or objectives are elaborated (established), while time allocation, identified attitudes, available resources, existing facilities,

and support determine the construction of the instructional plan. More can be planned based on multimedia-based instruction. The teacher's ability now determines the educational practises or instructional method used in attaining the set goals and objectives. An instructor with multimedia instruction abilities will use multimedia-based instruction to meet the needs of the students and develop their abilities.

According to Jabbarifar (2009), every instruction or instruction method, such as multimedia-based instruction, is based on three components: identification of the objectives of multimedia instruction (which represent the 'why'), developing plans on how to attain these objectives (which represent the 'how'), and elaborating and describing the pedagogic activities that will effectively take place either in the classroom, online, or offline forums (which actually represent the 'what'). These three components are actually reinforced by a fourth, known as assessment and evaluation, which verify the authenticity and attainability of each component. Without assessment and/or evaluation, it is scientifically impossible to establish if the objectives were correctly stated, the plans were developed with respect to the objectives, or the pedagogic activities (practises) enabled the attainment of earlier stated objectives.

A multimedia-based instruction programme is supposed to clearly state its purpose (objectives) and what it is intended to achieve at the end of the day with respect to the teaching and learning process. If this is properly done, then it will lead to the development of a framework (plan) on how to attain the objectives. These plans will determine and facilitate the description of the multimedia pedagogic activities or practises that will be put in place and will ensure that these multimedia pedagogic practises are effective and efficient in attaining the objectives of the multimedia instruction.

Assessment verifies the attainability of the objectives, the implementation possibilities of the plans, and the concrete, realistic, and creative nature of the multimedia pedagogic activities. This makes classroom assessment very important and a key component because, while it indicates the strengths and weaknesses of the other components, it is greatly influenced by these components, especially in classroom assessment. This is because it verifies inputs, objectives, plans, and practises to bring out the output of instruction. Therefore, in multimedia-based instruction, assessment is done diagnostically, formatively, and summatively while respecting the norms of validity and reliability.

2.8.0. CONCLUSION

This section presented and examined the writings, views of diverse authors and publications with respect to the quality education and multimedia based pedagogy from the perspective of academic quality, pedagogic quality, didactic quality, and technical quality, and professional development. Information relevance, information validity, and information reliability were reviewed as components of academic quality; pedagogic planning (construction), pedagogic implementation (methods and strategies), and assessment method are examined as elements of pedagogic quality; learning content, learning activities, and learning material are reviewed as components of didactic quality; while browsing, design, technological ingenuity are examined as elements of technical quality in multimedia based pedagogy; and addressing students' professional needs, digital support, and assessment were reviewed as components of professional development in multimedia based pedagogy (instruction).

CHAPTER THREE
THEORETICAL REVIEW

3.0. INTRODUCTION

This chapter provides theories, models, a review of empirical studies and their findings, the study's variables, and a recapitulative table connected to the evaluation of multimedia-based quality.

3.1.0. THEORETICAL REVIEW

The theory and models that is the subject of this section's discussion are in relation to the evaluation of multimedia-based pedagogy quality, and professional development. A theory, according to Mbua (2003), is a methodical, deductive manner of thinking about reality that aims to characterise and understand it. It involves knowledge of a phenomenon's facts, theories, guidelines, or laws. Theories define relationships between variables and are predicated on assumptions. By producing questions that need to be answered or testable hypotheses, they direct research. The following theories will be applied in this work: The study looks at Kirkpatrick's four-level evaluation model, the social learning theory, the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model, the CIPP (Context, Input, Process, Product) evaluation model of Daniel Stufflebeam, and Richard E. Mayer's cognitive theory of multimedia learning (including instruction).

3.1.1. Cognitive Theory of Multimedia Learning

It is important to understand that the Cognitive theory of multimedia learning (CTML) draws its basis from a series of cognitive theories, which, amongst many others, include the theory of cognitive load by Sweller, the model of working memory by Baddeley, and the dual coding theory by Paivio. This laid a very strong foundation for what is called today the cognitive theory of multimedia learning, elaborated by Richard E. Mayer. More et al. (2004) hold that the cognitive theory of multimedia learning originates from a broad framework that examines cognitive science together with cognition’s information processing model. This model exposes a number of memories, or what it calls information stores, that function in transmitting and converting stimuli into information. Stillings et al. (1995) strongly argue that on this particular subject, cognitive scientists tilted their orientation in the direction of having a vivid comprehension of the functioning of mental processes such as perception, refreshing, recalling, comprehension, communication, and learning.

Also, Stillings et al. (1995) still maintain that cognitive scientists have also worked very hard to establish ways by which mental processes such as perception, refreshing, recalling, comprehension, communication, and not leaving out learning could be strengthened or reinforced through the use of multimedia devices and materials in teaching or instruction or in programme (curriculum) implementation known as multimedia-based pedagogy. Furthermore, Sorden (2005) concludes that cognitive science has been seen as very instrumental as a main insight as far as human nature is concerned, as well as human potentials, in the development of methods that are more effective and efficient in the teaching and learning process with the aid of multimedia pedagogy or technology-based instruction.

3.1.1.1. Major (key) components of Cognitive Multimedia Theory of Learning (CMTL)

Mayer (2009) in Sorden (2016) explaining the Cognitive Multimedia Theory of Learning (CMTL) states clearly that the theory roots from the ideology that learners put in efforts to construct meaningful connections in the course of instruction between the words of the speaker and pictures or images presented. The result of this is that it facilitates deep learning more than when words and pictures are used separately. Therefore, Cognitive Multimedia Theory of Learning (CNTL) has as one of its main purposes in multimedia-based pedagogy to instill in the learners or students a sense of extrinsic motivation that will trigger intrinsic motivation. Therefore, the end product of this is the students being able to build a mental presentation that is consistent due to the manner in which instructional and learning materials were presented in the course of the lesson and in post-instruction, which sometimes can be classroom assessment.

The role of the teacher or facilitator in this case is to ensure that the devices used and the material or medium are active in such a way that the learners or students are not passive but active participants, which results in excellent performance during classroom assessment. Components or variables of assessment such as validity, reliability, motivation, and performance are greatly influenced by curriculum implementation factors, of which multimedia pedagogy has become very influential in recent times. Hence, multimedia usage in instruction needs to be evaluated to establish its relationship with students' professional development.

Furthermore, Mayer (2003) in Sorden (2016) states that the Cognitive Multimedia Theory of Learning (CMTL) originates from the roots of three key assumptions. The first is

the *dual-channel* assumption; the second is the assumption of *limited capacity*; and the third is the assumption of *active processing*. Also, Sorden (2016) states that the assumption of dual-channel shows the existence and functioning of the auditory (hearing) and visual (vision) channels from the perspective of Baddeley's working memory theory of 1986 and the dual coding theory elaborated by Paivio in 1986 and Clark and Paivio in 1991.

Furthermore, Sorden (2016) continues with the explanation of the assumption of limited capacity, which originated on the basis of cognitive load theory, in the views of Sweller (1988, 1994) in Sorden (2016), which practically demonstrate the limited capacity of every single component (subsystem) of the working memory. While the assumption of active processing establishes that the construction of knowledge by humans in a manner that makes it meaningful only when they comprehend relevant material by paying attention has the ability to organise the material into a mental structure that is consistent and uses the ability of integration to insert it into previous or prior knowledge (Mayer, 1996 & 1999, in Sorden, 2016), These three assumptions do not only influence multimedia pedagogy online or offline but also classroom assessment from the perspectives of validity, reliability, motivation, and performance.

3.1.1.2. CTML's Three Structure Memory

The cognitive theory of multimedia learning establishes and supports the three-store model, which is known as the sensory memory, the working memory, and the long-term memory. The functioning and impact of these memories need to be taken into consideration not only during instruction but also during assessment. Multimedia-based pedagogy serves the purpose of meeting the needs of these memories by making evaluation valid, reliable, motivating, and improving performance. According to Sweller (2005) and Sorden (2016), sensory memory refers to the cognitive structure used by humans to perceive new data or information, while working memory is the cognitive structure used to process information consciously, and long-term memory is established as the human cognitive structure that is considered the knowledge store base. Information has to be encoded and processed by the sensory and working memories, respectively, before being transferred to the long-term memory for storage. The retrieval of information during assessment depends on how well it was presented, perceived, processed, and stored.

Furthermore, Mayer (2005a) holds that there is a representation of words and images (pictures) in five different forms, and they function as processed information in the memory. Each of these representations indicates or represents a stage of processing information, which includes sensory, working, and long-term memory (the three memory store model). The first stage of representation manifests in multimedia presentation (instruction) in words and pictures; the second stage manifests sensory memory through sounds (acoustic representation) and images (iconic representation); the third stage is in the working memory in the form of sounds and images; the fourth stage, which takes place in the working memory, is verbal and pictorial models; and the fifth stage has to do with information stored in long-term memory as schemas or prior knowledge. This shows the role of multimedia in instruction and assessment (processing and retrieving information).

Content knowledge is established by the cognitive theory of multimedia learning as the content in schemas. A schema has to do with constructs that are cognitive in nature and play the role of preparing data for storage or classification in the long-term memory. They carry out the function of organising simpler elements to act as higher-order schema elements. As pedagogy is practised through instruction, sophisticated schemas are progressively developed as already learned procedures are transformed or changed to automatic processing from controlled processing. When this happens, the information is quickly stored in the long-term memory for future use. This is why multimedia-based pedagogy should be evaluated, so as to determine if it actually carries out this function of facilitating automatic information processing and storage in the long-term memory and how that affects variables of classroom assessment. When the procedure for information processing is automatic, the capacity of working memory to carry out other functions is enabled and reinforced.

COGNITIVE THEORY OF MULTIMEDIA LEARNING FRAMEWORK

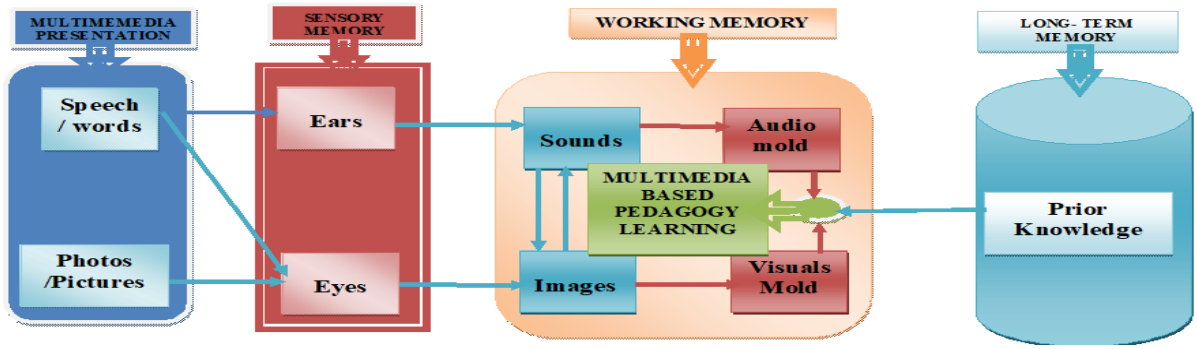

Figure 11: Cognitive theory of multimedia learning Framework

Source: adapted from Mayer (2003) in Billa (2017)

Mayer (2003) in Billa (2017) states that the aim of multimedia in instruction is to facilitate learners, students, or participants comprehension or understanding through a presentation that combines (mixes) words and pictures, taking into consideration the respective groups of persons learning. With the assumptions of the dual channel, the human body possesses units for verbal and visual information, which leads to the indisputable role of multimedia instruction in facilitating learning, as affirmed by Baddeley (1998) in Lulu-Billa (2007). Animation, from the perspective of Mayer (2003) in Lulu-Billa (2017), refers to the presentation of pictorial, visual, audio (oral or spoken words), or narrations in a combined verbal or auditory and visual channel. It is important to remember that multimedia is not only used in instruction; it is also used for assessment in or out of the classroom.

According to Sorden (2016), in 1968, Atkinson and Shiffrin came up with the short-term memory model, which greatly influenced and facilitated the work on the cognitive theory of multimedia learning, which other terms can still be considered as the cognitive theory of multimedia instruction or teaching. This is because it takes into consideration the structure of the memory, how it functions, and how teachers, lecturers, or facilitators could use multimedia in instruction to facilitate comprehension, retention, and retrieval. This makes the theory both an instruction theory and a learning theory.tkinson and Shiffrin focused on the concept of the central executive, which controls the working memory's two subcomponents, which are the visuo-spatial sketch pad and the phonological loop. The central executive, like its name states, controls the whole system while engaging it in focusing attention and problem-solving tasks. Its functioning is enhanced by the use of multimedia materials during instruction and classroom assessment. This is a strong factor in the process of students' professional development.

3.1.2.0. ADDIE Model

Instructional designers and scholars have worked very hard to come up with frameworks that not only make learning interactions effective but also make the instructional and learning process systematic and indisputably open to assessment and evaluation. This brings about the systematisation of teaching or programme implementation and the measurement of effectiveness and efficiency. However, Hess and Greer (2016) affirm ADDIE as a complete instructional-evaluation model, which is among the most frequently used in the curriculum process. The origins of ADDIE as a framework, according to Hess and Greer (2016), are difficult to establish, which is why Molenda (2015) and Hess and Greer (2016)

consider ADDIE when it concerns a process-based approach to instruction content development as a shorthand that best describes the process. In his opinion, the majority of instructional design and diverse designs fall under the umbrella of ADDIE (abbreviation). The model is a process that starts with an input, precedes the process, and ends with an output as it gives feedback (Branch, 2009; in Hess and Greer, 2016).

This work focuses on evaluating multimedia-based pedagogy and its relation to classroom assessment; therefore, the ADDIE model is relevant in that it is useful to both teachers (lecturers) as well as educational or programme evaluators. The model has the flexibility of being adapted to examine stakeholders' needs, facilitate the designing of a logic model for support, ensure the development of main work functions, and above all, evaluate the effectiveness and efficiency of each main work function in an instruction or programme. And this is done through its stages of Analysis, design, development, implementation, and evaluation. In evaluating multimedia-based pedagogy, all these components are being evaluated.

ADDIE DESIGN MODEL IN DIAGRAM

Figure 12: ADDIE design model in diagram

Source: Adapted from McGriff (2000)

3.1.2.1. Analysis phase

McGriff (2000) holds that analysis refers to the process of establishing intended learning. This is done by assessing needs, identifying the problem, carrying out task analysis, studying the participant profile, describing constraints, establishing a needs and problem statement, and completing task analysis. Furthermore, Danks (2011) holds that this phase is all about conducting needs analysis and, in an educational setup, comes before the beginning of the programme or the academic year. It focuses on collaboration with school administration

to establish the possible needs of the staff (lecturers) and students with respect to the programme or method of implementation, analyse the performance of learners as well as implementation methods and tools, as well as assessment and evaluation methods and tools. This information will be examined to establish other needs, analysed, and presented to the right quarters.

3.1.2.2. Design phase

According to McGriff (2000), the function of the process of designing is to specify how the content will be learned (taught or implemented). For this to be realised, at this level objectives are established, test items are constructed, an instruction plan is elaborated, resources (human, material, and financial) to be used are identified, objectives are structured in measurable form, instructional strategies are identified, and a prototype specification is established. According to Danks (2011), this stage takes place before the academic year or programme and is meant to come up with a support model. In this light, the obtained information is used to come up with a logic model draught and project scorecard design and to elaborate a list and description of each main work function.

3.1.2.3. Development phase

McGriff (2000) considers this stage to be the stage for developing the processes of authoring and material production. This is done by working with programme or curriculum developers and producers, developing a workbook, a flowchart, and then the programme, establishing a storyboard and script, constructing exercises, and developing and establishing the functioning of computer-assisted instruction or a multimedia-based pedagogy. Furthermore, Danks (2011) holds that this stage comes at the beginning of the academic year or programme and concentrates on main function development, tools and strategies for data management development, and the communication of the goals and objectives to all stakeholders who are deemed relevant. It is important to note that at this level, the content, implementation methods, resources, assessment, and evaluation methods are being developed or elaborated.

3.1.2.3. Implementation phase

At this stage, the focus is on the process of implementation by installing the programme or project in the training centre or classroom, which is its real-world context; this

includes teacher or instructor training, testing the programme, getting participants or students' feedback, and analysing the data obtained from various stakeholders (McGriff, (2000). According to Danks (2011), this stage runs throughout the year or programme, and its mission is the implementation of main work functions. At this stage, the model chosen is applied or used, the effectiveness of the main functions is examined based on the quality of the tools used at this stage of implementation, and accurate records of every activity, document, document idea, and input to the main work functions are taken and analysed to appreciate this phase of programme implementation.

3.1.2.4. Evaluation phase

The evaluation stage, from the perspective of McGriff (2000), can be said to be the process in programme (curriculum) development that seeks to determine the adequacy of the programme implementation (instruction), which in this study is multimedia-based pedagogy as a method of curriculum or programme implementation. This is done by time data recording, interpretation of test results, surveys on graduates, practise or activity revision, making ameliorating recommendations, building a programme or project report and analysing it, and revising the prototype if need be before full-scale implementation. At this phase, there is an examination of the impact of all the functions, and it is often done at the end of the year by analysing data from surveys or focus groups and programme results with the purpose of determining the level of attainment of the programme's goals and objectives. Then recommendations are made for the next session (Danks, 2011).

MULTIMEDIA BASED INSTRUCTIONAL AND EVALUATION SYSTEM DESIGN (MBIESD): INSPIRED BY ADDIE MODEL

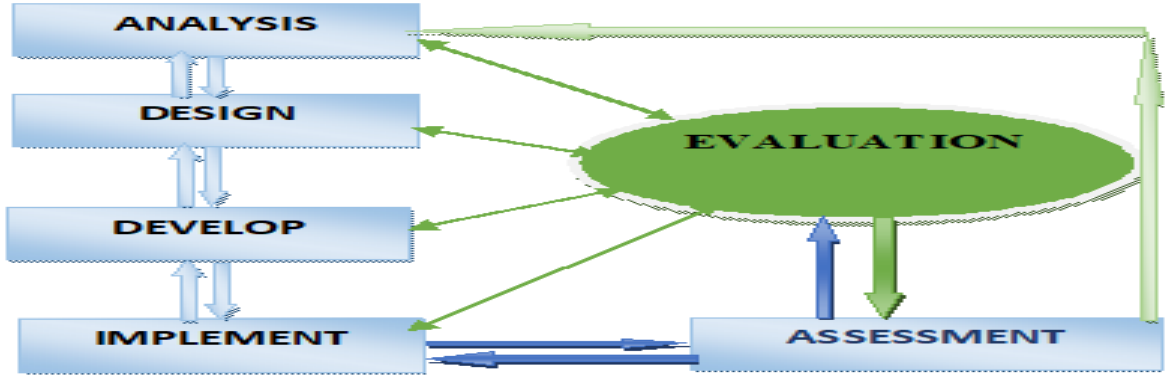

Figure 13: Multimedia based instructional and evaluation system design

Source: Adapted from McGriff (2000)

The ADDIE model in its original form is a design to make the instructional process more explicit, where there is formative evaluation as per stage or phase, and the data or results gotten might take the designer back to the previous phase (the information is used to review the previous stage) (McGriff, 2000). In the classroom, assessment takes place during the course and at the end of the instructional process to verify the level of attainment of instructional objectives. It also acts as an assessment of the whole instructional process because it is the last stage in the design (multimedia-based instructional and evaluation system design). At the general completion (end) of an instructional programme, summative evaluation is done, which involves evaluating the analysis, design, development, implementation, and assessment phases. This evaluation results in a general or overall review of the instructional design or programme by the specialists involved.

3.1.2.5. Criticisms of ADDIE model

According to Vejvodová (2010), irrespective of negative criticisms against the ADDIE model, it cannot be eliminated. To him: ADDIE is can be exploited or followed easily; it is very flexible, which is very important in online studies (multimedia based pedagogy) development; it present at each stage suggestions of potential activities that could be applied, as in a project that is e-learning oriented they organiser may choose and even add activities of their own; the ADDIC model is a systematic one, which follow pedagogic scientific norms and is void of unnecessary errors; it must not be used as a linear process but can also be exploited as a iterative process (possibility of continuously returning to previous stages); the analysis stage serve time and money in the long run; the outcome of ADDIE model is often satisfactory to all stakeholders; and in e-learning programme development, it is a heuristic useful framework .

Irrespective of the fact that the ADDIE model is very suitable for understanding the development and evaluation of educational programmes such as multimedia-based pedagogy, However, the ADDIE model has also been criticised for being linear and not flexible, for being rigid in recommending stages of activities, for the analysis stage being time-consuming and costly, and for being a constraining process (Vejvodová, 2010). However, the ADDIE model is increasingly being applied to multimedia-based instruction in classrooms, offline and online, because of its systematic nature and openness to the exploitation of diverse resources and materials. Evaluation and assessment are key components of the ADDIE model because

every activity at each stage is evaluated. Therefore, it is essential to evaluate the quality of multimedia-based pedagogy to determine its influence on students' professional development.

3.1.3.0. The CIPP (Context, Input, Process, Product) Evaluation Model

Wang (2009) affirms that CIPP is an evaluation model with management orientations with the purpose of providing definitive and valid data (information) that would guide decision-makers in taking effective and efficient managerial decisions in line with hierarchy. The CIPP model also takes into consideration the destination of the evaluation results, their purpose, and the sectors or fields of application. Also, in the EEPA interview (1980) in Wang (2009), Daniel Stufflebeam came up with the CIPP model for evaluation of educational programmes due to the unsatisfactory conditions that prevailed in inner-city schools in Chicago, which to him could only be made better if there existed a method of evaluation that could help individuals and communities make productive decisions with respect to their educational programmes and their products. This is because the Stufflebeam decision-making process in effective management can only be based on results or information obtained from evaluation.

Frye and Hemmer (2012) hold that the Context Input Process Product (CIPP) model, as its name states, has four components, which are complementary evaluation studies with the ability to evaluate an educational programme from diverse dimensions following the dynamism of the programme. These complementary components are Context, Input, process, and Product. Evaluation of these components evolves as educational programmes evolve over time. This model also facilitates educators' needs for increasing data on or for programme improvement. Technically, the fact that the CIPP model focuses on Context, Input, Process, and product means the model takes into consideration and examines an educational programme from all dimensions. This is interpreted as the CIPP model focusing on programme planning, implementation, and retrospective or summative assessment. While the Context, input, and Process components of the model focus on improving evaluation studies (formative assessment), the fourth (4^{th}) component (product) focuses on the end product, which is gotten through summative or final evaluation or studies.

Also, Wang (2009) strongly holds that in designing the CIPP model by Stufflebeam, he was focused on confronting and addressing key classes when it comes to decision-making. The first of which is planning, which has to do with identifying and selecting goals or

objectives of a programme; the second is structuring, which has to do with designing the programme with respect to set objectives; the third is implementation, which focuses on how the programme is operated and executed; and the fourth but not the least is recycling, which is concerned with judgements and reactions. This leads to the four methods found in the Context, Input, process, and Product model of programme evaluation brought forth by Stufflebeam, which correlate with the four methods of evaluation in the CIPP model.

3.1.3.1. Context Evaluation in CIPP model

Frye and Hemmer (2012) explain that Context evaluation in the CIPP model refers to the evaluation studies that are carried out when a programme is in its planning phase. When a curriculum engineer or educationist is charged with developing a programme or is taking over an old educational programme, one of the first actions to be taken is context evaluation. This will facilitate the development or management of the programme because there will be an understanding of how the programme should function or was intended to function. Contextual evaluation studies are also instrumental when administrators or decision-makers are facing difficulties in making decisions on the necessity of abolishing or reducing programmes. The importance of explicitly examining an educational programme such as multimedia pedagogy cannot be underrated because context examination is very important and necessary for an efficient evaluation, and it relates excellently with theories that emphasise context, such as complexity theory.

On the other hand, Fritzpatrick et al. (2004) in Wang (2009) state very clearly that the objective or focus of the CIPP model as an evaluation model is to seek to identify preliminary information on how the programme will be structured to function. It takes into consideration the planning phase of an educational programme, irrespective of the fact that context evaluation goes as far as the identification of the potential consumers (participants), their desires or needs, as well as stakeholder expectations in relation to the objectives and goals of the programme.

Also, Frye and Hemmer (2012) hold that context evaluation in CIPP focuses on identifying and defining the goals and priorities of a programme by examining relevant needs, assets, problems, and opportunities for the programme. The importance of context evaluation findings is that they are instrumental or serve as the basis for outcome or product evaluation, which comes later. On the other hand, Wang (2009) holds that these multiple techniques of

evaluation include: diagnostic test implementation, system analysis, achieved data, and multiple interviews. These components ensure that the objectives and goals of educational processes such as instruction and learning are linked to evaluation.

3.1.3.2. Input evaluation in CIPP model

Input evaluation examines or assesses the cost effectiveness or feasibility of competing or alternative approaches in relation to educational needs, such as plans for staffing and allocation means for key resources. The importance of this evaluation in educational programmes is to provide elements for allocating resources for budgeting, time, materials, staff, and personnel as duties of planning educational programmes as well as drawing up educational programme proposals. Input evaluation as an approach plays a significant role in programme development as it guides programme developers to respond objectively and productively to the unfolding needs of a programme over time. In the CIPP programme evaluation model, the input evaluation builds on the foundation laid by context evaluation as it focuses on ways of bringing about expected changes in an educational programme. When input evaluation is effectively and efficiently conducted, it results in clear explanations of the reasons and the method by which a particular approach is preferable or chosen, as well as the existing alternatives thathave been examined and are under consideration (Frye and Hemmer, 2012).

In addition, Fitzpatrick et al. (2004) in Wang (2009) state that Input studies in the CIPP model of programme evaluation are conducted to implant support systems, develop strategies that are solution-oriented, and design procedures for programme implementation. This is given more weight by Stufflebeam (2003) and Wang (2009), who state that for Input evaluation to be successfully implemented, accessible and personal resources must be established by the evaluator or evaluators. At this stage, a number of things are examined, such as estimated costs, expected results, strengths and weaknesses, as well as other factors that determine the successful implementation of a programme. Therefore, Input evaluations or studies give a deep and precise understanding of the resources and determining factors of the programme in view.

Frye and Hemmer (2012) hold the view that one of the achievements of Input evaluation or studies in the context, Input, process, and Product (CIPP) evaluation model is that the approach to educational programmes is scholarly and formalised. Its feasibility and

effectiveness potentials permit an educational programme under development or construction to be consistent with respect to educational practises with the potential to work effectively and efficiently. Visiting sample programmes, conducting a literature review, and consulting with experts and interested parties are some of the main methods involved or employed when identifying and examining approaches in the course of studying educational needs in an input study.

3.1.3.3. Process evaluation in CIPP model

Frye and Hemmer (2012) state that the context, Input, process, and Product (CIPP) evaluation model's third component, which is Process evaluation or study, focuses on examining or assessing education programme implementation. It facilitates evaluators' interpretation of educational products or outcomes. This is because it also focuses on programme components that are associated with or provoke outcomes. Process evaluation is a study that has the capacity and potential to be conducted multiple times, so long as the programme is functioning, so as to give formative feedback that will facilitate and guide the process of programme revision. Educational programmes usually function or operate in complex environments. This is because there is a lot of emphasis on process, which is programme implementation, like the use of multimedia pedagogy or instruction, especially in Cameroonian higher education institutions today, which permits information flow for the utility of the management of the programme and amelioration towards effectiveness and efficiency.

Process studies, according to Wang (2009), refer to an examination of the implementation process of a programme, which takes into consideration programme design refinement and procedures involved in the functioning of the programme. It examines the efficacy and efficiency of programme implementation and the possible obstacles that can obstruct the success of the programme. Measures are therefore taken to prevent the programme from plunging into failure. Stufflebeam (2003) and Wang (2009) consider that for Input evaluation under the CIPP evaluation model to obtain valuable and objective information that would make it successful, there has to be interaction between the evaluators and the stakeholders, decision makers, consumers, and people of interest.

Furthermore, according to Frye and Hemmer (2012), the role of Process evaluation or studies in the CIPP evaluation model in facilitating programme partners or stakeholders in

accountability is invaluable. This is because it permits and facilitates essential information collection for an educational programme's consistency and amelioration. A documented Process study in education is often very useful and instrumental to educators as they strive to improve their respective programmes. The least obtrusive methods, such as document review, participant interviews, and observation, are often used or taken into consideration when designing a Process evaluation or study on a functioning educational process or activity following the Context Input Process Product (CIPP) Process programme evaluation model.

3.1.3.4. Product Evaluation in CIPP model

Frye and Hemmer (2012) affirm that product, outcome evaluations or studies are very common in the education field. This is explained by the reason why most educators and educational evaluators are familiar with It is also because it focuses on the outcome, or the final results, of educational programmes or practises. The CIPP programme evaluation model contains Product evaluation or study as the fourth component, and it is more often seen to be strongly related to summative programme evaluation, which is very traditional. It focuses on identifying and examining programme outcomes, or final results. The purpose is to present outcomes from the dimensions of strengths and weaknesses, positive and negative, short-term and long-term, planned and unplanned (hidden) outcomes.

Also, according to Wang (2009), the outcome of Product evaluation is the result or product of a series of descriptive collections and judgements based on achieved data on a programme's objectives, worth, merits, or demerits. On the other hand, Frye and Hemmer (2012) state that when a product evaluation using the CIPP model is effectively and efficiently conducted, it provides the evaluator(s) with information on the outcomes of an educational programme for individual participants, sub-groups, or all the participants who took part in the training using a particular programme. Process studies facilitate the interpretation of findings on a programme's products. This is because Process studies more often precede Product studies and have a great influence on the outcome of Product evaluations. The outcome of a programme (especially educational programmes) depends on the implementation process; if the implementation is effectively and professionally done, then the products or outcomes will be fabulous or excellent. The purpose of Product studies is to carry out a systematic search for unintended outcomes of a programme, be they positive or negative (Frye and Hemmer, 2012).

Furthermore, Wang (2009) holds that Product evaluation can be categorised into subcategories of effectiveness, sustainability, impact, and transferability. This will help the evaluator obtain credible and precise information on the effects of the programme in the long term. Frye and Hemmer (2012) hold that educators as well as the education field have a number of expectations when choosing or using the context, Input, process, and Product (CIPP) model. CIPP is so dynamic that it can be used to study programme implementation (formatively) and retrospectively, or to examine the final results (summative evaluation) of an educational programme. It helps educationists or educators identify the contextualization of a programme in the education field: what precedes learners and the educational community concerned with respect to an educational programme under implementation and the dependence nature of the programme on other educational factors or determinants that make an educational programme mature.

There are considerations to be taken by educators when making a choice of the CIPP model for an effective and efficient examination of an educational programme or programmes. This is because the CLIPP model demands efficacy in planning, whether on a new programme or in doing retrospective evaluations of a programme that has come to an end. There are a series of data collection methods that are used in the CIPP model to obtain objective results, as they are analysed using the appropriate method of data analysis with respect to the assessment or evaluation of the data collection instruments (questions) addressed. Fritzpatrick et al. (2004) and Wang (2009) confirm that the CIPP model of Stufflebeam is neither systematic nor linear, irrespective of the fact that it is designed in such a way that it addresses specific aspects of a programme. And he himself states that the CIPP model is easy to modify so as to accommodate additional information needed by programme decision-makers.

3.1.3.5. Criticism of CIPP model

According to Tan et al. (2010), there is no formula when it comes to designing an evaluation study; what the CIPP model presents is simply a versatile framework. This versatile framework, composed of a rigorous combination of instructions, guides adaptability by the evaluator with respect to the objectives of the evaluation project. This makes the CIPP dynamic as it focuses on improving programmes or their components, just like multimedia-based pedagogy. This view as a strength of the CIPP programme evaluation model is supported by Guerra-López (2008) and Tan et al. (2010), who hold that the CIPP model is not

designed to evaluate any particular programme. This makes it easily adaptable to any project and varying situations. According to Stufflebeam (2003b), the model serves as a framework that is comprehensive in guiding the evaluation of programmes, projects, products, personnel, systems, processes and situations with either formative or summative orientations.

According to Guerraópez (2008) and Tan et al. (2010), the CIPP model is an evaluation approach that is holistic in structure. This is because it covers all stages of a programme; in educational programmes, it covers the planning stage through the design, implementation, and evaluation stages. That is, it covers input, process, outcome, and product, promoting iterativeness during the design and implementation processes. Tan et al. (2010) hold that the holistic nature of the CIPP evaluation model can be identified by those involved in evaluation and what is being evaluated. All stakeholder groups in this model are actively involved, either in collecting or providing information.

This is in conformity with Stufflebeam (2003b), who holds that the role of stakeholders in the course of evaluation is to aid the evaluation team in: fundamental values affirmation, evaluation question definition, evaluative criteria clarification, needed information contribution, and evaluation report assessment. While evaluators focus on the management and integrity of the evaluation process. Furthermore, Stufflebeam (2003b) sees the active participation of stakeholders as a responsibility that is ethical, as it empowers them as they may not take part in other types of evaluations. He also recommends checklists used for contractual agreements and the final report with stakeholders by evaluators. For this reason, the CIPP programme evaluation model is best suited for the evaluation of multimedia-based pedagogy programmes and their impact on classroom assessment.

It is important to take note that the CIPP programme evaluation model is not a perfect model, approach, or system in evaluation, but it is at the disposal of evaluating institutions and evaluators. These institutions or individual evaluators determine the level of accuracy of the evaluation through the decisions they make in the course of conducting the evaluation process, exploiting the CIPP model. Its evidence-based data system creates room for finding verification and validation.

Possible methods overview to be used at each stage of the CIPP model

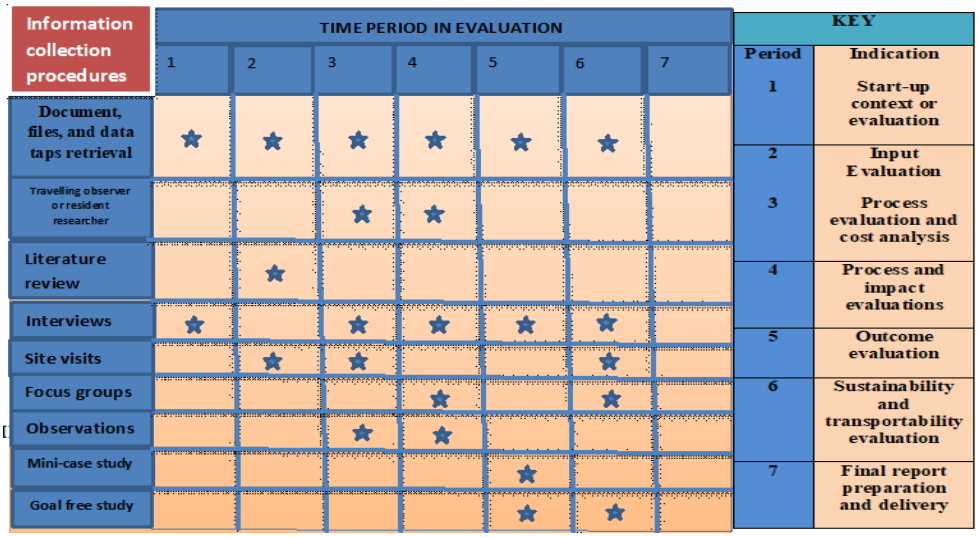

Figure 14: Possible methods overview to be used at each stage of the CIPP model

Source: Adapted from Stufflebeam and Shinkfield (2007)

3.1.4.0. Kirkpatrick's Four Level Evaluation Model

Frye and Hemmer (2012) affirm that Kirkpatrick's four-level model has made significant contributions as far as evaluation in the education field is concerned. It has brought a lot of clarity to the outcome of programmes and has clearly described the outcome of programmes to the extent that it goes beyond technical learner satisfaction. The author makes recommendations on how data should be gathered to make an assessment of his four-level model (approach), which Frye and Hemmer (2012) see as: i. Learner's reaction to the training programme or learner's training satisfaction; ii. Learning measures attributed to the training programmes. These include knowledge to be acquired, skills to be developed, and attitudes to change; iii. Expected changes in behaviour taking into account the context of the training programme; iv. The final results of the programme go beyond the immediate context of training.

3.1.4.1. The First Level of Kirkpatrick's Program Evaluation Model: Reaction or satisfaction of learner's measuring.

In explaining the component of learner's reaction, Kirkpatrick (1998) states that it refers to the extent to which learners react favourably to a training programme, while learner's satisfaction has to do with the level of satisfaction a participant in a programme derives, which serves as a measure of a client's level of satisfaction. Therefore, the focus of this

component in the model, according to Boyle and Crosby (1997) and Wang (2009), is more on what the participants liked and did not like in the programme. This has to do with feelings of comfort or discomfort; therefore, it is attitudinal and can be classified more in the affective learning domain than behavioural. To Schumann et al. (2001) in Wang (2009), This aspect provides feedback for educational administrators, policymakers, and decision-makers such as heads of departments, Deans, educational managers, registrars, deputy Vice chancellors, and chancellors on participants or students level of satisfaction by providing quantitative and qualitative data or information on participants satisfaction. This will enable these decision-makers to take measures to ameliorate or reinforce the programme in the future to improve performance.

For an assessment of a learner's reaction or satisfaction to a training programme, which is the first level of Kirkpatrick's model, Frye and Hemmer (2012) hold that the evaluator needs to establish the desired satisfaction or reaction of participants by questioning their thoughts about the programme. Find out if the training was useful in their learning process, if individual components and values were met, etc. Wang (2009) holds that the data or information the evaluator sets out to collect at this level focuses on reaction or satisfaction with respect to the facilitator, the course content, or the learning environment, with some particularities being the nature of the session planning, the content presentation, and the quality of material used in training (teaching and learning). This can be done by using data collection instruments such as interviews, questionnaires, or different evaluation forms. These forms have been assigned different names depending on how they function; they include, amongst others, smile sheets and happy sheets.

This has to do with obtaining data on the relevance of objectives, the information relevance and reliability of academic content, the potentials of the course or programme to sustain interest and attention, online interaction activities, facilitator and participant relationships, pedagogical planning, pedagogic implementation, and method use in assessment, learning content, learning activities, and learning materials, the design of on- and off-line learning, the quality of browsing, and the nature of technical ingenuity. Sometimes questions are structured to verify how useful the training is to professional or work life.

The impressions of the participants gotten from the analysis of the interviews, questionnaires, or information sheets are very useful in ameliorating participant and public opinion about a course, method, or programme. Multimedia pedagogy is gaining ground in

the Cameroonian higher education system with the advent and proliferation of Information and Communication technologies. It is therefore important to verify the reactions and satisfaction of students with respect to multimedia-based pedagogy programmes. This will eventually lead to measuring the depth of learning.

3.1.4.2. The Second Level of Kirkpatrick's Program Evaluation Model: Measuring learning

Frye and Hemmer (2012) hold that level two (2) of Kirkpatrick's model, which is Learning measures attributed to the training programme, such as knowledge to be acquired, skills to be developed, and attitudes to change, constrain valuators in the course of assessment to focus on the content participants actually internalised or learned in the course of the training programme. There exist a number of designs that connect learning to a training programme and eliminate or technically avoid the environment's learning opportunities that are not directly linked to the programme. Knowledge and skill tests are frequently used to investigate learning in training programmes when the control group is appropriate or meets the basic standards. Schumann et al. (2001) and Wang (2009) established that studies have shown 37 percent (37%) of programme evaluation takes place at level two of Kirkpatrick's model, making it more complicated and demanding.

According to McGovern and Bernthal (2002), in Wang 2009, the measure of changes in terms of attitudes, motivation, and skills with respect to participants is measured at this level. Wang (2009) holds that level two (2) measures factual information and knowledge, which belong to the cognitive domain; attitudes classified as the affective domain; and skills, which are of the psychomotor domain, that have taken place in the learners in the course of the training using a particular course or programme. In assessing the cognitive domain to verify the level of retention, a number of evaluation instruments are often used, including fact-listing, open-ended, and multi-choice tests.

Measurement in the psychomotor domain has to do with measuring the level of physical application of acquired knowledge known as skills in the training environment and is not necessary at a work site. According to Kirkpatrick 1998, measuring in the affective domain focuses on participants' feelings and thoughts, the implication of motivation about the training programme, skills using confidence, goal attainment abilities, information

interpretation skills, comprehended and acquired techniques, and the degree to which learning has taken place.

According to Kirkpatrick (1998), measures should not be taken only at the end but are important both at the beginning and at the end of a training course or programme while focusing on a response rate of 100 percent (100%). This is explained by Wang (2009) because at this level, when collecting data from participants of a training course or programme, instruments or equipment such as surveys, interviews, and pre- and post-tests (tests) with experimental and control groups are used.

3.1.4.3. The Third Level of Kirkpatrick's Program Evaluation Model

The third level of Kirkpatrick's evaluation model has to do with assessing expected changes in behaviour taking into account the context of the training programme, such as making use of knowledge acquired through application in a new situation in a standardised manner (Frye and Hemmer, 2012). That is, in a situation of training on measurement and evaluation, by the end of the training session, participants should be able to collect data in a standardised manner. Wang (2009) states that level three of Kirkpatrick's evaluation model is more demanding and expensive than level one, even though only thirteen percent (13%) of evaluation takes place at this stage. The behaviour change stated at this level refers to knowledge, attitudes, and skills transfer to society, which means applying acquired knowledge, attitudes, and skills in their daily activities. At this level, knowledge, attitudes, and skills are applied in the workplace by applying the principles and techniques acquired during training. Therefore, assessing how participants or students are using acquired knowledge, attitudes, and skills in the real world becomes imperative as it shows the effectiveness of the training programme.

Changes in behaviour after a training session have to be evaluated because they are what the real world (companies, industries, organisations, and institutions) use to judge the efficacy and effectiveness of a training programme. Evaluation at this level of Kirkpatrick's evaluation model helps programme designers (curriculum developers) ameliorate training programmes so as to render them not only useful to the real world but also contribute to a trainee's survival and success in the job market after training. This also means assessing the assessment methods used in the training to find out how effective the assessment instruments are in verifying the level of knowledge, attitudes, and skills acquired in the course of the

training session. Kirkpatrick and Kirkpatrick (2005) present terms (encouraging, preventing, discouraging, requiring, neutral) likely to be used in the future on a scale of Likert-type design based on behaviour level with the objective of measuring an individual's performance in a job or work place, and through encouragement and coaching, performances can greatly improve in workplaces.

3.1.4.4. The Fourth Level of Kirkpatrick's Program Evaluation Model

According to Frye and Hemmer (2012), the fourth level of Kirkpatrick's evaluation model focuses on the final results of the programme beyond the immediate context of training. The evaluator might observe a participant after a given period after the participant has most likely completed the training to verify how the programme has improved his or her performance. Wang (2009) holds that at this level, the rate of evaluation stands at three percent (3%) even though it evaluates the end product of a training programme or the performance of the programme as a whole.

Allinger and Janak (1989) in Wang (2009) hold that to define 'results, the objectives or goals of the training course or programme have to be taken into consideration, as they may refer to desired end products, increments in production quantity and quality, cost and turnover reduction, grievances and absenteeism reduction, and why not increasing morals? Without data on the performance of the programme, there will be no evidence to be used by the institution to know the level of attainment of goals and objectives. Kirkpatrick (1998) holds that at this level there is verification of the degree or level to which participants in the training programme have increased in productivity due to their participation in the training programme.

Wang (2009) establishes Kirkpatrick's views on evidence and proves them at different levels of the model. While evidence is easy to establish, proofs are neither easy to establish nor come across. The possibility of obtaining honest answers is demonstrated at the first level of Kirkpatrick's programme evaluation model by making responses anonymous so as to obtain honest answers. While in the course of evaluation at levels two and three (2 and 3), the possibility of obtaining proves is very low; therefore, an evaluator has to construct and use appropriate tests and control groups to obtain a certain degree of proves.

Again, in level four of Kirkpatrick's programme evaluation model, it is said to be nearly impossible to obtain proofs. However, he remarks that the evaluator has to do everything possible to provide proof, convince the hierarchy that the evidence collected is good enough, or be honest and state the impossibility of getting proof at this level. Therefore, while level one is more comfortable providing evidence through evaluation, levels two and three are almost impossible and level four is impossible.

Kirkpatrick's Level 1 to 4 Evaluation Guide

N°	Guideline	Reaction Level 1	Learning Level 2	Behaviour Level 3	Results Level 4
1	Determine what you want to find	✓			✓
2	A form to quantify results should be design	✓			
3	Written statements should be encourage	✓			
4	Response should be gotten at 100%	✓	✓		
5	Anonymous instrument be used to get honest response	✓			
6	Get delayed reaction	✓		✓	✓
7	An acceptable bench mark or standards should be developed	✓			
8	Measure using agreed standards	✓			
9	Measure pre and post instruction		✓	✓	✓
10	Paper and pencil should be used to evaluate knowledge and attitude		✓		
11	Evaluate skills using performance measures		✓		
12	Opportunity (give time for behaviour to take place)			✓	✓
13	Use a control group (if there is possibility)		✓	✓	✓
14	Survey a 360 degree observation of new behaviour			✓	
15	At appropriate times repeat evaluation			✓	✓
16	Determine the benefits of evaluation			✓	✓

Figure 15: Kirkpatrick's Level 1 to 4 Evaluation Guide

Source: Adapted from Kirkpatrick and L'Allier (2004) in Wang (2009)

These guidelines contain sixteen (16) points, and none of these sixteen points is involved in all four levels of Kirkpatrick's evaluation model. In determining what you want to find or investigate, the first and fourth levels take place, while designing a form to quantify results and writing statements should be Encouragement is limited only to level one; getting a 100% response concerns levels one and two; using an anonymous instrument so as to get honest responses is limited to level one; and getting a delayed reaction is related to levels one, three, and four.

Further, developing an acceptable bench mark or standards and measuring using agreed standards are limited to level one, while measuring pre- and post-instruction cuts across levels two, three, and four; paper and pencil usage to evaluate knowledge and attitude; and evaluating skills using performance measures are limited only to level two. Also, Opportunity (giving time for behaviour to take place) goes through levels three and four,

while using a control group (if there is a possibility) cuts across levels two, three, and four. While surveying a 360-degree observation of new behaviour is limited to a level, repeating evaluation at appropriate times, and determining the benefits of evaluation in relation to cost are limited to levels three and four.

3.1.4.5. Criticisms of Kirkpatrick's Program Evaluation Model

Kirkpatrick's Programme Evaluation Model has received some criticism from critics. Wang (2009) sees Kirkpatrick's Programme Evaluation Model as a model that has withstand the test of time because it has been used and confirmed as good by a good number of evaluators for a long period of time. This is due to the fact that it contains the strengths of simplicity (it is easy to understand), practicability (it is easy to use as well as being very functional), flexibility (it can be used to evaluate diverse programmes in different fields of training), effectiveness (its results have the potential of objectivity, validity, and reliability), and completeness (it takes into consideration all the basic components of a training programme).

This view is upheld by Allinger and Janak (1989), and in Wang (2009), they state from their observation that the force the model commands is based on the fact that it is simple and has motivated evaluators to ponder over evaluation criteria, as well as Kirkpatrick's four-level model, which has made provision for a vocabulary in evaluation as well as a sketch taxonomy for evaluation criteria. This sketch taxonomy created the basis for later evaluation theories and models while improving evaluation criteria.

However, in contrast to or with respect to the weaknesses of Kirkpatrick's Programme Evaluation Model, Holton (2006) and Frye and Hemmer (2012) hold that there are a number of evaluation components that Kirkpatrick's Programme Evaluation Model does not take into consideration in the evaluation process. These include variables that frequently intervene in the learning process (or instruction process), such as previous knowledge and skills, motivation, and many others; the important programme elements relationship with programme context; resource usage effectiveness; and a series of key components of evaluation.

This model is said to be more in line with reductionist linear theories, which require causality assumptions in relation to the outcomes of an educational programme. The model is

said to take into consideration unrealistic assumptions and needs to consider replacement, as well as some critics refusing to acknowledge it as a model for the reason that it lacks hierarchical steps and is not an evaluation concept (Riotto, 2001; Allinger and Janak, 2004; Hilton, 1996a in Wang, 2009).

On the other hand, Holton (2006) and Frye and Hemmer (2012) still hold that Kirkpatrick's four-level evaluation model (approach) has elements evaluators can gain from, including a taxonomy of programme training outcomes that is useful in evaluation practise. However, Bates (2004) and Frye and Hemmer (2012) still emphasise that the possibility of Kirkpatrick's evaluation approach to guide educational evaluators to wholly evaluate an educational programme is slim, or, according to Frye and Hemmer (2012), to determine the success factors of a programme or why the training programme has been working. It is important to note that as one proceeds from one level to the next, information is not only accumulated, but evaluation becomes more expensive. This explains why most evaluators and institutions hardly go beyond the first two levels (Wang, 2009).

This model can be more successful if used with other models, as it has the potential to define training programme outcomes or complete missing components in other models. Kirkpatrick (1996), in response to critics, maintains that he developed a framework, not a model. However, Boyle and Crosby (1997) and Wang (2009) still emphasise the importance of Kirkpatrick's Programme Evaluation Model in that the amelioration or continuity of some programmes is based on supplied data from different sources. They also consider the model an approach that is systematic when it comes to higher education programme evaluation because it measures key components such as learner satisfaction or reaction, proficiency level of learning, skill application, and the general nature of programme effectiveness. These are key components in programme evaluation and are contained in Kirkpatrick's Programme Evaluation Model. Therefore, Kirkpatrick's Programme Evaluation Model has its place in the evaluation of higher education processes and multimedia-based pedagogy in particular.

3.1.5.0. Social Learning Theory of Albert Bandura in Professional Development Perspective

Albert Bandura started his early education in a two-teacher small school (Stokes, 1986; Nabavi, 2012), and he grew in education to be considered the father of cognitive theory, of which social learning theory is very prominent and relevant with respect to multimedia-

based pedagogy as well as professional development. As he continued in higher education at the University of British Columbia, he took an accidental interest in psychology, even though he had started with biological sciences as his major (Nabavi, 2012). According to Pajares (2004) in Nabavi (2012), this interest was kindled by his culture of working into the morning and commuting (sharing) with students of different courses who were earlier than his course mates, amongst whom were mostly psychology students.

3.1.5.1. Principles of Social learning theory according to Bandura

The social learning theory of Bandura (1971) focuses on social context learning. He established that people learn mutually (from one another) by exploiting the concepts of learning by observation, imitation, and modelling. Therefore, people learn by observing the behaviours of others and their impacts or consequences, which must not result in them changing their behaviour. The SLT is based on the following principles:

- People have the potential to learn by observing other people's behaviours and their consequences.
- There is the possibility of learning taking place without a change of behaviour. In contrast to behaviourists, who believe that learning is indicated by a permanent change of behaviour, social learning theorists hold that learning must not necessarily be manifested through performance because it can occur through observation.
- It should be known that it is not obligatory for learning to be manifested through behaviour change; there is great role cognition plays in learning, and the theory has been more and more interpreted from the perspective of cognition in relation to human learning.
- Future punishments or reinforcements expectations and awareness can greatly affect behaviour; social learning theory plays the role of a transitional bridge between the ideals of learning theories propagated by behaviourists and those propagated by cognitivists.
- According to Bandura (1971), the reinforcement and punishment of modelling by the environment occur when people's desire to model the behaviour of other people is reinforced. Therefore, the environment is a great element that affects modelling.

According to Nabavi (2012), these principles are summarised into three key principles, which are: observation, imitation, and modelling, which are assumingly operational in the same

manner for a lifetime. The social theory of learning takes into consideration principles of development, which are very essential in multimedia-based pedagogy in its efforts to reinforce professional development. In this perspective, professional development through multimedia-based pedagogy and the exploitation of social learning theory makes use of basic principles of development. These principles are systematically presented by Akdeniz et al. (2016) as follows:

1. Development takes place as an effect of the interaction that takes place between hereditary and environmental factors.
2. Development is a process that continues and has certain phases. This is because it is a life-time process that is structured in such a way that one phase leads to the next as the current phase lays the basis for the next or future phase.
3. Development takes place at critical points. Critical development periods are often accompanied by a specific field of development that sets in to catalyse development while other areas are on hold.
4. Development takes place in a predictable line as it can be predicted, which means that it occurs from top to bottom, from inside to outside, from general to specific, and is holistic in nature. No component of professional development should be left out during training so as to render the product effective and efficient.
5. Development takes place holistically, from one zone of development to the next through interaction. Therefore, learning through interaction leads to cooperation, which is a very important element in professional development in and out of school.
6. Development with respect to people has its own differences, just as every human being has his or her own unique inherited features, experiences, manner of environmental interaction, and individual qualities.
7. Development has critical moments due to certain environmental and learning experiences, as well as time or period. That is why professional development programmes and their means of transmission keep improving to meet the demands or needs of the times.

3.1.5.2. Social learning theory in educational professional development context

According to Guskey (2000) and Van Veen et al. (2010) in Heijne-Penning et al. (2018), in an educational context, professional development, especially of lecturers and students, is designed with specificities to facilitate knowledge, learning behaviour, and

attitudes. The purpose of this is to enable changes in classroom practises, attitudes and beliefs, and students learning outcomes. Therefore, if a lecturer values a certain instructional method or strategy, such as multimedia-based instruction, he or she will certainly use it regularly. There are two major factors that influence professional development practises, according to Guskey (2000; 2002) and Heijne-Penning et al. (2018). They are: i. the motivation that pushes lecturers to get involved in professional development; and ii. The processes involved in bringing about actual change in a lecturer (teacher). Guskey (2002) and Heijne-Penning et al. (2018) best present the process of these changes in their '*Model of Teacher Change'*, as illustrated in figure 16.

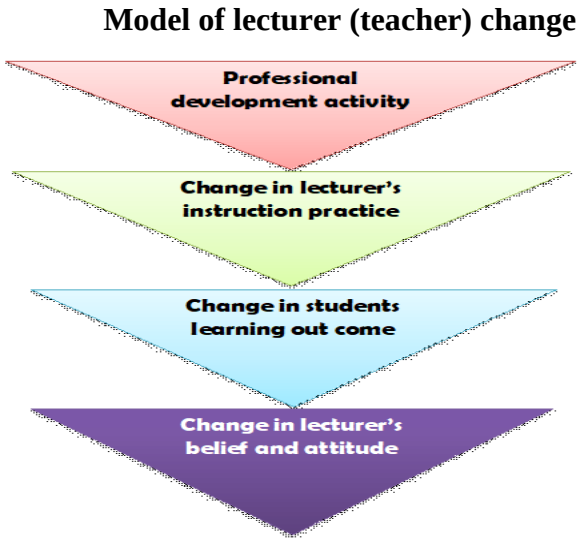

Figure 16: Model of lecturer (teacher) change
Source: Adapted from Guskey (2002) in Heijne-Penning et al. (2018)

According to Heijne-Penning et al. (2018), this model is important in that it indicates that changes with respect to the lecturer's (teacher's) beliefs and attitudes are a result of the experiences of practising new knowledge and strategies rather than just taking a course. The social learning theory component of learning through interaction is reinforced by this model because lecturers believe in the workability of a concept, notion, or practise when they experience it with their students. Guskey (2002), in Heijne-Penning et al. (2018), further holds that an activity for professional development should aim at changing key beliefs while regulating strategies and developing specific qualities. With this, there is the possibility of developing a series of principles that may serve as guidelines for professional development, exploiting Bandura's social learning theory.

3.1.5.3. Relationship between Social Learning Theory and Social Cognitive Learning Theory

According to Hoffman (1993) and Nabavi (2012), learning theories such as social learning theory identify the environment as a leading force in development. Over the years, scholars have tried to group learning theories into behaviourism, SLT (Social Learning Theory), and Social Cognitive Learning Theory (SCLT). Nabavi (2012) holds that Albert Bandura's social learning theory, or social cognitive theory, has had a great influence on many professional fields of study and practise, especially those that have to do with inquiry, such as education, social policy, health sciences, and psychotherapy. This is best illustrated by Figure 17.

Relationship between Social Learning Theory and Social Cognitive Learning Theory

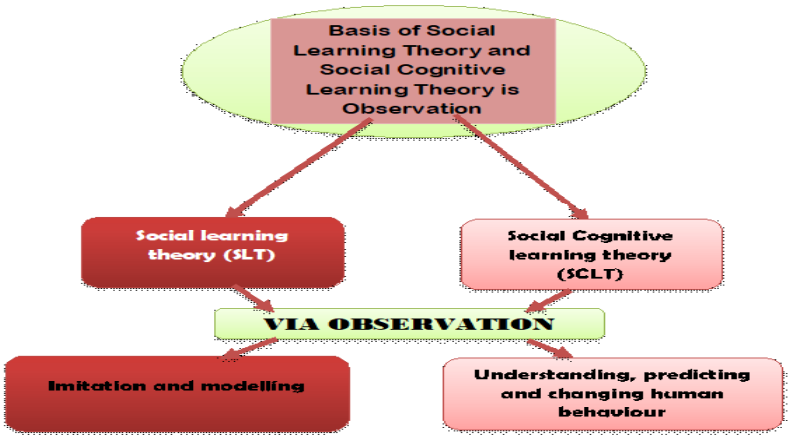

Figure 17: Observation process as the basis of SLT and SCLT
Source: Adapted from Nabavi (2012)

Muro and Jeffery (2008) in Nabavi (2012) attest to the fact that social learning theory is increasingly being cited with respect to sustainable natural resource management and desirable behavioural change. Nabavi (2012) holds that social learning theory has as its notion basis that learning takes place under social context interaction. Which occurs through observation of others behaviour separately and apes the admired behaviour; when people observe a desired behaviour in others, they initiate and assimilate that particular behaviour. For this reason, Bandura (1977) examines and describes imitation as having to do with the process of observing motor activities and actually reproducing them. This makes social learning theory one of the most influential learning and development theories due to its roots in a series of traditional learning theory concepts. SLT theory is considered or referred to as

the bridge between behaviourists and cognitivist learning theorists because it is comprised of key elements such as motivation, attention, and memory. These are key factors in institutionalised professional development.

Furthermore, it is due to the fact that the theory contains these elements of motivation, attention, and memory that Bandura upholds the belief that reinforcement that is direct is not potential in accounting for all learning types (Nabavi, 2012). That is why, in the social learning theory, Bandura puts forth the argument that, through watching others, people have the possibility and potential of learning information and behaviours that are new. The general principles of social learning theory simply insinuate that learning must not be judged by change of behaviour because it also holds that learning can also be cognitive, which is not visible. According to Bandura (1965) in Nabavi (2012), these principles are in contrast to behaviourist stands, which hold that for learning to occur, there must be a permanent change of behaviour, while theorists of social learning argue that people also learn by observing behaviour alone, which may not be manifested in performance. Furthermore, Bandura (2006b) and Nabavi (2012) affirm that learning must not necessarily be manifested through a change of behaviour.

According to Bandura (1971), behaviour modelling is often reinforced in a number of ways. These include: i. The model reinforces the observer; ii. A third party (person) reinforces the observer because the actions of a different person might be modelled by the observer; iii. When a behaviour is aped (imitated), it facilitates consequences that are reinforcing; iv. The observer's behaviour is vigorously affected by the consequences of the model's behaviour, which is referred to as vicarious reinforcement. In professional development, especially using multimedia-based pedagogy, these four modelling components are very important as they influence lecturers and students to want to be like the best of them; positive behavioural improvements related to professional development are reinforced through praise from administration or a lecturer; good professional behaviour (knowledge and skills) imitated has rewarding consequences; and the nature of professional development knowledge and skills copied or imitated by a student or a work depends on the impact the particular knowledge or skill has had on the main model.

Furthermore, Bandura (1977) and Watson (2013) in social learning theory consider observation as the main learning and knowledge (skills included) building mechanism. Watson (2013) goes further to state that the social learning theory presents an observed

mental modelling type that results in the construction of new behaviours that are sophisticated. This is because behaviours are not often imitated the way they are, but are first observed and then restructured to suit circumstances. Both students and lecturers should be able to observe and introduce innovations, not copy them exactly as they are. The spirit of innovation shows maturity in professional development. For this reason, Lortie (2002) and Watson (2013) affirm that learning through observation (observational learning) is a very strategic instrument of professional development, especially in education (teacher development). This is because lecturers (teachers) are considered builders; the manner in which they choose to influence or construct behaviour through a course or activity is often related to the context, professional knowledge, and skills required for future career success.

Also, Bandura's (1971) social learning theory in this contemporary era, in relation to the impact of multimedia-based pedagogy on professional development, is analysed from the perspective of the impact of positive and negative reinforcements (reward and punishment) on learning. This is because it contains both qualities, but they are not the main n orsole cause of learning,; there are many other factors o that contribute tolearning.earned behaviour, more often in professional development, refers to knowledge, skills, and comportment. Bandura (1971) also holds that reinforcement expectations such as awards or suspension influence learning promotion cognitive processes. As a result, components like attention are critical when learning is concerned because they influence reinforcement expectations. One of the key roles of multimedia-based pedagogy in professional development is to arouse and maintain attention.

Bandura (1971) emphasises that modelling is one of the ways behaviours are learned. These behaviours must not necessarily be positive because even assault or aggressions are sometimes learned from models. Observation and modelling also influence moral thinking, which in turn affects moral behaviour with respect to the ability to judge right and wrong. Morality is a key component of professional development, which is why trainers are often required to be role models. Being a role model only comes with self-efficacy and is very important at the beginning because, as Bandura (1977, 1999) and Watson (2013) hold, there is no planning or prior modelling when behaviour becomes routine. According to Lave and Wenger (1991) in Watson 2013, the development of professional behaviours by lecturers (teachers) is influenced by auto assessment, feedback, and response. Multimedia-based

pedagogy facilitates auto-assessment, response, and feedback, hence catalysing professional development.

According to Watson (2013), the professional development of lecturers and teachers is greatly influenced by social learning theory. Therefore, he holds that professional learning with the help of social learning theory can be considered from three perspectives: professional knowledge of the lecturer, self-efficacy beliefs of the lecturer, and contextual, social, and environmental effects. This has to do with a Lecturer's professional knowledge on how to respond to the professional needs of the students, taking into consideration the effects of certain knowledge and skills on the students' professional development. This can be done taking into consideration potential behaviour mental models from the perspective of social learning theory. The lecturers or institutions in their training need to take into consideration factors that influence professional behaviour, such as job hunts or demand, working conditions, the nature of instruction (preferably multimedia-based), and how the institution of learning is structured (Watson, 2013).

Furthermore, Watson (2013) recommends that professional development programmes be designed to support instruction that is problem-solving-oriented. Multimedia-based pedagogy creates the opportunity for instruction to be as problem-solving-oriented as possible. This is because it facilitates collaboration and group work, enables lecturers (teachers) to work together, and develops students reasoning through questioning (formative assessment), with the goal of facilitating the application of problem-solving tasks that are enriched and open. Watson (2013) still holds that professional development programmes should exploit professional development materials such as audios and videos in lesson activities. These multimedia materials in professional development programmes, courses, and lessons should take instruction out of the lecture-centered approaches. However, it should be dynamic to permit lecturers to exploit different instructional and learning approaches as facilitated by multimedia-based pedagogy materials.

According to Bandura (1971) there are a series of social learning theory implications in education as a professional development tool: students learning greatly through observation; rewarding or punishing behaviour increases the likelihood of reoccurrences of positive behaviours and vice versa; new behaviours are sharp through modelling; lecturers should a ensure they model appropriate behaviour, while they must avoid circumstances of modelling inappropriate behaviour; students should be exposed to a variety of appropriate

models by lecturers; students must be instilled with spirit of positive self-concept, self-esteem, and efficacy with regard to the accomplishment of school tasks and professional tasks; lecturers should be catalyst in guiding students in realistic academic and professional expectations setting for accomplishment; and lecturers should also instil in students techniques of self-regulation in improving academic and professional knowledge, skills, or professional behaviour in general. This can only be possible with the proper exploitation of multimedia-based pedagogy and its accompanying tools.

3.2.0. EMPIRICAL REVIEW

On the evaluation of quality multimedia-based pedagogy, Ngoungouo (2017) evaluated the use of ICTs, of which multimedia is a key component, by teachers in teaching in some selected schools in Cameroon, taking into consideration the composition of the ICTs domain as made up of tools such as computers, telephones, cameras, projectors, storage tools (USB keys, CDs, etc.), interactive white boards, and platforms for online or offline learning, amongst others. The results revealed that 85% of teachers use computers and storage tools; 100% use telephones; 23% use projectors; and 10% use platforms for online or offline learning. On the issue of ICTs (multimedia), tools used for lesson planning were the internet, computers, phones, and printers, while computers and projectors were used for lesson delivery, examination, grading, laboratory activities, and distraction or relaxation. 80.95% of teachers used these ICT tools in lesson preparation by carrying out research, typing, and printing, and 100% for calculations. Also, 61% use ICT tools in assessment, examination, and decision-making processes; 61% for filling out report cards; and only 4.7% use these ICT tools for distraction.

Also, Chiafie (2011) carried out a study at the University of Buea, Cameroon, with the focus on evaluating ICTs (Information and Communication Technologies) in instruction, with a main focus on the education and Health Sciences Faculties, as well as the actual use and views of faculty members. The approach used in the study was qualitative, and fourteen (14) Faculty members of the Faculties of Education and Health Sciences were involved, as were university officials, along with policy documents, documentaries, and internet sources. Findings of the study after analysis of the data showed that Information and Communication Technologies were perceived by the participants as having strengths over the traditional lecture method in terms of improved methodology (quality) and willingness for their integration into the instructional process of lesson planning and execution. This faces

difficulties from the perspective of financial, material, technical, and human resources. These obstacles originated from the faculty to the state policy level.

With respect to multimedia (computer)-based instruction evaluation, Frey and Birnbaum (2002) carried out an investigation in which the majority of students (participants) agreed that multimedia or computer-assisted learning (multimedia-based pedagogy) is a positive element in the teaching and learning process. This is because it facilitates the taking (jotting down) of notes, particularly for classroom assessment purposes, which increases academic performance and gives a good image of the academic, pedagogic, didactic, and technical quality of the course or programme.

The research findings of Frey and Birnbaum (2002) are confirmed by Smith and Woody (2000), who hold that multimedia-based pedagogy is considered favourable by students in the learning process and improves their performance during assessment. This was proven by self-reports and results of objective testing, which indicated an increase in students' performance in the course of the usage of multimedia-based instruction in the instruction and assessment processes.

Academic quality

Yarmohammadiana et al. (2011) carried out an education quality evaluation titled AQIP (Evaluation of Quality of Education in Higher Education Based on Academic Quality Improvement Programme) model. Many contemporary universities the world over are taking the issue of improving academic quality in higher education institutions very seriously. The purpose of this study was to find out whether medical records courses are quality in four medical universities using an evaluation of the quality of education in higher education based on the Academic Quality Improvement Programme model with respect to the nine (9) dimensions of the AQIP model. These Iranian universities included Shahid Behesshi, Tehran, Isfahan, and Iran. This study focused on graduate students, academic staff, and scientist board members. The findings of this study in all the universities showed that the nine (9) dimensions were relatively favourable to the quality of education.

Pedagogic quality

Moluayonge et al. (2017) use a bit of ICT to evaluate the use of ICT in the instruction (teaching) and learning processes in Cameroonian secondary schools: teachers had to collect

information for t lesson preparation using internet surf; collect materials and resources for students learning in the course of the lesson by browsing the internet; prepare lesson presentation using online or offline applications; create a personal digital material for student learning, using school website to post of home assignment for students; assess and provide feedback to students using ICT tools; communicate with parents online; from a learning platform, virtual learning environment, or school's website, browse, upload, and download material or resources; search for opportunities for professional development online.

The result of this investigation or study showed that the use of ICT (multimedia) in the instruction and learning process by teachers is low, with a mean of 2.24 and a Standard deviation of.33. All the items designed for the measurement of ICT usage in the instruction and learning process these fell below the cut-off mean of 3. Therefore, this clearly indicates that the integration or use of ICT in the instruction (teaching) and learning processes in Cameroonian secondary schools is low, and to them, this can partly be explained due to inadequate ICT infrastructures in schools.

From an empirical perspective, Yamauchi (2008) examines a number of researchers efforts to evaluate (research) different technological instructional techniques (materials) and measure (evaluate) their effects on students' learning. Yamauchi (2008) emphasise that researchers in their courses integrated instructional methods based on technology, so as to examine the effects of their respective methods on nature students' learning. Some compared the scores of the pre-test and post-test of the groups understudy and analysed the students' academic performance. The results were varying; while some found that technology-mediated teaching methods increased students' knowledge and facilitated comprehension, others found a significant effect of technology-based instruction on students' learning. Students' comprehension and knowledge acquisition served as an important indicator in finding out the level of comprehension of the presented materials.

Didactic quality

On the didactic quality of multimedia-based instruction (pedagogy), Ghode (2012) holds that information or learning material presented through multimedia tools, gadgets, and materials may sometimes be new and stimulating as compared to information or learning material presented using the traditional classroom lecture method. Ghode supports this assertion with empirical studies from a series of researchers, such as Clark (1983) and (1985),

Kulik et al. (1983), Clark and Craig (1992), Khalili and Shashaani (1994), and more than forty research studies on multimedia, which all affirm that learning was more effective in groups when multimedia-based instructions were applied as compared to traditional classroom lectures.

Harvey and Green (1993) in Mizikaci (2006), in their search for a better definition and criteria of quality in higher institutions of learning, carried out a study on *Quality Assessment Methodology* in higher education. This methodology focused on identifying criteria for teaching and learning assessment with the vision of coming up with a new policy on quality. Students, teachers, support staff, entrepreneurs, agencies of accreditation, assurers, evaluators (assessors), and the government were the main stakeholders they examined, using a number of data collection tools such as surveys, interviews (in-depth), and seminars (discussion).

The results they obtained from these groups showed that a majority agreed on the criteria of physical resource adequacy, human resource adequacy, the establishment of clear aims and objectives for every participant, subjects and their content relevance with respect to programme aims and objectives, the nature of active student participation in all existing levels, programme content relevance to the award, level of assessment objectivity, course objectives and assessment consistency, and transferability of knowledge and skills learned.

Technical quality

Mohd Zi. M. Z. et al. (2012) carried out a study on Education Quality Enhancement via Multimedia Technology. The objective of the study was to *evaluate the relationship between multimedia usage at the understanding level and students interest*. Results from the study from the comparison of student progress from traditional methods and quality multimedia technology showed that expertise is required in implementing multimedia technology to enable students' support, which improves quality and prepares students to be capable of facing societal challenges. The societal change challenge higher education graduates are facing today is employability.

Furthermore, Goodluck (2021) evaluated the *role of media technology in teaching and learning the English language in this era of insecurity and the COVID-19 pandemic.* The focus of this study was how the technical component of multimedia teaching technology enhances the instruction and learning of the English language. The results he obtained

revealed that the quality component of multimedia-based pedagogy employs a number of modes of content presentation and greatly motivates students. Furthermore, it provides a process of training that is individualised, creates opportunities and a platform for the implementation of new content, effectively builds bridges between knowledge and learning objectives, fully engages students, facilitates the retention of knowledge, stimulates interest in subject matter, and facilitates the relevance of illustration concepts through design, browsing, and technological ingenuity. These, therefore, give all the students equal learning opportunities.

3.3.0. VARIABLES OF THE STUDY

Luma et al. (1999) see a variable as a characteristic by which people or elements differ from one another.

3.3.1. Independent variables

For Mbua (2003), the independent variables refer to factors that provoke or caused an event. In this respect, the main independent variable is the quality of multimedia based pedagogy. The independent variable in this study has following sub variables:

1. Academic quality
2. Pedagogic quality
3. Didactic quality
4. Technical quality

3.3.2. Dependent variable

A dependent variable refers to the characteristic that is derived from the statement of the hypothesis (Luma et al. 1999). The dependent variable in this study is professional development. The indicators of professional development used in this study are:

1. Addressing students' needs
2. Digital learning support
3. Classroom assessment

3.4.0. RECAPTULATIVE TABLE OF VARIABLES OF THE STUDY

Table 01: Recaptulative table of variables of the study: "An evaluation of the quality of multimedia based pedagogy program and its impact on students' professional development"

SPECIFIC RESEARCH QUESTIONS	RESEARCH HYPOTHESIS	INDEPENDENT VARIABLES	INDICATORS	MODALITIES	DEPENDENT VARIABLE	INDICATORS	MODALITIES	MEASUR-ING SCALE	STATIS-TICAL TECH-NIQUE
1. Does the academic quality of multimedia based pedagogy influence students' professional development?	**H1**.The academic quality of multimedia based pedagogy has a significant influence on students' professional development.	**Academic quality**	**- Information relevance -Information validity - Information reliability**	Agree Strongly Agree Disagree Strongly Disagree	**Students' Professional development**	**-Addressing students' needs -Digital learning support -Classroom Assessment**	Agree Strongly Agree Disagree Strongly Disagree	Ordinal scale	r(Correlation) Pearson Product Moment r
2. Does the pedagogical quality of multimedia based pedagogy influence students' professional development?	**H2.** The pedagogical quality of multimedia based pedagogy has a significant influence on students' professional development.	**Pedagogical quality**	**- Pedagogical planning - Pedagogical implementation (strategies) -Assessment method**	Agree Strongly Agree Disagree Strongly Disagree	**Students' Professional development**	**-Addressing students' needs -Digital learning support -Classroom Assessment**	Agree Strongly Agree Disagree Strongly Disagree	Ordinal scale	r(Correlation) Pearson Product Moment r
3. Does the didactic quality of multimedia based pedagogy influence students' professional development?	**H3.** The didactic quality of multimedia based pedagogy has a significant influence on students' professional development.	**Didactic quality**	**-learning content - Learning activities -Learning materials**	Agree Strongly Agree Disagree Strongly Disagree	**Students' Professional development**	**-Addressing students' needs -Digital learning support -Classroom Assessment**	Agree Strongly Agree Disagree Strongly Disagree	Ordinal scale	r(Correlation) Pearson Product Moment r
4. Does the technical quality of multimedia based pedagogy influence students' professional development?	**H4.** The technical quality of multimedia based pedagogy has a significant influence on students' professional development.	**Technical quality**	**-Design -Browsing -Technological ingenuity**	Agree Strongly Agree Disagree Strongly Disagree	**Students' Professional development**	**-Addressing students' needs -Digital learning support -Classroom Assessment**	Agree Strongly Agree Disagree Strongly Disagree	Ordinal scale	r(Correlation) Pearson Product Moment r

3.5.0. CONCLUSION

This section examined a series of theories and models related to multimedia-based pedagogy, evaluation, and professional development. The focus of this chapter was on theories, models, principles, or laws about this phenomenon. Theories were presented based on assumptions and specified relations among variables. They were also discussed as guides for the research work. The theories facilitated the construction or generation of questions to be answered as well as hypotheses that could be tested. This section of the work focused on Richard E. Mayer's cognitive theory of multimedia learning (instruction inclusive), the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model, the CIPP (Context, Input, Process, Product) Evaluation model of Daniel Stufflebeam, Kirkpatrick's four-level evaluation model, and the social learning theory of Albert Bandura from a professional development perspective. The chapter also presents an empirical review of research works and findings, the variables of the study, and a recapitulative table.

PART THREE

METHODOLOGY

This section will go over the procedure and tools utilised to gather the study's data. The research design, the study's domain and population, the sample and sampling technique, the data collection instrument, the validation of research instrumentation, the data collection and method of data analysis, ethical considerations, and a schedule of research activities are all presented.

The study's data collection and analysis process, known as the mixed research design, included both qualitative and quantitative procedures as well as qualitative (focus group discussions) and quantitative (questionnaire) instruments. This section also outline the study's subject areas, which include the Republic of Cameroon's four regions, three regional capital towns, and one divisional headquarters town. The population of this study consists of Cameroonian students who are enrolled in a university, a higher education institution, or a specialised higher education institution to pursue a career after education. The target population, which consisted of 1619 individuals, was made up of third-year (3rd) higher education students from the respective institutions that were selected for this study. The sampling method that will be employed is straightforward.

An online Sample size calculator at www.surveymonkey.com was used in calculating the sample from a population of 1619 respondents (students), a confidence level (%) of 95, and a margin of error (%) of 4. This gave a total sample size of 439. This section further presents the sampling procedure, instrument for data collection, validation of research instruments, data collection, method of data analysis, and variables of the study. Probability and nonprobability sampling techniques or designs were used. A simple random sampling technique was used to select respondents to the questionnaire, while a convenience (nonprobability) sampling technique was used to select participants for the focus group discussion from the sample. The research instruments that were used for data collection in this work are an interview guide for a focus group and a questionnaire. The questionnaire and the interview guide were pretested and validated. Then data was collected directly using the Direct Delivery Technique (DDT). The descriptive and inferential statistics were used to analyse the data collected using SPSS and percentages, respectively. Ethical considerations were all considered and respected, as was the plan of activities.

CHAPTER FOUR
METHODOLOGY

4.0. INTRODUCTION

This chapter will go over the procedures and tools utilised to gather the study's data. The research design, study area, study population, sample and sampling technique, data collection instrument, instrument validation, data collection and method of data analysis, ethical considerations, and planning of research activities are all covered.

4.1.0. RESEARCH DESIGN

Research design is a plan that specifies how data related to the problem under investigation is collected for analysis. This research work used a triangulation research design with a questionnaire and Focus Group Discussion (interview), which are quantitative and qualitative in nature, respectively. Denzin (1978) sees triangulation as a study that combines a number of methodologies in a study of the same phenomenon. According to Amin (2005), a quantitative approach to research has to do with a research type that has the methodological principles of positivism as well as neo-positivism as its basis and also adheres to the principles and standards of developing a research design that is strict as a prerequisite for proper research to begin. Therefore, quantitative research is a structured way of collecting and analysing data obtained from different sources and, above all, uses computation, statistical, and mathematical tools in analysis to arrive at results. Methods of data collection used in a quantitative study, amongst others, include surveys, observations, socio-metry, and quasi-experiments; these methods are diverse, straightforward, and simple (Amin, 2005).

Amin (2005) holds that the qualitative research approach focuses on promoting in-depth understanding or comprehension of the way things are and the reason for their being the way they are. He further states that qualitative research was first used in the social sciences, but more recently or today it is being applied to educational problems. Also, qualitative research methodology is considered suitable when the researcher or investigator either investigates a new field of study or intends to ascertain and theorise prominent issues. There are many qualitative methods that are developed to provide an in-depth and extensive understanding of the issues through their textual interpretation. The qualitative method employed by this student is a Focus Group Discussion (interview).

According to Creswell (2003) and Williams (2007), Asiamah et al. (2017) affirm that quantitative studies require the participation of a certain (large) or sufficient number of individuals, and extensive descriptions of experiences as well as the phenomena under study is not required from these large numbers of individuals. On the other hand, Bakarada (2014) and Creswell (2003) argue in Asiamah et al. (2017) that qualitative studies are concerned with studies that relatively focus only on a few participants who have been identified to have the abilities and qualities of giving an in-depth description of their experiences as well as knowledge following some research questions or the phenomenon under study. When both quantitative and qualitative methods and/or approaches are used, like in this study, it is referred to as triangulation.

According to Singleton and Straits (1999) and Burton and Obel (2011), in Turner et al. (2015), triangulation or mixed methods present the usage or exploitation of two or more (multiple) different approaches with the purpose of having a deep understanding of a phenomenon or theory. On the other hand, according to Campbell and Fiske (1959), Amin (2005), and Turner et al. (2015), in the social sciences, such as education, the focus is on the diverse methods used to assess validity in measurement. Furthermore, triangulation, from the perspective of this study, plays the role of giving in-depth and broad understanding as well as validity to this research work.

4.2.0. AREA OF STUDY

This research is carried out in four regions in the Republic of Cameroon: three regional headquarters cities and one divisional headquarters town. Cameroon is a country that lies between West and Central Africa, according to the World Population Review (2019). Cameroon is an African country located in the bay of the Eastern Atlantic Ocean, known as the Bight of Biafra. To the north, Cameroon is bordered by Chad, to the East by the Central African Republic, to the South by the Republic of Congo, Gabon, and Equatorial Guinea, and to the East by Nigeria. Furthermore, the World Population Review (2019) holds that Cameroon has 475,442 (four hundred and seventy-five thousand, four hundred and forty-two) kilometres square (183,521 miles square) of land surface area, making it the 24th largest country. Cameroon has an estimation of forty (40) persons per square kilometre, which makes it sparsely populated and ranks it as the 167th country with respect to population density.

In the last population census of 2002, Cameroon's population stood at 17.4 million and is estimated today at 25.88 million, ranking Cameroon as the 52nd most populous country and the 17th African country with an increasing urbanisation rate that stands at 3.63% (World Population Review, 2019). This trend of urbanisation has greatly affected higher education institutions with respect to technology in instruction and professional development. According to the World Population Review (2019), the political headquarter of the Republic of Cameroon is Yaounde (located in the Centre region) with a population of 2.5 million, and the Economic headquarter is Douala (located in the littoral region). Cameroon is administratively structured into ten (10) regions, fifty-eight (58) divisions, and three hundred and fifty (338) sub-divisions (Municipal Councils) (Cameroun, 2010) (Cameroun, 2010). The country got its name in the 15th and 16th centuries from the Portuguese, who called it Rio dos Camaroes, meaning 'River of Prawns', referring to the estuary of the Wouri River (Ngoh, 1996; Cameroun, 2010; World Population Review, 2019).

According to Britannica (2018) in World Population Review (2019), in 1884, Cameroon became a German protectorate and became known as Kamerun, which almost corresponds to today's state and territorial integrity. The indigenous Cameroonians are known as the Baka (Pygmies), who have been in existence in the territory for over two thousand (2000) years; there are also over 250+ (two hundred and fifty plus) ethnic groups in Cameroon and 248 languages according to Tchamabe (2010); contacts with Europeans started in the 1400s; by the 1800s, the Germans annexed Cameroon and were later defeated in the First World War; and the country was divided between the British and the French (1/5 and 4/5) of the surface area, respectively (World Population Review, 2019; Ngoh, 1996).

French Cameroon had independence on the 1st of January 1960, and British Cameroon had theirs on the 1st of October 1961, with immediate reunification of the two Cameroons with French and English as official languages (Ngoh, 1996; Tchamabe, 2010). Sixty percent (60%) of the Cameroonian population today is under twenty-five (25) years old, making the demand for quality higher education as well as professional development very sensitive, as life expectancy stands at approximately 59 years (World Population Review, 2019). Cameroon's educational system in general has experienced a series of metamorphoses since the 1995 educational forum under the patronage of the then ministry of national education, which resulted in the law of educational orientation signed by the head of state on April 4,

1998, while signing a series of international conventions, treaties, and charters with respect to the development of education (Tchamabe, 2010).

On the other hand, in 1993, according to Tchombe (1998) and Njeuma et al. (1999), there were university reforms that focused mainly on the higher education sector. These reforms also increased the number of state universities from one (1) to six (6), and they also liberalised the higher education sector as private investment, ventures, and partnerships were welcomed. This saw the creation and opening of a series of higher and higher professional institutions of learning. In 2004, the ministry of education was restructured into the ministries of Basic, secondary, and Higher Education (Tchamabe, 2010). In ways to revise and better improve the Cameroonian higher education system to meet academic, technological, and professional challenges and become a catalyst of national development, in the year 2001, law No. 005 was promulgated by the president of the Republic, His Excellency Paul Biya, on the 16th of April (law No. 005 of April 16, 2001).

This was a turning point in the history of higher education in Cameroon as technology in general and Information and Communication Technology (ICT), which is a great tool, became catalysts that enabled multimedia-based pedagogy programmes to improve educational quality. This, in turn, influenced professional development. The result was its explosion and proliferation in the Cameroonian higher education system. As stated by Tchamabe (2010), the most remarkable reform in the Cameroonian educational system as a whole is the integration and exploitation of ICTs in the educational system. ICTs are not only used in research or the learning process but, most importantly, in the instructional and learning process through a programme implementation method and tool today called multimedia-based pedagogy. Both the state and private sector partners have invested much in technology at the higher education level, and it is important for these efforts to be evaluated so as to verify how the use of technology in instruction has impacted the professional development of students over the years.

In the centre, regional headquarter Yaounde, which doubles as the political headquarter of the Republic of Cameroon, has a population of one million, two hundred and ninety-nine thousand, three hundred and sixty-nine (1.299.369) (World Population Review, 2019), a surface area of 180 kilometres square (Kund, 1889), and a good number of higher education institutions of learning as well as higher professional institutes. The Information and Communication Technology (ICT) University Campus is located in Yaounde. In the

South West regional Chief town of Buea, with a population of above 200.000 (World Population Review, 2019) and a surface area of 870 kilometres square, there is the University of Buea, located in the Molyko neighbourhood, which stands as the first Anglo-Saxon University in Cameroon. In the North West regional Chief town of Bamenda, with a population of 390.835 (World Population Review, 2019) and a surface area of 5250 kilometres square, there is the University of Bamenda located in the Bambili neighbourhood. In the Extreme North chief town of Maroua, with a population of 319.941, there is the University of Maroua with the Faculty of Petroleum Industries and Mines (Faculté des Mines et des Industries Pétrolières), located in Kaele (divisional headquarter of Mayo-Kani), some sixty-seven (67) kilometres from Maroua. This town has a population of over 150.000 inhabitants on a surface area of 5,033 kilometres square.

The categories of students in the study were students from the Department of Curriculum Studies and Teaching in the Faculty of Education, University of Buea; students from the Department of Communication and Development Studies, Faculty of Arts, University of Bamenda; students from the Faculty of Petroleum Industries and Mines (Faculté des Mines et des Industries Pétrolières), University of Maroua; and students from the Information and Communication Technology (ICT) University, Yaounde Campus. Multimedia components in instruction exist in these institutions, and they are professional development-oriented, enabling the evaluation of multimedia-based pedagogy and its impact on students' professional development.

The focus of this study is on the third year students in the Department of Curriculum Studies and Teaching in the Faculty of Education, University of Buea, with a student population of 999; Department of communication and Development Studies, Faculty of Arts, University of Bamenda, with student population of 76;Departments of Faculty of Petroleum industries and Mines (Faculté des Mines et des Industries Pétrolières), with a student population of339, from the Departments of Economie, Gestion et Législation Minière Pétrolière et Gazière (EGLM),Génie Mécanique Pétrolier et Gazière (GMPG),Ingénierie Minière et Traitement Des Minières (IMTM), Exploration Minière et Pétrolière et des Resources en Eaux (XMPE), Sécurité etqualité de l'Environnement (SQE), Raffinage et Pétrochimie (RPC); and students of Information and Communication Technology (ICT) University, Yaounde Campus with a student population of 205. This University is one of the

few in Cameroon that focuses mainly on ICT studies and is greatly engaged in using Multimedia in instruction, both online and offline.

4.2.1. University of Buea

The University of Buea was created by presidential decree No. 92/074 of April 1992, which dissolved the University of Yaounde 1 and transformed the university centres of Buea and Ngaoundere into full universities. There was another decree (N0.93/026 of January 19, 1993), which created the universities of Yaounde I, Yaounde II, Douala, and Dschang. On the other hand, the organisation of the University of Buea was done by Decree No. 93/027 of January 19, 1993.

The aim of these degrees was to improve the performance and professionalisation of higher education in Cameroon. Amongst the many reasons for the reforms, one of the most captivating was to: render university academic programmes more professional with respect to skilled labour demands while expanding and increasing educational opportunities; get diverse stakeholders involved in the funding institutions of higher learning; grant universities more managerial and academic autonomy; create an environment for equal university education opportunity for all Cameroonians; and maximise nationally existing services, facilities, and infrastructure.

The University of Buea stood tall at the heart of the economic crisis of the 1990s and went operational in May 1993, having 768 students in the Advanced School of Translators and Interpreters (ASTI), Faculty of Arts (with English, English, French, and History as programmes), Faculty of Science (with Chemistry, Physics, Mathematics, Life Sciences, and Geology programmes), and Social and Management Faculty (with Economics, Law, and Geography as programmes). While the Faculty of Health Sciences was in existence, it only became operational in the 1997–1998 academic year.

In addition, Education existed as a Department under the Faculty of Arts until the 1998–1999 academic year. In the 1998–1999 academic year, it was decreed an independent faculty, with the first Dean being Professor Lydia Luma. Today, the Faculty of Education has four Departments (Curriculum Studies and Teaching, Educational Foundation and Administration, Educational Psychology, and Special Education, with a special distance

learning programme in Primary education) and a Higher Technical Teacher Training College (H.T.T.C.) in Kumba.

4.2.2. University of Bamenda

The University of Bamenda, before becoming a full-fledged university, has gone through an academic metamorphosis over the years and decades. In 1967, an ANNEX of E.N.S. (Higher Teacher Training College) Yaounde was created in Bambili, known as ENSAB. It was jointly administered with CCAST Bambili under the leadership of a Director Delegate to pilot the affairs of the set institution. Ministerial Decision Number (No.) 000009/MINESUP/ of March 2009 by the Minister of Higher Education brought enabling reforms to ENSAB. This was done with a focus on professional development. The institution was upgraded, with 18 departments integrating the training college created. There was the inclusion of the technical education teacher training college for secondary schools.

On the 14th of December 2010, there was a turn in the history of the institution as it was transformed into a full-fledged university by the President of the Republic of Cameroon in a speech in Bamenda. In his speech during the 50th anniversary of the Cameroon Arm Forces in Bamenda, the President acknowledged the significant increase in enrollment of the institution with respect to meeting the needs of the nation and the region with respect to higher education opportunities. "I am pleased to announce to you the creation of the University of Bamenda," he solemnly declared on the 14th of December 2010. Decree No. 2010/372 of December 14, 2010, which created the University of Bamenda, introduces two separate higher professional schools for teacher training; To H.T.T.C. (Higher Teacher Training College) for general education was added H.T.T.C. (Higher Technical Teacher Training College), with a focus on training teachers for secondary technical education.

It was on the 8th of March 2011 that the decree organising the University of Bamenda saw the light of day, containing ninety-six (96) articles highlighted in an Anglo-Saxon character (article 1) with six (6) faculties and five (5) schools in prospect (article 49), and becoming operational with the available resources. These faculties included The Faculty of Arts, the Faculty of Science, the Faculty of Economics and Management Sciences, the Faculty of Education, and The Faculty of Health Sciences. The schools included The College of Technology, The Higher Institute of Commerce and Management, The Higher Institute of Transport and Logistics, The Higher Teacher Training College, and the Higher Technical

Teacher Training College. The University of Bamenda was created with the underlining philosophy of professional development.

4.2.3. University of Maroua

The University of Maroua, created by presidential decree No. 2008/208 of August 9th, 2008, is one of the young state university institutions in the Republic of Cameroon. After the planting and organisation phases the officials and personnel of this institution experienced a new beginning. By the 21st of March 2013, during the installation of newly appointed officials by the Minister of Higher Education, the University of Maroua had seven institutions: four (4) faculties and three (3) schools. Faculties include the Faculty of Economic Sciences and Management (Faculté des Sciences Économiques et de Gestion), the Faculty of Petroleum Industries and Mines (Faculté des Mines et des Industries Pétrolières), located in Kaele some sixty-seven (67) kilo metres from Maroua, the Faculty of Human Sciences and Letters (Faculté des Lettres et Sciences Humaines), which later became the Faculty of Arts, Letters, and Human Sciences (Faculté des Arts, Lettres et Sciences Humaines), the Faculty of Sciences (Faculté des Sciences), and the Faculty of Law and Political Sciences. Schools include the Higher Teacher Training College (École Normale Supérieure (ENS)) for secondary general education, the Higher National Polytechnic (École Nationale Supérieure Polytechnique de Maroua (ENSPM)), and the Higher Sahel Institute (l'Institut Supérieur du Sahel). Most of these faculties and all schools are professional development-oriented.

4.2.4. Information and Communication Technology University Yaounde Campus, Cameroon

The ICT University was founded in 2010, based on a United States-based curriculum. It focuses on Africa, the Caribbean, Latin America, and Asia, with the purpose or mission of providing quality ICT and Human Managerial Capacity Development. As an institution, it also focuses on imposing itself in the fields of research and training students with respect to the contextual relevance of developing economies. ICT University goes beyond offering degrees in ICT to develop knowledge and skills in academic disciplines such as Business Administration. ICT University, though registered in the state of Louisiana in the United States of America under Charter Number 40115325N as the main funding university foundation, has campuses in other countries in the world. The foundation focuses on

providing ICT University campuses with equipment and materials such as e-libraries and e-learning laboratories, especially in developing nations with a focus on Africa.

Cameroon plays host to the headquarters of the ICT university campuses in Africa. It also has a campus in Cameroon, Yaounde, which was founded in 2012 with accreditation from the Cameroonian Ministry of Higher Education by authorization number 02/04505/N/MINESUP/DDES/ESUP/SAC/EBM of September 21st 2012. On its campuses worldwide, it has more than fifteen thousand (15000) students, and they offer programmes or training on-site and online. These programmes range from Diploma, bachelor's, master's, and Doctorate programmes, with a focus on developing knowledge and skills and substantial problem solving. The focus of ICT University campuses, especially the one in Cameroon, is to create a campus with an enabling environment and resources for producing future ICT specialists or experts, renewable energy engineers, technopreneurs, and business managers. This is based on partnerships established with leading United States, African, and international institutions.

4.3.0. POPULATION OF THE STUDY

Polit and Hungler (1999) define population as the sum of subjects that are within, conform to, or are identified with a stated set of specifications, which represent the entire group a researcher is interested in and contain potential for generalisation of results obtained. The population in this study is made up of Cameroonian students pursuing professional education, be it in the university, a higher institution of learning, or a specialised higher institution of learning. The population of this study stands at one thousand six hundred and nineteen (1619**)** third-year students.

4.3.1. The target population

Asiamah et al. (2017) define the target population as the refined population from the general population. The refined population in this case refers to the members of the general population left after selection has been done from the general population. They are referred to by Bartlett et al. (2001) and Creswell (2003) in Asiamah et al. (2017) as the individuals who make up the group with relevance and specific attributes known as participants. The target population, therefore, is the refined part of the general population, ready for exploitation.

The target population of this study was made up of 1619 students from the Department of Curriculum Studies and Teaching in the Faculty of Education, University of Buea, Department of Communication and Development Studies, Faculty of Arts, University of Bamenda, Faculty of Petroleum industries and Mines (Faculté des Mines et des Industries Pétrolières avec les Départements d'Economie, Gestion et Législation Minière Pétrolière et Gazière (EGLM), Génie Mécanique Pétrolier et Gazière (GMPG), Ingénierie Minière et Traitement Des Minières (IMTM), Exploration Minière et Pétrolière et des Ressources en Eaux (XMPE), Sécurité et qualité de l'Environnement (SQE), Raffinage et Pétrochimie (RPC)), and ICT University Campus Cameroon, Yaounde.

The constitution of the target population comprising third year (3^{rd}) year higher education students from the respective chosen institutions for this study was as follows: students in the Department of Curriculum Studies and Teaching in the Faculty of Education, University of Buea, with a student population of 999; Department of Communication and Development Studies, Faculty of Arts, University of Bamenda, with student population of 76; Faculty of Petroleum industries and Mines (Faculté des Mines et des Industries Pétrolières), University of Maroua with a student population of 339; and students of Information and Communication Technology (ICT) University, Yaounde Campus with a student population of 205. This University is one of the few in Cameroon that focuses mainly on ICT studies and is greatly engaged in using Multimedia in instruction, both online and offline.

4.3.2. The accessible

The accessible population was made up of 999 third-year students of the Department of Curriculum Studies and Teaching in the Faculty of Education, University of Buea; 76 third-year students of the Department of Communication and Developmental Studies, Faculty of Arts, University of Bamenda; 339 third-year students of the Faculty of Petroleum Industries and Mines (Faculté des Mines et des Industries Pétrolières); and 205 third-year students of Information and Communication Technology (ICT) University, Yaounde Campus. This gave a total of 1619 potential participants (an accessible population) for the study.

4.4.0. SAMPLE AND SAMPLING TECHNIQUE

Sampling refers to the process of selecting respondents or participants from the target population in such a way that the selected participants reflect and represent the entire target population (Amin, 2005). The sampling technique that will be used is simple random sampling (SRS), which is a type of probability sampling technique. Simple random sampling is a sampling technique that is used to obtain a sample from a population by giving every individual in the group an equal opportunity to be studied or selected. Pieces of paper were written with yes and no. The papers were then coded 1 for yes and 2 for No and folded. Participants were asked to make one choice; those who answered yes (1) automatically became participants. The formula below represents the manual calculation of what the sample size calculator does automatically and digitally.

$$\text{Sample size} = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p(1-p)}{e^2 N}\right)}$$

N = population size • e = Margin of error (percentage in decimal form)
z = z-score

0nline sample size calculator at www.surveymonkey.com was used in calculating the sample from a population of 1619 respondents (students), a confidence level (%) of 95, and a margin of error (%) of 4. This gave a total sample size of 439. The members of the focus group were drawn from the sample population. This sample was distributed as shown in Table 2.

Sampling Technique: There were two sampling techniques used in this study to obtain a 439 (four hundred and thirty-nine) sample size, from which eight were chosen as participants for the focus group discussion. Given that sampling technique has to do with a procedure that facilitates the selection of a representative population to be used in the process of data collection to be exploited as research information, probability and nonprobability sampling

techniques or designs were used. A simple random sampling technique was used to select respondents to the questionnaire.

A total of 439 students who, through the ballot, picked 'yes' automatically became the sampled population, while convenience (nonprobability) sampling was used to select participants for the focus group discussion from the sample. Participants in the focus group discussion were students who had Android phones, active WhatsApp software, and laptops and had mastery over using their accessories with an internet connection. The balloting was done during compulsory course lectures, more often shortly after lectures. This was to ensure that no student or group of students participated in the exercise twice or more.

The simple random sampling technique (probability) was used to give every member of the target population an equal chance of being selected to participate in the study. The convenience (non-probability) sampling technique was used to select participants for the focus group discussion because the sample had to be constituted by a few from the general sample size with precise knowledge and skills because, according to Cohen et al. (2000), the convenient sampling technique is used to select the most convenient and readily available subjects for the study.

Distribution of Sample Population

N°	**Institution /Faculty/ Department (3rd year)**	**Target population**	**Sampled population (+ Focus group)**	**Distribution of Focus group members (FG)**
1	Curriculum studies and teaching (FE,UB)	999	245	3
2	Communication and Development Studies (FA, UBA)	76	30	1
3	Petroleum Industries and Mines,Kaele (University of Maroua)	339	97	2
4	ICT University Campus, Yaounde, Cameroon	205	67	2
	TOTAL	**1619**	**439**	

Table 02: Sampling procedure and Sample
Source: Billa (2020)

The choice of these Universities or institutions, particular faculties, and subsequently Departments and campuses is justified by the fact that the area (institutions and departments) possesses all the features (variables or characteristics) of the problem under study. The choice of these institutions for the programme evaluation study is because they are professionally equipped with modern technological tools and equipment used in the teaching and learning process. Furthermore, the researchers have lived a significant part of their professional or career lives in these areas and have a good mastery of them. These institutions, faculties, and departments are well equipped to facilitate multimedia-based pedagogy and learning, and they are all professional development-oriented.

4.5.0. INSTRUMENTS FOR DATA COLLECTION

Zait (2006), Bordeianu, and Moroşan-Dănilă (2013) view a research instrument as a technical artifice that is used to initiate research action. It exists in a digital or physical form and size that is structured and adapted to effectively and efficiently realise a research work. The research instruments that were used for data collection in this work are an interview guide for a focus group and a questionnaire. The questionnaire was constructed and administered, taking into consideration the following steps: I. Revisiting and working in line with the objectives of the study; II. Defining the target population and deriving the methods of reaching them; III. Development (design) of the questionnaire and focus group discussion (interview) guide; IV. Pilot testing; V. Administration of instruments; VI. Analysis of data and Interpretation of Results (outcome).

4.6.0. VALIDATION OF RESEARCH INSTRUMENTS

Mbua (2003) views validity from the perspective of the accuracy with which instruments measure what they intend to measure, and Bordeianu and Moroşan-Dănilă (2013) conclude that an instrument's appropriateness and usefulness in achieving its usefulness is what is referred to as instrument validity. Therefore, it is important that constructs be properly defined so as to obtain construct validity.

The supervisors of this work accepted the interview guide instrument, and it was further examined and validated by three (3) measurement and evaluation specialists while acknowledging and accepting the results of the construct validity test for the questionnaire, using Indices 'C' of Cliff's consistency indices. Indices 'C' of Cliff's consistency indices

were applied to validating this instrument because of its strength. They verified to ensure that the instruments were appropriate for the collection of relevant data. Corrections were made before approval of the instruments (interview guide and questionnaire) as good for pilot validity testing (administration). The questionnaire instrument was administered to a small population of forty (40) randomly selected third-year students from different departments and faculties that exploit multimedia-based pedagogy in the universities of Buea, Bamenda, Yaounde, and Maroua.

These students were not later included in the final study. In NRTVB, a computer programme was used to analyse (calculate) the construct validity of the data collected using Indices 'C' of Cliff's consistency indices, which gave a result of 0.61, indicating that the instrument was appropriate and useful in achieving its usefulness with respect to the construct under evaluation. According to the index 'C' of Cliff's consistency indices criteria, a value of 'C' of 0.32 and above makes an instrument valid. The questionnaire was then administered directly, via WhatsApp and e-mail (according to choice and comfort), to the sample population of the study, while discussions in the focus group (interview) were carried out in a WhatsApp forum with eight (8) respondents from the sample population.

Reliability of a research instrument, according to Amin (2005), refers to trustworthiness or dependability, but specifically, reliability of a research instrument refers to the degree to which a research instrument consistently or repeatedly (continuously) measures a variable or variables under study. In this study, the type of reliability that was used on the research instruments was test-retest reliability or stability reliability. Amin (2005) holds that when an instrument is repeatedly administered to the same respondents over time, the degree of consistency in their performance is referred to as test-retest reliability.

The questionnaire instrument was administered to a small population of forty (40) randomly selected third-year students of different departments and faculties that exploit multimedia-based pedagogy in the universities of Buea, Bamenda, Yaounde, and Maroua; one month (4 weeks) later, the same instrument was still administered to the same population (these respondents were not part of the final study). The two sets of responses obtained were correlated using NRTVB software, and the results obtained gave a calculated correlation coefficient value of.01 level of significance. This indicates that the test-retest reliability of the instrument is significantly high, with a standard error of 1.98 and a 0.016 standard error of

the correlation coefficient, establishing very high test-retest reliability of the research instrument. Therefore, the question was confirmed as a reliable instrument for the study.

4.7.0. DATA COLLECTION

Data was collected directly using the Direct Delivery Technique (DDT). The identified sample population was directly handed the questionnaires by the researcher and his assistants, while a WhatsApp group discussion was created for the focus group discussion (interview).

4.7.1. The study tools used in collecting data

Study tools used in the collection of data using WhatsApp and e-mails for the questionnaire (the questionnaire was Likert scale in structure) and focus group discussion (interview) were a laptop computer and an Android phone with internet connections. The focus group discussions took place from June 2019 to November 2019, giving a duration of 100 + 22 minutes in five (5) months. The WhatsApp group was the platform used for discussions because the participants were found in four (4) different higher education institutions located in four different regions of the country. Discussion days and times were agreed upon at the end of each session, which lasted 10 to 15 minutes. The researcher was the moderator, and each participant was given an equal opportunity to respond to the items asked by the moderator.

The questionnaires had a 100% return rate. The questionnaire had 25 items (questions) divided into five sections: academic quality, pedagogic quality, didactic quality, technical quality, and students' professional development. It was graded as follows: Strongly Agree (SA) = 4 scores; Agree (A) = 3 scores; Disagree (D) = 2 marks; strongly disagree (SD) = 1 score. Therefore, no section could have scores above 20 and less than 5. The total maximum scores were 100, while the minimum score had to be 20.

Questionnaire

The research work makes use of questionnaires in the data collection process from students. The purpose of this quantitative data is to gather information rather than make speculations and also to exploit measures that are quantitative and facilitate the use of statistical analysis at the analysis phase (Amin, 2005). The orientation of the study is to

understand the phenomenon under investigation from the perspective of the respondents and not the researcher. Therefore, a questionnaire is designed for students. The questionnaire served as the key instrument for collecting data from respondents (participants) on the quality of multimedia-based pedagogy and its impact on students' professional development.

The questionnaire was constructed following the Likert scale, containing closed-ended statements (closed-ended questions), and was graded from four to one (4-1), with five (5) sections each having five statements (amongst which there was a distractor statement), making a total of 25 items to be responded to per questionnaire. It was also constructed with a preliminary information section to collect background information such as region of origin, gender, institution, and age. According to Wilson and Mclean (1994), the Cohen et al. (2007) questionnaire is a data collection instrument that is most useful and widely used for survey studies because it is often structured, numerical, can be easily administered with or without the researcher's presence, and is straightforward to analyse comparatively.

However, Wilson and Mclean (1994) in Cohen et al. (2007) caution that irrespective of the strengths of questionnaires, they also demand a lot of time in development or construction because they have to be first constructed, piloted, corrected, or refined, and the scope of the data collected is limited because of their limited scope and inflexibility in responses. This is because more often questionnaires are closed-ended in structure; these closed-ended questions are specific and direct, which also renders questionnaires very attractive and motivating to respond to. However, the shortcoming of questionnaires can be overcome with mixed studies, which can use a questionnaire and a qualitative data collection instrument.

The researcher believes in the strengths of questionnaires, especially their characteristics of being easy to administer and the fact that the analysis of their data is simple and straight-forward. Also, the confidentiality principle is easily applied as the anonymity of respondents is easily guaranteed, creating an enabling environment for respondents to be free, void of influence, and honest in the course of responding to the questionnaire. Therefore, the data collected can be said to have a higher level of validity and reliability.

Table 03: Questionnaires distributed and responded to by students

Distributed	Returned	Return Rate	Incomplete	Complete	Adjusted Return Rate
439	**439**	**100%**	**00**	**439**	**100%**

Table 03 shows that 439 questionnaires were distributed and collected directly, and all were returned, giving a percentage of 100%. Also, all the items were responded to by all the respondents, making all 439 questionnaires complete, giving an adjusted return rate of 100%.

Focus Group Discussion (Interview)

The researcher used Focus Group Discussion as a method, technique, and instrument for collecting qualitative data on the quality of multimedia-based pedagogy and its impact on students' professional development. Eight (8) participants were involved in the discussion process as they presented their opinions on every question asked. The researcher acted as the moderator while the participants were selected from the institutions, faculties, and departments in the sample population of the study. After selection, the participants were schooled on the basic rules and modalities for group discussions. Discussion days, hours, and duration were then decided upon, and the place and forum WhatsApp group were created by the researcher.

Also, a set of nineteen (19) questions was constructed and structured into five (5) parts. These questions guided discussions for a five-month period. The discussions (text, audio, and video) were automatically recorded and stored electronically in the WhatsApp group. At the end of the Focus Group Discussion process, analysis was done with respect to the questions asked and the responses or reactions received with respect to the various parts or sections to which the questions belonged. A mixed method was used to collect in-depth and first-hand information on the quality of multimedia-based pedagogy and students' professional development. This method has been asserted to be very useful and honest, and it brings out feelings, opinions, attitudes, and facts the way they are.

Focus Group Discussion as a method, technique, or instrument of data collection uses interview guides. In the case of this study, the participants never had to displace themselves and meet physically but were connected digitally. The material or tool they needed was an Android phone and internet data. With this, they actively participated in and contributed to

discussions from any of their comfort zones. This made the process faster and less costly for the researcher as well as for the participants. The participation rate was excellent, as all the participants were motivated and actively involved. With modern technology, Focus Group Discussions break geographical, physical, national, and international barriers.

4.8.0. METHOD OF DATA ANALYSIS

The descriptive statistics were used to analyse the data collected using the questionnaire. The NRTVB data analysis software and Statistical Package SPSS (Statistical Package for Social Sciences) were used at different stages of the analysis processes. However, Statistical Package (SPSS) version 20 was the main software used after final data was collected from the field. Data was analysed using percentages (for focus group discussion), mean, standard deviation, and Pearson correlation (for questionnaires).

This research work made use of hypotheses in verification following the answers to research questions. Multimedia based pedagogy (Independent Variable) with factor hypotheses as follows:

RH1: The academic quality of multimedia based pedagogy has a significant influence on students' professional development.

RH2. The pedagogical quality of multimedia based pedagogy has a significant influence on students' professional development.

RH3. The didactic quality of multimedia based pedagogy has a significant influence on students' professional development.

RH4. The technical quality of multimedia based pedagogy has a significant influence on students' professional development.

Dependent variable (students' professional development) questions were analysed under the factor students' professional development. Correlation analysis was used to establish the correlation between the independent and dependent variables. The American Psychological Association (APA) was used to report the findings of the analysis.

4.8.1. Ethical considerations

Educational research takes issues of ethics very seriously because of their influence on data collection, which might be damaging to research findings if not professionally handled. According to Lankshear and Knoble (2004), ethics in educational research is focused on securing the wellbeing and personal i interestsof all active participants in a research process.t is on this basis that certain elements have to be taken into consideration prior to, during, and after the research process.

Concern clearance

Before effectively collecting data from the field, the researcher must obtain authorization from the faculty administration. A request letter for authorization to gain access to the institution was written to the respective institutions (departments, faculty, and Campus), and the request was granted. The institutions were approached by the researcher and his assistants.

Voluntary participation

Participants voluntarily participated in this research, both by responding to questionnaires and participating in the focus group. They were educated on their right to leave the research activities of responding to questionnaires or questions in the focus group whenever they were uncomfortable.

Anonymity and confidentiality

Participants were assured of their physical and psychological security. Anonymity and confidentiality were highly respected throughout the research process. Names were not used in filling out the questionnaires, in focus group discussions, or in the report writing, and participants were assured that any private data would not be exposed to the public. Questionnaires and focus group discussions have been kept secure and confidential.

Feed back

Every individual who participated or actively assisted in one way or another will be informed of the results and findings of the research study and its conclusions.

4.8.2. Planning of research work, report and writing activities

Table 04: Planning of research work, report and writing activities

PLANNING OF RESEARCH WORK, REPORT AND WRITING WRITING ACTIVITIES					
Stages	**Activities**	**Duration**	**Location**	**Results**	**Indicators**
1	Critical Reading and noting	February 2018-July 2018	Internet / libraries	- Effective reading - Review sufficient literature	65 general reviews 80 on specialty 15 on methodology 5 on research ethics
2	Writing of thesis and articles	May 2021 – November 2023	Cameroon	Complete thesis and a number of articles	
	Atricles	May 2021 – November 2023	Cameroon	Publish articles	
	Chapter one	May 2021 – November 2021	Cameroon	Complete chapters 1	
	Chapter two		Cameroon	Complete chapters 3 & 4	
	Chapter three				
	Chapter four				
2	Writing of thesis and articles	May 2018 – November 2019	Cameroon	Complete thesis and a number of articles	-Submit thesis parts and chapters for correction and do corrections -Publish articles
I	Articles	May 2018 – November 2019	Cameroon	Publish 6 articles	
Ii	**PART ONE** Chapters 1and 2	July 2018 – February 2019	Cameroon	Complete chapters 1 & 2	
Iii	**PART TWO** Chapters 3 and 4	March 2019 – April 2019	Cameroon	Complete chapters 3 & 4	
Iv	Chapters 5 and 6	May 2019 – August 2019	Cameroon	Complete chapters 5 & 6	
V	**PART THREE/FOUR** Chapters 7 Chapters 8 and 9 designing an evaluation model	**September2019-December 2019**	Cameroon	Complete chapters 7,8 and 9 pedagogic project	
3	Proof read, edit and submit	**Jan 2019-December 2020**		Final copy and submit for defense	**Submit for defense**
4	Preparation for public defense	January 2021-programmed	Cameroon	Multimedia presentation	Present and obtain a mark at the range of excellence
5	Finances / search for sponsors	May 2018-February 2019	Internet	Get sponsor	Thesis financed

4.9.0. CONCLUSION

The procedure and tools utilised to gather the study's data have been covered in this section. It has covered the research design, the study area and population, the sample and sampling technique, the data collection instrument, the validation of the data collection instrument, the data collection and method of data analysis, ethical considerations in research, the planning of the research work, and report and writing activities. This chapter focuses on the presentation and interpretation of data and provides a glimpse into the activities and debate in the part that follows.

PART FOUR

DATA PRESENTATION AND INTERPRETERTION OF RESULTS

The findings from the study and analysis of the field data are presented in this section of the research report. This is accomplished utilising correlational graphs, tables, charts, and percentages. The descriptive and inferential analysis of the identified qualities is presented in the first section of chapter five (5). The focus group conversation is examined in Chapter 5's second section, and hypothesis verification is done in the chapter's third section. Chapter six (6) also focuses on interpreting the results and discusses the study's findings. It also suggests a quality evaluation model, offers suggestions to address the problem, and offers advice for future researchers in the field on what additional research they should pursue.

This work's Chapter 5 focuses on the data presentation and findings. It displays the target population distribution for each of the factors, together with demographic (background) data. A summary report on the results of focus group discussions is presented in accordance with the relevant themes (academic quality, pedagogic quality, didactic quality, technical quality, and their relationship with students' professional development), and emphasis is also placed on the presentation of data gathered from students and the results of focus group discussions. Additionally, with regard to the study hypotheses previously stated, verification of the research hypotheses is carried out, and analytical discussion is held regarding measures (a summary) of the quality of multimedia based pedagogy (teaching) and students' professional development.

The interpretation of the findings, recommendations, and conclusions are covered in chapter six. The limits of the study are reviewed after a summary of the findings is discussed in relation to the research questions and research hypotheses, followed by an interpretation of the findings in light of the stated hypothesis. Additionally, the pedagogic innovation and implications of a model on "*The Evaluation of Multimedia based Pedagogy Qualities and Students' Professional Development*" are presented, as well as the pedagogical implications of the research work (to students, lecturers, university and school administrators, communities, the educational community, policymakers, and the state). Additionally, the connection between the research and the suggested model is formed, and advice is given to students, lecturers, university and school administrators, communities, the educational community, policymakers, and the state.

CHAPTER FIVE
DATA PRESENTATION AND FINDINGS

5.0. INTRODUCTION

The findings from the study and analysis of the field data are presented in this section of the research report (work). This is accomplished utilising correlational graphs, tables, charts, and percentages. An analysis of the traits that have been identified is included in the first part. The focus group conversation is examined in the second section, and the inferential analysis-based hypothesis testing is done in the fourth section.

5.1.0. DATA PRESENTATION

The main purpose of this research study was to evaluate the relationship between the quality of multimedia-based pedagogy and students' professional development. Professionally oriented departments and faculties in four universities were used to bring out the results.

The researcher exploited questionnaires to carry out a survey and a focus group discussion among students of the chosen institutions to bring out the results. The research questions were as follows:

1. To investigate whether the academic quality of multimedia based pedagogy influences students' professional development.
2. To find out whether the pedagogical quality of multimedia based pedagogy influences students' professional development.
3. To investigate whether the didactic quality of multimedia based pedagogy influences students' professional development.
4. To find out whether the technical quality of multimedia based pedagogy influences students' professional development.

The presentation of analysis in this chapter for the questionnaire respects collected data from November 2019 and that of focus group discussions dates from June to November 2019. This chapter is structured into four sub-sections: demographic information presentation, research question responses, verification of hypotheses, and presentation of a summary of the

findings based on the results gotten with respect to the objectives, research questions, and hypotheses.

The data analysis done in this part of the work focuses on effectively and efficiently describing and measuring the relationships between variables and their respective strengths. In this regard, bivariate descriptive statistics describe such relationships. This study with 439 students in professional-oriented departments and schools of higher education institutions in four regions of Cameroon also took interest in their background characteristics (Region of origin, gender, marital status, age category).

5.2.0. PRESENTATION OF THE DISTRIBUTION OF THE TARGET POPULATION FOR EACH OF THE VARIABLE

The distribution of study's participants by institutions, place of origin, gender, age group, and focus group participants by institutions is shown in this section.

5.2.1. Demographic (Background) Information

Table 05: Distribution of the respondents according to institutions

Institution /Faculty/ Department (3rd year)	**Respondents**	**Percentage**
Curriculum studies and teaching (FE,UB)	245	56%
Communication and Development Studies (FA, UBA)	30	07%
Petroleum Industries and Mines, Kaele (University of Maroua)	97	22%
ICT University Campus, Yaounde, Cameroon	67	15%
TOTAL	**439**	**100%**

From Table 5, the Department of Curriculum Studies and Teaching of the Faculty of Education at the University of Buea had 245 participants, making a total of 56% of the sampled population, which is the majority. Also, the Department of Communication and Development Studies of the Faculty of Arts at the University of Bamenda made up 7% of the sample population with 30 participants and was the least While the Faculty of Petroleum Industries and Mines in Kaele of the University of Maroua had 97 participants, making up 22% of the sampled population, And the ICT University Campus in Yaounde, Cameroon, had 67 participants, making up 15% of the total participants as well as the sample population. As shown in figure 18.

Figure 18: Distribution of participants by institution

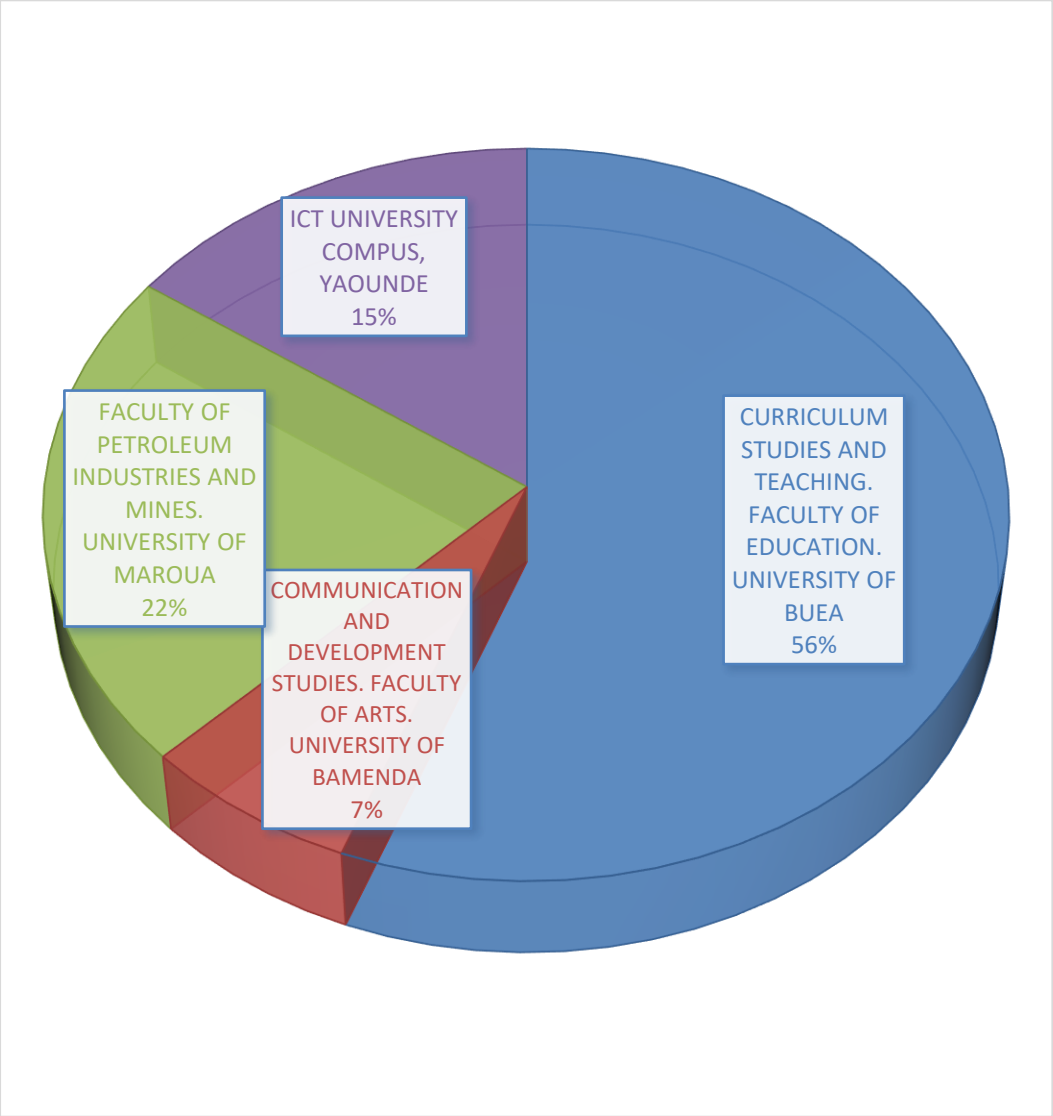

Figure 19 shows that the majority of respondents or participants in this study originate from the North West and South West regions with a percentage of 21 and 20 respectively (38) and the least were from the East, Adamawa, North, and South regions with percentages of 02, 03, 03, and 03, respectively. while the centre region had 5%,, the far north 04 4% (14), the west had 13%, and the littoral had 9%, while 17% of the respondents, due to insecurity, did not declare their region of origin. This gives a total of 439 participants with a percentage of 100%.

Figure 19: Distribution of respondents baccording to Region of origin

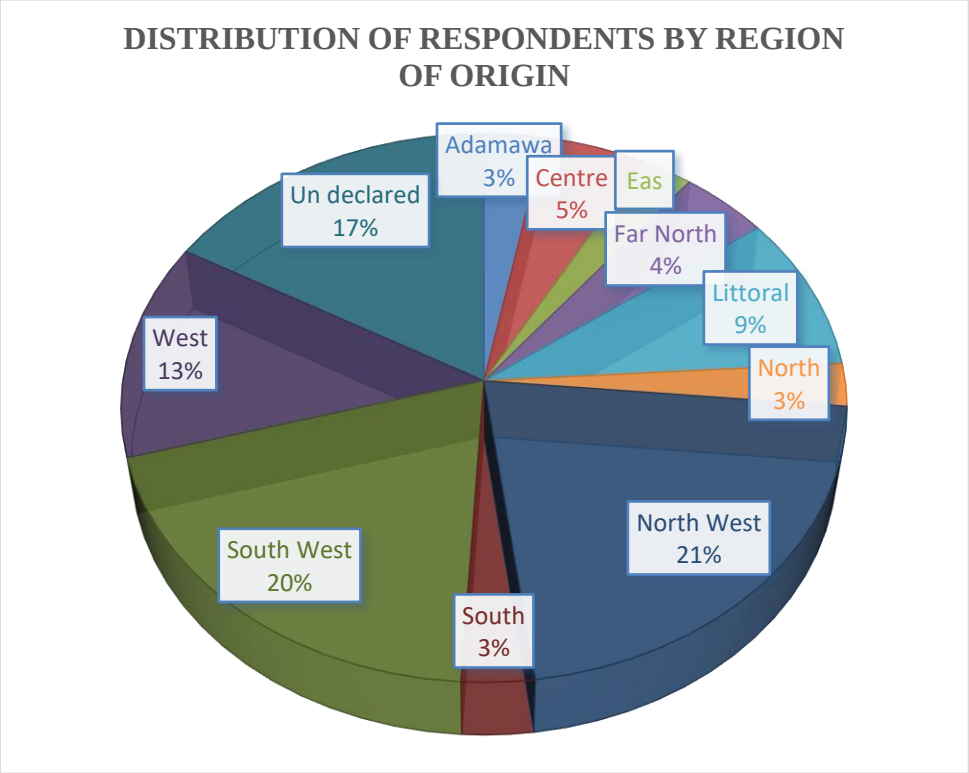

Figure 20 establishes females as the majority of the participants or respondents (245), with a percentage of 56, while males (121) constituted 27% of the participants, and 17% (73) did not declare their gender for security reasons. This is better illustrated by Figure 21.

Figure 20: Distribution of participants according to Gender

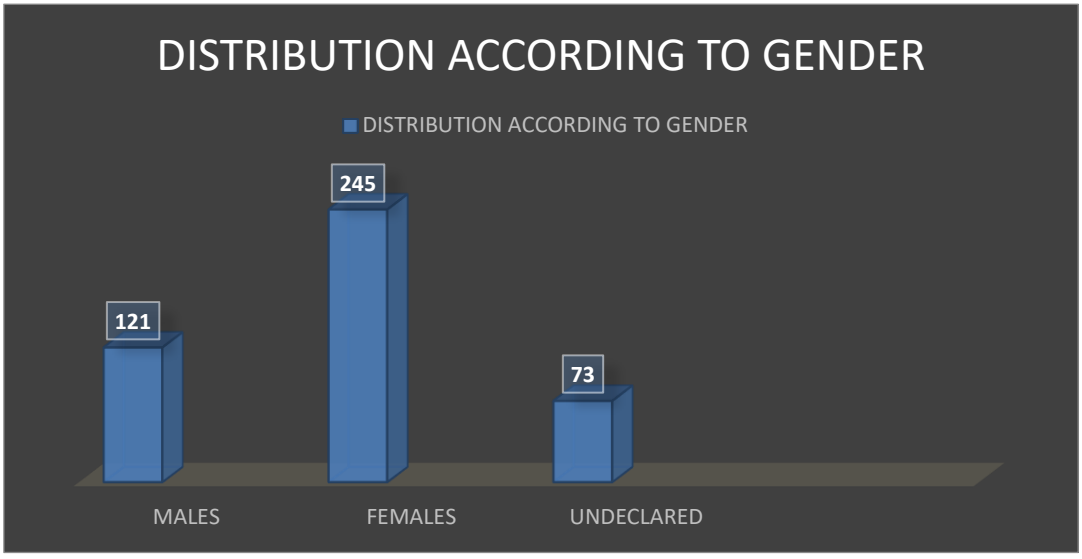

Figure 21: Distribution according to gender

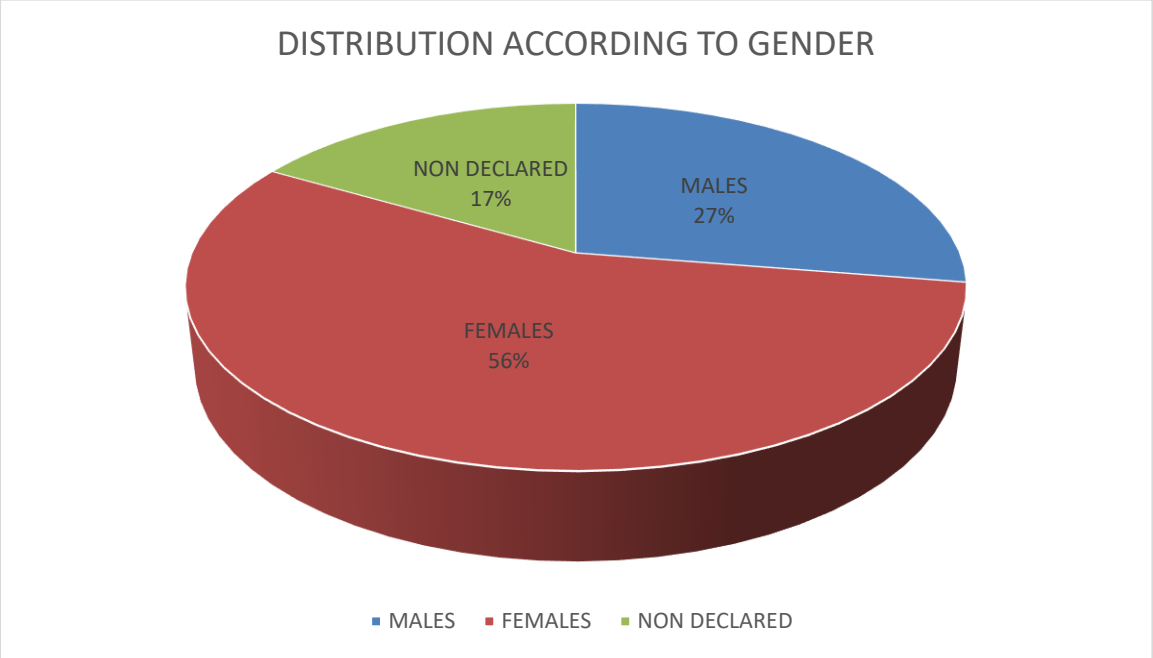

Figure 22 shows on marital status that the majority of the participants are single, with a percentage of 76 (325), while participants that are married constitute 4% (18) of the participants. While 2% are divorced, with 1% being widows or widowers, and up to 17% (73) did not declare their marital status.

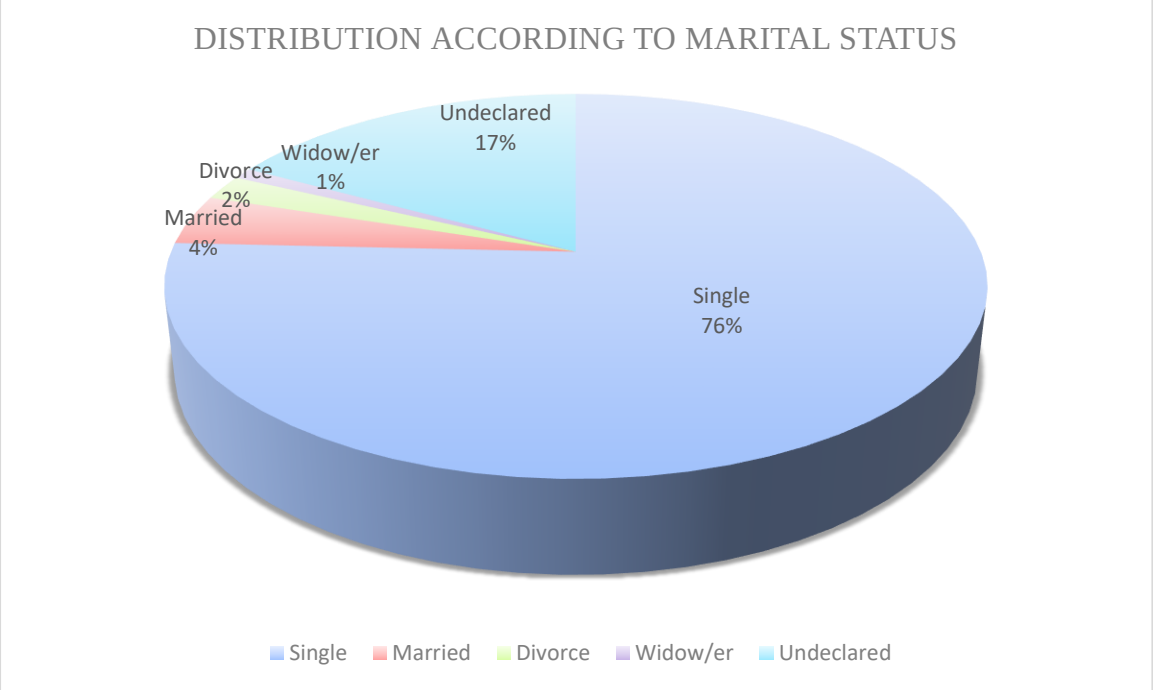

Figure 22: Distribution according to marital status

Looking at figure 23, the highest number of participants (161) with a percentage of 37 are between the ages of below 20 (161) with a percentage of 37, closely followed by the ages 21 to 25 (127) with 29%, then 26 to 30 years with (59) 13%, and the least were the ages 30 and above (19) with 4%. While 17% did not declare their ages, they therefore could not be classified. This is best illustrated by the histogram on figure 23 and established by the pie chart on figure 24.

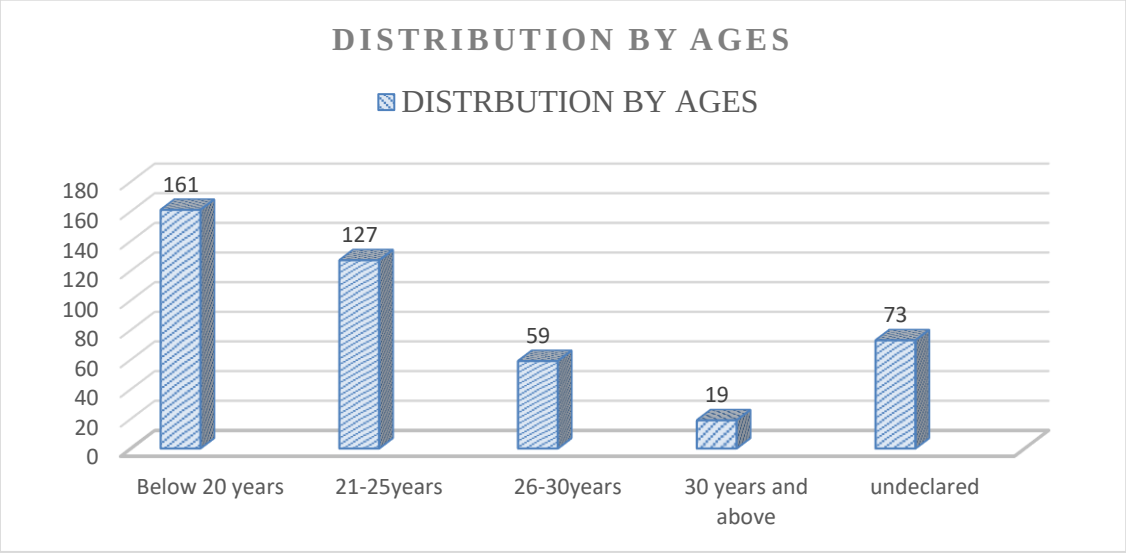

Figure 23: Distribution of respondents by Age Group

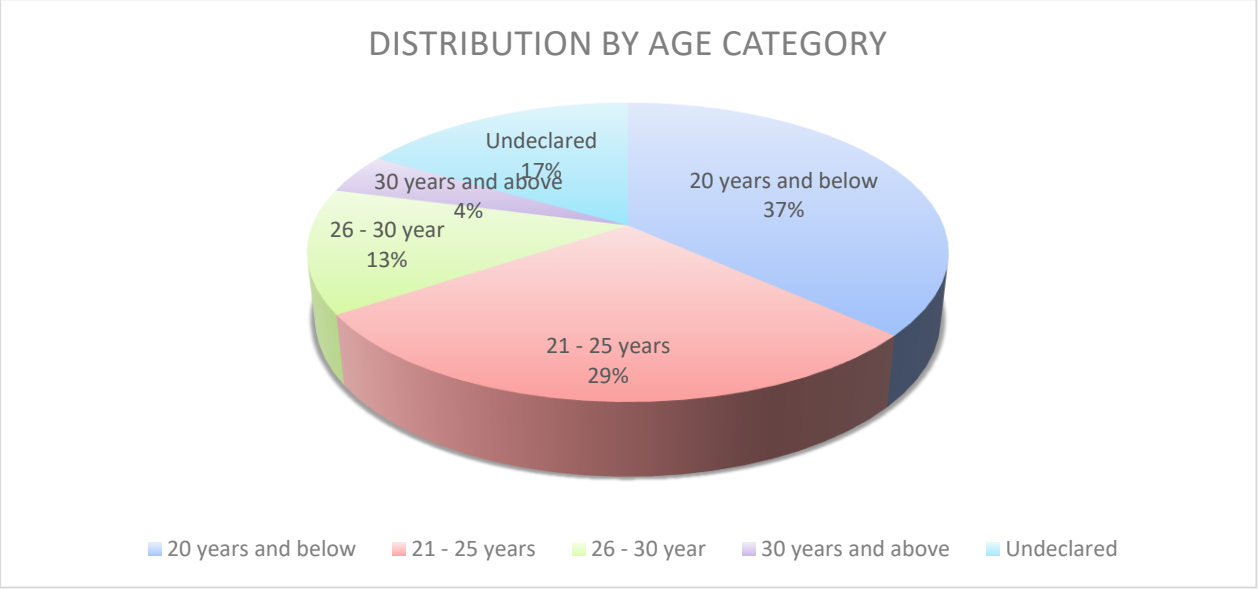

Figure 24: Distribution by age category

From figure 25, the Department of Curriculum Studies and Teaching of the Faculty of Education at the University of Buea had 3 participants in the focus group discussion, making a total of 37% of the sampled population, which is the majority. Also, the Department of Communication and Development Studies of the Faculty of Arts at the University of Bamenda made up 13% of the sample population with 1 participant and was the least While the Faculty of Petroleum Industries and Mines in Kaele of the University of Maroua had two participants, making up 25% of the sample focus group population, And the ICT University Campus in Yaounde, Cameroon, had two participants, making up 25% of the total participants. As illustrated below.

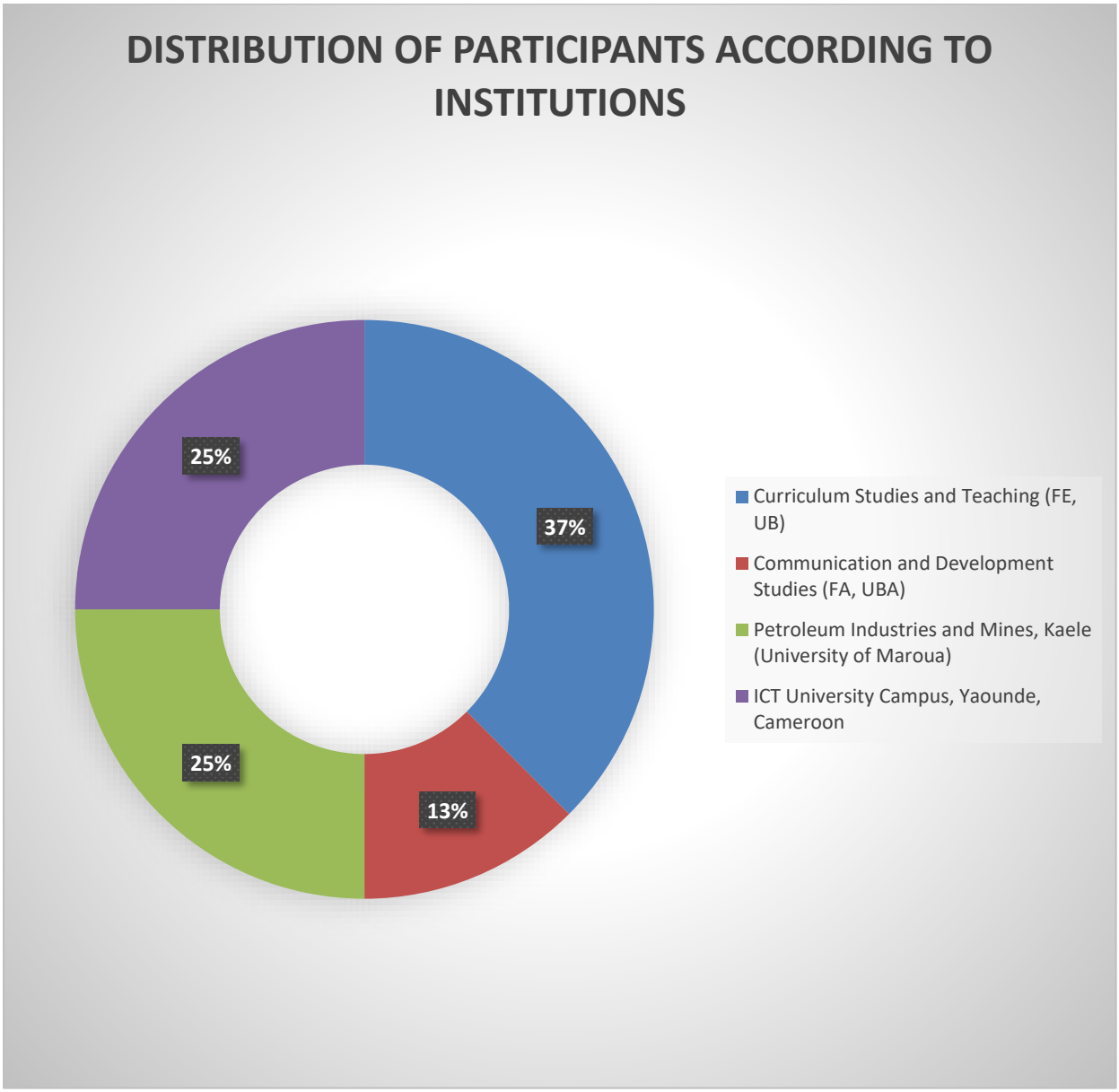

Figure 25: Distribution of focus group participants according to institutions

5.3.0. PRESENTATION OF QUANTITATIVE DATA COLLECTED FROM STUDENTS

Four research questions are addressed in this presentation, and one portion is devoted to the dependent variable. The following were the research questions:

1. **Does the academic quality of multimedia based pedagogy influence students' professional development?**

Table 06: Response rates of questionnaire on academic quality section

SN	STATEMENT	Strongly Agree (SD)	Agree (A)	Disagree (D)	Strongly Disagree (SD)
		4/4	**¾**	**2/4**	**1/4**
	ACADEMIC QUALITY				
1	**MBP** provides quality information that is relevant in addressing your **PNs**	290	141	08	00
2	Information validity is very important in improving your performance in **CA**	301	135	03	00
3	**MBP** information relevance quality does not facilitate classroom assessment	00	08	141	290
4	The quality of information reliability reinforces digital learning support in **MBP**	275	144	21	00
5	The quality of information relevance does influence your professional needs	290	141	08	00

Table 6 shows that a gross majority of respondents focused their responses on strongly agree and agree. Indicating that information relevance, information validity, and information reliability as components of academic quality in multimedia-based pedagogy are significantly involved in influencing the academic quality of multimedia-based pedagogy and contributing to students professional development in the higher education sector. With this, information relevance, information validity, and information reliability qualities should be carefully determined in the planning, designing, and development of multimedia-based pedagogy programmes in the higher education sector in particular and the education system in general if professional orientation and development are the policy, aim, or focus.

The total marks, or points, for each section of statements on the questionnaire were 20 (4 marks x 5 statements). The questionnaire had a total of twenty-five (25) items in five (5) sections or parts, with each section or part having five (5) items, with one of them being a distractor. Therefore, in each section, a respondent who responded to all the items in the section could not score below 4 marks or above 20 marks. In the section on academic quality, 8 respondents scored 18, 290 scored 17 and were the highest, 26 scored 16 and were the least, and 115 scored 15, as shown on the histogram on figure 26.

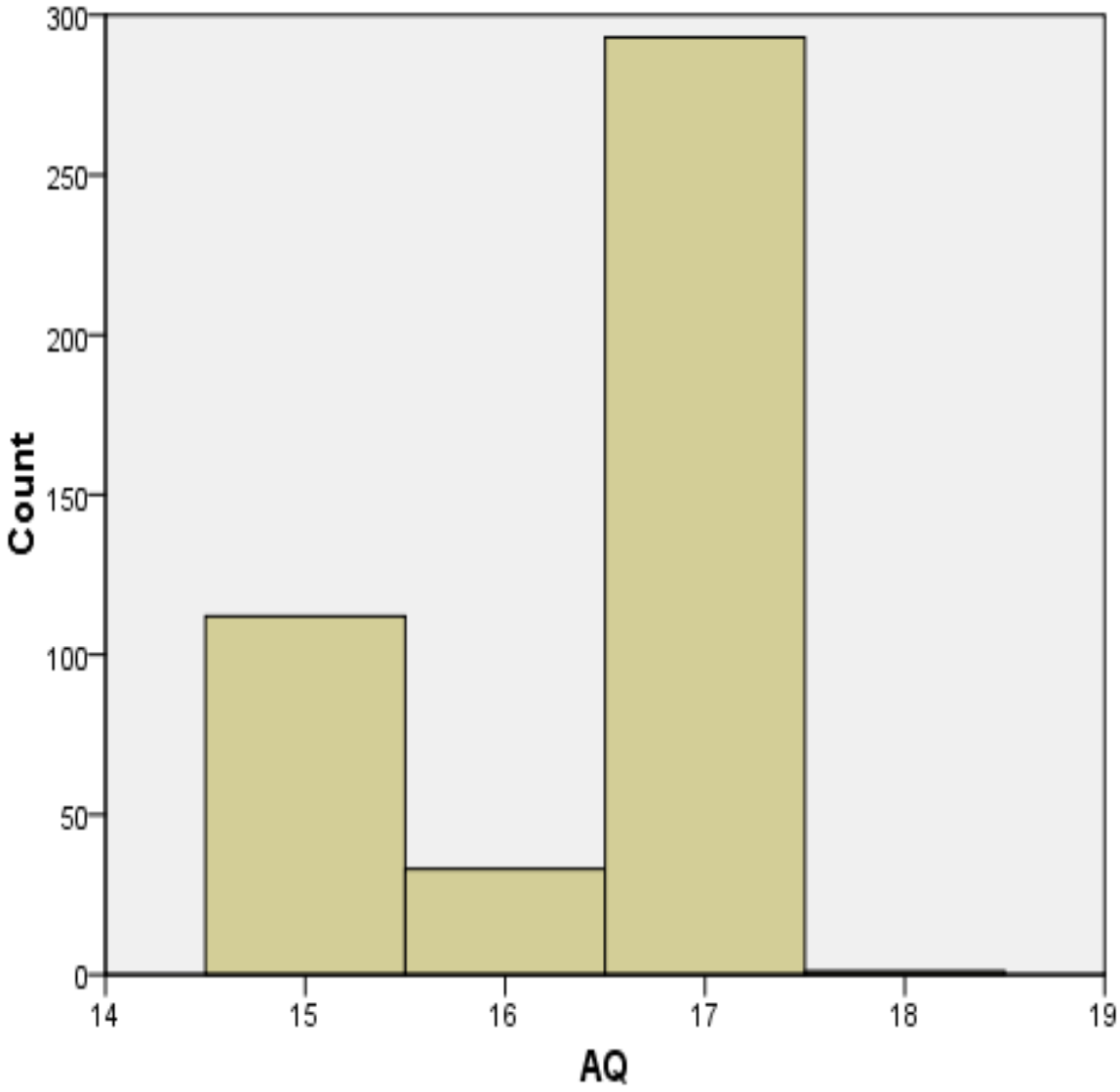

Figure 26: Distribution of respondents according to sum scores of response on academic quality

2. **Does the pedagogical quality of multimedia based pedagogy influence students' professional development?**

Table 07: Response rates of questionnaire on pedagogical quality section

SN	STATEMENT	Strongly Agree (SD)	Agree (A)	Disagree (D)	Strongly Disagree (SD)
		4/4	3/4	2/4	1/4
	PEDAGOGICAL QUALITY				
1	The pedagogic quality in **MBP** facilitates the extent to which your **PNs** are met	180	242	11	07
2	The quality of pedagogical planning in **MBP** does influence the quality of **DLS**	234	200	03	02
3	Quality pedagogic implementation increases your digital learning support in **MBP**	210	221	05	03
4	Quality of assessment method in **MBP** does not influence your **DLS** exploitation	02	03	200	234
5	The use of an effective assessment method improves your performance in **CA**	234	199	04	02

Table 7 shows that a huge majority of the respondents focused their responses on strongly agreeing and agreeing. Indicating that qualities from the perspective of pedagogic planning, pedagogic implementation, and assessment methods, as components of pedagogic quality in multimedia-based pedagogy, are significantly involved in influencing the pedagogic quality of multimedia-based pedagogy and contributing to students professional development in the higher education sector. Therefore, multimedia-based pedagogy should be highly taken into consideration in the higher education pedagogic processes of multimedia-based pedagogy. On the questionnaire, the section on pedagogical quality had the highest number of respondents (210) with a total score of 15, followed by 180 respondents with a total score of 15. 40 respondents scored 16, 04 respondents scored 18, 03 respondents scored a total of 14, and the least was 2 respondents who scored a total of 13 on the 20 marks or points on the section; this can best be explained by the histogram on figure 27.

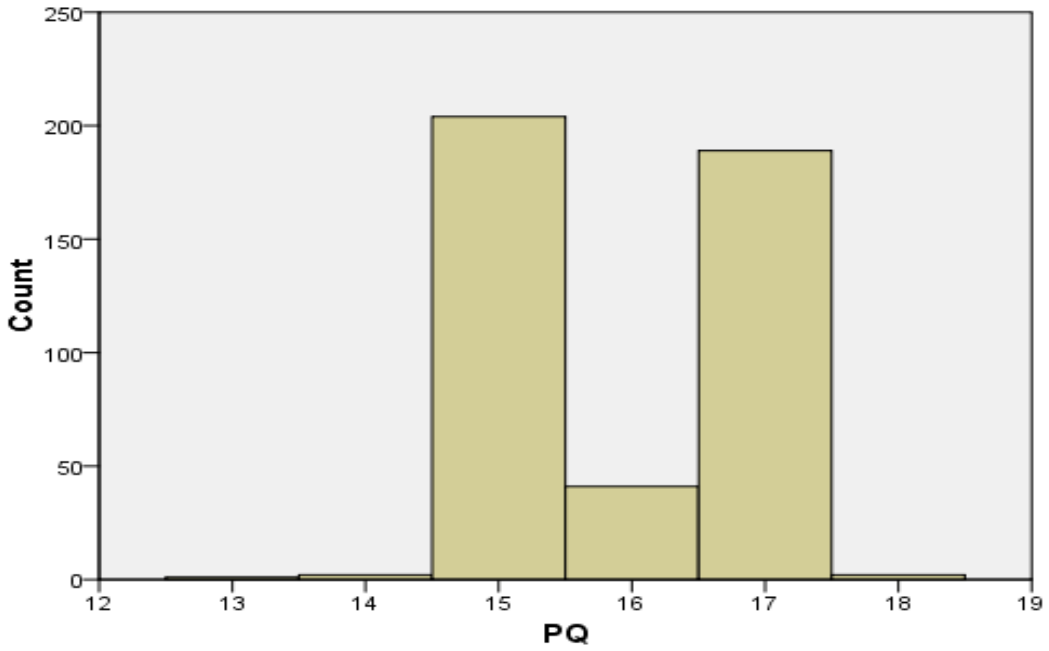

Figure 27: Distribution of respondents according to sum scores of response on pedagogical quality

3. **Does the didactic quality of multimedia based pedagogy influence students' professional development?**

Table 08: Response rates of questionnaire on didactic quality section

SN	STATEMENT	Strongly Agree (SD)	Agree (A)	Disagree (D)	Strongly Disagree (SD)
		4/4	**¾**	**2/4**	**1/4**
	DIDACTIC QUALITY				
1	Quality learning content in **MBP** effectively addresses your professional needs	205	226	06	02
2	The quality of learning materials does influence the quality of **DLS** in **MBP**	233	199	04	03
3	The quality of learning activities in **MBP** determine the effectiveness of **DLS**	250	180	09	00
4	The quality of learning activities has no influence on your professional needs	00	09	180	250
5	The quality learning materials in **MBP** enhances students' motivation in **CA**	228	201	06	04

Table 8 shows that a gross majority of respondents focused their responses on strongly agree and agree. Indicating that learning content, learning materials, and learning activities as components of didactic quality in multimedia-based pedagogy are significantly involved in influencing the didactic quality of multimedia-based pedagogy and contributing to students' professional development in professional-oriented programmes. With this, learning content, learning materials, and learning activity qualities should be carefully determined in the planning, designing, and development of multimedia-based pedagogy programmes in the higher education sector in particular and the education system as a whole. On the questionnaire, the section of didactic quality had the highest number of respondents (180) with a total score of 15, followed by 160 respondents with a total score of 17, 90 respondents scored 16, and the least number of respondents (9) who scored a total of 18 on the 20 marks or points on the section. This can best be described by the histogram on figure 28.

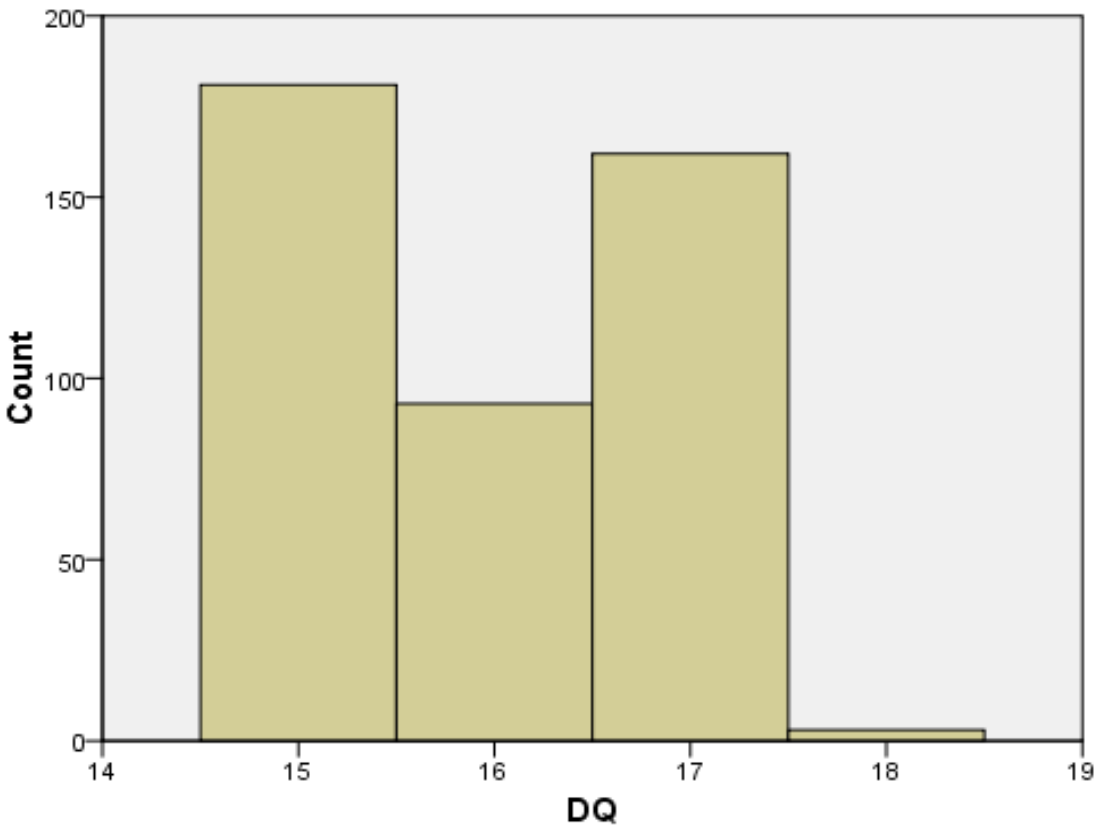

Figure 28: Distribution of respondents according to sum scores of response on didactic quality.

4. **Does the technical quality of multimedia based pedagogy influence students' professional development?**

Table 09: Response rates of questionnaire on technical quality section

SN	STATEMENT	Strongly Agree (SD)	Agree (A)	Disagree (D)	Strongly Disagree (SD)
		4/4	¾	2/4	1/4
	TECHNICAL QUALITY				
1	The quality of **MBP** design effectively determine the extent your **PNs** are met	201	231	04	03
2	The quality of browsing does impact your performance in classroom assessment	225	204	06	04
3	Quality browsing in increases the quality of digital learning support in **MBP**	273	170	05	01
4	Mastery of browsing skills does not influence the attainment of your **PNs**	01	05	170	273
5	Quality technological ingenuity increases motivation in classroom assessment	218	214	04	03

Table 9 shows that a huge majority of the respondents focused their responses on strongly agree and agree. Indicating that qualities from the perspective of design, browsing, and technological ingenuity, as components of technical quality in multimedia-based pedagogy, are significantly involved in influencing the technical quality of multimedia-based pedagogy and contributing to students professional development in the higher education sector through meeting their professional needs, facilitating digital learning support, and improving their performance in theoretical and practical classroom assessment. Therefore, multimedia-based pedagogy should be highly taken into consideration in the higher education pedagogic processes of multimedia-based pedagogy.

On the questionnaire, the section of technical quality had the highest number of respondents at 177 with a total score of 17, followed by 170 respondents with a total score of 15, 75 respondents scored 16, 11 respondents scored 18, and 4 respondents scored a total of 14, and the least was 2 respondents who scored a total of 11 on the 20 marks or points on the section. This can best be explained by the histogram on figure 29.

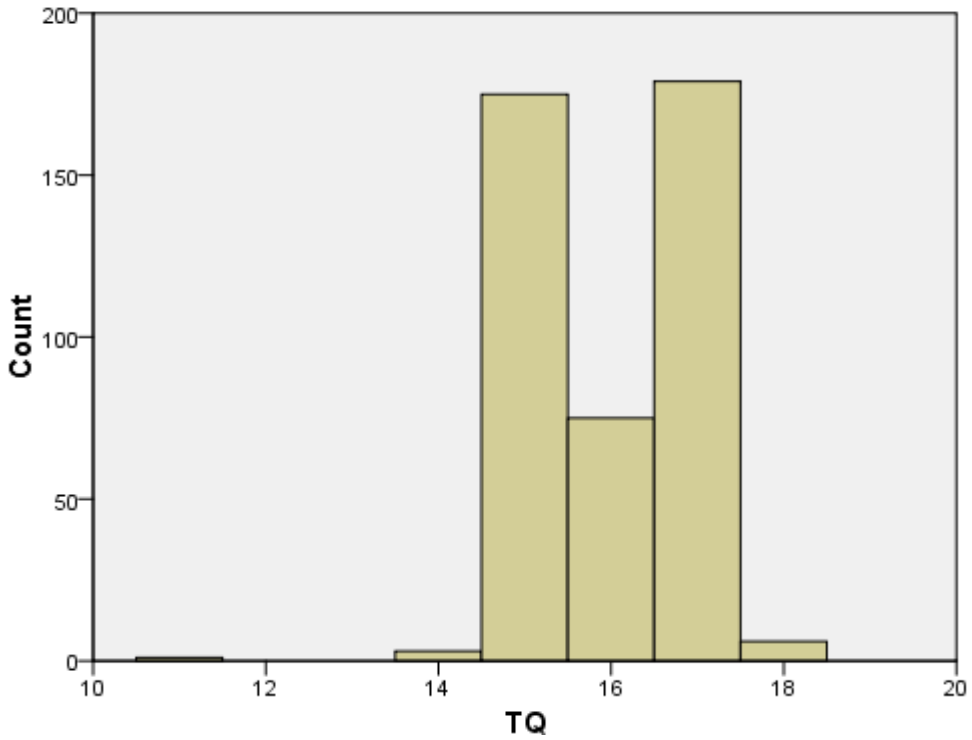

Figure 29: Distribution of respondents according to sum scores of response on technical quality

Professional development (Dependent variable)

Table 10: Response rates of questionnaire students professional development section

SN	STATEMENT	Strongly Agree (SD)	Agree (A)	Disagree (D)	Strongly Disagree(SD)
		4/4	¾	**2/4**	¼
	DEPENDENT VARIABLE				
1	Your **PN**s effectively impacted the outcome of **MBP**'s academic quality	280	262	05	03
2	Digital Learning Assistance influences pedagogic quality in **MBP**	225	204	06	04
3	Classroom assessment is a determinant for **MBP** didactic quality	273	170	05	01
4	Your professional needs does not influence the technical quality in **MBP**	02	06	162	280
5	Professional development is effectively influenced by **MBP**	227	204	05	03

Table 10 shows that a gross majority of respondents focused their responses on strongly agree and agree. Indicating that students' professional needs, digital learning assistance, and classroom assessment as components of students' professional development with respect to multimedia-based pedagogy are significantly influenced by the academic, pedagogic, didactic, and technical qualities of multimedia-based pedagogy, which in turn contribute significantly to students professional development in professional-oriented programmes in the higher education system. On the questionnaire, the section of pedagogical quality had the highest number of respondents at 212 with a total score of 17, followed by 206 respondents with a total score of 15, 13 respondents scored 18, 06 respondents scored 16, and the least number of respondents was 3 who scored a total of 19 on the 20 marks or points on the section. This can best be explained by the histogram on figure 30.

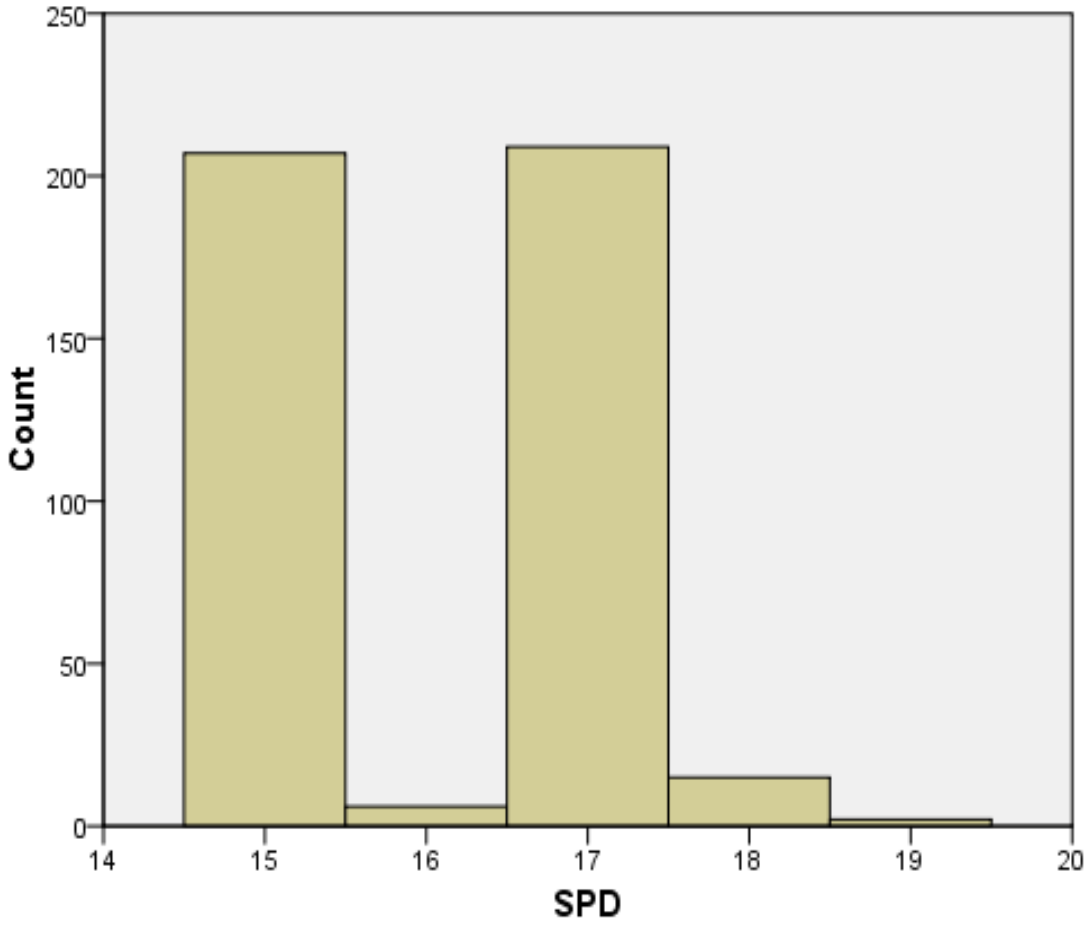

Figure 30: Distribution of respondents according to sum scores of response on students' professional development

5.3.0. VERIFICATION OF RESEARCH HYPOTHESIS

This section prsents the research hypotheses in relation to the findings obtained.

5.3.1. Research Hypothesis I:

The academic quality of multimedia based pedagogy has a significant influence on students' professional development.

Table 11: The mean and standard deviation of the responses on research hypothesis 1

Descriptive Statistics

	Mean	Std. Deviation	N
AQ	16.42	.872	439
SPD	16.09	1.058	439

Table 11 presents the mean of academic quality at 16.42 against 16.09 for responses on students' professional development for 439 respondents. The standard deviation of 0.9 for academic quality and 1.06 for students' professional development shows that most of the scores were close to the mean. N represents the total number of respondents who attempted to respond to the questionnaire.

Table 12: Bivariate correlation of academic quality and students' professional development

Correlations

		AQ	SPD
AQ	Pearson Correlation	1	.431**
	Sig. (2-tailed)		.000
	N	439	439
SPD	Pearson Correlation	.431**	1
	Sig. (2-tailed)	.000	
	N	439	439

**. Correlation is significant at the 0.01 level (2-tailed).

Table 12 presents the Pearson correlation for academic quality and students' professional development, which resulted in a coefficient of 0.43. Significance stood at 0.00,

indicating a significance level of 0.01 (2-tailed). N represents the total number of respondents (students). To obtain the coefficient of determination (r^2), the given Pearson correlation coefficient stands at 0.10, (0.43)2 = 0.19. Multiplied by 100, the result is 19.00. This 19% variance value indicates that 1% of the variance in the dependent variable is caused by the independent variable. Therefore, 19% of the variance in students' professional development is explained by academic quality. This case has two-tailed significance, and the correlation is bidirectional. This therefore means that 19% of the variance in academic quality is influenced by students' professional development.

Therefore, there is a significant relationship between the academic quality of multimedia-based pedagogy and students' professional development. This confirms hypothesis one (1).

5.3.2. Research Hypothesis II:

The pedagogical quality of multimedia based pedagogy has a significant influence on students' professional development.

Table 13: The mean and standard deviation of the responses on research hypothesis II
Descriptive Statistics

	Mean	Std. Deviation	N
PQ	15.96	.976	439
SPD	16.09	1.058	439

Table 13 presents the mean of pedagogic quality at 15.96 against 16.09 for responses on students' professional development for 439 respondents. The standard deviation of 0.98 for pedagogic quality and 1.06 for students' professional development shows that most of the scores were close to the mean. N represents the total number of respondents who attempted to respond to the questionnaire.

Table 14: Bivariate correlation of pedagogic quality and students' professional development
Correlations

		PQ	SPD
PQ	Pearson Correlation	1	.339**
	Sig. (2-tailed)		.000
	N	439	439
SPD	Pearson Correlation	.339**	1
	Sig. (2-tailed)	.000	
	N	439	439

**. Correlation is significant at the 0.01 level (2-tailed).

Table 14 presents the Pearson correlation for pedagogic quality and students' professional development, which resulted in a coefficient of 0.34. Significance stood at 0.00, indicating a significance level of 0.01 (2-tailed). N represents the total number of respondents (students). To get the coefficient of determination (r^2), the given Pearson correlation coefficient stands at 0.12; (0.34)2 = 0.12. Multiplied by 100, the result is 12.00. This 12% variance value indicates that 12% of the variance in the dependent variable is caused by the independent variable. Therefore, 12% of the variance in students' professional development is explained by pedagogic quality. This case has two-tailed significance, and the correlation is bidirectional. This therefore means that 12% of the variance in pedagogic quality is influenced by students' professional development.

Therefore, there is a significant relationship between the pedagogic quality of multimedia based pedagogy and students' professional development. This confirms hypothesis two (2).

5.3.3. Research hypothesis III:

The didactic quality of multimedia based pedagogy program has a significant influence on students' professional development.

Table 15: The mean and standard deviation of the responses on research hypothesis III
Descriptive Statistics

	Mean	Std. Deviation	N
DQ	15.97	.900	439
SPD	16.09	1.058	439

Table 15 presents the mean of didactic quality at 15.97 against 16.09 for responses on students' professional development for 439 respondents. The standard deviation of 0.90 for didactic quality and 1.06 for students' professional development shows that most of the scores were close to the mean. N represents the total number of respondents who attempted to respond to the questionnaire.

Table 16: Bivariate correlation of didactic quality and students' professional development
Correlations

		DQ	SPD
DQ	Pearson Correlation	1	.288**
	Sig. (2-tailed)		.000
	N	439	439
SPD	Pearson Correlation	.288**	1
	Sig. (2-tailed)	.000	
	N	439	439

**. Correlation is significant at the 0.01 level (2-tailed).

Table 16 presents the Pearson correlation for didactic quality and students' professional development, which resulted in a coefficient of 0.29. Significance stood at 0.00, indicating a significance level of 0.01 (2-tailed). N represents the total number of respondents (students). To get the coefficient of determination (r2), the Pearson correlation coefficient stands at 0.29; (0.29)2 = 0.08. Multiplied by a hundred (100), the result is 08.00. This 8% variance value indicates that 1% of the variance in the dependent variable is caused by the

independent variable. Therefore, 8% of the variance in students' professional development is explained by didactic quality. This case has two-tailed significance, and the correlation is bidirectional. This therefore means that 8% of the variance in didactic quality is influenced by students' professional development.

Therefore, there is a significant relationship between the didactic quality of multimedia-based pedagogy programmes and students' professional development. This confirms hypothesis three (3).

5.3.4. Research hypothesis IV:

The technical quality of multimedia based pedagogy has a significant influence on students' professional development.

Table 17: The mean and standard deviation of the responses on research hypothesis IV
Descriptive Statistics

	Mean	Std. Deviation	N
TQ	16.01	.973	439
SPD	16.09	1.058	439

Table 17 presents the mean of technical quality at 16.01 against 16.09 for responses on students' professional development for 439 respondents. The standard deviation of 0.97 for technical quality and 1.06 for students' professional development shows that most of the scores were close to the mean. N represents the total number of respondents who attempted to respond to the questionnaire.

Table 18: Bivariate correlation of technical quality and students' professional development
Correlations

		TQ	SPD
TQ	Pearson Correlation	1	.283**
	Sig. (2-tailed)		.000
	N	439	439
SPD	Pearson Correlation	.283**	1
	Sig. (2-tailed)	.000	
	N	439	439

**. Correlation is significant at the 0.01 level (2-tailed).

Table 18 presents the Pearson correlation for technical quality and students' professional development, which resulted in a coefficient of 0.28. Significance stood at 0.00,

indicating a significance level of 0.01 (2-tailed). N represents the total number of respondents (students). To obtain the coefficient of determination (r^2), the given Pearson correlation coefficient stands at 0.16; (0.28)2 = 0.08. Multiplied by 100,, the result is 8.00. This 8% variance value indicates that 8% of the variance in the dependent variable is caused by the independent variable. Therefore, 8% of the variance in students' professional development is explained by academic quality. This case has two-tailed significance, and the correlation is bidirectional. This therefore means that 8% of the variance in technical quality is influenced by students' professional development.

Therefore, there is a significant relationship between the technical quality of multimedia-based pedagogy and students' professional development. This confirms hypothesis 4 (4).

5.3.5. Measures (summary) of the quality of multimedia based pedagogy and students' professional development.

Table 19: Summary presentation of the mean(s) and standard deviation of the statistics on qualities
Descriptive Statistics

	Mean	Std. Deviation	N
AQ	16.42	.872	439
PQ	15.96	.976	439
DQ	15.97	.900	439
TQ	16.01	.973	439
SPD	16.09	1.058	439

Table 19 presents the summary of the mean of academic quality at 16.42, of pedagogic quality at 15.96, of didactic quality at 15.97, and of technical quality at 16.01 against 16.09 for responses on students' professional development for 439 respondents. The standard deviation of 0.9 for academic quality, 0.98 for pedagogic quality, 0.90 for didactic quality, and 0.93 for technical quality against 1.06 for students' professional development indicates that most of the scores were found close to the mean.

Table 20: Summary of all the correlations from respondents Correlations

		AQ	PQ	DQ	TQ	SPD
AQ	Pearson Correlation	1	.366**	.330**	.269**	.431**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	439	439	439	439	439
PQ	Pearson Correlation	.366**	1	.420**	.315**	.339**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	439	439	439	439	439
DQ	Pearson Correlation	.330**	.420**	1	.316**	.288**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	439	439	439	439	439
TQ	Pearson Correlation	.269**	.315**	.316**	1	.283**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	439	439	439	439	439
SPD	Pearson Correlation	.431**	.339**	.288**	.283**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	439	439	439	439	439

**. Correlation is significant at the 0.01 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 20 presents a summary of Pearson correlations for academic quality, pedagogic quality, didactic quality, technical quality, and students' professional development, which resulted in coefficients of 0.43, 0.34, 0.29, and 0.28 with significance levels of all 0.00, respectively. This indicates significance levels of 0.01 (2-tailed) for academic quality, pedagogic quality, didactic quality, and technical quality (for all the variables). N represents the total number of respondents (students). The coefficient of determination (r^2) was 0.19 and 0.12, respectively, for academic quality and pedagogic quality, and didactic quality and technical quality stood at 0.08. The 19% variance value indicates that 19% of the variance in the dependent variable of students' professional development has as causes the independent variables of academic quality, as well as 12% for pedagogic quality, while didactic and technical qualities stand at 8%. As a result, academic quality explains 19% of the variance in

students' professional development, pedagogic quality explains 12%, and didactic and technical qualities explain 8% of the variance in students' professional development. These cases have two-tailed significance, and the correlation is bidirectional. This therefore means that 29% of the variance in academic quality and 12% in pedagogic quality are influenced by students' professional development.

Therefore, there is a significant relationship between the academic, pedagogic, didactic, and technical qualities of multimedia based pedagogy and students' professional development. This confirms the main hypothesis.

5.4.0. PRESENTATION OF QUALITATIVE DATA COLLECTED FROM FOCUS GROUP DISCUSSIONS

The conclusions drawn from the focus group talks are presented in this section. According to how similarly or dissimilarly the participants' responses differ, the responses are assessed in percentage form.

5.4.1. FINDINGS OF FOCUS GROUP DISCUSSIONS

An overview of focus group findings on the effectiveness of multimedia based pedagogy and how it affects professional growth is provided in this section. The focus group looked at the connection between students' professional development and the calibre of multimedia-based instruction. To do this, it was necessary to comprehend the phrases multimedia-based pedagogy and professional development. The relationship between the two was then examined from the angles of academic quality, pedagogic quality, didactic quality, and technological quality. Addressing students' professional needs, digital learning support, and classroom assessment were the elements of professional development that were investigated.

Eight (8) participants expressed their experiences and opinions during the focus group, which was moderated by the researcher. They were applied to qualitative information probes to support survey-based data collection. Because the questions were open-ended, the focus group conversations gave the researcher additional in-depth input. Additionally, it allowed the participants a chance to interact and link diverse ideas on the six (6) subjects covered in order to increase knowledge. The results of the focus groups build on those

discovered through the survey, which employed a questionnaire as a data collection tool. In relation to the six (6) topics, the qualitative data analysis showed the following:

5.4.1.1. Preliminary Information

Preliminary information was gotten from the participants on their understanding of the concepts of multimedia-based pedagogy and professional development.

Theme 1: Multimedia-based Pedagogy and Professional Development

Findings

About 87.5% of the participants agreed on the fact that multimedia-based pedagogy has to do with the use of modern ICT tools such as computers, multimedia projectors, audio and video gadgets, audio-visual resources, and internet resources. While 12.5% of participants added the fact that multimedia-based pedagogy is a collection of teaching strategies that are active and strive to meet the needs of all learners, Students' professional development was agreed upon by participants in the focus group, who unanimously (100%) agreed that students' professional development refers to the acquisition of knowledge, skills, abilities, and competences for the practise of a particular profession in a particular field of study, which should have as characteristics transferability, integration, and practicability.

Participants agreed at a 100% level that multimedia-based pedagogy influences students' professional development, but for diverse reasons. According to some of the participants, multimedia-based pedagogy creates learning opportunities that expose students to universal professional knowledge, skills, abilities, and competences in their field of specialisation. This is done through audio, video, audio-visual, and internet resources. Another school of thought held that multimedia-based pedagogy enhances the professional development of students by meeting the needs of diverse learners (audio, visual, and kinaesthetic), which accelerates the effective and efficient internalisation of knowledge, the development of skills and abilities, and the consolidation of competences. The third school of thought held that multimedia-based pedagogy uses modern technology that the youth or learners are familiar with, if not addicted to. Therefore, students enjoy and are motivated to effectively and efficiently learn with these technological and digital tools, hence their professional development.

5.4.1.2. Multimedia Qualities

This section focuses on participant replies (vies) regarding the connection between students' professional development and the qualities of multimedia based pedagogy (academic, pedagogical, didactic, and technological).

Theme 2: Academic Quality

Findings

With respect to multimedia-based pedagogy respecting academic quality, the participants, for diverse reasons, acknowledged the fact that multimedia-based pedagogy respects academic quality. The first group explained that the world has become a global village with the use of the internet and other ICT tools. Therefore, the academic quality of the content taught and their procedures can easily be verified, even by the students, to see if they meet norms and standards. The second group of participants felt that multimedia-based pedagogy is a programme implementation method and therefore only effectively and efficiently executes the content of the programme. Therefore, the issue of academic quality in multimedia-based pedagogy is moving in the direction of implementation. The third group stated clearly that their institutions are under the direct supervision of the Cameroonian ministry of higher education, which has elaborated norms and standards to be followed, and these standards are verified through quality evaluation or assessment from time to time.

Responding to the question of whether multimedia-based pedagogy respects academic quality. All the participants in the focus group, at a rate of 100%, agreed that it does. The reasons put forth were as follows: the material taught respects the official programme designed by the institution; the documents used have standards and verifiable references with respect to courses or programmes under study; the contents are positively impactful with respect to developing knowledge, skills, and abilities and also guide towards building professional competences; and multimedia-based pedagogy facilitates students exposure to the reality of the professional world. Furthermore, 100% of the participants acknowledge that the information presented in the course of multimedia-based pedagogy is relevant to academic quality or standards because it facilitates students’ construction of knowledge, the development of skills and abilities, as well as competences in their field of study. They have notice when they go out for internships or practical activities off campus.

The participants, though with divergent views, all (100%) accepted that the academic quality of multimedia-based pedagogy programmes influences students' professional development. However, to some, it depends on the forum and the mastery of the lecturer; to others, it depends on the tools and materials used; and to a majority of about 50%, it depends on the content and the instructional processes, as well as teaching and learning activities. With respect to the reliability of multimedia-based pedagogy with respect to academic quality, there was a school of thought that held that multimedia-based pedagogy has to do with the quality of the implementation of courses and programmes. Therefore, it makes the teaching and learning process very easy to repeat or review with little or no changes. While the second school of thought held that multimedia-based pedagogy in today's world is easily digitalized and that digitalized information in higher education is structured to be reliable and respects the norms and standards of academic quality,

Theme 3: Pedagogic Quality

Findings

Multimedia-based pedagogy was considered by all participants at a rate of 100% to be of standard pedagogic quality. 25% of the participants confessed that it makes learning very visible and practical while concretely exposing students to concrete realities through audio, video, and animation. Another 25% of the participants said that from their experience, multimedia-based pedagogy content is easily verified with other students who have taken the course or who are taking it at another institution and therefore has excellent pedagogic standards. A third group of participants, made up of 50% of the participants in the focus group discussion, expressed their experiences with multimedia instructional and learning processes as being concrete and practical. This is because the materials and activities carried out in the course of a multimedia-based pedagogy are effectively calculated and planned. According to them, given that it facilitates concrete learning, it is of standard pedagogic quality.

Participants brought up a series of reasons why multimedia-based pedagogy was exceptional compared to other instructional methods: it meets the needs of the different types of students (audio, visual, and kinaesthetic) found in the lecture hall or platform, by using audios, videos, audio-visual, and animation; is carefully planned and can exploit a series of instructional and learning resources at once, especially when using the internet; it save time

and resources, because there is little or no use for chalk and papers; content is easily transferable through diverse electronic means such as USB key, email, WhatsApp group, and on any electronic platform because it is easily digitalised; it is easy to revise and upgrade, therefore create opportunity for quality and standard content; its content sources and references are easily verifiable making it very reliable.

Although 100% of the participants considered pedagogical implementation (instructional and learning) strategies in multimedia-based pedagogy to be effective, about 37.5% of the participants thought that it depended on the lecturer's mastery of the processes and choice of learning activities. However, they were seen to be effective because: because they motivate the teaching and learning processes through images or visuals, audio, audio-visual and animation; it reduces time wastage and introduces effective time management, because there is no board writing as well as it is well planned; they give room for students to be active and participate in the teaching and learning processes, by asking and answering questions, working in teams and groups, and practically realising something; knowledge and skills are easily transferable, because it gives opportunities for observations and physical practical activities as well as manipulations; and it prepares students for professional life by enable them visualise realities in the field.

From views of the participants, multimedia-based pedagogy and assessment methods facilitate the teaching and learning process in a number of ways. They include: it makes use of all the main assessment types, such as placement, diagnostic, formative, and summative. When these assessments are carried out, they inform the lecturer on the level, difficulties, and level of mastery of the students. They also give the lecturer information on the best strategies that better suit these students. Multimedia assessment methods, which are more flexible, continue to enable the lecturer to choose teaching and learning activities that are learner-friendly, which facilitates learning, and they also enable the structuring of the teaching and learning process to meet both collective and individual professional needs.

Theme 4: Didactic quality

Findings

Responding to the question, what new elements does multimedia-based pedagogy introduce in classroom learning content, learning activities, and learning materials? The

participants at 100% acknowledge that multimedia is very modern and represents the instructional method of the time that makes classroom learning content, learning activities, and learning materials through audios, videos, and animation very visible, active and participation-oriented, organised, dynamic, motivating, practical, modern, time-serving, facilitates research, and is digital. Therefore, as compared to the traditional method, which is not very visible, not concretely active and participation-oriented, not very motivating and practical, not modern nor digital, makes time management very complicated and makes research very complicated and demanding, its universality is difficult to establish.

Participants in the focus group at 100% thought that multimedia-based pedagogy has greatly improved the quality of instructional materials as compared to traditional instructional methods. This is done by ensuring that its processes are carefully planned with respect to the objectives of the lesson and the course, learning activities, resources, and materials. The use of gadgets such as multimedia computers, multimedia phones, microphones, loud speakers, multimedia projectors, and internet resources has greatly facilitated the quality of instructional procedures, strategies, processes, and styles. It has brought in modern didactic materials and resources that make instruction and learning very visible and concrete. This is done by meeting the learning needs of all types of learners, be they audio, visual, or kinaesthetic-oriented.

Theme 5: Technical Quality

Findings

According to a majority (75%) of the participants in the focus group, technical quality in multimedia-based pedagogy refers to the satisfactory state of the tools and resources used in multimedia-based teaching. While a minority of 25% held the view that technical quality in multimedia-based pedagogy refers only to the state of equipment or apparatus used in the multimedia instructional process. However, they all agreed on the state of tools or equipment but differed in the case of resources. The latter argued that technical quality has to do with physical things that can be seen, touched, and manipulated, while the majority (75% of respondents) thought technical quality goes beyond physical items to include resources and, why not, skills? Some of these resources and skills (techniques) are not very visible, but their results are, and an example presented was a software or internet connection, which is not physical but whose state greatly influences the quality of multimedia-based pedagogy.

On the issue of the reinforcement role played by design and browsing in multimedia pedagogy. The participants felt that multimedia-based pedagogy's design determines how learning is facilitated, the nature of learning activities, and the resources and materials to be used. If the design has taken all these into consideration and has been efficiently constructed, the instructional and learning processes in multimedia-based pedagogy will be greatly enhanced. Browsing facilitates research, thereby facilitating students in knowledge construction and skill development. Therefore, a lecturer (teacher) or student equipped with good browsing knowledge and skills will be very instrumental in the multimedia-based pedagogy processes. According to the participants, technology, especially ICTs, is the foundation of multimedia-based pedagogy. Technology plays a great role in reinforcing multimedia-based pedagogy from conception, planning, design, implementation, transferability, and monitoring and evaluation processes.

Theme 6: Students' professional development

Findings

At a rate of 100%, the participants in the focus group acknowledged the fact that multimedia-based pedagogy significantly influences students' professional development by addressing students' professional needs and providing digital learning support. They argued that multimedia-based pedagogy, when well-structured or designed, takes into consideration both the individual and collective professional needs of students. This is because in professional-oriented programmes, students are trained to meet up with professional challenges after school. This process, according to participants, is being strengthened by multimedia-based pedagogy through its diverse mediums, such as audio, video, audio-visual, animation, and online and offline resources. Multimedia-based pedagogy in both online and offline mediums facilitates students' professional development through accessibility to information, help, and exposure to the realities of the particular field of professional study and work.

The participants in the focus group discussed the quality of multimedia-based pedagogy and its impact on students' professional development and also expatiated on the role played by classroom assessment in developing students' professional skills in multimedia-based pedagogy. They thought that classroom assessment also assesses the various qualities (academic, pedagogic, didactic, and technical) as well as their components

(information relevance, validity, and reliability; pedagogic planning, implementation, and methods of assessment; learning content, activities, and materials; design, browsing, and technological ingenuity) with respect to the development of professional knowledge, skills, and abilities, as well as the level of competency. This will lead to reinforcing or restructuring multimedia-based pedagogy programmes to better suit their professional development objectives and goals.

According to the participants (100%), multimedia-based pedagogy assessment methods, which are holistic, create opportunities for the students to construct professional knowledge, build professional skills, develop problem-solving abilities, and consolidate competences. This is done through the use of modern technologies, especially Information and communication Technologies such as the whiteboard; gadgets such as multimedia computers, multimedia projects, multimedia phones, palmtops, microphones, and multimedia and loud speakers that produce audio sounds, videos, and animation; and resources such as the internet, which facilitate research and sharing of information for professional development purposes and for better performance in and out of the classroom during theoretical and practical assessment. Also, the participants hold that multimedia assessment methods are more objective and goal-oriented. Thereby, facilitate the processes of meeting up with students' professional needs and redirect as well as orient students on developing professional knowledge and skills exploiting digital learning support.

5.5.0. SUMMARY REPORT ON FOCUS GROUP DISCUSSIONS (FINDINGS)

The discussion of the focus group's findings will highlight how, by addressing students' professional needs, offering digital learning support, and incorporating classroom assessment inputs, the effectiveness of multimedia-based pedagogy influences students' professional development to a significant (dynamic and complex) degree. A variety of perspectives and experiences are presented, and six (6) underlying themes are examined. These points of view and judgements are situated within the context of the calibre of multimedia-based professional development.

Themes on academic quality, pedagogic quality, didactic quality, and technical quality are therefore not the only factors that determine the quality of contemporary education; rather, they reflect multimedia-based evaluation patterns that pose difficulties for the Cameroonian higher education sector. These conversations with eight (8) participants took place on a WhatsApp group platform for five (5) months, from June 2019 to November 2019,

lasting 100 + 22 minutes. These participants, who came from the four (4) participating institutions, responded when it suited them. Interventions that were original and creative were required if we were to fully comprehend how multimedia-based pedagogy affected students' professional development.

5.5.1 Theme 1: Multimedia based pedagogy and Professional development

` Respondents presented, and many agreed on the view that multimedia-based pedagogy has to do with the use of modern ICT tools such as computers, multimedia projectors, audio and video gadgets, audio-visual resources, and the collection of teaching strategies that are active and strive to meet the needs of all the learners. As stated by some respondents:

"*In my opinion, multimedia-based pedagogy is teaching entirely done with the use of modern ICT tools such as computers, audios, videos, audio-visuals, and projections.*"

"*To add to the above-mentioned tools, I wish to state that the internet is a very essential tool or resource today when discussing multimedia-based pedagogy.*"

Students' professional development was agreed upon by all the respondents to refer to the acquisition of knowledge, skills, abilities, and competences for the practise of a particular profession in a particular field of study, which should have the characteristics of transferability, integration, and practicability. Stated by some respondents:

"*Students professional development, in my opinion, is the ability of students to first of all desire a profession based on personal or economic reasons and know how, and then build up knowledge, skills, and abilities that will practically improve the profession.*"

"*I believe we cannot discuss students' professional development without stating that whatever knowledge, skills, and abilities students acquire or develop through training should be transferable, integrative, and above all, practical. A student can be said to be developing professionally."*

The participants unanimously accepted that multimedia-based pedagogy influences students' professional development, but for diverse reasons. According to some of the participants, multimedia-based pedagogy creates learning opportunities that expose students to universal professional knowledge, skills, abilities, and competences in their field of

specialisation. This is done through audio, video, audio-visual, and internet resources. Stated by a respondent:

"*Yes, greatly. The world is gradually becoming a global village, like wise professional skills Therefore, for a student to fit into the global world, multimedia-based pedagogy is an educational platform and tool that exposes students to universal knowledge, skills, and abilities and develops competences with the help of audio, video, audio-visual, and internet resources; above all, it exposes students to vast opportunities needed for better professional development*.

Another school of thought held that multimedia-based pedagogy enhances the professional development of students by meeting the needs of diverse learners (audio, visual, and kinaesthetic), which accelerates the effective and efficient internalisation of knowledge, the development of skills and abilities, and the consolidation of competences. Stated by a respondent:

"*My personal experience and point of view, I would say yes. Given that multimedia-based pedagogy makes use of audio, video, audio-visual, and internet resources, students' professional development is met by facilitating learning for all types of learners (audio, visual, and kinaesthetic) in the professional course or programme. With multimedia-based pedagogy, irrespective of the type of learner a student is, knowledge acquisition, skill and ability development, and consolidation of competences are not only accelerated but are effective as well as efficient.*"

The third school of thought held that multimedia-based pedagogy uses modern technology that the youth or learners are familiar with, if not addicted to. Therefore, students enjoy and are motivated to effectively and efficiently learn with these technological and digital tools, hence their professional development. Stated by a respondent:

"*From my observations, yes. Multimedia-based pedagogy makes use of modern technological tools, which our generation can be said to be not only familiar with but addicted to. I have personally noticed that our class is highly motivated, and assimilation (learning) is facilitated when a lecturer uses technological or digital tools in teaching. In my opinion, they make learning very visible and the practical part simple. Practicality is a very important*

component in a student's professional development because it is the skills and abilities employers or the job market is waiting for."

5.5.2. Multimedia Qualities

This section looks at the focus group respondent views on the academic, didactic, pedagogical, and technical factors that commonly affect the effectiveness of multimedia based pedagogy.

5.5.2.1. Theme 2: Academic quality

With respect to multimedia-based pedagogy respecting academic quality, the respondents acknowledged that multimedia-based pedagogy respects academic quality for diverse reasons. The first respondent explained that the world has become a global village with the use of the internet and other ICT tools. Therefore, the academic quality of the content taught and their procedures can easily be verified, even by the students, to see if they meet norms and standards. Stated by a respondent:

"*I strongly hold to the view that the world has become a global village, especially with the use of the internet and other ICT tools, as we discussed earlier. Therefore, today it takes less than a few minutes or hours to verify the academic quality of the content being taught, as well as procedures that can easily be verified even by the students to see if they meet national or universal norms and standards. These verifications have even given comparative education much popularity*.

The second group of respondents felt that multimedia-based pedagogy is a programme implementation method and therefore can only effectively and efficiently execute the content of the programme. Therefore, the issue of academic quality in multimedia-based pedagogy is in the direction of implementation. Responded by a respondent:

"*I will like to differ in that I see multimedia-based pedagogy as a programme implementation method and therefore can only effectively and efficiently execute the course content of the programme. With this, academic quality in multimedia-based pedagogy is mainly in the domain of programme implementation. Therefore, it can be said to have academic quality because it is used to implement the prescribed curriculum*.

The third group of respondents stated clearly that their institutions are under the direct supervision of the Cameroonian ministry of higher education, which has elaborated norms and standards to be followed, and these standards are verified through quality evaluation or assessment from time to time. Stated by a respondent:

"*Most of our universities are under the direct supervision of the Cameroonian Ministry of Higher Education, which has elaborated norms and standards that are obligatory for higher education administrators, programme developers, and lecturers (programme implementers) to follow, and we believe these standards are often verified by the ministry through quality evaluation or assessment*.".

The respondents stated that the material taught respects the official programme designed by the institution, the documents used have standards and verifiable references with respect to courses or programmes under study, The contents are positively impactful with respect to developing knowledge, skills, and abilities and also guide towards building professional competences, and multimedia-based pedagogy facilitates students exposure to the reality of the professional world. Furthermore, respondents acknowledged that the information presented in the course of multimedia-based pedagogy is relevant to academic quality or standards because it facilitates students' construction of knowledge, the development of skills and abilities, as well as competences in their field of study. These they have notice of when they go out for internships or practical activities in and out of campus. A respondent stated:

"*I believe the material taught using multimedia-based pedagogy (modern communication technologies) respects the official programme designed for our school. From my observations, the documents used have standards and verifiable references with respect to the courses or programmes we are studying; the contents have positively impacted me with respect to developing knowledge, skills, and abilities and also guide towards building professional competences; and multimedia-based pedagogy has facilitated my exposure to the reality of the professional world. This I noticed when I went for our second internship last year.*"

The participants accepted that the academic quality of multimedia-based pedagogy programmes influences students' professional development. However, to some, it depends on the forum and the mastery of the lecturer; to others, it depends on the tools and materials

used; and to a majority, it depends on the content and the instructional processes, as well as teaching and learning activities. With respect to the reliability of multimedia-based pedagogy with respect to academic quality, there was a school of thought that held that multimedia-based pedagogy has to do with quality implementation of courses and programmes. While the second school of thought held that multimedia-based pedagogy in today's world is easily digitalized and that digitalized information in higher education is structured to be reliable and respects the norms and standards of academic quality, Stated by some respondents:

"*I feel that multimedia-based pedagogy contains reliability with respect to academic quality because it has to do with the quality implementation of courses and programmes. Therefore, it has been experimented with, and the results obtained from its quality of course implementation have been observed to be consistent".*

"*In my opinion, multimedia-based pedagogy in today's world is easily digitalized, and digitalized information in higher education is structured to be reliable and respects the norms and standards of academic quality.*"

5.5.2.2. Theme 3: Pedagogic quality

"*From my experience, multimedia-based pedagogy makes learning very visible and practical. This is because it exposes the students to reality through audio, audio-visuals, and animations.*

Others stated that multimedia based pedagogy content is easily verified with other students who have taken the course or who are taking it at another institution and therefore has excellent pedagogic standards.

"*If I am permitted, there are no worries about verifying the quality of content taught via multimedia-based pedagogy. This is because verification in this digital age can be done digitally by contacting students who have taken the course or who are taking it at another institution. Technology has come to promote excellent pedagogic standards.*"

Many respondents expressed their experiences with multimedia instructional and learning processes as being concrete and practical. This is because the materials and activities carried out in the course of a multimedia-based pedagogy are effectively calculated and

planned. According to them, given that it facilitates concrete learning, it is of standard pedagogic quality. A respondent stated:

"*To add to the series of views projecting multimedia-based pedagogy as concrete and practical, I would like to state that from my observations, multimedia-based pedagogy lessons are well organised and planned. As a consequence, it enhances concrete learning and therefore should have standard pedagogic quality.*"

Respondents brought up a series of reasons why multimedia-based pedagogy was exceptional compared to other instructional methods. Stated by respondents:

"*In my opinion, multimedia-based pedagogy is different from traditional teaching approaches or methods in that it meets the needs of the different types of students (audio, visual, and kinaesthetic) found in the lecture hall or platform through its usage of audio, videos, audio-visual, and animation resources. Also, we have agreed that it is carefully planned and can exploit a series of instructional and learning resources at once, especially when using the internet.*

"*To add, I think MBP saves time and resources because there is little or no use for chalk and paper and the content material is easily transferable through diverse electronic means such as USB keys, email, WhatsApp groups, and on any platform because it is easy to digitalize.*"

"*Multimedia-based pedagogy is further different and better than other teaching and learning approaches in that its materials and resources are easy to revise and upgrade, thereby creating an opportunity for quality and standard content evolution. Also, its content sources and references are easily verified, making it very reliable*.

Although all respondents considered pedagogical implementation (instructional and learning) strategies in multimedia-based pedagogy to be effective, some respondents thought that it depended on the lecturer's mastery of the processes and choice of learning activities. However, they were seen as effective. Reaction from respondents:

"*I will like to state that from my experience, MBP strategies motivate the teaching and learning processes through their usage of images or visuals, audio, audio-visuals, and animation. They also greatly reduce time wastage and introduce effective time management because there is no board writing, irrespective of the fact that it is professionally planned*.

"*From my own experiences, multimedia based pedagogy has teaching strategies that give students the opportunity to be active and participate in the teaching and learning processes by asking and answering questions, working in teams and groups, and practically realising something.*"

"*To add to the contributions above, as per my experience, MBP strategies facilitate the transferability of knowledge and skills because they give us the opportunity to observe and carry out physical and practical activities as well as manipulations. And it also prepares students for professional life by enabling them to visualise realities in the field, especially through videos.*"

According to the respondents, multimedia based pedagogy and assessment methods facilitate the teaching and learning process in a number of ways. Stated by respondents:

"*It makes use of all the main assessment types, such as placement, diagnostic, formative, and summative. The administration of these assessment types orients the lecturer (teacher) on the level, difficulties, and level of mastery of the students; it also gives the lecturer information on the best strategies that better suit his or her students*".

"*Furthermore, I will like to add that multimedia-based pedagogy assessment methods, which are more continuing, enable the lecturer to identify and choose teaching and learning activities that are learner-friendly, that is, facilitate learning, and they also enable the structuring of the teaching and learning process to meet both collective and individual professional needs*".

5.5.2.3. Theme 4: Didactic quality

The respondents collectively acknowledged that multimedia-based pedagogy is very modern and represents the instructional method of the time that makes classroom learning content, learning activities, and learning materials through audios, videos, and animation very visible, active and participation-oriented, organised, dynamic, motivating, practical, modern, time-serving, facilitates research, and is digital. Therefore, as compared to the traditional method, which is not very visible, not concretely active and participation-oriented, not very motivating and practical, neither modern nor digital, makes time management very

complicated, and makes research very complicated and demanding, its universality is difficult to establish. Respondents reacted:

"*I have observed that teaching with ICT tools (multimedia-based pedagogy) is very modern and represents a teaching method of the time. It makes classroom learning content, learning activities, and learning materials through audios, videos, and animation very visible, active and participation-oriented, organised, dynamic, motivating, practical, modern, and time-serving. Therefore, it is better than traditional teaching approaches*".

Also, *we have experienced how MBP has facilitated research through digital resources, making it universal and dynamic as compared to the traditional method, which is not very visible, not concretely active and participation-oriented, not very motivating and practical, not modern nor digital, makes time management very complicated, makes research very complicated and demanding, and its universality is difficult to establish*".

Respondents expressed that multimedia-based pedagogy has greatly improved the quality of instructional materials as compared to traditional instructional methods. This is done, in the opinion of some, by ensuring that its processes are carefully planned with respect to the objectives of the lesson and the course, learning activities, resources, and materials. Respondents' reactions:

"*We can factually state today that multimedia-based pedagogy has brought about the use of gadgets such as multimedia computers, multimedia phones, microphones, loud speakers, multimedia projectors, and internet resources that have greatly facilitated the quality of instructional procedures, strategies, processes, and styles*".

"*MBP has brought in or made use of modern didactic materials and resources that make the teaching and learning processes very visible and concrete. These didactic materials and resources facilitate the attainment of the learning and professional needs of all types of learners or students*".

5.5.2.4. Theme 5: Technical quality

All of the responders concurred that multimedia-based pedagogy is quite modern and the dominant teaching method today. It makes the information being learned in a classroom more visible, active and participation-oriented, organised, dynamic, and inspiring, as well as

practical, modern, time-serving, and digital. Therefore, it is difficult to demonstrate the universality of the conventional technique since it is less apparent, less concretely active and participation-oriented, less inspiring and practical, neither modern nor digital, and it is very difficult to manage time and conduct research. Respondents said in response:

"*In my opinion, technical quality has to do with physical things that can be seen, touched, and manipulated.*"

"*From my point of view, I would like to throw more light on the concept of 'technical quality' by emphasising that technical goes beyond physical items to include resources and skills. Some of these resources and skills (techniques) are not very visible but their results are, and an example is a software or internet connection that is not physical but whose state greatly influences the quality of multimedia-based pedagogy*".

On the issue of the reinforcement role played by design and browsing in multimedia pedagogy. The respondents felt that multimedia-based pedagogy's design determines how learning is facilitated, the nature of learning activities, and the resources and materials to be used. Stated by a respondent:

"*I have observed that when the design takes efficiency into consideration during construction, the instructional and learning processes in multimedia-based pedagogy will be greatly enhanced and will reflect quality*".

To many of the respondents, browsing facilitates research, thereby facilitating students in knowledge construction and skill development. Stated by a respondent:

"*I have observed that lecturers (teachers) or students equipped with good browsing knowledge and skills are very instrumental in the multimedia-based pedagogy processes*".

According to the respondents, technology, especially ICTs, is the foundation of multimedia-based pedagogy. A respondent's reaction:

"*I have also experienced that modern technological tools play a great role in reinforcing multimedia-based pedagogy as well as improving the quality of instruction from perspectives of conception, planning, design, implementation, transferability, and monitoring and evaluation processes*".

5.5.3.0. Theme 6: Students' professional development

All respondents agreed that by addressing students' professional demands and offering digital learning assistance, multimedia-based pedagogy greatly influences students' professional development. According to respondents:

"*Multimedia-based pedagogy, from my point of view, when well-structured or designed, takes into consideration both our individual and collective professional needs. This is because in professional-oriented programmes, students are trained to meet up with professional challenges after school. This process and aspect are being strengthened by multimedia-based pedagogy through its diverse mediums, such as audio, video, audio-visual, animation, and online and offline resources*".

"*To add, multimedia-based pedagogy in both online and offline mediums facilitates students' professional development through accessibility to information, help, and exposure to the realities in the particular field of professional study and work*".

The respondents in the focus group discussed the quality of multimedia-based pedagogy and its impact on students' professional development and also expatiated on the role played by classroom assessment in developing students' professional skills. Stated by respondents:

"*Classroom assessment, from my observation, also assesses the various multimedia qualities (academic, pedagogic, didactic, and technical) as well as their components (information relevance, validity, and reliability; pedagogic planning, implementation, and methods of assessment; learning content, activities, and materials).*"

"*Also, design, browsing, and technological ingenuity with respect to the development of professional knowledge, skills, and abilities, as well as the level of competency, are easily developed. This leads to the reinforcement or restructuring of multimedia-based pedagogy programmes to better suit their professional development objectives and goals*".

All respondents agreed with the respondent who viewed multimedia-based pedagogy assessment methods as holistic, creating opportunities for the students to construct

professional knowledge, build professional skills, develop problem-solving abilities, and consolidate competences. A respondent's reactions:

"*I have experienced that through the use of modern technologies, especially Information and communication Technologies such as whiteboards, gadgets such as multimedia computers, multimedia projectors, multimedia phones, palmtops, microphones, and loud speakers that produce audio sounds, videos, and animation, and resources such as the internet that facilitate research and sharing of information for professional development purposes, thereby improving students' performance during theoretical and practical assessment*,

"*I will like to confess that multimedia-based assessment methods are more objective and goal-oriented. They facilitate the processes of meeting up with our professional needs and redirect as well as orient us on developing professional knowledge and skills exploiting digital learning support*".

5.7.0. CONCLUSION

An analytical presentation of data and findings has been made in this chapter. Also, the research work in this section of the research report presents the results obtained from the study and analyses of collected data from the field. This is done by using percentages, tables, charts, frequency, graphs, and correlation. The first section focused on the descriptive analysis of the identified characteristics. The second section examined the focus group discussion, and the fourth section did hypothesis verification. The presentation of the distribution of the target population for each of the variables through demographic (background) information was presented. Also, focus was laid on the presentation of data collected from students and the findings of focus group discussions. A summary report on the findings of focus group discussions was presented according to the respective themes (academic quality, pedagogic quality, didactic quality, technical quality, and their relationship with students' professional development). Furthermore, the verification of research hypotheses was done following research hypotheses, and measures (summaries) of the quality of multimedia-based pedagogy and students' professional development were analytically discussed.

CHAPTER SIX
INTERPRETATION OF RESULTS, RECOMMENDATIONS AND CONCLUSION

6.0. INTRODUCTION

This chapter tries to evaluate the results acquired, describe the study's conclusions, make recommendations to address the phenomena, and provide advice for future scholars in the field on what more research to pursue.

6.1.0. SUMMARY OF FINDINGS

The purpose of the study was to assess the quality aspects of multimedia based pedagogy factors that affect students' professional development.

Four research hypotheses were developed in order for the researcher to carry out this study. The main research tools were a questionnaire and a focus group discussion (interview). The mean, standard deviation, and Pearson correlation were used in the collection and analysis of the data. The analysis produced the following results:

1. The academic quality of multimedia based pedagogy has a significant influence on students' professional development.
2. The pedagogical quality of multimedia based pedagogy has a significant influence on students' professional development.
3. The didactic quality of multimedia based pedagogy has a significant influence on students' professional development.
4. The technical quality of multimedia based pedagogy has a significant influence on students' professional development.

6.1.1. Summary findings according to research questions

Research Question 1: To what extent does the academic quality of multimedia based pedagogy influence students' professional development?

There is a significant relationship between features (characteristics) of academic quality and students' professional development in multimedia based pedagogy programmes. The findings expose that, on average, from students' responses, 19% of the variance in

students' professional development is explained by academic quality and vice versa. This therefore means that 19% of the variance in academic quality is influenced by students' professional development and vice versa. Therefore, features of academic quality, namely, information relevance, information validity, and information reliability, are influential on students' professional development components of addressing students' professional needs, digital learning, and classroom assessment. Therefore, there is a significant correlational relationship between the academic quality of multimedia-based pedagogy and students' professional development. This confirms research question one (1).

Findings of focus group discussions with respect to multimedia-based pedagogy respecting academic quality: with diverse reasons, the respondents with a 100% rate acknowledged the fact that multimedia-based pedagogy respects academic quality. Responding to the question of whether multimedia-based pedagogy respects academic quality. All the respondents in the focus group, at a rate of 100%, agreed that it does. Furthermore, 100% of the respondents acknowledge that the information presented in the course of multimedia-based pedagogy is relevant to academic quality or standards. The participants, though with divergent views, all (100%) accepted that the academic quality of multimedia based pedagogy programmes greatly influences students' professional development. However, to some, it depends on the forum and the mastery of the lecturer; to others, it depends on the tools and materials used; and to a majority of about 50%, it depends on the content and the instructional processes, as well as teaching and learning activities.

Therefore, there is a significant correlational relationship between the academic quality of multimedia based pedagogy and students' professional development, according to the conclusion arrived at from the findings of both the survey and the focus group discussion. These findings entirely confirm research question one (1).

Research Question 2: To what extent does the pedagogical quality of multimedia based pedagogy influence students' professional development?

There exists a significant relationship between characteristics of pedagogic quality and students' professional development in multimedia based pedagogy. The results of the findings indicate that an average of 12% of the variance in students' professional development is explained by pedagogic quality and vice versa. This therefore means that 12% of the variance in pedagogic quality is influenced by students' professional development and

vice versa. Therefore, characteristics of pedagogic quality, namely, pedagogical planning, pedagogical implementation, and method of assessment, are influential on students' professional development components of addressing students' professional needs, digital learning, and classroom assessment. Therefore, there is a significant correlational relationship between the pedagogic quality of multimedia based pedagogy and students' professional development. This confirms research question 2.

This question is also answered by the findings from the focus group discussions. Multimedia-based pedagogy was considered by all respondents at a rate of 100% to be of standard pedagogic quality. 25% of the participants confessed that it makes learning very visible and practical while concretely exposing students to concrete realities through audio, video, and animation. Another 25% of the participants said that from their experience, multimedia-based pedagogy contents are easily verified with other students who have taken the course or who are taking it at another institution and therefore have excellent pedagogic standards. A third group of participants, made up of 50% of the participants in the focus group discussion, expressed their experiences with multimedia instructional and learning processes as being concrete and practical.

Although 100% of the respondents considered pedagogical implementation (instructional and learning) strategies in multimedia-based pedagogy to be effective, about 37.5% of the participants thought that it depended on the lecturer's mastery of the processes and choice of learning activities. According to the participants, multimedia based pedagogy and assessment methods facilitate the teaching and learning process in a number of ways. Therefore, there is a significant correlational relationship between the pedagogic quality of multimedia-based pedagogy programmes and students' professional development, according to the conclusion arrived at from the findings of both the survey and the focus group discussion. These findings entirely confirm research question 2 (2).

Research Question 3: To what extent does the didactic quality of multimedia based pedagogy influence students' professional development?

There is a correlational relationship between features (characteristics) of didactic quality and students' professional development in multimedia based pedagogy. The findings expose that, on average, from students' responses, 8% of the variance in students' professional development is explained by didactic quality and vice versa. This therefore

means that 8% of the variance in didactic quality is influenced by students' professional development and vice versa. Therefore, features of didactic quality, namely, learning content, learning activities, and learning materials, are influential on students' professional development components of addressing students' professional needs, digital learning, and classroom assessment. Therefore, there is a significant correlational relationship between the didactic quality of multimedia based pedagogy and students' professional development. This confirms research question 3.

In the focus group discussion, the respondents at a 100% rate acknowledged that multimedia is very modern and represents the instructional method of the time that makes classroom learning content, learning activities, and learning materials through audios, videos, and animation very visible, active and participation-oriented, organised, dynamic, motivating, practical, modern, time-serving, facilitates research, and is digital. Respondents at 100% held the view and expressed the experience that multimedia-based pedagogy has greatly improved the quality of instructional materials as compared to traditional instructional methods. Therefore, there is a significant correlational relationship between the didactic quality of multimedia based pedagogy and students' professional development, according to the conclusion arrived at from the findings of both the survey and the focus group discussion. These findings entirely confirm research question 3.

Research Question 4: To what extent does the technical quality of multimedia-based pedagogy influence students' professional development?

There is a correlational relationship between features (characteristics) of technical quality and students' professional development in multimedia based pedagogy programmes. The findings show that an average of 8% of the variance in students' professional development is explained by technical quality and vice versa. This therefore means that 8% of the variance in technical quality is influenced by students' professional development and vice versa. Therefore, features of technical quality, namely, design, browsing, and technological ingenuity, are influential on students' professional development components of addressing students' professional needs, digital learning, and classroom assessment. Therefore, there is a significant correlational relationship between the technical quality of multimedia based pedagogy and students' professional development. This confirms research question 4.

The above conclusion is given more in depth in the focus group discussion. According to 75% of the respondents in the focus group, technical quality in multimedia-based pedagogy refers to the satisfactory state of the tools and resources used in multimedia-based teaching. While a minority of 25% held the view that technical quality in multimedia-based pedagogy refers only to the state of equipment or apparatus used in the multimedia instructional process. Also, 75% thought technical went beyond physical items to include resources and skills. Some of these resources and skills (techniques) are not very visible, but their results are, and an example presented was a software or internet connection, which is not physical but whose state greatly influences the quality of multimedia based pedagogy.

On the issue of the reinforcement role played by design and browsing in multimedia pedagogy. All the respondents (100%), though with divergent views, experienced that multimedia-based pedagogy's design determines how learning is facilitated, the nature of learning activities, and the resources and materials to be used. Browsing facilitates research, thereby facilitating students in knowledge construction and skill development. Therefore, technology plays a great role in reinforcing multimedia based pedagogy from conception, planning, design, implementation, transferability, and monitoring and evaluation processes. Hence, it significantly influences professional development. Therefore, there is a significant correlational relationship between the technical quality of multimedia based pedagogy and students' professional development, according to the conclusion arrived at from the findings of both the survey and the focus group discussion. These findings entirely confirm research question 4.

6.1.2. Summary findings according to hypotheses

This research work used the following alternative hypotheses:

Research Hypothesis 1: The academic quality of multimedia based pedagogy has a significant influence on students' professional development.

SPSS version 20 was used in conducting data analysis on academic quality and students' professional development in multimedia based pedagogy. The Pearson Product-moment correlation coefficient (r) for students with respect to Pearson correlation for academic quality and students' professional development resulted in a coefficient of 0.43; significance stood at 0.00, indicating a significance level of 0.01 (2-tailed). We can therefore

scientifically reject the null hypothesis (Ho) (The academic quality of multimedia-based pedagogy has no significant influence on students' professional development) and scientifically retain the alternative hypothesis (Ha). Therefore, the academic quality of multimedia-based pedagogy has a significant influence on students' professional development.

This conclusion is reinforced by the findings of focus group discussions. With respect to multimedia-based pedagogy respecting academic quality, the respondents with a 100% rate acknowledged the fact that multimedia based pedagogy respects academic quality for diverse reasons. Responding to the question of whether multimedia based pedagogy respects academic quality. All the respondents in the focus group, at a rate of 100%, agreed that it does. Furthermore, 100% of the respondents acknowledge that the information presented in the course of multimedia based pedagogy is relevant to academic quality or standards.

Despite the fact that every respondent agreed that multimedia based pedagogy's instructional and learning strategies were effective, roughly 37.5% of respondents claimed that this depended on the lecturer's familiarity with the techniques and choice of learning activities. According to the participants, multimedia based pedagogy and evaluation approaches support teaching and learning in a variety of ways. The second hypothesis (Ha) is therefore retained in relation to focus group talks while the null hypothesis (Ho) is disregarded. The results of the focus group talks and the survey analysis thus show that the pedagogical effectiveness of multimedia based pedagogy has a significant relationship with students' professional development.

Research Hypothesis 2: The pedagogical quality of multimedia-based pedagogy has a significant influence on students' professional development.

The Pearson Product-moment correlation (r) for pedagogic quality and students' professional development resulted in a coefficient of 0.34, and significance stood at 0.00, indicating a significance level of 0.01 (2-tailed). Therefore, the null hypothesis (Ho) (that the pedagogical quality of multimedia based pedagogy has no significant influence on students' professional development) is rejected, while based on scientific norms, the alternative hypothesis (Ha) is retained. In this light, the pedagogical quality of multimedia based pedagogy has a significant relationship with students' professional development.

This result was confirmed by the findings from the focus group discussions. Multimedia based pedagogy was considered by all respondents at a rate of 100% to be of standard pedagogic quality. 25% of the participants confessed that it makes learning very visible and practical while concretely exposing students to concrete realities through audio, video, and animation. Another 25% of the participants said that from their experience, multimedia-based pedagogy content is easily verified with other students who have taken the course or who are taking it at another institution and therefore has excellent pedagogic standards. A third group of participants, made up of 50% of the participants in the focus group discussion, expressed their experiences with multimedia instructional and learning processes as being concrete and practical.

Although 100% of the respondents considered pedagogical implementation (instructional and learning) strategies in multimedia based pedagogy to be effective. About 37.5% of the participants thought that it depended on the lecturer's mastery of the processes and choice of learning activities. According to the participants, multimedia based pedagogy and assessment methods facilitate the teaching and learning process in a number of ways. The null hypothesis (Ho) is therefore, with respect to focus group discussions, rejected, while the alternative hypothesis (Ha) is retained. Therefore, the pedagogic quality of multimedia based pedagogy has a significant influence on students' professional development, as proven by both the survey analysis and focus group discussion findings.

Research Hypothesis 3: The didactic quality of multimedia-based pedagogy has a significant influence on students' professional development.

The Pearson Product-Moment Correlation (r) between instructional quality and students' professional growth had a coefficient of 0.29 and a significance level of 0.00, or 0.01 (2-tailed), according to the analysis. The alternative hypothesis (Ha) can therefore be maintained while scientifically rejecting the null hypothesis (Ho) (The didactic quality of multimedia based pedagogy has no substantial influence on students' professional growth). As a result, the effectiveness of multimedia based pedagogy has a relationship with how students professional growth.

The Pearson Product-moment correlation (r) for didactic quality and students' professional development resulted in a coefficient of 0.29, and significance stood at 0.00, indicating a significance level of 0.01 (2-tailed). We can therefore scientifically reject the null

hypothesis (Ho) (The didactic quality of multimedia based pedagogy programmes has no significant influence on students' professional development) and retain the alternative hypothesis (Ha). Therefore, the didactic quality of multimedia based pedagogy has a significant influence on students' professional development.

The survey result is strongly supported by the focus group discussion findings. Responding to the question on the new elements that multimedia-based pedagogy has introduced in classroom learning content, learning activities, and learning materials The participants at 100% acknowledge that multimedia is very modern and represents the instructional method of the time that makes classroom learning content, learning activities, and learning materials through audios, videos, and animation very visible, active and participation-oriented, organised, dynamic, motivating, practical, modern, time-serving, facilitates research, and is digital. Respondents in the focus group held the view and experience that multimedia based pedagogy has greatly improve the quality of instructional materials as compared to traditional instructional methods.

Based on the findings of the focus group discussion, the null hypothesis (Ho) is rejected and the alternative hypothesis (Ha) is retained. Therefore, the didactic quality of multimedia based pedagogy has a significant influence on students' professional development, as shown by both the survey analysis and focus group discussion findings.

Research Hypothesis 4: The technical quality of multimedia-based pedagogy has a significant influence on students' professional development.

The Pearson Product-moment correlation for technical quality and students' professional development resulted in a coefficient of 0.28, and significance stood at 0.00, indicating a significance level of 0.01 (2-tailed). In this light, the null hypothesis (Ho) (The technical quality of multimedia based pedagogy has no significant influence on students' professional development) is rejected, while on a scientific basis, the alternative hypothesis (Ha) is retained. Therefore, the technical quality of multimedia based pedagogy has a significant influence on students' professional development.

The above conclusion is given more in depth in the focus group discussion. According to 75% of the respondents in the focus group, technical quality in multimedia based pedagogy refers to the satisfactory state of the tools and resources used in multimedia based teaching.

While a minority of 25% held the view that technical quality in multimedia based pedagogy refers only to the state of equipment or apparatus used in the multimedia instructional process. Also, 75% thought technical went beyond physical items to include resources and skills. Some of these resources and skills (techniques) are not very visible, but their results are, and an example presented was a software or internet connection, which is not physical but whose state greatly influences the quality of multimedia-based pedagogy.

On the issue of the reinforcement role played by design and browsing in multimedia based pedagogy. All the respondents (100%), though with divergent views, experienced that multimedia-based pedagogy's design determines how learning is facilitated, the nature of learning activities, and the resources and materials to be used. Browsing facilitates research, thereby facilitating students in knowledge construction and skill development. Therefore, technology plays a great role in reinforcing multimedia based pedagogy from conception, planning, design, implementation, transferability, and monitoring and evaluation processes. The null hypothesis (Ho) is therefore, with respect to focus group discussions, rejected, while the alternative hypothesis (Ha) is retained.

Therefore, the technical quality of multimedia based pedagogy has a significant influence on students' professional development, as proven by both the survey analysis and focus group discussion findings.

6.2.0. INTERPRETATION OF RESULT

Based on the conclusions drawn from the study's findings and the authors' personal beliefs, this part will concentrate on discussing each of the study's hypotheses. This study sought to determine whether the level of multimedia based instruction and students' professional development were related. To highlight the findings, academic, pedagogic, didactic, and technical features were utilised. A survey was conducted on students of four (4) higher institutions of learning in Cameroon conducted using questionnaires. We'll talk about research hypotheses below.

6.2.1. The academic quality of multimedia based pedagogy has a significant influence on students' professional development.

Findings show that students' professional development is highly influenced by the

academic quality of multimedia based instruction. A 0.34 value was obtained for the Pearson association between academic standards and students' professional development. The significance level was 0.01 (2-tailed), while the value for significance was 0.00. With a variance value of 19% and a coefficient of determination (r2) of 0.19, it is clear that the independent variable and vice versa are responsible for 19% of the variance in the dependent variable.

This is consistent with the conclusions reached from focus group talks. Regarding the regard for academic excellence shown by multimedia based pedagogy, the respondents agreed that this respect is shown for a variety of reasons.

This is in conformity with Shrestha (2010) in Yarmohammadiana et al. (2011) hold that in relation to academic quality, there exist seven dimensions that when graduates are employed their employers use them to evaluate the academic quality of the faculty, program, course and even the educational administrators. It involves leadership skills in teaching (pedagogy), leadership skills in research, skills in fair and efficient management, visionary spirit and strategic skills, participative leadership skills, development orientation, and ability to recognition and manifestation of interpersonal skills. These are skills developed in the course of professional development during training. Therefore, the academic quality of multimedia based pedagogy does not only impact students' professional development while in school but also while working.

The findings from the focus group discussions show that respondents, though with divergent views, all (100%) accepted that the academic quality of multimedia-based pedagogy programmes influences students' professional development. This is in line with Hogg and Hogg (1995) in Yarmohammadiana et al. (2011), who maintain with respect to the changing rate of society that most graduates are frustrated as most stakeholders in society are calling for changes in the higher education system to meet the demands of society as they consider current graduates as not sufficiently efficient. This shows that the academic quality of higher education needs to be improved with much effort with respect to societal expectations. This can be done by improving students' professional development (performance) through innovative teaching methods such as multimedia-based instruction, which has the potential to lead to the supply of competent and efficient graduates into society who will be able to meet up with and adapt to the changing labour market and society.

With respect to multimedia technology quality in the teaching and learning process, Ljubojevic et al. (2014) hold that there has been great exploitation of multimedia technology in the vision of innovations and inventions in the teaching and learning process for the improvement of the process. Gardener (2000) and Ljubojevic et al. (2014) affirm in line with the cognitive theory of multimedia learning that tools such as videos are used in the teaching and learning process to engage the linguistic (verbal), spatial (visual), and rhythmic (musical) intelligence of participants in the instruction and learning process, and with the advent of autolearning, videos have played a very important key role.

On the other hand, Marques (2012) and Ljubojevic et al. (2014) put more input into multimedia-based instruction as a method that improves the academic quality of an institution due to the positive effects of video clip features that are dynamic, multisensory, and have the capacity of attracting and retaining attention for a much longer period. For this reason, according to Marques (2012), multimedia tools such as video are instruments used in engineering education.

The Pearson correlation between academic quality and students' professional development resulted in a coefficient of 0.34. Significance stood at 0.00, indicating a significance level of 0.01 (2-tailed), which confirms multimedia-based pedagogy information accuracy. Accuracy of information is considered by Tworek (2018) to be the first most important factor with respect to information reliability and is followed by accessibility of information. Multimedia-based instruction in highly educated areas needs to guarantee the accuracy of information and skills transmitted to students through the different instruction mediums used (classroom, online, or offline).

Also, the information should not only be accurate but accessible to all (students, colleagues, administration, and all other stakeholders). This will facilitate the assessment or evaluation of the reliability of the information. They will be able to compare the information on that course or programme at other sister institutions or universities to determine its level of validity. One of the major roles of multimedia-based pedagogy in higher education is to facilitate information reliability in curriculum (curriculum) implementation, which in turn enhances students' professional development.

Furthermore, in conformity with the findings of this research work, Mizikaci (2006) holds that information relevance in higher education or institutions of learning is closely

linked to quality. Higher institutions of learning are organised or planned in such a manner that they are open, flexible to change (adapt to changing times), interactive, and holistic. The relevance of its features is highly considered in developing higher education programmes and courses to make it a quality s ystem.

The organisation of such systems in terms of information relevance is an essential component of the system's input and transformation processes, which result in quality output and make the system whole. For the relevance of the information to be established, there has to be a comprehensive and systematic evaluation system or approach in higher education institutions that reviews the relevance of information in its programmes and their function when it comes to practise. This evaluation approach determines and enhances education quality.

Also, the findings correlate with the views of Kane (2006) that information validity has to begin by making a clear statement on the purpose, predictive interpretations, and what the information will be used for. Furthermore, Cronbach (1980) shares the view that validity with information validity included has a tough job of thoroughly attempting to validate an instrument as well as the information gotten, and if the efforts do not succeed to show that the assessment instrument or information covers content matter, then the assessment (instrument) and information can be said to be invalid, but if it covers content, then it is said to be valid and can serve the intended purpose. AERA (2008) concludes that validity refers to the degree of support gotten from all accumulated evidence on the interpretation of a score from an assessment (test) for an intended purpose.

The results obtained from this research work prove the views of Tworek and his model are right with respect to information reliability in education. According to Zahedi (1987) in Tworek (2018), reliability as a theoretical concept in relation to information is a measurable component that is relevant in controlling, managing, determining quality, and indicating potential problems. In higher education, information reliability is very important in making the courses, programmes, and whole system effective and efficient. Tworek (2018) affirms that these components cannot be separated from efficiency. Information reliability can be said to be built based on factors from different theories, of which TAM (1985) and Tworek (2018) came up with the technological acceptance model. In fact, in today's higher education, it is difficult to verify the reliability of information, especially in multimedia-based instruction programmes, if technology is not accepted.

With respect to academic quality, Frye and Hemmer (2012) state that Kirkpatrick's four-level model has made significant contributions as far as evaluation in the education field is concerned. It has brought a lot of clarity to the outcome of educational processes and has clearly described the outcome of multimedia-based pedagogy to the extent that it goes beyond technical learner satisfaction. The author makes recommendations on how data should be gathered to make an assessment of his four-level model (approach), which is very profitable for students' professional development.

These levels are presented by Frye and Hemmer (2012) as: i. Learner's training satisfaction; ii. Learning measures attributed to the training such as knowledge to be acquired, skills to be developed, and attitudes to change; iii. Expected changes in behaviour taking into account the context of the training; iv. The final results of the training go beyond the immediate context of training. These levels indicate the process to arrive at an acceptable academic quality, which will result in students' professional development.

All of these support the favourable outcomes in terms of academic quality and its connection to students' professional development. The first study question, which is: To what extent does the academic quality of multimedia-based education influence students' professional development, is favourably supported by these responses.

6.2.2. The pedagogical quality of multimedia based pedagogy has a significant influence on students' professional development.

The results indicate that the pedagogic quality of multimedia based pedagogy significantly influences students' professional development. The Pearson correlation for pedagogic quality and students' professional development shows a coefficient of 0.29. Significance stood at 0.00, indicating a significance level of 0.01 (2-tailed). A coefficient of determination (r^2) of 0.12; therefore, 12% of the variance in the dependent variable has as a cause the independent variable. Therefore, 12% of the variance in students' professional development is explained by pedagogic quality and vice versa.

This is in conformity with the discussions and findings in the focus group, where multimedia-based pedagogy was considered by all respondents to be of standard pedagogic quality. Some of the participants confessed that it makes learning very visible and practical while concretely exposing students to concrete realities through audio, video, and animation.

Also, a number of other participants affirm that, from their experience, multimedia-based pedagogy content is easily verified with other students who have taken the course or who are taking it at another institution and therefore has excellent pedagogic standards.

A third of the group of participants in the focus group discussion expressed their experiences with multimedia instructional and learning processes as being concrete and practical. All the respondents considered pedagogical implementation (instructional and learning) strategies in multimedia-based pedagogy to be effective. A number of the participants thought that it depended on the lecturer's mastery of the processes and choice of learning activities. According to all the respondents, multimedia-based pedagogy and assessment methods facilitate the teaching and learning process in a number of ways.

The finding on the influence of the pedagogic quality of multimedia-based pedagogy on students' professional development is in accordance with the CIPP model, which according to On the other hand, Fritzpatrick et al. (2004) and Wang (2009) affirm that the objective of the CIPP model is to identify preliminary information on how a pedagogic programme or process will be structured to function efficiently. It takes into consideration the planning, strategies, and assessment phases of a pedagogic process for quality multimedia-based instruction purposes. Furthermore, context evaluation goes as far as identifying future students as well as their professional desires or needs in relation to stakeholders' expectations in relation to professional development.

The findings of this work are in conformity with those of Onguene Essono (2008), who examined the role of multimedia resources in education in Cameroon's educational system. According to Onguene (2008), the installation or creation of multimedia resource centres in private structures, high schools, and universities is a contributing factor to the pedagogic quality of these structures, schools, and higher education institutions. Furthermore, he emphasises that it is an indicator of political or government efforts in improving the quality of instruction and learning, facilitating the attainment of national educational aims, goals, and objectives, thereby closing up the gap created by the unemployment of graduates.

This finding is also in conformity with Dick et al. (2001), who affirm that instructional strategy plays the role of not only sequencing but organising learning content, specifying learning activities, and making decisions on how learning content and activities shall be delivered. Furthermore, Merril (2002) presents a number of instructional strategies or

architectures that can be considered during the process of planning strategies for multimedia or technology-based instruction.

These instructional strategies include: reception instruction, is lecture based or the use of an internet site mainly for provision of content or information to learners; directive instruction, which is a computer based tutorial used in presenting content, learners react and feedback is given and the process can be repeated over and over; guided discovery, has to do with learners manipulating a device or an environment with the help of computer simulation; and exploratory instruction that takes place in an open environment of learning, where in learners are gives access to network database rich in information and content from which the learners selects the content and information that meet their mental models and current needs. Therefore, the pedagogic quality of multimedia significantly influences students' professional development.

Also, Weber (2003) and Yarmohammadian (2004) in Yarmohammadiana, Mozaffaryb, and Esfahanic (2011) state that it has been proven by experience that higher education can provide effective and efficient services to communities when they are constantly improving the quality of their services through quality pedagogy. The basis of education and higher education in particular that determines the end product is the pedagogical process. In this contemporary time, multimedia-based pedagogy has proven to be an instructional method that improves the quality of pedagogic processes and, in turn, enhances students' professional development. In fact, the evidence is factual that the quality of multimedia based pedagogy significantly influences students' professional development.

The Pearson correlation for pedagogic quality and students' professional development shows a coefficient of 0.29. Significance stood at 0.00, indicating a significance level of 0.01 (2-tailed), in conformity with Nkwenti Ndongfack (2015), who established the role technology plays in developing teachers' competency in the teaching and learning process. In this light, teachers' multimedia-based instruction should be modelled to meet up with the changes in educational technology as schools strive to upgrade technologically as technology evolves.

According to Gurney (2007), in line with teachers' professional skills, effective teachers have to facilitate interaction by promoting interaction factors. These factors include among others, knowledge, responsibility, and enthusiasm for learning. Also, activities and

assessments planned and implemented by a professional teacher should motivate learning and provide engaging feedback; he should also create a warm relationship and environment with and for learners, respectively, in which mutual respect will prevail and facilitate learning. These facilitate students' professional development.

Also, to affirm this hypothesis, Stillings et al. (1995) maintain that cognitive scientists have also worked very hard to establish ways by which mental processes such as perception, refreshing, recalling, comprehension, communication, and not leaving out learning could be strengthened or reinforced through the use of multimedia devices and materials in teaching or instruction or in programme (curriculum) implementation known as multimedia-based pedagogy. Furthermore, Sorden (2005) concludes that cognitive science has been seen as very instrumental as a main insight as far as human nature is concerned, as well as human potentials, in the development of methods that are more effective and efficient in the teaching and learning process with the aid of quality multimedia pedagogy or technology-based instruction.

According to all the respondents in the focus group discussions, multimedia-based pedagogy and assessment methods facilitate the teaching and learning process in a number of ways. This is affirmed by Len-Kibinkiri (2018), who projects a number of communication techniques to be used by a lecturer or teacher in the teaching and learning process to ensure learners' participation in every activity in the curriculum. Also, Andrew (2011) believes that engaging learners in learning improves retention and mastery of content, improves learners' attitudes, lengthens their attention spans, increases the length of time spent on a task, and develops skills such as communication, critical thinking, interaction, reading, and writing, just to name a few. The development of these skills is facilitated by the use of multimedia in the teaching and learning process, which results in a classroom assessment that is skills development-oriented. Skills-development-oriented assessments greatly enhance student professional development.

The results of this study show that for a multimedia-based instruction programme to indicate excellent qualities and standards when evaluated, it has to be effectively and efficiently planned so as to also positively impact students' professional development and classroom assessment in particular. This is in accordance with Koontz and Weihrich (1994) see planning as a process that creates opportunities by setting objectives, developing a plan of action, and means of realisation. In instruction planning, the facilitator or teacher plans three

key components: 1. Delivery: which involves components such as topics, objectives, presentations, methods, objects, and content, just to name a few; 2. Content: Lesson planning (topics are sequenced), selecting tutorial strategy (presentation and assessment strategy) and execution (relevant knowledge sources);3. Execution: methods, strategies and materials. If the quality of planning is therefore of standard, the implementation and assessment will certainly be of quality.

The results from the study agree with Smith et al. (2014) that implementations have to do with processes used to enable the widespread and massive use of new practises. Furthermore, McGriff (2000) refers to implementation as the phase of actual practical delivery of instruction. It ensures learners understanding of taught material, supports learners' mastery and attainment of objectives, and secures the building of knowledge or skills in the learning and teaching process. In conformity with this view, Jabbarifar (2009) holds that instruction practises should include, amongst others, quality strategies, instructional activities and practises, tasks, and didactic materials to be exploited by both facilitators and students in the teaching and learning process in the classroom or any other instructional forum or medium for standard pedagogical quality.

Furthermore, in accordance with the results of this research work, Kay (2012) states that using video materials in instruction has significantly increased learners' activities, which has further led to effectiveness and efficiency in the teaching and learning process. Multimedia pedagogy has brought about both auto-study and interactive study, especially for those doing distance education. They do not have to always displace themselves physically (limited physical mobility), yet they still have frequent contact with study materials or content and study mates. Classroom assessments are therefore aimed at seeking multimedia methods of improving learning content and the quality of learners or audience work.

There is a lot of work on multimedia pedagogy, especially with a focus on the application of supplementary video in teaching as a tool for improving the quality of teaching and learning experiences and bringing efficiency to the teaching and learning process (Ljubojevic et al.). When there is quality and efficiency in the instruction and learning process, then it can be said with all certainty that students' professional development is realistic.

This gives a perfect positive response to research question two (2), which states that to what extent does the pedagogical quality of multimedia-based pedagogy programmes influence students' professional development?

6.2.3. The didactic quality of multimedia based pedagogy has a significant influence on students' professional development.

The findings confirm that the didactic quality of multimedia-based pedagogy significantly influences students' professional development. Pearson correlation for didactic quality and students' professional development resulted in a coefficient of 0.29, and the significance was at 0.1, indicating a significance level of 0.01 (2-tailed). The coefficient of determination (r^2) stood at 0.12; therefore, 12% of the variance in students' professional development is explained by didactic quality and vice versa.

Also, this is in accordance with the findings obtained from the discussions in the focus group, where the participants (respondents) acknowledged that multimedia is very modern and represents the instructional method of the time that makes classroom learning content, learning activities, and learning materials through audios, videos, and animation very visible, active and participation-oriented, organised, dynamic, motivating, practical, modern, time-serving, facilitates research, and is digital. Respondents in the focus group held the view and expressed the experience that multimedia-based pedagogy has greatly improved the quality of instructional materials as compared to traditional instructional methods. These, in turn, ensure students' professional development.

The findings of this study on the didactic quality of multimedia and professional development are in accordance with the Social Learning Theory of Bandura (1971), which focuses on social context learning. Didactic quality creates better opportunities for students to learn mutually by exploiting the concepts of learning by observation, imitation, and modelling. Therefore, there are professional knowledge, skills, competences, and attitudes that students learn by observing the behaviours and activities of others and their professional consequences, which must not result in quality professional development. This is because the students can strive to address their own needs, exploit digital support, and perform better in their classroom assessments.

This result is in conformity with Ghode (2012), who holds that modern technology has rendered didactic practises and aids easier, more effective, and more efficient, as teachers and students can easily access and examine information and material on the content to be taught and learned. Furthermore, the results concord with Cabero and Salinas (2000) in Barzega et al. (2012), where teaching and learning processes (activities) in educational institutions and establishments are being adapted to meet up with technological advances in the field of education as well as in professions. This adaptation is meant to keep up with the professional evolutions and revolutions going on in the world, with its base being modern technology. Therefore, the role of technology in the instructional process is imminent in preparing students qualitatively for future professions.

The results with respect to didactic quality in multimedia-based instruction and its impact on students' professional development are strongly supported by Kedzierska and Wnek-Gozdek (2015), who state that modern ICTs and multimedia tools support educational processes in schools and play a great role in promoting institutions in the web space. They further hold that educational administrators have seen and understood the important didactic role of ICTs and multimedia tools and methods in the educational process and are equipping not only teachers but also the administrative staff with information and technological tools accompanied by skills and competences through hybrid or predefined remote training. Academic institutions, especially in higher education, are more than ever willing to actively digitise their programmes to enable access to resources and the usage of multimedia equipment by teachers and students in the teaching and learning process so as to attain an effective didactic level with standard didactic practises and modern (technological) didactic materials, which will in turn facilitate students' professional development.

Furthermore, examining how multimedia operates in the instructional process Yamauchi (2008) states that the use of multimedia in instruction permits teachers to integrate into their lessons or lectures texts, images, animation, and graphics, amongst many others, into a single package, which facilitates the presentation of information to students in a comprehensive manner in order to attain specific objectives in a course. Also, multimedia tools and multimedia-based instructions in particular create opportunities for complicated processes to be demonstrated in an animated, highly interactive fashion in which the interconnection of instructional materials with related topics is done in a more intuitive and

natural way that facilitates comprehension and minimises confusion (Crosby and Stelovsky, 1995; Yamauchi, 2008).

With the relevance of the research findings to learning content as a didactic element, Hornung and Jakob-Haringerstrasse (2006), citing Mayer and Moreno (1998, 2003), focus on multimedia-based instruction content that has as its main objective to bring about meaningful and useful learning; therefore, developers and users should be guided or oriented on how to assess or evaluate the quality of multimedia-based instruction's learning content. This assertion is influenced by dual encoding theory, ACT-R production system theory, cognitive load theory, theory of the working memory, and cognitive theory of multimedia learning, making cognitive theories of great importance in content learning in the didactic process.

Furthermore, meaningful learning is described by the cognitive theory of multimedia learning as an in-depth comprehension of learning material (content) by the students, which has to do with mastery elements of the material presented and retention of relevant information in the auditory working memory and visual working memory. This information is later arranged into a mental structure, as well as inserting relevant and vital information into previous knowledge. This variable projects the quality of the pedagogic component of multimedia-based pedagogy to be very instrumental in students' professional development.

The findings affirm that learning activities are a key component in the didactic process, especially in higher education. Kedzierska and Wnek-Gozdek (2015) carried out a study on *selected innovative activities integrated with ICT*. Their focus was on learning activities carried out using interactive whiteboards, e-journals, multi-text books, multimedia interactive white boards, e-textbooks, multi-text books, students and parents MOODLE platforms (platforms for parents and students to work together), implementing online student MOODLE platform projects through the internet, Facebook, GG, blog creation, as well as school blog maintenance, and galleries.

There was a promotion of the school's virtual tour and presentation, which is interactive on the school's blog and website, the development of the school's Facebook page, and contacting students through the internet and SMS (Short Message Service). Excellent performance by students in learning activities was rewarded for motivational purposes. A series of online exercises were presented to students to execute during the learning process,

making learning with multimedia very interactive and performant (Kedzierska and Wnek-Gozdek, 2015).

The results of this research work are also strongly in accordance with Len (2018), who establishes that visual education, or the use of visuals in the teaching and learning process in the classroom, has a significant impact on developing learners' socio-cognitive skills. This, therefore, makes visual material a very key element in multimedia-based teaching. Anzaku (2011) sees the term audio-visual materials as often used to refer to instructional materials mainly used for conveying meaning. Some of these materials are in motion picture form, and their latent value is released by a device or piece of equipment, while others are in print form. With this audio-visual component in multimedia instruction, include both materials and devices that facilitate instruction so as to make classroom assessment valid.

Also, in accordance with the obtained results, establishing didactic quality as significantly influencing students' professional development Hess and Greer (2016) hold that ADDIE as an instructional design model ensures the incorporation of the most appropriate practises in the teaching and learning process into an online literacy information course. She further shows how ADDIE can be redesigned to highly impact instruction practises, and e-learning-appropriate practises were integrated into the course content as scaffolds.

They further hold that the ADDIE model has several ways it could be used to attain different objectives of literacy information instruction because it gives room for instructional interaction and makes learners' engagement, learning, classroom assessment, and programme evaluation more intentional and objective. The findings affirm the fact that the ADDIE model is relevant to the evaluation of multimedia-based pedagogy and its impact on professional development because it has the qualities of instructional planning, implementation, assessment, and evaluation.

Furthermore, these findings are in accordance with the findings of Crosby and Stelovsky (1995), who examined the effects of technology-based instruction on the learning of students in relation to lecture-type traditional instruction. Two groups were created (the experimental and control groups), and they were both administered a pre-test to determine the minimum level of the participants. The experimental group was taught using multimedia

technology while the control group received lectures traditionally, and at the end, both groups were administered the post-test.

Their findings were clear after analysis: multimedia-based instruction through multimedia courseware enhances students' learning in computer science instruction and renders the course accessible to a large student population of heterogeneous nature. This is to establish the role of didactic quality in multimedia-based pedagogy and its impact on students' professional development.

The findings have clearly positively responded to research question three, which is: To what extent does the didactic quality of multimedia-based pedagogy programmes influence students' professional development?

6.2.4. The technical quality of multimedia based pedagogy has a significant influence on students' professional development.

These findings show that students' professional development is greatly influenced by the technical quality of multimedia based instruction. Technical quality and students' professional development were correlated by Pearson with a coefficient of 0.28, significance at 0.00, and a 2-tailed significance level of 0.01 as a result. The determination coefficient (r^2) was 8.00. As a result, academic quality accounts for 8% of the variation in students' professional development and vice versa.

This is in line with the discussions and conclusions from the focus group, where the respondents said that the satisfactory condition of the tools and resources utilised in multimedia-based teaching constitutes technical quality in multimedia based pedagogy. While a small portion of people believed that the technical quality of multimedia based pedagogy only referred to the condition of the tools or apparatus utilised throughout the multimedia educational process. The majority of participants also believed that technical included resources and abilities in addition to tangible objects. An example given was a software or internet connection, which is not tangible but whose state strongly determines the quality of multimedia based pedagogy. Some of these resources and talents (techniques) are not especially visible, but their outcomes are.

On the issue of the reinforcement role played by design and browsing in multimedia pedagogy. All the respondents, though with divergent views, had experienced that multimedia based pedagogy's design determines how learning is facilitated, the nature of learning activities, and the resources and materials to be used. Browsing facilitates research, thereby facilitating students in knowledge construction and skill development. Therefore, technology plays a great role in reinforcing multimedia-based pedagogy from conception, planning, design, implementation, transferability, and monitoring and evaluation processes. Therefore, the technical quality of multimedia-based pedagogy greatly influences students' professional development.

The study's findings are consistent with the Cognitive Theory of Multimedia Learning (CTML), which maintains that the goal of multimedia based pedagogy or instruction is to improve students' comprehension through a presentation that combines audio and visuals while taking into account the different learner groups (Mayers, 2003; Billa, 2017). The findings of this study thus support the CTML dual channel assumptions that the human body has units for verbal and visual information, which leads to the undeniable role of multimedia instruction in facilitating learning as stated by Baddeley (1998) in Lulu-Billa (2007). This is so that students' professional development can be built while learning is taking place.

Also, the finding of this research work on how the technical quality of multimedia-based pedagogy significantly influences students' professional development is in accordance with Kang and James (2004), who affirm that service (professional development) quality and technical quality affect each other simultaneously, which in turn influences satisfaction. When the interaction in the course of multimedia-based instruction is satisfactory with respect to students' perception, then multimedia-based pedagogy can be said to be of good quality, but if vice versa, the technical quality is poor. Good technical quality in multimedia-based pedagogy certainly impacts students' professional development positively.

However, multimedia-based pedagogy or instruction is a carefully and technically designed instruction that, through hypertext systems, does not only transmit knowledge but also responds to its own difficulties to make it better. Müller-Kalthoffa and Möller (2006) address the problems brought on by Chandler and Sweller (1991) with cognitive overload by stating that navigation aids have been designed and inserted in a hypertext environment to function as graphical overviews or maps of the content or document under study. Also, these

graphical or map aids in some hypertext are too complicated for students to easily study because they do not give insights.

This can be resolved by creating restrictions on certain parts of the hypertext environment; movements are restricted to substructures. Evaluating multimedia-based pedagogy demands that the flexibility of browsing and its quality be assessed or examined because the key to multimedia-based instruction in higher education today are network links. This has been facilitated by the availability of internet access in most Cameroonian higher education institutions. This is a key instrument in guiding and facilitating students' professional development.

Technical quality and students' professional development were correlated by Pearson with a coefficient of 0.28, significance at 0.00, and a 2-tailed significance level of 0.01 as a result. According to Omodara and Adu (2014), who back them up, multimedia based pedagogy has to do with the channels used to transmit information to students, including the tools and technology that are used in that process. They also claim that there are many different types of multimedia and educational media technology used in the teaching and learning processes in today's society, including digital video-on-demand, online streaming media, interactive whiteboards, microphones, pod-casts, and mobile and desktop computers with multimedia capabilities.

Also, multimedia computer systems in the instruction and learning processes permit lecturers, when presenting a new lesson, to demonstrate, present new materials, animate, present new websites, and, as far as new programmes are concerned, illustrate how they are used. As a consequence, WebCrawler (2013) and Omodara and Adu (2014) affirm that irrespective of whether the class is large or noisy, students will be able to hear clearly and comprehend, especially when microphones are exploited. When this occurs, students' professional development is enhanced.

Furthermore, in conformity with the findings of this work, Pass et al. (1998) and Müller-Kalthoffa and Möller (2006) hold that studying through browsing or instruction based on hypertext permits students to auto-exploit learning material using their own selected methods, strategies, and styles. This enables students to engage in auto-learning activities, making the teacher a facilitator or guide. The students also have the possibility of adapting

the learning process to meet their needs, thereby working independently of classic print media and computer-based systems that are conventional.

These learning adaptation possibilities are considered either non-linear (non-sequential) or multi-linear in structure by Nielsen (1995) and Bolter (1998) in Müller-Kalthoffa and Möller (2006), so as to distinguish hypertext from texts with structures that are predetermined. There have been a number of studies investigating instructional design or features of the system, such as systems of interactive learning and their potential for facilitating knowledge construction globally. With respect to browsing in multimedia-based instruction, the studies have been favourable.

Additionally, according to Yang and Wang (2012) and Ghavifekr and Rosdy (2015), certain developed nations, including the United Kingdom and the Netherlands, recognise the critical importance of technical support or help to lecturers in classrooms and teaching that use ICT or multimedia pedagogy. The end result of this technical support for lecturers employing multimedia and educational media technologies for instruction and learning is high-caliber technological innovation in multimedia based pedagogy and evaluation.

Also, the role of the lecturer's multimedia and educational technology skills and preparedness to use them in the instructional and learning process is an added advantage to technical quality. This is because their confident, high-level skill when used in an instructional and learning setting motivates learners and keeps them focused. This increases technological quality during programme evaluation. Therefore, it consequently impacts students' professional development positively, as shown by the findings of this study.

Results support the claim that the CIPP is an effective model for highlighting the quality of educational activities. According to Wang (2009), CIPP is a management-oriented assessment model whose goal is to provide conclusive and reliable facts (information) that would help decision-makers make effective and efficient administrative decisions in accordance with hierarchy. The CIPP model also takes into account the sectors or fields of application, final destination, and purpose of the evaluation outcomes.

Also, in the EEPA interview (1980) in Wang (2009), Daniel Stufflebeam came up with the CIPP model for evaluation of educational programmes due to the unsatisfactory conditions that prevailed in inner-city schools in Chicago, which to him could only be made

better if there existed a method of evaluation that could help individuals and communities make productive decisions with respect to their educational programmes and their products. This is because, in the view of Stufflebeam, the decision-making process in effective management can only be based on results or information obtained from evaluation.

Furthermore, evaluation from the perspective of the CIPP model (Stufflebeam (2003) and Wang (2009)) refers to an investigation designed systematically to verify the level of value without leaving out related values. This evaluation approach is value-oriented, as he further states in reference to operationalization in the CIPP model that operational evaluation has to do with the process of carrying out a number of activities such as delineating, obtaining data, reporting information, and using information that is descriptive and judgmental with respect to the merits, probity, worth, usefulness, or significance of an object (programme).

It is important to note that Stufflebeam took note of the fact that for an evaluation to be effective, it has to identify and be consistent in its role of guiding decision-making, accountability data provision, and effective and efficient programme methodology advocacy (Wang, 2009). This greatly influences the technological quality of multimedia based pedagogy and how it impacts students' professional development.

Answering the fourth research question in a very positive manner has been justified by authors and literature; this question is: to what extent does the technical quality of multimedia based pedagogy programmes influence students' professional development?

These findings are supported with respect to the quality of multimedia (computer) based instruction, as revealed by Frey and Birnbaum (2002) from the findings of their investigation, in which the majority of students (participants) agreed that multimedia or computer-assisted learning (multimedia-based pedagogy) is a positive element in the teaching and learning process. This is because it facilitates the taking (jotting down) of notes, particularly for classroom assessment purposes, which increases academic performance and gives a good image of the academic, pedagogic, didactic, and technical quality of the course or programme.

The research findings of Frey and Birnbaum (2002) are confirmed by Smith and Woody (2000); they hold that multimedia-based pedagogy qualities are considered

favourable by students in the learning process, which improves their performance during assessment, hence professional development. This is proven by their self-report and results of objective testing, indicating an increase in students' performance in the course of the usage of multimedia-based instruction in the instruction and assessment process, indicating professional development.

6.3.0. LIMITATION OF THE STUDY

The researcher was faced with some challenges in carrying out this study in the field. They are worth stating:

1. Getting participants and respondents to understand the concepts and nature of the study from an outlook perspective seem very easy to understand. Ironically, when the researcher got to the field, he had to work with some of the respondents and participants for over five months for them to understand the purpose of the research work and its variables. Since these respondents and participants were in four different regions of the country, it was difficult to educate them because many of them had little mastery in the constructive use of social media. The first meetings had to be physical, with a select group selected for training on the purpose of the work, its variables, methods, and procedures, as well as the nature of participants and respondents. All these made the work of the researcher extremely demanding in terms of time and the process financially very demanding.
2. Financial challenges: This study was financially demanding. The participants were found in different regions of the country, and the medium used meant that they had to be financially assisted (or assisted for some) with an internet connection. This was particularly the case for participants in the focus group who were on it for over six (6) months. On the part of the questionnaire, some respondents were not materially equipped to respond to questionnaires online. Therefore, the questioner had to be printed out and people trained to administer the questionnaire to this particular group of respondents. Compensating the respondents after they responded was also very financially demanding, given that there were 439 respondents. Also, the work was solely financed by the researcher. Furthermore, given that the researcher recruited and trained personnel to assist in the research process, it was financially demanding in terms of materials, transportation, and motivation.

3. Mobilising assistants: It took time to convince and train those who assisted with awareness, the administration of the questionnaire, and those who participated in the focus group discussions. They were sceptical of assisting because some of them had never carried out such an activity and considered it to be so demanding or time-consuming on their part as they had to undergo training before assisting.
4. Scepticism of some of the sample population: Also, some of the respondents, especially in Bamenda and Buea, were sceptical about research because to them it could be for spying purposes, and some were not willing to fill in their preliminary information on the questionnaire as they expressed security concerns. This group of participants had to be convinced, and some never understood. This temporally reduced the accessible and target population from what was originally planned by the researcher, which resulted in demand for more time than was planned.

6.4.0. PEDAGOGIC INNOVATION AND IMPLICATION

The research has been given the opportunity to introduce pertinent innovation with concrete pedagogic implications for the Cameroonian educational system, the higher education sector, and curriculum implementation and quality evaluation as a field of study and as a professional speciality. This work is titled "The Quality of Multimedia Based Pedagogy and Students' Professional Development." The researcher has been able to establish a model for assessing the effectiveness of multimedia based teaching and identifying its relationship with students' professional growth thanks to this research effort. This innovation will make it easier for quality assessors to do their jobs and will help teachers, lecturers, and educators in general understand the traits to look for when using multimedia and educational technology tools and resources for instruction.

6.4.1. Pedagogic Innovation

This work introduces the "*model for evaluation of the quality of multimedia-based pedagogy and students' professional development*", which establishes the qualities and their indicators to be considered when evaluating the quality of a multimedia based instruction and learning processes. These qualities can be evaluated qualitatively and quantitatively. The educational system in general and the higher educational system are in great demand and need for standard multimedia based pedagogy quality. This quality can only be improved

upon when identified specific components are evaluated, the quality level is known, and measures are taken to improve the quality of these components.

6.4.1.1. PROPOSED MODEL ON THE EVALUATION OF MULTIMEDIA BASED PEDAGOGY QUALITIES AND STUDENTS' PROFESSIONAL DEVELOPMENT

Evaluating the quality of multimedia based pedagogy and determining its relationship to students' professional development requires a series of qualities to be examined. These qualities are academic, pedagogical, didactic, and technical qualities as input indicators for quality multimedia-based pedagogy and addressing students' needs, digital learning support, and classroom assessment as output indicators for professional development.

INPUT INDICATORS FOR MULTIMEDIA BASED PEDAGOGY

Academic quality: For academic quality to be determined, its relevance, validity, and reliability have to be examined and established within standard norms. Academic quality is a very important component in the professional development of students because it determines the professional knowledge, skills, and attitudes to be developed by the learners and how competent they will become in their profession. Therefore, it is very important to evaluate the quality of its components for innovation, invention, and improvement purposes.

This model has as one of its pillars of foundation the views of Yarmohammadiana et al. (2011), which state that given that the world is constantly changing, it is the responsibility of higher institutions or education to make provisions for meeting social needs conveniently in this age of uncertainty. The quality of university education has greater chances of improving society. Therefore, higher education has to be modernised to improve academic quality and meet the challenges of this rapidly changing society, especially in the dimension of development. This can only be done if the higher education system, institutions, programmes, courses, and methods of pedagogic implementation and assessment are constantly evaluated so as to use acquired data for strategic reformation that will increase quality and meet the needs of a fast-changing society. And one of the qualities of these programmes that must be constantly evaluated, especially in multimedia-based pedagogy programmes, is their academic quality.

This model is further inspired by the views of Hogg and Hogg (1995) in Yarmohammadiana et al. (2011), who maintain that with respect to the changing rate of society, most graduates are frustrated as most stakeholders in the society are calling for changes in the higher education system to meet the demands of the society as they consider current graduates as not sufficiently efficient. This shows that the academic quality of higher education needs to be improved with much effort with respect to societal expectations. This can be done by improving students' professional development (performance) through evaluating and improving the components of academic quality with respect to societal and job market demands. Standard academic quality has the potential to lead to the supply of competent and efficient graduates into society who will be able to meet up with and adapt to the changing labour market and society.

Pedagogic quality: Also, in establishing the pedagogic quality of multimedia-based pedagogy, pedagogic planning has to be professional, pedagogic implementation (strategies), and assessment methods have to be standard and aim at attaining the educational aim of policies, goals, and objectives.

In higher education in particular and educational institutions in general, irrespective of how quality is defined, the instrument used to establish its existence or non-existence and its level is evaluation. Evaluation in higher education today focuses on bringing out limitations so as to foster amelioration through corrective measures. These corrective measures can be used to improve the quality of programme planning, implementation, learners' assessment, and higher education evaluation itself. However, the issue of quality in higher education has been contextualised for different academic purposes by different authors, such as Harvey and Green (1993), El-Khawas (1998), Birnbaum and Deshotels (1999), and Campell and Rozsnayi (2002).

According to Jabbarifar (2009), I also hold very strongly that the roles played by teachers and students, respectively, in the teaching and learning process determine the relationship that will exist between them with respect to teaching and learning content, activities, practises, and materials. In student-centred instruction, the student plays most of the active role by deciding their activities and how and when they will be carried out. This is done with consultations with the facilitator (teacher), who guides the students in identifying and selecting learning activities that are good for their educational growth, and together, still under the guidance of the facilitator, they come up with plans and a road map for realising

these plans. These pedagogic activities can only be effectively and efficiently planned and implemented if components of pedagogical quality are constantly evaluated, especially in multimedia-based pedagogy, and improved upon.

Didactic quality: Furthermore, the didactic quality has to be examined because it is complicated to have quality pedagogic implementation without quality didactics. Didactic quality in multimedia-based pedagogy is determined by the standards of learning content, learning activities, and learning (or instructional) materials, which in this case are often technological.

In the affirmations of Koper (2000) and Padrón et al. (2005), didactic tools (materials) refer to aids of all types and kinds that facilitate educational actors in achieving their planned objectives in the course of the teaching and learning process. He examines two types of didactic aids with respect to the views of some educational actors in the educational and instructional process. These two didactic aids separate those used in instruction from those used in learning, resulting in instructional aids and learning aids.

Instructional aids in this context refer to those aids that provide teachers with diverse resources to guide, facilitate, and support students' learning processes. They may include, among many others, books, photos, images, and devices (such as multimedia gadgets). On the other hand, learning aids refer to resources and assets that facilitate or support students' learning in the course of the learning process. These aids may include, among many others, books, photos, images, games, devices (such as multimedia gadgets), and worksheets. Therefore, it is important for both to be assessed or evaluated to determine their quality with respect to the set objectives.

Furthermore, examining how multimedia operates in the instructional process Yamauchi (2008) states that the use of multimedia in instruction permits teachers to integrate into their lessons or lectures texts, images, animation, and graphics, amongst many others, into a single package, which facilitates the presentation of information to students in a comprehensive manner in order to attain specific objectives in a course. Also, multimedia tools and multimedia-based instructions in particular create opportunities for complicated processes to be demonstrated in an animated, highly interactive fashion in which the interconnection of instructional materials with related topics is done in a more intuitive and

natural way that facilitates comprehension and minimises confusion (Crosby and Stelovsky, 1995; Yamauchi, 2008).

Kedzierska and Wnek-Gozdek (2015) cite Professor Manfred Spitzer, who affirms that the changes that are taking place in the brain have a neurological basis that is influenced by modern media and information transfer fragmentarily. The purpose of evaluating the didactic quality of multimedia-based instruction is to render it more productive during assessment and in shaping brain changes to improve professional development through performance.

Technical quality: Multimedia-based pedagogy or instruction quality cannot be established without examining the technical quality because their base is technology. Therefore, the design outlook, browsing skills and knowledge, and ingenuity of the technology used in the multimedia instruction process have to be cross-examined to establish or determine their quality.

In higher education today, multimedia-based pedagogy's role in students' professional development cannot be isolated. It is important to note that students' professional development is very differently oriented with respect to workers professional development. Therefore, students professional development in this mode is examined from the perspective of the extent to which individual and collective professional knowledge and skills desires and needs are met, the opportunities available for using available resources for self- and academic (professional) improvement, and how well they manifest their knowledge, skills, and competences in classroom assessment (theoretically and practically).

Rengkung et al. (2017) refer to technical quality as the perception a client develops from a service interaction that results from the service process. Therefore, technical quality in multimedia-based pedagogy can be said to be the perception of the students (clients) or an assessment response to the multimedia-based instruction method offered by an institution, and higher education institutions in particular. As an indicator, it presents students perceptions of professionalism in multimedia-based instruction from the perspectives of design and browsing; however, elements such as teachers professionalism and skills, physical resources available, and the operational system used to meet students' academic, pedagogic, and didactic needs as well as address instructional and learning difficulties (Tjiptono, 2014; Rengkung et al., 2017) Taking into consideration the technical quality as provided by the

institution, a positive perception is influenced by students or stakeholders expectations and what they actually experience. The quality is known after an assessment or evaluation, with the respondents being the clients or consumers (students and stakeholders).

PROCESS

Quantitative or qualitative assessment and evaluation designs and tools could be used in collecting and analysing collected data for objective results for exploitation towards multimedia-based pedagogy quality and professional development improvements.

OUTPUT INDICATORS FOR STUDENTS' PROFESSIONAL DEVELOPMENT

From the perspective of Holloway (2006), citing Barry Fishman and colleagues, professional development refers to the process in the educational sector of building new concepts and skills in students by instructors that are directly related to their profession. Therefore, professional development has to do with building new concepts and skills in students that are directly related to their chosen profession. This is done by improving students' acquisition, learning, and achievement skills, which are applied first of all in a classroom (physical or visual) setting and later in practise (the workplace).

On the other hand, Cambridge Assessment International Education (2017) holds that professional development should focus on developing professional mental processes and field practice in teachers and subsequently students by enhancing the instruction and learning process. The enhancement of the instruction and learning process in higher education is facilitated by multimedia-based pedagogy with exploits from programme evaluation. Professional development can only be attained by taking into consideration evidence-based and ongoing reflective practises and activities in multimedia-based pedagogy.

One of the key components of social teaching theory, according to Watson (2013), is the self-regulatory process known as self-efficacy. In professional development, one of the goals is to prepare students or workers for self-efficacy. This is because the level of success or realisations of an individual depends on his or her self-belief in relation to work and professional success with respect to their specific actions in certain contexts. This is better expatiated upon by Bandura (1997) and Watson (2013) as the cognitive capacities reflect the

underlying skills and further incorporate motivation, confidence, and innovation willingness, which are affective components.

Professional development, especially in higher institutions of learning, has as its mission to professionally motivate students, build their self-confidence, and imbibe them with the spirit and willingness to innovate. These components increase both academic and professional achievement. Negative reinforcements, according to Woolfolk et al. (1990) in Watson (2013), reinforcing the views of Bandura (1971), hold that professionals with lower efficacy turn out to be very pessimistic about motivation, which results in negative reinforcement (sanctions) to attain their objectives and goals.

Students' professional development in this context is examined from the perspective of three (3) components, which involve addressing students' professional needs, the role of digital learning support in developing students' professional skills, and the role of classroom assessment in students' professional development.

Addressing students' professional needs: Most students in higher education institutions are there to acquire professional knowledge, skills, and abilities. Therefore, they have a series of professional needs to be met before the end of their studies. This makes addressing students' professional needs a very important component when evaluating academic programmes related to students' professional development. This is why Thiry et al. (2008) state that as institutions of learning have the aim of preparing and developing students' knowledge and skills and meeting the challenges of an ever-changing society and environment, they should look beyond academic achievements and structure the educational system to be comprehensive.

For the educational system to be comprehensive in order to meet students' needs, the programmes and courses offered should be responses to the varying professional needs of the student as they are developed professionally. Multimedia-based pedagogy is a very valid instructional programme to be used to attain this multi-task goal. That is why the Centre for Teaching (1993) recommends that lecturers be flexible in nurturing students professionally.

Furthermore, in order for students' professional needs to be addressed, the Centre for Teaching (1993) recommends a series of strategies in the instructional process that are very compatible with multimedia-based pedagogy. They involve putting students into groups and

teams; making classroom, forum, or lecture hall discussions open and honest, giving every student the opportunity to participate and freely express their opinion; obtaining from students their goals and measures to attain them; obtaining from them possible opportunities of maximising time while meeting their academic and professional needs; adjusting the structure and instructional methods, techniques, strategies, and styles to address or attain the academic and professional development needs of the students; and taking into consideration all types of students (visual, audio, audio-visual, and kinaesthetic). With multimedia-based pedagogy, all these are possible, as it is possible to address the individual, academic, and professional needs of diverse learners. That is the reason it has to be evaluated to see how it affects professional development.

Also, Thiry et al. (2008) state that students' needs are not just supposed to be addressed for addressing purposes but for relevance in the context of professional development. The students should be taught to apply the knowledge, skills, and professional experiences of professional development in their own work. Therefore, they should be involved in professional development courses, workshops, publications, coaching, and other resources related to activities in their different fields of interest and specialisation. One of the key components, according to Thiry et al. (2008), is transferability. Transferability is considered, especially in the sciences, a very critical component of addressing the needs of professional development. That is why there is an emphasis on the practical exploitation of knowledge and skills in individual projects.

The role of digital learning support: The role of digital support in students' professional development in today's digital world cannot be undermined but instead emphasised. The relationship between digital supports and professional development is as close today as ever before. That is why it is important to examine and evaluate how multimedia-based pedagogy quality affects students' digital learning support, which in turn impacts students' professional development.

In establishing the relationship between digital learning support and professional development, Sousa et al. (2017) hold that for educators (lecturers) to exploit digital learning support effectively and efficiently for professional development, they also require continuous ICT capabilities and professional development training. This view is given more impetus by the Committee for Economic Development (CED) (2013), which considers students in this age as "*digital-age learners*", because of their technologically reflective orientation and

approach to learning, which is referred to as free-agent. Students are more comfortable learning with digital learning and multimedia support tools like computers, iPhones, iPods, computer games, text messaging, social media pages, and online and offline forums.

Professional development in this digital age is being facilitated by multimedia-based instruction, which facilitates instructional and learning knowledge and resource access beyond lecture halls, institution infrastructure and facilities, and traditional lecture hall practises. On the other hand, digital learning support is being examined by Grand-Clement (2017) from the lecturer's disruptive role and support perspective. Furthermore, Ross (2018) views technology in relation to education and instruction as an effective tool that is replacing low-level instructional duties. One of the key components of multimedia-based pedagogy is digital learning support, which is a great tool today for realising professional development.

Sousa et al. (2017) hold that for educators (lecturers) to exploit digital learning support effectively and efficiently for professional development, they also require continuous ICT capabilities and professional development training. This view is given more impetus by the Committee for Economic Development (CED) (2013), which considers students in this age as "*digital-age learners*", because of their technological orientation and approach to learning, which is free-agent. Students are more comfortable learning with digital learning and multimedia support tools like computers, iPhones, iPods, computer games, text messaging, social media pages, and online and offline forums. Professional development in this digital age is being facilitated by multimedia-based instruction, which facilitates instructional and learning knowledge and resource access beyond lecture halls, institution infrastructure and facilities, and traditional lecture hall practises.

Nam (2016) and Sousa et al. (2017) examine digital learning support as an influence on students' social presence and attitudes towards online collaboration and learning environments. While Sousa et al. (2017) affirm with all certainty that digital learning support technologies are relatively more motivating when it comes to discussions amongst students from the point of view of constructivism, Also, Grand-Clement (2017) holds that digital technologies have enabled digital skills to meet up with day-to-day professional activities such as appointment booking and personal banking (e-banking).

Furthermore, Ross (2018) on digital learning support technologies and assessment for learning states that it is difficult to manage current data retrieved through a comprehensive,

coherent, and continuous system of continuous assessment, which is not supported by digital technologies. This is because digital technologies facilitate the task of tracking the assessment performance of both individuals and groups of students, as well as linking their performance or assessment to standards of content, desired learning outcomes, and professional development.

Furthermore, Ross (2018) examines digital technology in students' professional development from the perspective of assessment, especially multiple-choice, with dozens, hundreds, and even thousands of students in lecture halls or online at the same time or simultaneously. Also, it facilitates the lecturer's ability to obtain quick snapshots of up-to-date progress and the ability to easily forward students' progress reports to them and their families from the comfort and safety of their home.

With regard to instruction, Ross (2018) strongly contrasts the views of Grand-Clement (2017) that technology is disruptive by stating that no educator (lecturer) can express the patience manifested by digital technology in repeating presentations over and over. This can be done by presenting text content, visual content (pictures or images), audio content, audio-visual (video, film), animation interactions, or exploiting different media sources to enable the students to view and review for mastery and internalisation. Ross (2018) actually expresses one of the numerous advantages of multimedia-based pedagogy as a tool for effective and efficient professional development.

Classroom assessment: Quality or standard professional development cannot be assured if assessments, and most importantly, classroom assessments, are not conducted. Assessment exposes students' trends, strengths, and weaknesses in professional development for better guidance. Therefore, with respect to multimedia based pedagogy and professional development, it is an important component of professional development to be examined and evaluated.

According to Jabbarifar (2009), the purpose or importance of classroom assessment is to create an opportunity for students to express or show case their acquired knowledge or skills; students ought not to be surprised or embarrassed by asking for or requesting what has neither been taught nor learned. It focuses on the diverse issues or components of the teaching and learning process, if not all elements leading to professional development. It involves content taught in the classroom, including text books, online and offline studies,

instructional materials, teacher efficacy and effectiveness, student achievement, and the instructional programme as a whole.

These assessments need to respect the norms of validity and reliability to be able to concretely reflect students' acquisition and professional development trends. According to Messick (1989), validity has to do with the degree to which facts, data, and theory prove the interpretation of scores from a test (assessment) obtained from subjects who participated in the assessment. Furthermore, he states that the process of validation has to do with the accumulation of evidence for a solid scientific basis for score interpretations.

In other words, assessment has to do with the interpretation of scores from a test for diverse evaluation purposes. Shillingburg (2016) holds that the key factor in test development is to create an assessment that will enable appropriate inferences with respect to the performance of a learner on a particular content material and to be confident of allocating or indicating the contribution of the teacher, method, technique, or strategy to the performance.

Also, Cohen and Swerdlik (2009) in Covacevich (2014) refer to reliability as the consistency with which an assessment instrument is used; reliability also measures the degree of error of a test instrument or tool (JCSEPT, 1999; and Wilson, 2005 in Covacevich, 2014). This refers to the ability of a test or assessment tool to produce the same results repeatedly; for example, the same General Certificate Examination (G.C.E.) Advanced Level History or Geography paper one (1) is given to students with the same or almost the same intelligence level in different sessions, and the results obtained are the same or almost the same.

Motivation in multimedia assessment is more often determined by the objectivity of the assessment instrument and the nature of the multimedia gadgets or tools used. When students feel comfortable with the objectivity of assessment instruments and multimedia tools and materials, they are motivated to put in their best, thereby improving their professional development as manifested through performance. According to Okan (2003), the process of learning, which ends with assessment, is intrinsically motivated because a majority of students invest or put in a lot of time studying for mastery. They are excited and feel fulfilled over what they master (learn), such as knowledge, skills, and competences that they use in their daily lives on and off campus.

Furthermore, multimedia-based pedagogy is designed to stimulate both intrinsic and extrinsic motivation in the instruction and learning process that ends with assessment; these motivations come from the multimedia tools and materials used both in instruction and assessment to determine the academic, pedagogic, didactic, and technical quality of the instruction.

Performance is a major indicator of classroom assessment, which also indicates professional development; it is from the performance of students that the assessment tools or instruments are judged from the perspectives of validity, reliability, and motivation. Heinich et al. (2001) hold that in the 20th century, there were changes in instructional and learning processes, tools, and materials. The focus, which has been increasing up to date, is still on using technology and technological aids in instruction to improve students learning and internalisation and consequently increases their success rate while indicating standards in academic, pedagogic, didactic, and technical qualities of the instrument process, lesson, course, and the programme as a whole.

Ysseldyke and Bolt (2007) hold that assessment provides data or information collected for the purposes of formative or summative evaluations, which are catalysts in the instructional process, be it multimedia-based or not, by improving learning outcomes. Assessment is based on content, referred to by some authors as curriculum-based measurement (CBM) and also seen as a synonym of formative evaluation (Deno, 1985; Silberglitt and Hintze, 2005). In multimedia-based instruction, assessment is done diagnostically, formatively, and summatively while respecting the norms of validity and reliability and taking into consideration motivational factors so as to improve students' professional development.

According to Jabbarifar (2009), every instruction or instruction method, such as multimedia-based instruction, is based on three components: identification of the objectives of multimedia instruction (which represent the 'why'), developing plans on how to attain these objectives (which represent the 'how'), and elaborating and describing the pedagogic activities that will effectively take place either in the classroom, online, or offline forums (which actually represent the 'what').

These three components are actually reinforced by a fourth and fifth, known as assessment and evaluation, which verify the authenticity and attainability of each component.

Without assessment and/or evaluation, it is scientifically impossible to establish if the objectives were correctly stated, the plans were developed with respect to the objectives, or the pedagogic activities (practises) enabled the attainment of earlier stated objectives. Therefore, assessment is a very important component of professional development that should be evaluated for quality improvement purposes.

Multimedia-based pedagogy has to do with the exploitation (using) of modern technological tools, materials, and resources such as multimedia computers, phones, video projectors, microphones, loud speakers, and the internet; in fact, ICT tools are used in the instructional (teaching) and learning processes. The process of determining the quality of multimedia-based pedagogy is not directly generic but indirectly generic. non-generic because it does not form a cycle in the educational procedures, and generic because the end process of evaluation leads to reforms and innovation, and all its implementation processes need quality control evaluations to make them more effective and determined.

To ensure quality students' professional development through addressing students' needs, facilitating their exploitation of digital learning support resources, and improving classroom assessments, it is very essential to facilitate quality professional development. It is imperative that when striving for students' professional development, none of the components of multimedia qualities (academic, pedagogic, didactic, and technical) and their elements should be left out.

According to Jabbarifar (2009), the purpose or importance of classroom assessment is to create an opportunity for students to express or show case their acquired knowledge or skills; students ought not to be surprised or embarrassed by asking for or requesting what has neither been taught nor learned. It focuses on the diverse issues or components of the teaching and learning process, if not all elements leading to professional development. It involves content taught in the classroom, including text books, online and offline studies, instructional materials, teacher efficacy and effectiveness, student achievement, and the instructional programme as a whole.

The focus of this study, however, is to examine the impact of multimedia instruction on students' professional development. Be it online, offline, or facilitated with multimedia gadgets in or out of the classroom. The focus is on how it influences the validity, reliability, motivation, and performance of classroom assessment, irrespective of whether it is

diagnostic, formative, or summative. In return, these qualities positively facilitate students' professional development.

This proposed model for evaluating the quality of multimedia-based pedagogy and students' professional development is better illustrated by figure 32 below.

MODEL ON THE EVALUATION OF MULTIMEDIA BASED PEDAGOGY QUALITIES AND STUDENTS' PROFESSIONAL DEVELOPMENT

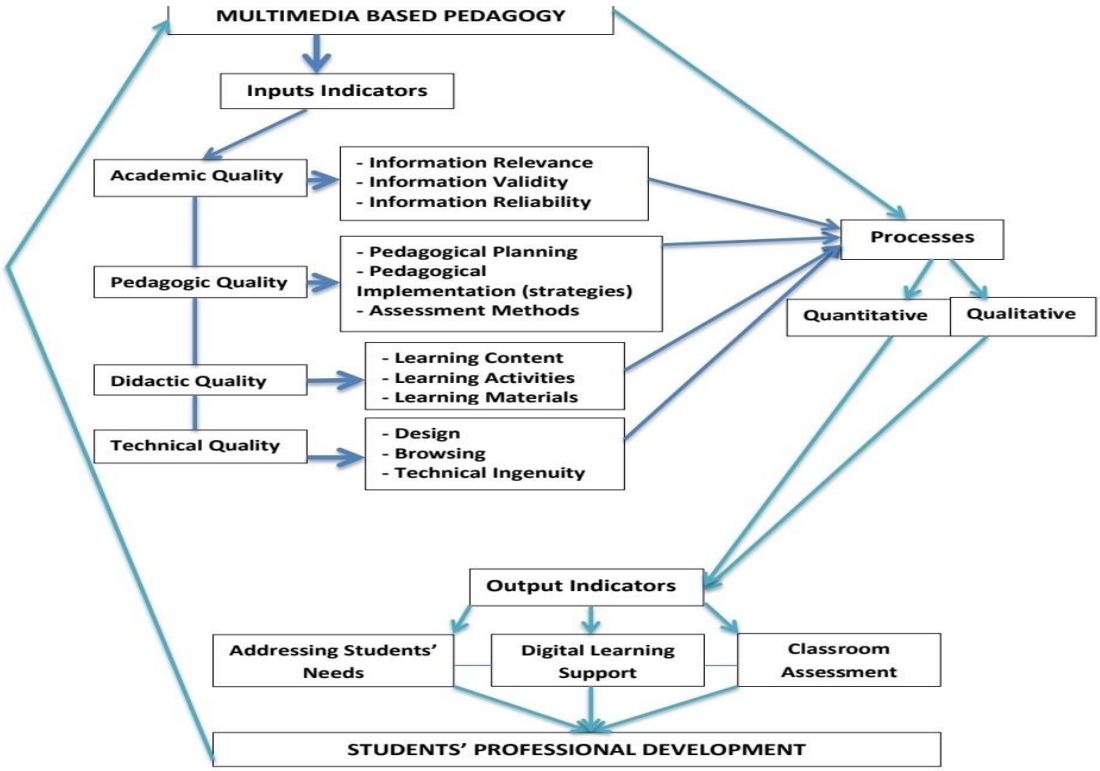

Figure 32: Model on the evaluation of multimedia based pedagogy qualities and students' professional development

Source: Billa 2020

6.5.0. PEDAGOGIC IMPLICATION OF THE RESEARCH WORK

The goal of educational research is to improve the teaching and learning processes, which are the foundation of education. As a result, the majority of educational works aim to enhance and improve quality. There will inevitably be disruption if the pedagogical component of quality improvement is missing. Due to the fact that instruction and learning are the foundation and focal points of educational practises, this work has demonstrated not only how to assess quality but also how to employ contemporary technology to enhance these processes.

6.5.1. Students

This study raises consciousness and awareness in students' minds about the importance of multimedia-based instruction and the role it plays in improving professional development with standard qualities and norms. This, in turn, facilitates mastery while improving the quality of education through quality performance. The study makes the students understand that the evaluation of the instruction process, especially the tools and materials used, is a prerequisite to improving programmes, teaching, and learning processes. This work exposes the role of multimedia in the teaching and learning process, the qualities (academic, pedagogic, didactic, and technical) involved in its evaluation, and how it influences professional development in terms of addressing students' needs, digital learning support, and classroom assessment (validity, reliability, motivation, and performance in classroom assessments). This work therefore has the potential to act as a catalyst for students to exploit technology for quality learning purposes, which will result in a knowledgeable, skilled, and professional graduate ready to create or serve.

6.5.2. Lecturers/teachers and tutors

This work has exposed lecturers, teachers, and tutors to the facts that in today's educational system, there is much talk and focus on the use of technology in instruction, and multimedia is one of the key components being emphasised and frequently used. The study has enlightened teachers, lecturers, or tutors not only on the use of quality multimedia resources in instruction but also on how to evaluate their impact on instruction in general and professional development in particular.

The work has made them understand the basic factors involved in evaluating a multimedia-based pedagogy, such as academic quality (information relevance, validity, and reliability), pedagogical quality (pedagogical planning, implementation, and assessment methods), didactic quality (learning content activities and assessment methods), and technical quality (design, browsing, and technological ingenuity). So that in using multimedia-based pedagogy, which is a current educational phenomenon, they should be able to auto-evaluate and use it efficiently in improving the standards of students' professional development. This work has also helped teachers understand the difference between evaluation and assessment, terms often used in educational measurement and evaluation in relation to programme evaluation and professional development.

6.5.3. Educational administrators

This research study has exposed university and school administrators to the importance of not only using multimedia in instruction but, at the end of the day, evaluating multimedia-based instruction (pedagogy) so as to strategize ways of improving it in this technological age to improve the quality and standards of students' professional development. The pedagogic resources and materials presented in this work evoke the need not only to equip study halls (lecture halls) or classrooms with modern multimedia gadgets (materials and devices) and ensure instructors use them, but also to evaluate their usage and their impact on students' professional development and other components of a learner's educational life (addressing students' needs, digital learning support, classroom assessment in terms of validity, reliability, motivation, and performance).

Also, educational administrators have been presented with the role of evaluation in improving programmes, the way they are taught, and the way they are assessed. Also, the work has presented the need to empower teachers with programme evaluation knowledge and skills (academic quality, pedagogic quality, didactic quality, and technical quality) while empowering them in the use of technology in instruction so as to improve the quality of education in the country.

6.5.4. Parents/sponsors and community

This study has helped parents understand how the evaluation of the use of multimedia can influence the professional development of students and the contributions they can or should make to make programme evaluation easier while supporting multimedia usage in professional development so as to improve students' performance in classroom assessment as well as field work. The parents, sponsors, and community have been exposed to how big or huge their role is in supporting institutions in the improvement of the quality of education through investing in and sponsoring programme evaluation, multimedia usage, and professional development schemes.

Parents, sponsors, and local communities need to partner with higher institutions to make education productive by financing programme evaluation, the use of multimedia in teaching and learning, and professional development that meets international standards and

norms. This will help the community in particular and the nation at large attain the sustainable development goal of quality education by 1930; why not emergence by 2035?

6.5.5. Educational community

This work has made an effort to educate educational partners, particularly local organisations like the Parents Teachers Associations, national and international non-governmental organisations, and governmental organisations such as the United Nations Educational Scientific and Cultural organisation (UNESCO), and CONFEMEN Education System Analysis Programme, also known in French as Programme d'Analyses de System Educative CONFEMEN (PASEC), recognise the technical, financial, and material assistance they could provide to promote programme evaluations in the Cameroonian Educational System in general and the Higher Educational System in particular. They could also support educational technology (multimedia) in the instruction (teaching), learning, and evaluation processes in order to make the Cameroonian Educational System more professionally productive and, why not, efficient as well as modern.

6.5.6. Policy makers and the state

The government now has a better understanding of the value of multimedia in instruction and the contribution that multimedia based pedagogy makes to professional development, which has an impact on the standard of education. This aims to inform lecturers and instructors about the value of evaluation in the use of multimedia-based pedagogy in lecture halls and classrooms, as well as to promote and urge the government to continuously create or programme assessment programmes in universities. Section 4 of the general provision of the 1995 National Forum on Education in Cameroon states that education's goal is to "*train children for their intellectual, physical, civic, and moral development and their smooth integration into society while bearing in mind prevailing economic, sociocultural, political, and moral factors"*. This suggestion was made law in 1998.

By strengthening multimedia instruction technologies in classrooms and lecture halls and their evaluation in relation to professional development, as well as reforms made to improve technological usage in instruction and assessment standards, this work assists the state in fulfilling its mandate in the information age of multimedia (technology). In light of the education and strategic growth paper, the government and all of its stakeholders with an

interest in education can, after utilising this work, ensure the effective and efficient evaluation of the use of multimedia based pedagogy; and improve students' professional development quality and standards for quality and productive educational system.

6.6.0. RESEARCH WORK AND THE MODEL ON THE EVALUATION OF MULTIMEDIA BASED PEDAGOGY QUALITIES AND STUDENTS' PROFESSIONAL DEVELOPMENT

It is important to note that the model for evaluating multimedia-based pedagogy quality and students' professional development is a result of this research work. In this technological and digital age, the educational system cannot afford to use technology for technological fantasy purposes. It is very important that the quality of the technological tools, materials, and resources be verified, maintained, or improved upon. This work and model on multimedia-based pedagogy quality evaluation and students' professional development present to educators in general and educational multimedia evaluators (educational qualifiers) a clear-cut approach, varied procedures, and the qualities to be taken into consideration when in the process of evaluating multimedia-based instruction or educational technology to establish its quality in relation to an educational variable. In this work, the educational variable is professional development.

Quality is an indispensable component of education and its activities. This work and this model have been able to expose the role of quality in educational components and how it affects the educational product. In higher education, the technology is more advanced and the expectations for its products are higher. This work has been able to show and direct the model that the ability of the Cameroonian higher educational system to establish higher quality technology in the instruction, teaching, and learning process would result in better quality in students' professional development.

The future of the national and educational systems is highly dependent on technology, which has been improved to such a level through information and communication technologies. Therefore, this research work has been able to present some educational technology qualities, their components, how they manifest, how they could be used to improve the instruction and learning process, and their impact on students' professional development, which is the main policy or focus of higher education.

This work has contributed to education scientifically through literature, theories, and above all, the initiation of a multimedia based pedagogy quality evaluation model.

6.7.0. RECOMMENDATIONS

The researcher has the following recommendations based on the research's findings that have the potential to be used as potential solutions to enhance the effectiveness of the use of multimedia in instruction, educational technology in general, and the teaching and learning processes.

6.7.1. To students / student teachers

Students and student teachers from rich or poor backgrounds should understand that this is a technological age and the world has become a global village. Therefore, they can develop and improve quality professional knowledge and skills as well as be open to the world these days if they embrace the constructive use of technology in their daily lives and most especially in their academic lives. The students and student teachers are condemned today to develop quality skills in the use of quality multimedia tools and ICTs (digital learning support) in general in the learning process for the purposes of improving quality academic professional performance and in the future through the use of quality multimedia or ICT tools in their respective schools and work places to improve productivity and quality of the educational system in general.

6.7.2. Teachers / lecturers or tutors

Teachers, lecturers, and tutors of respective higher institutions of learning should invest in quality multimedia-based instruction and educational technology in general. The world today is technology-oriented, with enormous benefits. Technologies in general and multimedia, or ICT, have brought enormous benefits and quality professionalism to the instruction and learning processes and the educational system as a whole.

The use of quality modern technology (multimedia) in the instruction (teaching) and learning process is a catalyst for meeting students professional needs, developing students' self-esteem and determination, and bringing reality closer to the learner, which in turn increases both lecturers and students quality in professional development and productivity in the education sector and society as a whole. Therefore, lecturers should cultivate the habit

and culture of using quality technology in the instruction and learning process for the purpose of quality professional development, which will improve the educational system and, in turn, lead to national integration and development.

6.7.3. To university and school administrators

The higher education institutions and school administration should put in place an input, process, context, and product quality mechanism and system that ensure investment and evaluation (assessment) of quality in the instructional and learning processes. This will make the students, lecturers, and institutions as a whole more professionally and qualitatively productive. Therefore, they should invest in quality multimedia-based instruction technologies specifically and quality educational technology in general. This can be done through constructing, equipping, and maintaining the functioning of quality multimedia halls, lecture halls, and classrooms; equipping lecture classrooms with ICT and multimedia equipment, resources, and materials; organising a series of in-service trainings on the quality practical and professional use of educational technology in the instruction and learning process by lecturers and teachers; and periodic quality assessment and evaluation. This will greatly impact the quality of institutional productivity and the quality of students' professional development by meeting their professional needs, facilitating the exploitation of digital learning support, and improving their performance in classroom assessment.

Universities or higher institutions' administrations facing financial challenges should seek and exploit partnerships and donor opportunities and forums for fund-raising and strategic implementation. This can be done by developing convincing projects that will provoke partners and funders' involvement. Also, create awareness among the public, partners, and donors on the importance of supporting and financing quality instructional technology for quality professional development through financial, equipment, material, and technical support. Contact organisations with projects that will push them to allocate funds for technological equipment in the institution's schools, lecture halls, and classrooms to facilitate quality instruction (teaching) and learning processes, thereby improving the quality of students' professional development and the productivity of the institution.

In professional institutions and schools, the directors should create public and international funding structures and search for national and international partners through projects that will develop and equip the institutions, schools, lecture halls, and classrooms

with multimedia technological equipment, resources, and materials. Why not train lecturers, teachers, tutors, or instructors on how to use and assess quality multimedia instructional technology and educational technology in the instruction (teaching) and learning process to improve the quality of students' professional development and educational productivity?

6.7.4. To the parents / community

Parents and sponsors of students should acknowledge that the future of students (their children) in this digital world is highly influenced and determined by technology. Therefore, they should provide the students with basic technological tools, resources, equipment, and materials that will facilitate and enhance the quality of learning processes in the course of instruction and improve their professional development as well as their productivity. They should financially support the institution's administration in its efforts to equip the institution or school with modern instructional technology. This can be done by supporting public fund-raising in universities and professional schools. Carry out individual financial or material donations to equip institutions or schools with modern technology or train lecturers, tutors, and teachers on the usage and quality assessment of modern technologies in teaching and learning processes so as to improve the quality of students' professional development and the productivity of the graduates.

6.7.5. To Educational community

This work has recommend to educational partners especially community based, national and international Non-governmental organisations and governmental organisations such as United Nations Educational Scientific and Cultural organisation (UNESCO), and CONFEMEN Education System Analysis Program, known in French as Program d'Analyses de System Educative CONFEMEN (PASEC) respectively to support the Cameroonian Education system and the Higher Educational System in particular technically, financially and materially to reinforce program quality assessments and evaluations, to reinforce quality educational technologies (multimedia) in the instruction (teaching), learning and quality evaluation process so as to make the Cameroonian educational system in general qualitatively professionally productive and efficient.

6.7.6. To policy makers and the state

To meet the 2030 sustainable development objective of quality education for all, the Cameroonian government and higher education system must offer inclusive and equitable quality education and support opportunities for lifelong learning for all. They must encourage the use of high-quality assessments and evaluations of educational technology and multimedia in the teaching and learning processes. This will guarantee that education is egalitarian and open to all students, regardless of whether they are kinaesthetic, audio, or visual learners. As a result, the professional development of professors and students in the higher education sector will be of higher quality and standards.

Also, the government should make provisions and invest hugely in the quality of multimedia and educational technologies through infrastructure, equipment, materials, resources, and technical know-how for the implementation of digital technology in higher education, the educational system, and the instruction and learning process in particular. This can only be realised if higher education policymakers and the state make and efficiently ensure the implementation of policies on quality improvement in the equipment, use, and quality evaluations for multimedia and educational technologies in higher education institutions, lecture halls, and classrooms. The ministries of education should allocate sufficient funds for technological equipment, materials, and quality assessments in higher institutions of learning and specialised professional schools.

Professional institutions and schools should be fully equipped with modern technology to enable the future workforce to be technologically literate, having the intellectual capacity and skills to use multimedia technology and digital technology in general in the curriculum implementation process of instruction (teaching) and learning in lecture halls, classrooms, laboratories, and work places. Institutions and schools should be given a free hand and facilitated to contact sponsors and sign partnership agreements and conventions with partners and donors in multimedia and educational technology development, implementation, and maintenance.

Above all, the government should create an independent body in charge of quality assessment, evaluation, and accreditation of all the educational institutions, schools, and universities in Cameroon. An independent body would assess and evaluate quality elements and components in the educational sector that are not usually taken into consideration. There

is a lot of focus on educational quality as a wholistic concept rather than a concept made up of a series of elements and components, such as multimedia based pedagogy.

6.8.0. SUGGESTIONS FOR FURTHER RESEARCH

The research work or study focuses on the evaluation of multimedia-based pedagogy quality and professional development. With a focus on academic quality, pedagogic quality, didactic quality, and technical quality in some selected higher education institutions in Cameroon. For further research, researchers can work in the following dimensions:

- The use of communication and information technology in quality evaluation and professional development
- Evaluation of digital learning materials and students' professional development
- The evaluation of the quality of audio tools and classroom productivity
- The quality of audio-visual tools and their impact on classroom assessment
- The quality of animation tools and students' professional development
- The trends of quality assessment and evaluation in the Cameroonian educational sector

6.9.0. CONCLUSION

This chapter's objectives were to analyse the findings, describe the study's conclusions, offer suggestions for how to address the problem, and provide future scholars in the field with ideas for new areas of investigation. In order to achieve this, an interpretation of the findings, a suggestion, and a conclusion have been provided. Summary of findings has been discussed with respect to research questions and research hypotheses; interpretation of results has been done with respect to stated hypotheses; limitations of the study have been discussed from the perspective of difficulties; pedagogic innovation and implication with the proposed model on "*The evaluation of multimedia-based pedagogy qualities and students' professional development*" have been presented. It has been argued how the research work has pedagogical consequences for students, lecturers, university and school administrators, communities, the educational community, policymakers, and the state. Additionally, a connection has been made between the research findings and the suggested model. Additionally, proposals for additional research have been emphasised in the final section of this section, and recommendations have been made to students, lecturers, university and

school administrators, parents and communities, the educational community, legislators, and the state.

GENERAL CONCLUSION

The purpose of technology is to make life easier and increase human pursuits' efficacy and efficiency. The goal of education is also the development of the individual and the people through the transmission of knowledge, skills, abilities, competences, and cultures in order to meet societal needs for construction and reconstruction (social, economic, cultural, political, and now technological). Universities and other institutions of higher learning also have the primary responsibility for preparing graduates for career and societal advancement.

In the direction of multimedia, which is a component of educational technology, Richey (2008) examines it from the perspective of the effective use of technological tools and materials in the learning process, and as a concept, it has to do with a series of arranged tools, which among many include machines, media (multimedia), and networking hardware, and their effective application. It is for this reason that individuals, educational institutions, and governments have been hugely investing in educational technologies in recent times. When these technologies used in lecture halls and classrooms are not of standard quality, the individual, institution, and public investments are wasted, which in turn negatively affects students professional development as well as the educational system. This puts such a society at risk of auto-destruction or regression, especially in this technological age.

Furthermore, making reference to the United Nations Children's Fund (2000), Bernard (1999) examines quality education from the perspective of the focus or purpose of learning (instruction and learning process). He affirms that the purpose is to strengthen students (learners) capacities to progressively act independently in the aspects of relevant knowledge acquisition, exploiting acquired and developed skills, and cultivating the appropriate attitudes. These qualities create an environment of safety, security, and healthy academic, social, and professional interactions.

This affirmation is given more impetus by the EFA Global Monitoring Report (2005), which holds that though the international community has engaged through a number of treaties with respect to quality education, such as the United Nations Millennium Declaration and its commitment to achieve at least Universal Primary education, which is a prerequisite to higher education, the policy is more focused on quantity and neglects explicitly referencing quality.

Also, the EFA Global Monitoring Report (2005) emphasised the fact that these universal educational policies can only be attained through universal engagement in fundamental quality education. The quality of education varies from the level of curriculum (education), policy making, planning, design, and development, implementation (which is the focus of this study), evaluation, and outcome or impact (a crucial component of this study). Furthermore, the EFA Global Monitoring Report (2005) holds that parents and sponsors abilities to finance the education of children strictly depend on the judgements they arrive at.

This is with respect to the quality of the teaching or instruction and the learning process. That is how these processes are developed and how instrumental they are in facilitating learners (students) in achieving their personal economic (professional) and socio-cultural objectives, and above all, through this professional development, being useful to their society. All these elements, especially in a developing country like Cameroon, can only be achieved through higher educational quality from primary up to higher education.

However, it has been proven that multimedia tools, materials, and resources have higher chances and potential for improving the quality of educational content. Quality content, according to UNESCO (2000) in Akemche (2014), represents the difference between what is known as the intended (aims, goals, and objectives) and taught curriculum (taught programme) in departments, programmes, or schools, with one of its major qualities being quality of content implementation. Multimedia-based pedagogy sets in at this stage because life skills are involved. Quality content implementation is directly linked to quality outcomes, which have as components knowledge, skills, attitudes, and competences, which are derived from national educational goals, as well as practical and active participation in the development process of society.

Many higher education institutions today focus on results while neglecting quality and professional development; this explains the overly increasing numbers of graduates, which corresponds with a higher level of unprofessionalism and consequently unemployment. The use of multimedia technology in the instruction and learning process is meant to meet both individual and collective professional needs of the student or learners, facilitate students' exploitation of digital learning supports for self and professional development, and improve theoretical and practical performance in classroom assessment. When these components are of standard quality, they greatly improve students' professional development.

To establish the quality of multimedia-based pedagogy for innovation, invention, and improvement purposes, this programme implementation process has to be evaluated. In this direction, Farani (2013) affirms that when a multimedia product has been developed, the process of development should end up measuring the quality of lecture hall or classroom activities. Kirkpatrick (1996) hold that multimedia based instruction is presented at four levels, which can be interpreted as follows: level one measures the response of participants or students with regard to the relevance of the programme in facilitating students in executing assignments; the second level is focused on the measurement of expected content, skills and achievement level in the learning process; while the third is level measures how knowledge and skills exploitation activity in the learning process influences behavioural changes; and the fourth level is focused on measuring multimedia activities and its formats of rewards in relation to their impact on the learning process (Lee and Owens, 2004 in Farani, 2013).

Human beings as problem solvers love and take up challenges; they organise their progression in a sequence so as to have each step right; to resolve conflicts or solve problems, they collaborate for a quicker, effective, and efficient solution to a common problem; and to solve a problem, they reflect and reason out the best way of solving the problem. There is a lot of reflection and reasoning that goes into creating, implementing, analysing, and interpreting evaluation tools for multimedia-based pedagogy that takes into account its relationship with students' professional development, as well as academic, pedagogic, didactic, and technical qualities.

According to Karakaya et al. (2001), a major innovation in multimedia (computer-based) instruction in the teaching and learning process, especially in higher education, is making lecturers and students versed with PowerPoint presentations in lecture halls, which has resulted in a high demand for PowerPoint presentations in higher institutions of learning. PowerPoint is used by most lecturers as a motivating tool for learning so as to capture and retain attention for a longer period, enabling grasping and conceptualization of notions and concepts taught. It facilitates the projection of images, text, and sound clips, which enhances students’ performance during classroom assessment and indicates the level of professional development because it reaches out to students with diverse learning difficulties.

In conformity with the findings of this research work, Lambert and McCombs (1998) examined the impact of multimedia-based instruction on the teaching and learning process and concluded that a good number of researchers have investigated multimedia in education.

These researchers had arrived at the conclusion that multimedia-based instruction is flexible, contains the potential to present learning material in diverse modes, and facilitates students' capacity for information processing, comprehension, and mastery of content, which improves performance during classroom assessment.

Furthermore, Aggarwal and Bento (2000) see multimedia-based instruction as a catalyst for exchange and interaction in the classroom and forums between students and teachers and students and students, which is very important psychologically during assessment and increases students' performance as well as professional development. The World Wide Web (www) has made access to the multimedia world and wealth very easy through tutorial tools, live data, and assessment tools, which are very instrumental in improving multimedia-based pedagogy and, in turn, students' professional development. Information is easily stored, disseminated, and retrieved when needed.

For evaluation instruments and tools to be valid, reliable, motivate, and improve students' and lecturers performance, they need to be standardised. Standardisation is very important, especially for reliability and validity in the evaluation process, as they are directly affected after their administration and analysis due to the manner of construction and administration. According to Covacevich (2014), a test is said to be valid when the technical characteristics of the instrument or tool are valid as a result of being administered before respecting standardisation conditions of the same nature. This has to do with the same or similar application context or environment, instructions, and procedures involved in scoring (which should be the same for all participants or respondents); this is to ensure that the data is analysed and interpreted properly, comparisons emanate, and exploited based on the principle of fair treatment to all users or participants. It is for this reason that McCallin (2006) holds that validity and comparability are greatly affected by any standardisation alteration or change.

Furthermore, Frye and Hemmer (2012) continue to hold that the context, input, process, and Product (CIPP) model concentrates a lot on inputs, which are taken into consideration in curriculum implementation, the characteristics of learners, learning preparation, and variability. It does not leave out content expertise with respect to faculty preparation, relevant instruction skills, and the faculty number available at the required moment for an educational programme. Learning opportunities are related to learners' characteristics and resources, and getting sufficient funding for an educational programme

demands good leadership.lso, this model enables educators to examine the process of programme implementation as well as the product, final results, or outcomes of an executed educational programme. However, the focus of the context, Input, process, and Product (CIPP) model is on programme amelioration or improvement rather than just providing information on an educational programme, with a focus on areas for improvement, programme outcome interpretations, and consistent accountability information.

Human beings live in social groups or settings; therefore, they should be agents of socialisation, which is a key factor taken into consideration when designing multimedia-based instruction for professional development purposes. Socialisation starts at a very tender age by interacting with peers and later inter-intra-group interaction, where interaction with others is to attain certain objectives, and at the professional level is teamwork, where people work together to attain common aims, goals, or objectives. Professional development in general is geared towards empowering a student to comfortably go through the transition from peer interaction to inter-group interaction, leading him or her to teamwork, which will be a determining factor in his or her current and future success in professional life. And multimedia-based instructions are there to facilitate all these by stimulating and sustaining their motivating variables.

This research work in chapters one, two, three, four, and five examines and exposes various qualities of multimedia-based pedagogy to evaluate and how they impact students' professional development. These qualities are: academic quality, having as content information relevance, information validity, and information reliability; pedagogic quality, with pedagogical planning, pedagogical implementation (strategies), and assessment methods as components; didactic quality, with learning content, learning activities, and learning materials as elements; and technical quality, having as content, design, browsing, and technological ingenuity. These qualities are great determinants of students' professional development from the perspective of meeting their professional needs, exploiting digital learning support resources, and exploiting classroom assessment for professional development gains.

Therefore, standardised actions should be made in Cameroon's higher education sector to enhance the quality of multimedia technology, which would enhance the calibre of students' professional growth through the effective application of this technology throughout the implementation of the curriculum. Which is demonstrated through the teaching and

learning process to instill a culture of high-quality technology in professors and students alike by raising the bar for quality evaluations and expanding the accessibility of high-quality multimedia and educational technology tools in institutions and schools with the support of the government, the educational community, educational authorities, professors, parents, and why not students? By raising creativity, innovation, invention, and professionalism, this will significantly reduce unemployment and underemployment while also fostering mass job creation and quick development.

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APPENDIXES

QUESTIONNAIRE

Dear respondent, this questionnaire is design to collect various items connecting with An Evaluation of the quality of multimedia base pedagogy and its impact on students' professional development in selected higher institutions in Cameroon. The data collected will be used to determine whether the use of multimedia in instruction affects students' professional development, for research purposes only. Your response will be treated with ought most confidentiality. Thanks

A: PRELIMINARY INFORMATION

Demographic information

i. Region of origin_____division_____subdivision_____

ii. Gender: male ☐ female ☐

iii. Marital status: single ☐ married ☐ divorce ☐ widow/er ☐

iv.Institution:_____Faculty_____Department_____

v. Age:_____

B. AN EVALUATION OF MULTIMEDIA BASED PEDAGOGY AND ITS IMPACT ON STUDENT'S PROFESSIONAL DEVELOPMENT

Instruction: Please rate the various aspects of multimedia in terms of the extent to which you agree with the various statement by marking "X" one of the following box: **SA**=Strongly Agree (**4/4**), **A**=Agree (**3/4**), **D**= Disagree (**2/4**), and **SD**= Strongly Disagree (**1/4**). **MBP**= Multimedia Based Pedagogy, **PN**=Professional Needs, **DLS**= Digital Learning Support, and **CA**=Classroom assessment

SN	STATEMENT	SA	A	D	SD
	ACADEMIC QUALITY				
01	**MBP** provides quality information that is relevant in addressing your **PNs**				
02	Information validity is very important in improving your performance in **CA**				
03	**MBP** information relevance quality does not facilitates classroom assessment				
04	The quality of information reliability reinforces digital learning support in **MBP**				
05	The quality of information relevance does influence your professional needs				
	PEDAGOGICAL QUALITY				
06	The pedagogic quality in **MBP** facilitates the extent to which your **PNs** are met				
07	The quality of pedagogical planning in **MBP** does influence the quality of **DLS**				
08	Quality pedagogic implementation increases your digital learning support in **MBP**				
09	Quality of assessment method in **MBP** does not influence your **DLS** exploitation				
10	The use of effective an assessment method improves your performance in**CA**				
	DIDACTIC QUALITY				

11	Quality learning content in **MBP** effectively addresses your professional needs				
12	The quality of learning materials does influence the quality of **DLS** in **MBP**				
13	The quality of learning activities in **MBP** determine the effectiveness of **DLS**				
14	The quality of learning activities has no influence on your professional needs				
15	The quality learning materials in**MBP** enhances students' motivation in **CA**				
	TECHNICAL QUALITY				
16	The quality of **MBP** design effectively determine the extent your **PNs** are met				
17	The quality of browsing does impact your performance in classroom assessment				
18	Quality browsing in increases the quality of digital learning support in **MBP**				
19	Mastery of browsing skills does not influence the attainment of your **PNs**				
20	Quality technological ingenuity increases motivation in classroom assessment				
	DEPENDENT VARIABLE				
21	Your **PN**s effectively impacted the outcome of **MBP**'s academic quality				
22	Digital Learning Assistance influences pedagogic quality in **MBP**				
23	Classroom assessment is a determinant for **MBP** didactic quality				
24	Your professional needs does not influence the technical quality in **MBP**				
25	Professional development is effectively influenced by **MBP**				

FOCUS GROUP DISCUSSION TRANSCRIPT

AN EVALUATION OF THE QUALITY OF MULTIMEDIA BASED PEDAGOGY AND ITS IMPACT ON STUDENT'S PROFESSIONAL DEVELOPMENT

MBP= Multimedia Based Pedagogy

Total Participant time required: 90 minutes – 100 minutes + 22 minuntes

Total focus group time: 90 minutes – 100minutes + 22 minuntes

Moderator: LULU John BILLA

Participants (coded names)

Curriculum studies and teaching (FE,UB)

A: Ami (female)

B: Sha (female)

C: Mos (male)

Communication and Development Studies (FA, UBA)

D: Cint (female)

Petroleum Industries and Mines, Kaele (University of Maroua)

E: Lion (male)

F: Nat (female)

ICT University Campus, Yaounde, Cameroon

G: Gis (female)

H: Fra (male)

I. Introduction (4mins)

Moderator: You are all welcome to this focus group discussion, we will be discussing on the "***The quality of multimedia based pedagogy and its impact on student's professional development***". Please feel free as you express your views and opinions clearly and in detail, one person at a given time. No answer is considered right or wrong; the purpose of this exercise is to share our experiences, views and opinions. You can express your self through text, audio message, or video, if audio or video then it would be advisable for all other mobile devices be switch off or put on silent. This focus group has as purpose to obtain

information about students' experiences, views and opinions on how the quality of multimedia based pedagogy impacts student's professional development. All information obtain from this discussion group is mainly for research purposes, therefore will be treated with oughtmost confidentiality. The information from our discussion would be exploied through analysis; names of participants will not be used in the process of discussion analyses. (Audio)

II. Warm up (15minutes)

Moderator: Please can we take turns in introducing our selves by giving our names and briefly how often we use multimedia technology in our daily study life. (Video)

A: Hi, I am Ami. My usage of multimedia technology in my daily study life can be rated to be highly frequent.

D: Hi, I am Cint. I am a technological fan; therefore my usage of multimedia technology in my studies can be rated to be highly frequent.

H: Hi, I am Fra. My usage of multimedia technology in my daily study life can be rated to be frequent.

B: Hi, I am Sha. I use multimedia technology as often as need arises in my daily study life, which is today but the order of the day.

E: Hi, I am Lion. My usage of multimedia technology in my study life can be rated to be frequent.

F: Hi, I am Nat. My usage of multimedia technology in my daily study life can be rated to be highly frequent.

G: Hi, I am Moss. I use multimedia technology on daily bases for my studies

H: Hi, I am Gis. My usage of multimedia technology in my daily study life can be rated to be highly frequent.

PRELIMINARY INFORMATION

III. Theme 1: Multimedia based pedagogy and Professional development (20 minutes)

Moderator: What do you think multimedia based pedagogy (teaching) is?

A: In my opinion multimedia based pedagogy is teaching entirely done with the use of ICT modern tools such as computers, audios, videos, audio-visuals, and doing projections"

D: I agree with A

Moderator: Any other opinions

B: Yes, to add to the above mentioned tools, I wish to state that the internet is a very essential tool or resource today when discussing multimedia based pedagogy. (Audio)

H: I support the inevitability of internet as multimedia tool in education today.

C: I humbly thing A and B completes the understanding of multimedia based pedagogy.

Moderator: Do we agree the opinion of B completes that of A to help us understand what multimedia pedagogy is all about?

E: I agree with A and B.

F: A and B are correct.

G: Opinions of A and B matches paint a clear image of multimedia based pedagogy.

Moderator: Most of us are in professional oreiented scholls.What do you understand by students' professional development?

C: Students' professional development in my opinion is the ability of students to first of all desire a profession based on personal reason or economic reason and know how, and building up knowledge, skills, abilities that will practically improve the profession

F: I agree with C

A: I think C is right

D: I think C is correct

Moderator: Any other view?

B: Yes, I believe we cannot discuss students' professional development without stating that whatever knowledge, skills, and abilities students acquire or develop through training should be transferable, integrative, and above all practical. There a student can be said to developing professionally. (Audio)

H: C and B are correct.the two is complimentary

G: Agree with both

E: C and B are right

Moderator: How?

G: Yes, greatly. The world is gradually becoming a global village, like wise professional skills. Therefore, for a student to suite into the global world multimedia based pedagogy is an educational platform and tool which exposes students to universal knowledge, skills, abilities, and develop competences with the help of audio, video, audio-visual, and internet resources; above all, it exposes students to vast opportunities needed for better professional development.

F: I believe audio, video, audio-visual, and internet resources are very important indicators.

A: I am ok with the explanations of G and F.

Moderator: Any other experiences?

D: Yes, from my personal experience and point of view, yes. Given that multimedia based pedagogy makes use of audio, video, audio-visual, and internet resources, students' professional development is met by facilitating learning for all types of learners (audio, visual, and kinaesthetic) in the professional course or program. With multimedia based pedagogy irrespective of the type of learner a student is, knowledge acquisition, skills and abilities development, and consolidation of competences are not only accelerated but are effective as well as efficient.

H: I think I support the opinions of D.

C: From my observations, yes. Multimedia based pedagogy makes use of modern technological tools of which our generation can be said not only to be familiar with but addicted to. I have personally noticed that our class is highly motivated and assimilation (learning) is facilitated when a lecturer is using technological or digital tools in teaching. In my opinion, they make learning very visible and the practical part simple. Practicality is a very important component in a student's professional development because it is the skills and abilities employers or the job markets are waiting for. (Audio)

B: I accord with C.

E: I share the views of C.

MULTIMEDIA QUALITIES

IV. Theme 2: Academic quality (20 minutes)

Moderator: Do you think multimedia based pedagogy respect academic quality? (video)

H: I strongly hold to the view that the world has become a global village especially with the use of internet and other ICT tools, as we discussed earlier. Therefore, today it takes less than few minutes or hours to verify the academic quality of the content being taught, as well as procedures can easily be verified even by the students to see if they meet national or universal norms and standards. These verifications have even given comparative education much popularity. (Audio)

F: I am in accordance with H.

C: I will like to differ in that, I see multimedia based pedagogy as a program implementation method, therefore can only effectively and efficiently execute the course content of the program. With this, academic quality in multimedia based pedagogy is mainly in the domain of program implementation. Therefore, it can be said to have academic quality because it is used to implement prescribed curriculum.

D: I support this idea.

A: C is correct.

B: Most of our universities are under the direct supervision of the Cameroonian Ministry of Higher Education, which has elaborated norms and standards, and it is obligatory for higher education administrators, program developers, and lecturers (program implementers) to follow and these standards we believe are often verified by the ministry through quality evaluation or assessment more often.

G: B is very correct.

E: B's explainations makes every very clear and visible.

Moderator: Why?

A: I believe the material taught using multimedia based pedagogy (modern communication technologies) respects the official program designed by our school. From my observations the documents used have standards and verifiable references with respect to courses or program we are studying; the contents have positively impacted me with respect to developing knowledge, skills, abilities and also guide towards building professional competences; and multimedia based pedagogy has facilitated my exposure to the reality of the professional world. This I noticed when I went for our second internship last year.

G: Supported.

C: A is right.

D: I support A's explainaions.

E: Perfecte explainations.

B: Perfecte explainations

F: Perfecte explainations

H: I support.

Moderator: Do you consider the information presented in the course of multimedia based pedagogy as relevant to academic quality or standards?

B: Yes

G: Ofcourse

A: Yes

D: Sure

E: Yes

H: Yes

F: Sure

C: Yes

Moderator: How is it relevant?

C: I feel that multimedia based pedagogy contain reliability with respect to academic quality, because it has to do with quality implementation of courses and programs. Therefore, it has been experimented and the results obtain from its quality of course implementation has been observed to be consistent.

Moderator: Does academic quality of multimedia based pedagogy program influence students' professional development?

H: I believe so. But it depends on the forum and the mastery of the lecturer.

G: for sure

B: Yes, but it depends on the tools and materials used, and to a majority it depends on the content and the instructional processes, as well as teaching and learning activities.

D: Ofcourse

A: Sure

E: Yes

Moderator: How is multimedia based pedagogy information reliable with respect to academic quality?

B: Multimedia based pedagogy has to do with quality implementation of courses and programs. Therefore, has been experienced to be efficient in terms of quality implementation.

G: I agree with B.

A: B is very correct.

D: I support.

E: In my opinion multimedia based pedagogy in today's world is easily digitalised, and digitalised information in higher education is structured to be reliable and respects the norms and standards of academic quality.

H: Share E's view.

F: E's view is better.

C: E is on track.

v. Theme 3: Pedagogic quality (20 minutes)

Moderator: From your personal experience do you consider multimedia based pedagogy to be of standard pedagogic quality?

H: From my experience, multimedia based pedagogy makes learning very visible and practical. This is because it exposes the students to reality through audios, audio-visuals, and animations.

G: I share in H's experience

B: in accord with H's view

Moderator: what about standards?

D: If I am permitted, there are no worries about verifying the quality of content taught via multimedia based pedagogy. This is because verification in this digital age can be done digitally by contacting students who had taken the course or who are taking it in another institution. Technology has come to promote excellent pedagogic standards.

E: sure

A: certainly

F: I support this view

C: To add to the series of views projecting multimedia based pedagogy as concrete and practical, I wish to state that from my observations multimedia based pedagogy lessons are well organised and planned. As a consequence, it enhances concrete learning, and therefore should have standard pedagogic quality.

Moderator: Do you consider pedagogical implementation (instructional and learning) strategies to be effective?

A: In my opinion multimedia based pedagogy is different from traditional teaching approaches or methods in that it meets the needs of the different types of students (audio, visual, and kinaesthetic) found in the lecture hall or platform, through its usage of audios, videos, audio-visual, and animation resources. Also we have agreed that it is carefully planned and can exploit a series of instructional and learning resources at once, especially when using the internet (audio).

G: Yes, I do.

Moderator: why?

G: We have agreed that it is carefully planned and can exploit a series of instructional and learning resources at once, especially when using the internet.

C: Sure.

D: To add, I thing MBP saves time and resources, because there is little or no use for chalk and papers and content material is easily transferable through diverse electronic means such as USB key, email, WhatsApp group, and on any platform because it is easy to digitalised.

H: MBP is really saves teaching and learning time.

B: True.

F*:* Multimedia based pedagogy is further different and better than other teaching and learning approaches in that its materials and resources are easy to revise and upgrade, thereby creating an opportunity for quality and standard content evolution. Also its content sources and references are easily verified making it very reliable.

Moderator: What makes multimedia based pedagogy effective?

B: I will like to state that from my experience MBP strategies motivate the teaching and learning processes through its usage of images or visuals, audio, audio-visual and animation. They also greatly reduce time wastage and introduce effective time management, because there is no board writing irrespective of the fact that it is professionally planned.

A: I share in B's experience

C: From my own experiences multimedia based pedagogy has teaching strategies that give opportunity for students to be active and participate in the teaching and learning processes, by asking and answering questions, working in teams and groups, and practically realising something.

D: I share in A's experiences.

G: To add to the contributions above, as per my experience MBP strategies facilitate the transferability of knowledge and skills, because it gives us the opportunities to observe and carry out physical practical activities as well as manipulations. And it also prepares students for professional life by enabling them visualise realities in the field especially through videos.

Moderator: How do MBP assessment methods facilitate the teaching and learning process?

C: It makes use of all the main assessment types such as placement, diagnostic, formative, and summative. The administration of these assessment types orientate the lecturer (teacher) on the level, difficulties, level of mastery of the students, it also gives the lecturer information on the best strategies that better suit his/her students. (Audio)

B: I strongly support C's view.

D: Great view.

Moderator: Any other view?

A: I will like to add that, it makes use of all the main assessment types such as placement, diagnostic, formative, and summative. The administration of these assessment types orientate

the lecturer (teacher) on the level, difficulties, level of mastery of the students, it also gives the lecturer information on the best strategies that better suit his/her students.

E: A's view is strongly supported.

G: Really, we can't underscore the role of

F: Furthermore, I will like to add that multimedia based pedagogy assessment methods which are more continues enable the lecturer to identify and choose teaching and learning activities that are learner friendly, that is facilitates learning; and they also enable the structuring of the teaching and learning process to meet both collective and individual professional needs.

H: Strongly supported.

VI. Theme 4: Didactic quality (15 minutes)

Moderator: At this stage we shall examine the didactic quality of Multimedia based pedagogy. What new elements does multimedia based pedagogy introduce in classroom learning content, learning activities and learning materials?

The respondents collectively acknowledged that multimedia based pedagogy is very modern and represent the instructional method of the time that makes classroom learning content, learning activities, learning materials through audios, videos and animation very visible, active and participation oriented, organised, dynamic, motivating, practical, modern, time serving, facilitate research, and is digital. Therefore universal, as compared to the traditional method that is not very visible, not concretely active and participation oriented, not very motivating and practical, not modern nor digital makes time management very complicated and makes research very complicated and demanding, and its universality is difficult to establish. Respondents reacted:

A: I have observed that teaching with ICT tools (multimedia based pedagogy) is very modern and represent a teaching method of the time makes classroom learning content, learning activities, learning materials through audios, videos and animation very visible, active and participation oriented, organised, dynamic, motivating, practical, modern, time serving. Therefore it is better than the traditional teaching approaches.

G: I share in A's experience.

C: I also share in A's experience.

D: Also we have experience how MBP has facilitated research through digital resources, making it universal and dynamic as compared to the traditional method that is not very visible, not concretely active and participation oriented, not very motivating and practical, not modern nor digital, makes time management very complicated, and makes research very complicated and demanding, and its universality is difficult to establish.

E: Supported.

B: I strongly share in D's experience.

F: I share in D's experience.

H: D's experience is very visible.

Moderator: Ok, how has multimedia based pedagogy improve the quality of instructional didactics as compared to traditional instructional methods?

B: We can factually state today that multimedia based pedagogy has brought about the use of gadgets such as multimedia computers, multimedia phones, microphones, loud speakers, multimedia projectors, and internet resources that has greatly facilitated the quality instructional procedures, strategies, processes, and styles.

H: Sure.

E: View, strongly supported.

G: Very true.

C: Also, MBP has brought in or make use of modern didactic materials and resources that makes the teaching and learning processes very visible and concrete. These didactic materials and resources facilitate the attainment of the learning and professional needs of all types of learners or students.

A: View, strongly supported.

F: View, strongly supported.

VII. Theme 5: Technical quality (20 minutes)

Moderator: Today we will be examining the technical quality of multimedia based pedagogy. In your opinion, what is referred to in multimedia based pedagogy as the technical quality?

H: In my opinion technical quality has to do with physical things that can be seen, touched, and manipulated.

G: From my point of view I would like to throw more light on the concept of 'technical quality' by emphasizing that technical goes beyond physical items to include resources and skills. Of which some of these resources and skills (techniques) are not very visible but their results are, and an example is a software or internet connection which is not physical but its state greatly influence quality of multimedia based pedagogy. (Audio)

C: H and G are very correct. I think I share views.

A: I also.

F: I believe the above views are correct.

E: Correct.

D: These two views compliment each other.

B: Agreed.

Moderator: And how does design, Browsing and technological ingenuity reinforce multimedia based pedagogy?

H: I have observed that when the design takes into consideration efficiency during construction the instructional and learning processes in multimedia based pedagogy will be greatly enhanced and will reflect quality.

A: I share in this observation.

C: True.

Moderator: Any other view?

G: *Yes.* I have observed that lecturers (teachers) or students equipped with good browsing knowledge and skills are very instrumental in the multimedia based pedagogy processes.

F: I share in this observation.

E: Observation very true.

D: On my part, I have also experienced that modern technological tools play a great role in reinforcing multimedia based pedagogy as well as improving the quality of instruction from perspectives of conception, planning, design, implementation, transferability, and monitoring and evaluation processes.

B: True.

F: correct.

G: True

VIII. Theme 6: Students' professional development (20 minutes)

Moderator: At this final stage, we shall be examining the relationship between multimedia based pedagogy and students' professional development.

Is professional development influenced by **MBP** through addressing students' professional needs and providing digital learning support?

A: Multimedia based pedagogy from my point of view when well-structured or designed takes into consideration both our individual and collective professional needs. This is because in professional oriented programs students are being trained to meet up with after school professional challenges. This process and aspect is being strengthened by multimedia based pedagogy through its diverse medium such as audio, video, audio-visual, animation, online and offline resources.

B: To add, multimedia based pedagogy in both online and offline mediums facilitate students' professional development through accessibility to information, help, and exposure to the realities in the particular field of professional study and work.

Moderator: What is the role of classroom assessment in developing students' professionally?

B: Classroom assessment from my observation also assesses the various qualities multimedia qualities (academic, pedagogic, didactic, and technical) as well as their components (information relevance, validity and reliability; pedagogic planning, implementation, and methods of assessment; learning content, activities and materials.

A: Also, design, browsing and technological ingenuity with respect to the development of professional knowledge, skills, abilities, as well as the level of competency are easily developed. This leads to the reinforcement or restructuring of multimedia based pedagogy programs to better suit its professional development objectives and goals.

E: Views supported.

F: Ok.

G: Strongly support the above stated opinions.

D: Great.

H: Supported.

Moderator: What are your personal experiences on the role of classroom assessment in developing students' professionally through multimedia based pedagogy?

B: I have experience that through the use of modern technologies especially Information and communication Technologies such as the whiteboards, gadget such as multimedia computers, multimedia projectors, multimedia phones, palmtops, microphones, and loud speakers which produce audio sounds, videos, and animation; resources such as internet which facilitate research and sharing of information for professional development purposes, thereby improving students' performance during theoretical and practical assessment. (audio).

A: Similar.

C: My experiences are similar to that of B.

H: Similar.

F: I will like to confess that multimedia based assessment methods are more objective and goal oriented. They facilitate the processes of meeting up with our professional needs and redirect as well as orientate us on developing professional knowledge and skills exploiting digital learning support.

G: Supported.

D: Correct.

E: Inline with my observations and experiences

Closure (3 minutes)

Moderator: I heartily wish to thank all of you for being part and actively participating in this focus group discussion on "***The quality of multimedia based pedagogy and its impact on student's professional development***". Your views, opinions, observations and experiences shared will be very useful for this study. I wish to once more assure you people that information obtained from these focus group discussions will solely be used for academic purposes and respondent's confidentiality shall be strictly applied. Once more thanks a lot. (Video)

A. RESEARCH AUTHORISATION

REPUBLIQUE DU CAMEROUN
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Paix – Travail – Patrie
*****
UNIVERSITE DE YAOUNDE I
*****
FACULTE DES SCIENCES DE L'EDUCATION
*****
DEPARTEMENT DE CURRICULA ET EVALUATION

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Le Doyen

The Dean

N°/UYI/FSE/VDSSE

AUTORISATION DE RECHERCHE

Je soussignée, **Professeur Christine Félicité EWANE épouse ESSOH**, Doyen de la Faculté des Sciences de l'Éducation de l'Université de Yaoundé I, certifie que l'étudiant **LULU John BILLA,** matricule **14T3321** est inscrit en Doctorat à la Faculté des Sciences de l'Éducation, Département : ***Curricula et Évaluation***, *Filière :* **Évaluation**.

L'intéressé doit effectuer des travaux de recherche en vue de l'obtention de son diplôme de Doctorat. Il travaille sous la codirection du **Pr. MBALLA ZE Barnabé (Directeur de l'École Normale Supérieure de Yaoundé) et du Dr. KIBINKIRI Éric LEN (Chargé de cours)** enseignant à l'École Normale Supérieure de Yaoundé. Son sujet de mémoire porte sur: «***AN EVALUATION OF MULTIMEDIA BASED PEDAGOGY AND ITS IMPACT ON CLASSROOM ASSESSMENT IN HIGHER EDUCATION: CASE OF ICT UNIVERSITY CAMEROON, YAOUNDÉ***».

Je vous saurais gré de bien vouloir mettre à sa disposition toutes les informations susceptibles de l'aider.

En foi de quoi, cette autorisation de recherche lui est délivrée pour servir et valoir ce que de droit /.

Fait à Yaoundé, le 20 MAI 2019

Pour le Doyen et par ordre

Le Vice Doyen

Eloug's Martin, Ph.D
Professeur

B. PUBLICATION CERTIFICATES

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This is to certify that,

LULU John BILLA et al.

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