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Original Article

### Applicability of ADDIE model in Analysis of Content Resources for Blended Learning in Universities: Case of Bachelor of Science External at Makerere University

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**Keywords:**

*ADDIE model,  
Content Resources,  
Blended Learning,  
Bachelor of Science  
External.*

This article draws from a study on the applicability of the ADDIE model in the Analysis of Content Resources for Blended Learning at Makerere University. The study analyzed the current content resources for Blended Learning (BL) and strategies for improving content resources for BL on Bachelor of Science External at Makerere University. The connectivism theory was used as lens to explain findings in this study. The qualitative research design and interpretivism paradigm were adopted to explore opinions of the respondents for this study. The multi-stage sampling method with purposive technique was used to determine the general student population on the Bachelor of Science External program, identifying and selecting students in their various subject combinations. The first stage was identification of the college 'College of Natural Sciences', followed by purposive selection of B.Sc. External program. The selection of a B.Sc. program was followed by identification of various subject combinations and lastly purposive selection of students with consideration of the year of study and their lecturers. Interview data was analyzed in Atlas ti. coding In-vivo to create the quotations and memo of network view for findings of this study. The Atlas ti was used to organize uploaded transcribed interview data to generate the network views that contained meaningful information aligned with the objectives of the study. The analyze phase of ADDIE model involves the determination of instructional goals by understanding the competency gaps through which academic progress is catered for within the intended learning outcomes both in Biological and Physical sciences to address the needs in society. Target audience analysis require taking consideration of; gender, learners' experiences, learning interests, geographical location, motivation for learning, economic status, language proficiency, learners' abilities and intimate pattern for inclusivity in BL. Required resources were smart phones and laptops to access the internet-based content resources, artificial intelligence such as Chat GPT for learning, and digital learning using communication tools like; zoom, WhatsApp, google meet and TikTok. The well-designed lecture theatres, smart rooms and multimedia studios facilitate the preparation of content resources fit for BL. Strategies were; understanding of marital status of learners, experiences, motivation to pursue a course, excellent search engines such as refseek.com, worldcat.org, link.springer.com, bioline.org.br among others all important in designing of content resources for BL. Continuous professional development programs for lecturers and orientation of learners with support of a cross cutting

course, buy your own device policy at subsidized price from pre-qualified vendors like Stanbic at Makerere University and adoption of MUELE to build effective BL solutions for universities.

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## INTRODUCTION

Content learning resources involve provision of sufficient and adequate course materials and orientation to ensure delivery of quality education in terms of; material fit for purpose, description of the student learning outcomes; course credits, instructional strategies, content outline, and assessment (National Council for Higher Education Minimum Standards, 2019). Design of content resources like; power point presentation, mini-lectures, physical learning activities, e-tivities, recorded materials and audio-visual resources support blended learning on Learning Management System (LMS). Blended learning is a careful fusion of face-to-face and online learning modalities which provide an affordance of synchronous and asynchronous learning opportunities (Kabarungi, Ejiri & Kawuma, 2023). Distance Education learners are multitaskers and as such require well designed content resources that can support their learning anytime anywhere. The deficiency in design of content resources deters the quality of education offered through blended learning in universities.

### Content Resources

The content learning resources for a course in 21<sup>st</sup> Century utilizes a blended learning approach to ensure delivery of quality education in universities

(Yulifar, 2014). The content resources focus on the intended learning outcomes with engagement of students in the analysis and reconstruction of teaching material for distance learners at university (Nuttall, 2021). The facilitators provide content resources after analysis of learners' prior knowledge, learning and life support mechanisms, and administration experiences to design learning activities for the course unit to achieve the intended learning outcomes.

The use of digital technologies, including open educational resources (OER), machine learning and artificial intelligence (AI) in education and training are vital in the analysis of content resources 'learning materials', teaching and learning processes, as well as fundamentally changing pedagogies (ILO, 2020). The digitization of content resources incorporates the text book material, knowledge within the environment, learners' expectation, demands on job market trend and expertise of facilitators to ensure delivery of quality education (Shavab, et. al., 2023). Using LMS, students are able to achieve a knowledge comprehension level of 70%-90% as the content learning resources foster interactions among students, between students and digital technology/applications for blended learning under

the guidance of facilitators /lecturers (Shavab, et. al., 2023).

The content resources were evaluated to establish how applicable the analysis phase of ADDIE following its prescribed stages; instructional goals, target audience and required resources was during the designing process as attached in Appendix i. The mentioned stages are the primary activities for consideration by facilitators while designing content resources for the distance learners. The teaching material is utilized as content resource for blended learning at the university.

### **Blended Learning**

Blended learning (BL) is an approach to education that combines online educational materials and opportunities for interaction online with physical place-based classroom methods to deliver quality education (Cronje, 2020). The BL is a setting where learners and facilitators are at times in different physical locations and at times face-to-face and are engaged in synchronous or asynchronous learning using computer, internet and/or mobile phone technologies (Owston, York & Murtha, 2013). Blended learning is a thoughtful blend of resources, technologies and methods in the teaching learning process that fits the 21<sup>st</sup> Century (Kabarungi, Ejiri & Kawuma, 2023).

The BL is supported by the connectivism theory (George, 2005). The theory provides that learning is achieved through distribution of knowledge across networks and the interplay of connections among the learners and faculty. Knowledge is not centralized but rather distributed across a network of connections which support BL at HEIs. Currently, BL is globally recognized as a promising pedagogical approach integrating traditional learning with new and innovative technology-supported pedagogies for delivery of quality education in universities.

### **An Overview of ADDIE Model**

ADDIE model founded by Branch 2009 provides five stages; Analyze, Design, Develop, Implement and Evaluate for building effective learning solutions. Over the years, the phases have been revised with the model becoming more dynamic and

interactive than the original. The Analysis phase entails formulation of instruction goals, target audience characteristics and required resources. Design phases involve setting learning objectives, instructional and testing strategies. Development phase requires identification of learning resources, validation and piloting. Implementation phase is about preparation and participation, engagement and Evaluation in form of formative and summative assessment to accomplish instructional goals.

The ADDIE model facilitates understanding of students' cognitive levels to analyze content resources for blended learning to deliver quality education. This model is suitable in analyzing content resources since it provides for key ingredients in determination of instructional goals, target audience characteristics and required resources for effective learning and teaching. Analysis of content resources requires information about the learners, their needs, their learning environment, and the objectives of the training or instructional program. The analysis of content resources helps learners take ownership and connect to the content, making it more engaging and useful for their intended learning outcome (Drysedale, 2019). The analysis phase of ADDIE with emphasis on how it is applied and strategies for improvement informs this study.

### **Blended learning in Uganda's context**

In Uganda as indeed elsewhere, education is a human right and a powerful driver of economic development and one of the strongest instruments in 21<sup>st</sup> Century teaching and learning leading to attainment of Sustainable Development Goal (SDG): 4-Quality Education (World Bank Report, 2022). Uganda's higher education is regulated by National Council for Higher Education (NCHE) which gives guidelines on running distance education programs at universities (NCHE 2019). Makerere University one of the oldest Institutions in East Africa, currently stands at a student population of over 30,000 from both full-time day, evening, weekend and external modes (uniRank 2005-2024). Currently on the External mode, there are five programs; Bachelor of Education (B.Ed./Ext), Bachelor of Commerce (B. Cox/Ext), Bachelor of Science (B. Sc/Ext) Bachelor of Agriculture and

Rural Innovation (BARI) and Common Wealth Youth Program (CYP). The above programs are offered in their relevant constituent colleges that make up Makerere University.

The Bachelor of Science Program found in the College of Natural Sciences has the following subject specializations (Biology, Botany, Zoology, Chemistry, Physics, Computer Science and Mathematics). Agriculture is handled on BARI program. At Makerere University, the B.Sc./Ext admits both direct high school entrants and diploma holders some of whom are teachers. Bachelor of Science students need knowledge and skills that are relevant in the labor market through Fifth Generation Distance Education (FGDE) affordances such as use of; smart phones, desk computers, iPad and laptops among others to support delivery of content resources for Distance Education (DE), (World Economic Forum, 2020). However, much as Makerere University has an institutional LMS, the design of content resources on Makerere University Electronic Learning Environment (MUELE) using detailed design document (DDD) remains inadequate to support learning and teaching on DE.

The use of an LMS with well-designed content, embedded with use of online conversational tools like zoom, Big Blue Button and Google meet is needed to support delivery of quality DE (United Nations Report, 2021). In response to the transformation above, Makerere University passed a policy (ODEL Policy 2015) to regulate and manage adoption of Blended Learning (BL). Government through its agency (National Council for Higher Education) provided guidelines and standards for universities to offer Open Distance eLearning to meet students' expectations (NCHE, 2019). The Ministry of Education and Sports developed a digital agenda policy to regulate BL across Higher Education Institutions (HEIs) (MOE&S Report, 2023). Despite the Universities and Government policy interventions and guidelines, some facilitators at 48% still encounter challenges with analysis of content resources for BL (Young, et al, 2021).

### Problem statement

At Makerere University, distance education largely depends on the face-to-face sessions which are

organized during school holidays provided by Ministry of Education and Sports' year calendar that are limited to utmost two – three weeks (MOES, 2024). The face-to-face learning during the three weeks is inadequate to support distance education learners which necessitate access to content resources on the MUELE. Bachelor of Science External undergraduate program offers 237 course units; Botany (33), Chemistry (42), Physics (38), Zoology (36), Bio-Chemistry (26), Computer Science (30) and Mathematics (32) where only 15% represented by 36 course units have content resources on MUELE with differing structures (Bachelor of Science (Ext) Curriculum, 2024, MUELE, 2024). In addition, this situation presents a challenge of how learners on Bachelor of Science external (B.Sc.) receive instruction for learning continuity while away from campus for 13 weeks out of the 17 weeks of the semester without access to designed content resources on MUELE. Without standardized content resources on MUELE as a primary lecture room for B.Sc., learning and teaching falls short of fitting in the FGDE which impairs delivery of quality education for human capital development (NDPIV, 2024). This study established the applicability of ADDIE model in analysis of content resources for blended learning on Bachelor of Science External at Makerere University.

### Purpose of study

This study investigated the applicability of ADDIE model in analysis of content resources for blended learning in Universities: Case of Bachelor of Science External at Makerere University.

### Objectives

- To analyze the content resources for BL on Bachelor of Science External at Makerere University.
- To suggest strategies for improving content resources for BL on Bachelor of Science External at Makerere University.

### Scope

The study was carried out on B.Sc./Ext program at Makerere University and covered students of Year 1

– 4 in their respective subject combinations and lecturers. The study intended to test the analysis phase of content resources on ADDIE model focusing on instructional goals, target audience and required resources for building effective BL solutions on Bachelor of Science External students. The analysis phase is the foundation of designing content learning resources since it identifies what learners know, what resources they can access, how they can learn using digital affordances as this connects with the study problem. The excluded phases; design, develop, implement and evaluate are undertaken after completion of analysis phase. The study took three months September – November 2024.

## LITERATURE REVIEW

The analysis of instructional goals to respond to competency gaps while designing materials is vital to achieve the set course learning objectives of the distance learners at university (Dewi & Dian, 2020). The competency gaps of distance learners inform the selection of the instructional goals to design content resources. The faculty consideration of the students' prior knowledge, abilities, points of view, and perceived needs support content design on online learning management system (Fulgencio & Asino, 2021).

Adri et al. (2020) in their study about using ADDIE instructional model to design blended project-based learning, stated that inquiry of DE learners and benchmarking of available local content creates an interactive BL environment desired to meet desired learning outcomes. In addition, Orr, Csikari, Freeman and Rodriguez (2022) stated that identification intended learning outcomes with input of learners' support design of course content in FGDE. Shahbaznezhad et al. (2021) established that fan likes and comments about future opportunities on job market support designing of content resources for distance learners.

The distance student characteristics; gender, geographical location, marital status, competences attained justifies the nature of content resources to support learning (Zhao, 2018). Moreso, Yoong (2022) in the study about applicability of the ADDIE model to analyze, design and develop an instrument for dyscalculia in Malaysia submitted that

determination of student's characteristics guides the faculty while designing content resources. Furqon et al. (2023) in their study on impact of learning management system usage on students in Indonesia, stated that consideration of students' accessible gadgets in terms of computers and skills to utilize learning management systems define the nature of content resources to delivery of DE.

Borabo et al. (2024) in their study on impact of the utilization of LMS in the implementation of distance learning in the Philippines from 2019 to 2023 submitted that utilization of images while designing content resources demonstrate practical experiments which support effective learning and teaching of science course units using LMS. Furthermore, Ravik et al. (2024) in their study about usefulness of pedagogical design features of a digital educational resource pointed out that pedagogical design skills acquired by facilitators during retooling followed by administering cross-cutting course to distance learners builds effective BL solution.

## METHODOLOGY

Qualitative research design and interpretivism paradigm were adopted for this study. The qualitative research design involves collection of non-numerical data for this study (Cresswell, 2019). The qualitative research design allowed in-depth gathering of opinions from selected participants for problem which is not exhaustively studied like in this context. Furthermore, understanding of the DE learners and lecturers' experiences on how analysis is undertaken while modelling content resources for BL necessitated use of qualitative research design. Interpretivism paradigm is based on the assumption that reality is subjective, multiple and socially constructed to explore opinions of respondents (Cresswell, 2019). The participants opinions were interpreted into meaningful information in this study. The responses from selected participants on Bachelor of Science were interpreted using non-numerical tactic to address the objectives of this study as advocated by the interpretivism paradigm.

The study employed a multi-stage sampling method with a purposive technique. The study started by purposively determining the general student population on the B.Sc./Ext program. This was followed by identifying the various subject

combinations and students with special characteristics: gender, geographical location, disabilities and marriage status all of which affect learning. The students explicitly offering B.Sc. program from year one to year four were included in this study. In addition, this study included only lecturers and academic administrators who were available during data collection period.

The accuracy and reliability of interview guides was ensured by aligning the open-ended questions with the set objectives. In addition, the interview guide did not entail double-barreled questions that can influence or confuse the respondents during data collection. Participants were briefed about the study.

Permission was sought from the program coordinator Bachelor of Science in External at College of Natural Sciences Makerere University to conduct the study. Then after, individual participants were requested to participate and provided their written consent which defined the appointment date, time and venue. Appointments were made using phone calls, zoom and physical visits which led to formulation of an interview schedule bearing in mind convenient time as well as location either at their workplace (school) for those in mainstream teaching, evening and weekend for those in the private sector. However, written information regarding student numbers, gender, contacts, places of work as well as facilitators was received from the program coordinator B.Sc. external which guided the researcher on where and how to access the participants. The participants; lecturers and students on B.Sc. external were interviewed after their consent. Engagement of selected informants in the interviews took an average of 45 minutes each. The major instruments used to record data for this study were; voice recorder, pen and note book.

During the process of interviews, it was observed that students were beginning to provide repetitive responses on the variables of this study. This therefore indicated the point of saturation beyond which it was no longer necessary to exceed the 13<sup>th</sup> informant.

Interview data was transcribed and typed in Microsoft word document and later uploaded in Atlas ti. Coding In-vivo was done to create the

quotations and memo of network with similar views. The similar views were illustrated in network schematic diagram generate in Atlas ti. The codes inform the similarities whereby the first code shows the quotations and second code indicates the number of connections. The memo provides detail on the connectivity of the coded theme in the study. The connectivism theory was used as lens to explain the findings of this study. The findings are based on the analyze phase as advanced by ADDIE model to build effective BL solution for delivery of quality education.

The confidentiality of participants was attained by assigning axial codes, thus limiting the use of identifiers. The data was solely used for this research study. The data capture note books were discarded to avoid illegal access and utilization.

### **Presentation and discussion of key findings**

The sample of thirteen including seven students on B. Sc external, five lecturers and a Program Coordinator participated in the study. Female participants were 54% [seven out of thirteen] and male were 46% [six out of thirteen]. The students were evenly spread and selected from Year 1, 2, 3 & 4 to participate in this study. The interviewed lecturers had PhDs with experience of over ten years teaching on B. Sc (External) Program at Makerere University.

### **PRESENTATION OF FINDINGS**

The findings are presented following the research objectives premised on the first phase of ADDIE Model which is underpinning this study. The findings from students were coded in terms of S1 to Sn and lecturers together with program coordinator were coded as L1 to Ln for this study.

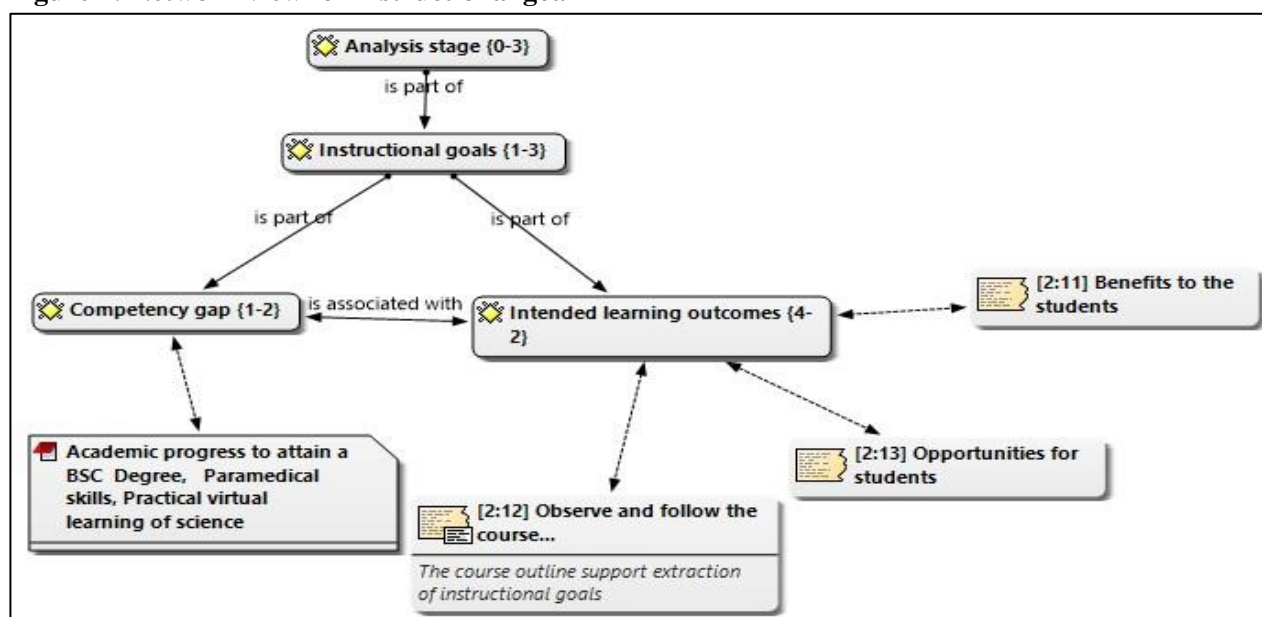
#### **Objective 1: Analyze the content resources for BL on Bachelor of Science External at Makerere University.**

The content resources were analyzed through validation of how faculty selected the instructional goals with consideration of target audience characteristics and required resources to build effective BL solutions to fit Fifth Generation Distance Education. The findings on the three stages in analyze phase are set out below.

**Instructional goals.** This is the first stage which involves facilitators' ability to respond to competency gaps defined by differing knowledge, skills and desired learning outcomes on successful course completion to build effective learning solution in the Fifth Generation DE. Instructional goals guide on how successful course completion is

achieved to support effective BL solution. Interviewees stated that understanding of competency gaps and intended learning outcomes is part of a strategy to assign the preferred instructional goals for learning to take place any time anywhere. Interviewees opinions are summarized in the network view set out below.

**Figure 1: Network view for instructional goal**



From the network view in figure 1, Intended Learning Outcomes (ILOs) cater for the likely benefits to the students, available opportunities for students and step by step follow up of the course outline to extract the instructional goals. The node counts as indicated in the network indicates the number of links that explain the significance of the opinions. The competency gaps were attributed to academic progress through knowledge required to achieve paramedical skills and practical virtual learning of science to attain a B.Sc. Degree, to address the needs in society.

Interview results showed that students as well as lecturers have different competency gaps which jointly constrain the implementation of BL to facilitate studying any time anywhere. S4 stated that, *"benefits and opportunities vary among students although goal congruence is triggered towards pursuing course completion leading to award of a degree in BSC<sup>1</sup>".* Students' involvement in setting

desired learning outcomes is key at all levels of academic progress. Subsequent year of study from first, second, third and fourth involve joint participation in the setting of desired learning outcomes. Prospective and retrospective analysis of students' opinions inform the desired instructional goals. During the orientation week, integration of students' opinions is key to state desired learning outcomes for successful course completion. The setting of instructional goals follows determination of target audience characteristics as shown below.

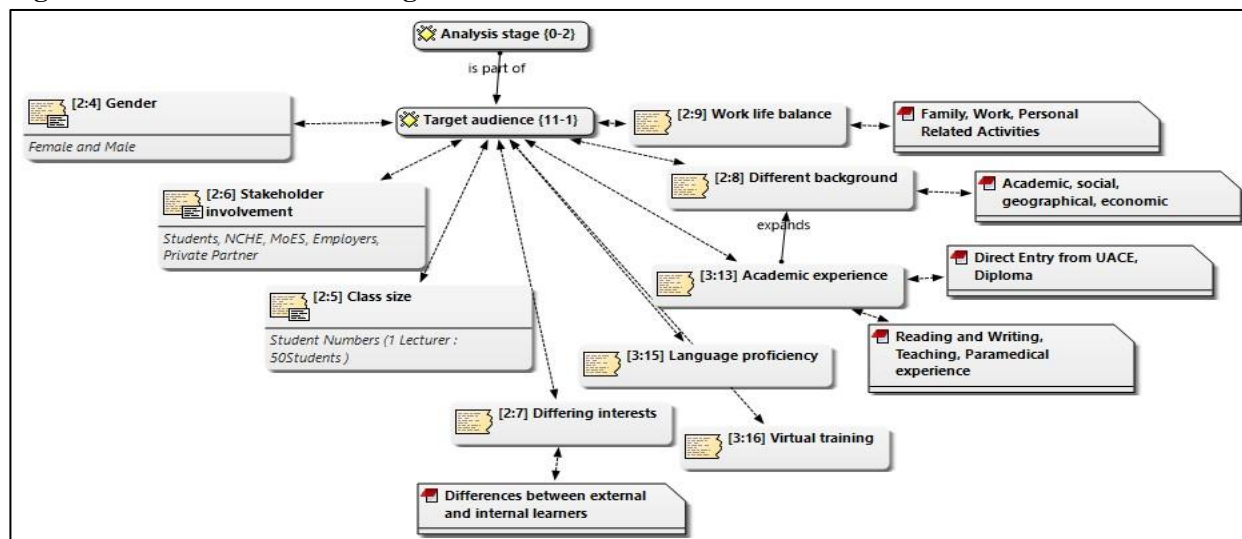
**Target Audience Characteristics:** Target audience characteristics is the second stage of analyze phase which entails; extraction of existing knowledge, skills, experience levels, language proficiency and motivation to upgrade which enhance building effective BL solutions. The target audience were students on the B.Sc. Ext program with key attention on knowledge as well as innovative skills required on the job market. Under this second stage of

<sup>1</sup> Interviewee 4: Student with Diploma in Paramedical, Thursday 19<sup>th</sup> September 2024

analyze phase, understanding target audience in various years [Year 1, 2, 3 & 4] and semester of academic progress is vital to build effective BL solutions in this Fifth Generation DE.

Interviewees stated that learning progress is determined by the target audience characteristics which inform the lecturer on the content desired to meet their expectations as well as those on job market. The target audience characteristics are illustrated in the network below

**Figure 2: Network view for Target audience**



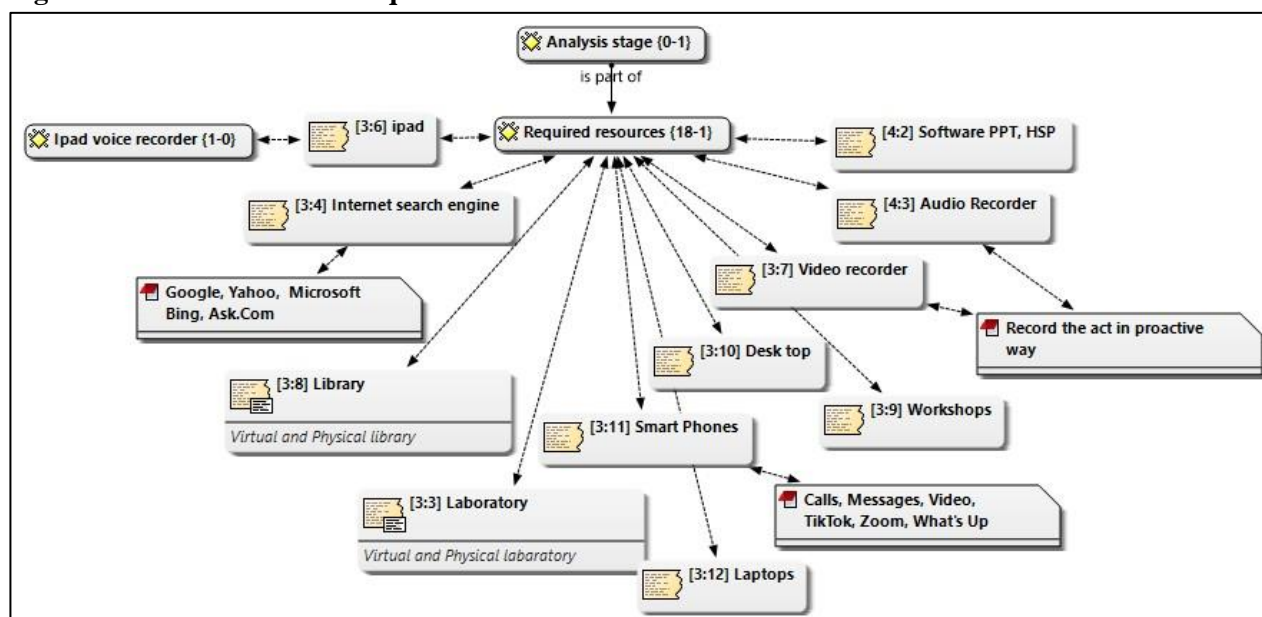
The network view in figure 2 on target audience characteristics involve attention on; gender [female and male], class size [1 lecture: 50 Students], stakeholder involvement [students, NCHE, MoES, employers, private partners], differing interests, different backgrounds [differences between external and internal learners], work life balance [family, work, personal related activities], academic experience [reading and writing, teaching, paramedical experience], language proficiency and virtual training awareness.

The academic, social, geographical and economic considerations determine one's entry on the course and these are important requirements for planning on the nature of preferred content resources for effective BL solution. Target audience involves not only students but also sponsors, employers and the community. L5 stated that, "*prior knowledge and*

*skills, experience levels acquired in environment and motivation aspects in form of career development, psychological satisfaction and social actualization are key considerations to analyze target audience to design content resources*<sup>2</sup>. Faculty determines required resources after identification of target audience characteristics.

**Required resources:** The determination of required resources is the last stage of analyze phase which include; content, technology, facilities and human resources. Determination of delivery methods depend on required resources which is important in building effective BL solutions. The required resources have to be provided in time to enable designing of the content for learning and teaching. The quality of content resources is determined by the university's ability to provide the required resources as indicated in the network view below.

<sup>2</sup> Interviewee 5: Lecturer at CONAS, Makerere University, Tuesday 16<sup>th</sup> September 2024

**Figure 3: Network view for required resources**

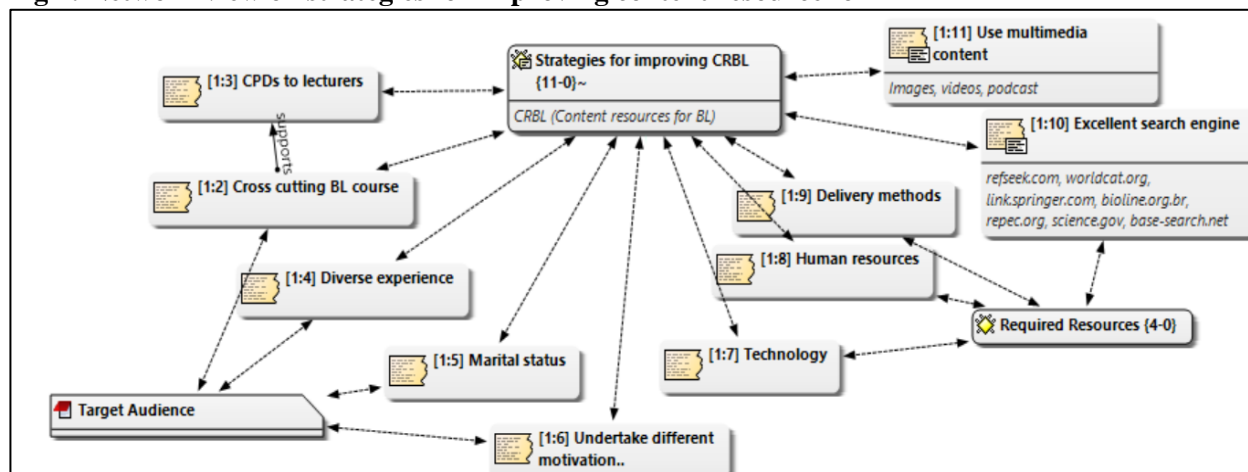
The network view in figure 3 on required resources include; technology software like PPT and HSP (HTML5 Package), gadgets; audio recorder; video recorder, desk top, laptops, smartphone, iPad, internet search engine [Goggle, Yahoo, Ask.com, Microsoft], workshops, library and laboratory [physical and virtual], zoom, what's up, google meet and TikTok. The delivery methods on BL were mainly through; zoom, google meet and face-to-face lecturers. S6 stated that, “*recording of the act is preferred in a pro-active way to supplement online teaching via YouTube, TikTok links attached in the content resources*”<sup>3</sup>

The analyze phase undertakes instructional goals anchored on intended learning outcomes, competency gaps, course outline and determination

of academic progress of learners on B.Sc. The target audience characteristics were; gender, work life balance, class size, background, academic experience and differing interest which are a vital consideration to analyze content resources for BL. Lastly, required resources; technology software, audio recorder; video recorder, desk top, laptops, smartphone, iPad, internet search engine, zoom, WhatsApp, google meet and TikTok are key tools for modelling content resource for BL. The mentioned aspects involved in the three stages of analyze phase of ADDIE model can be improved using appropriated strategies.

**Objective 2: Suggest strategies for improving content resources for BL on Bachelor of Science External at Makerere University**

<sup>3</sup> Interviewee 6; Student BSc External, Friday 27<sup>th</sup> September 2024

**Fig 4: Network view on strategies for improving content resource for BL**

The strategies to improve content resources for BL include understanding; diverse experience, differing motivations and marital status of target audience; required human and other resources, delivery methods and excellent search engine like [refseek.com](http://refseek.com), [worldcat.org](http://worldcat.org) to support modeling of content resources on LMS. The cross-cutting BL course to new entrants is important to introduce them on how to use LMS in navigating the various content resources, participating in the e-tivities, discussion forums and online assessment. The continuous professional development (CPD) to lecturers equip them with the competency to effectively develop content resources for BL and upload them on the LMS. L8 stated that, “*use multimedia contents like video, images and podcast to facilitate the interactivity of content resources for BL. Most of us at 95 percent, have access and ability to use smartphones for digital learning<sup>4</sup>*”.

The strategies; CPDs for lecturers, selection of delivery method, use of excellent search engine, human resources, adoption to technology, cross cutting courses for admitted students and understanding of diverse experience of learners are considerations to improve content resources for BL on B.Sc. Ext at Makerere University.

## DISCUSSION

The analysis of content resources is discussed in relation to consideration of; instructional goals, target audience characteristics and required

resources. This is followed by the identified strategies to improve content resources for BL on LMS.

The consideration of competency gaps of distance learners in terms of knowledge, skills and attitudes determine the choice of instructional goals while designing content resources to support BL. Facilitators select feasible instructional goals during design of content that accommodate distance learners' competency gaps to support them achieve their expected learning outcomes. This consideration of competency gaps of distance learners during design of content is supported by Dewi and Dian (2020) who stated that analysis of instructional goals to respond to competency gaps while designing materials is vital to achieve the set course learning objectives of the distance learners at university. In addition, integration of competency gaps of learners while designing content resources is in agreement with Fulgencio and Asino (2021) who stated that consideration of the; students' prior knowledge, abilities, points of view and perceived needs all support content design on the online learning management system.

The distance learners' expectation which facilitates determination of intended learning outcomes and their likely benefits are suitable while modelling content resources that build effective learning solution. Faculty consideration about distance learners known and unknown content is a preferred

<sup>4</sup> Interviewee 8: Lecturer on BSc External, Tuesday 8<sup>th</sup> October 2024

element while designing content resources. This finding concurs with Orr, Csikari, Freeman and Rodriguez (2022) who stated that identification intended learning outcomes with input of learners' support design of course content in FGDE. Further, faculty consideration on distance learners experience while modelling content resources agreed with the findings by Adri et al. (2020) in their study about using ADDIE instructional model to design blended project-based learning who stated that inquiry of DE learners and benchmarking of available local content creates an interactive BL environment desired to meet desired learning outcomes.

The expected distance education learners' expected opportunities after completion of the B.Sc. course informs the designing of content resources. The expected opportunities that DE learners intend to exploit on job market define the nature of content resources. Faculty sets course outline after analyzing skills and knowledge gaps needed on the job market which motivated the distance learners to upgrade. The finding agreed with Shahbaznezhad et al. (2021) who established that fan likes and comments about future opportunities on job market support designing of content resources for DE learners.

The target audience characteristics in form of; gender composition, class size, stakeholder involvement, academic experience, and work-life balance are considerations desired by faculty to design content resources for distance learners. Faculty takes consideration of distance learners' characteristics per cohort to suitably design content resources which addressing their needs to build effective BL at university. The finding concurs with Zhao (2018) who stated that DE student audience characteristics; gender, geographical location, marital status, competences attained justifies the nature of content resources to support learning. Similarly, consideration of target audience is supported by Yoong (2022) in the study about applicability of the ADDIE model to analysis, design and develop an instrument for dyscalculia in Malaysia who submitted that determination of student's characteristics guides the faculty while designing content resources.

The prior considerations of required resources; computers, audio recorder; video recorder, smartphone, iPad, internet search engine and data bundles while designing content resources builds effective BL solution. The awareness on how to use virtual communication tools; zoom, WhatsApp, google meet and TikTok support use of gadgets to effectively learn. Faculty consideration of affordances while designing content resources helps to build effective BL. This finding is in agreement with Furqon et al. (2023) in their study on impact of learning management system usage on students in Indonesia, who stated that consideration of students' accessible gadgets in terms of computers and skills to utilize learning management systems define the nature of content resources to delivery of DE.

The use of multimedia gadgets; images, video and pod cast while designing content resources make it interactive to accommodate the differing learner's competency levels which builds effective BL solution. The integration of texts and images in the designed content resources facilitates self-learning of anytime anywhere using LMS fit for FGDE. The images embedded in some courses on B.Sc. demonstrate how materials flow to ease conceptualization fostering co-creation of knowledge. This finding agreed with Borabo et al. (2024) in their study on impact of the utilization of LMS in the implementation of distance learning in the Philippines from 2019 to 2023 who submitted that utilization of images while designing content resources demonstrate practical experiments which support effective learning and teaching of science course units using the LMS.

The retooling and provision of required resources to lecturers facilitates modeling of content resources suitable for distance learners at university. Lecturers model content resources whenever motivated with access to required resources in terms of gadgets and CPDs. In addition, cross-cutting BL course for distance learners enables learners to navigate the user interface to login, register and participate on designed course content resources on LMS. The retooling of facilitators and equipping distance learners with pedagogical skills to use LMS concur with Ravik et al. (2024) in their study about the usefulness of pedagogical design features of a digital

educational resource who pointed out that pedagogical design skills acquired by facilitators during retooling followed by administering a cross-cutting course to distance learners builds effective BL solution.

## CONCLUSION

Therefore, analyze phase of ADDIE model involves instructional goals, target audience characteristic and understanding required resources for effective BL solutions. The instructional goals cater for competency gaps learners to attain their intended learning outcomes in Biological and Physical sciences to address the needs in society. Target audience characteristics require taking consideration of; gender, learners' experiences, learning interests, background, geographical location, place of user aboard, motivation for learning, economic status, multi-tasking, and language proficiency while designing content resources for BL.

The inclusivity undertaken by understanding of marital status of learners, experiences and motivation to attend a course is important in BL. In addition, accessibility and utilization of excellent search engine like refseek.com and worldcat.org among others aid the building of BL solution in universities.

The technology and digital tools that support effective BL include; use of smart phones, desktop and laptops to access the internet-based content resources as well as subscription to artificial intelligence such as Chat GPT and virtual learning with conversational tools like; zoom, WhatsApp, google meet and TikTok. The university learning management system (MUELE), is a necessary platform for effective delivery of content resources for BL. Human resources supported with well-designed lecture theatres, smart rooms and multimedia studios facilitate the preparation of content resources fit for BL in the university.

The faculty has partially applied the three stages provided under analyze phase of ADDIE to identify appropriate instructional goals with consideration of affordances of target audience during modelling content resources for BL.

## Recommendation

The analyze phase of the ADDIE model should consider the following in building content resources for BL;

Facilitators need to effectively analyze the previous experience of learners, motivation for further studies, marital status, and economic levels of learners to assist in designing content resources fit for building effective BL solutions.

The facilitators should consider the use of popular media like short films, music, and You Tube to help gain attention and maintain students' interest, who then concentrate on content resource for effective BL.

The use of smartphones and laptops are vital gadgets for consideration by facilitators to design content resources accessible by the target audience at the university. Learners on Bachelor of Science External at 95 percent have access to smartphones as facilitating gadgets to aid BL.

Makerere University should fully adopt MUELE to facilitate BL in this Fifth Generation DE. The university should allocate time in a semester for some lectures to be facilitated on MUELE. MUELE ably supports live lectures with Big Blue button and recording for sharing as well as referral for student while participating in e-tivities from anywhere anytime.

The government and private partners specifically Mobile Network Operators (MNO) like MTN and AIRTEL should provide subsidized ICT learning gadgets. In addition, data vendor companies like Lyca Mobile have to provide subsidized internet services for education with the purpose to build effective BL in universities.

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#### Appendix i: Analyze phase of ADDIE Model

