The SMILE, A Cyber Pedagogy based Learning Management System Models

Paula Dewanti[1]*, I Made Candiasa[2], I Made Tegeh[3], I Gde Wawan Sudatha[4]

Postgraduate, Education Science, Universitas Pendidikan Ganesha, Singaraja, Indonesia[1]
Department of Information Systems, Institut Teknologi dan Bisnis STIKOM Bali[1]
Department of Mathematics, Universitas Pendidikan Ganesha, Singaraja, Indonesia[2]
Department of Educational Technology, Universitas Pendidikan Ganesha, Singaraja, Indonesia[3]
Department of Educational Technology, Universitas Pendidikan Ganesha, Singaraja, Indonesia[4]

Abstract—The study's purpose is to create an LMS model that is adapted to the characteristics of university students to enhance the learning experience by utilizing various multidimensional learning resources in Cyber Pedagogy. This research and development study used the Analyze, Design, Develop, Implement, and Evaluate (ADDIE) instructional design framework as well as the Waterfall system development model to develop learning materials and infrastructure. The study involves 50 students from the Bali Institute of Technology and Business, as well as five lecturers and six judges at the expert test stage, namely learning media experts, learning design experts, and teaching experts, who were chosen through purposive sampling. The SMILE Model (Simple, Multidimensional, and Interactive Learning Ecosystem) is designed to meet the learning needs and expectations of today's largest market share of higher education, the millennial generation. The SMILE Model was developed successfully with ongoing assistance from researchers' students, particularly in the E-Tourism course. The implementation is accomplished through the combination of university E-Learning and the use of Microsoft Teams as a virtual learning platform alternative. During the COVID-19 pandemic, this was considered the new face-to-face norm.

Keywords—*ADDIE; cyber pedagogy; e-learning; higher education; learning management system*

I. INTRODUCTION

The purpose of this research is to develop a web-based Learning Management System (LMS) model which is termed "SMILE" (Simple, Multidimensional, and Interactive Learning Ecosystem). SMILE can be accessed by utilizing a variety of browsers on mobile devices and desktop computers. SMILE is expected to help students understand learning in a more entertaining way, as well as provide a different approach to millennial generation learning activities to improve their performance.

The SMILE consolidates constructivism learning theory as well as cyber pedagogy. The principles of constructivism theory that underlie the SMILE model include how students construct their own knowledge, with the readiness of knowledge gained through real-world experiences, collaborative activities, reflection, and interpretation, with activities that allow students to have different understandings of knowledge and perspectives in interpreting it. Despite the fact that the SMILE model incorporates Cyber Pedagogy principles, each student has completed independence in

accessing multiple learning resources from any location, at any time, and in a variety of ways. Learning occurs in a multi-directional, egalitarian, inclusive, and non-bureaucratic manner, with interaction and feedback made available only when requested, both formally and informally, and students have complete control over the learning and teaching processes [1]. There are three actors (users) of the SMILE application who have varying levels of access, namely administrators, lecturers, and students. They will get a username and password to access the SMILE application and its features online.

Pyöriä, Ojala, Saari, & Järvinen discovered that the Millennial Generation, which is the current market share of higher education, may not be as homogeneous in fundamental learning strategies and attitudes as is frequently proposed; regardless of their general character traits in learning, there is no evidence that these traits affect their fundamental learning process. Many curricular strategies have been implemented to address alleged changes in the learning styles of Millennial students. Nothing has clearly demonstrated superior results in academic achievement or skill development for graduates, and there are concerns about Millennial student engagement in the learning process [2]. Furthermore, Conklin's research emphasizes the importance of student experience by establishing classrooms that encourage millennial learner autonomy and teachers who value their students' perspectives and experiences [3]. Problem-Based Learning (PBL), Student-Centered Learning (SCL), and Classroom as Organizations (CAO) all require learners to recognize and respect the ideas, thoughts, feelings, and relationships of other learners during the learning process by participating in learning experiences that other learners have made available to them [3]. Self-evaluation of their ideas may be considered. Learning experiences that are not conducive can undermine our efforts to stimulate students.

II. LITERATURE REVIEW

A. Cyber Pedagogy

"Cyber pedagogy" refers to the science or art of teaching in an online environment. Cyber Pedagogy focuses on motivations and teaching methods that are appropriate for the technology being used, rather than those that are best suited to the traditional face-to-face classroom context [1]. The Principles of Cyber Pedagogy include the following:

---

*Corresponding Author.

- Each participant has access to an extensive set of resources that promote learning as an individual in a 24-hour environment.

- Procedures toward the source of learning are common, with many of them taking place solely, and in different ways.

- Internet resources are available dynamically and are constantly updated.

- The learning process is naturally spontaneous, contextual, and critical.

- Learning can come in different forms in an inclusive, equitable, and bureaucracy-free environment.

- Feedback and interaction are done formally and informally only when requested.

- Formal evaluations can be obtained at any time and in a number of ways.

- Participants in the learning process have complete control over the teaching and learning processes.

Indrajit also stated that universities should implement student-centered learning, where knowledge transfer is focused on students as part of Cyber Pedagogy and students have complete control over the learning process. In order for it to work, students must construct and reconstruct knowledge. When learning is integrated into an activity, it is most effective, and student experience produces outcomes that significantly improve learning. Student mentors direct, guide, and monitor students as they use all available Internet learning resources to ensure proper and optimal use [1].

B. Learning Management System in Higher Education

Each university's learning management system (LMS) is tailored to its specific needs. LMS development has made use of free (open source) production sites like Moodle, Sakai, and others, as well as systems developed by institutions themselves according to their own concepts. To name a few, below are some examples [4].

- Andrew Ng and Daphne Koller, both computer science professors at Stanford, founded Coursera, an online learning platform, in 2012. Coursera offers Massive Open Online Courses (MOOC), specialization programs, and degree programs in a variety of subjects in collaboration with universities and other organizations [5].

- edX, founded by Harvard University and MIT, is also one of the leading providers of open online courses (MOOCs). Similar to Coursera, edX is a global online course provider focused on students in higher education from a variety of disciplines. edX also offers a number of free courses [6].

- The Directorate General of Learning and Student Affairs of the Indonesian Ministry of Research, Technology, and Higher Education manages the Indonesian Online Learning System, known as SPADA Indonesia, which aims to promote equitable access to quality learning in higher education [7]. SPADA Indonesia enables students from one university to take specific quality courses from other universities, and their learning outcomes are recognized equally by the college where they are enrolled [7]. Furthermore, Arifin contended that SPADA Indonesia was formed to address some of higher education's challenges, such as the limited capacity of higher education institutions, the low affordability of universities due to uneven distribution, and the fact that many universities still lack adequate and high-quality educational resources.

- The SEAMOLEC Open Learning Center is presented by the Southeast Asian Ministers of Education Organization's (SEAMEO) education research and development center. SEAMOLEC focuses on open and distance education, training, and the exchange of knowledge and resources within and beyond Southeast Asia. The mission of SEAMOLEC is to establish itself as a center of expertise of open and distance education, as well as to assist SEAMEO member countries in identifying educational problems and solutions in human resource development through open and distance education systems [8].

The Learning Management System (LMS) developed is termed SMILE (Simple, Multi-dimensional, and Interactive Learning Ecosystem). It is a Web-based application that can be accessed on mobile devices and computers using various browsers. SMILE is expected to help students understand learning in a more fun way and provide a different environment and approach to maximize student potential.

III. RESEARCH METHODS

This study utilized the ADDIE instructional design framework, which covers Analysis, Design, Development, Implementation, and Evaluation [9], and the Waterfall system development model to develop learning materials and infrastructure that support students' learning. The Waterfall model, such as the ADDIE model, uses a structured framework for design that relies on completing each stage before going on to the next one. Requirement Analysis, System Design, Implementation, Testing, Deployment, and Maintenance are all part of the process [10]. By combining the two models, the designer's instructional team can perform more simple steps by formulating a cohesive model.

IV. RESULT AND DISCUSSION

A. ADDIE Design Development

1) ADDIE Model: According to Eller, the ADDIE Model has a lengthy history dating back to the establishment of teaching system designs and has been continuously improved by a number of scholars and instructional designers. Although structural design and software design are two separate areas, they contain many similarities and intersect in ways that instructional designers, subject matter experts, and educators who utilize the final version might benefit from [9]. Fig. 1 illustrates the ADDIE Model of SMILE.

The Waterfall Method is used in the development of SMILE LMS, so as to organize and integrate all aspects of learning materials and activities. From there, it can be seen that the Waterfall Model intersects with the ADDIE Model. The Waterfall steps are indicated in Fig. 2.
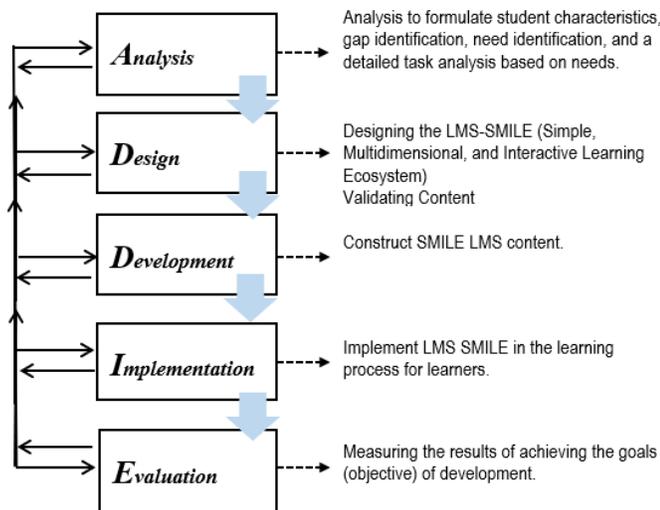
Fig. 1. ADDIE Model of SMILE.
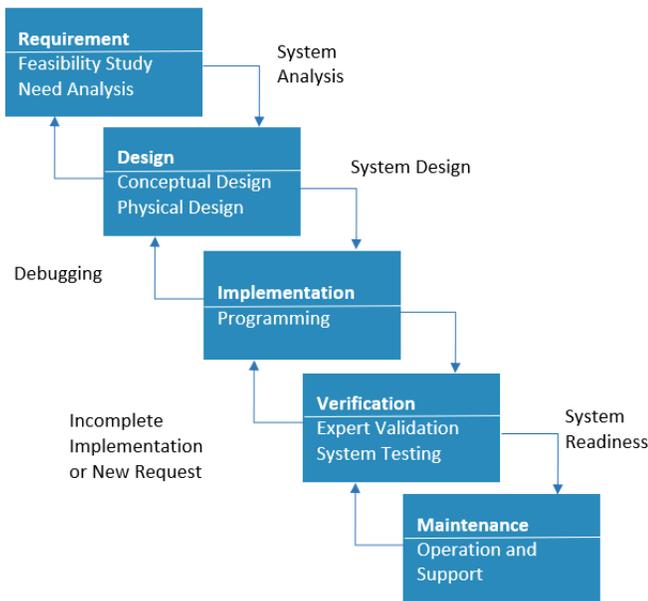
Fig. 2. Waterfall Model.

2) The waterfall model

a) Requirements: The needs analysis was included in the first stage of the waterfall model, and it involves both practical and non-functional requirements for the development of the SMILE LMS.

b) Design: The second stage is the design stage, in which the previous stage's system specification was explored and the system design was indeed prepared. In system design, Flow Diagrams, conceptual databases, and Entity Relationship Diagrams (ERD) are used to help with the overall system architecture concept. Fig. 3 describes an overview of the SMILE Design.

c) Implementation: Programming or coding is performed during the system's implementation stage, which is the design's interpretation into a computer-readable language. In addition, the generated program items will be subjected to verification.

d) Testing: At this stage, the system testing method of choice is Black Box Testing. It is a test method that involves observing the output results of data or conditions entered into the system without seeing how the data management process works. It is performed from the perspective of the user, enabling the identification of existing problems that can be resolved later.

e) Deployment: The SMILE is deployed into a live environment to be tested before being made available to users during this phase. This phase also includes user training programs to help users know how the system works.

f) Maintenance: This step involves providing support and maintenance for the SMILE to ensure that it runs smoothly. The main goal of this stage is to fix any errors, defects, or bugs that users encounter while using the Smile. Maintenance tasks include all processes needed to manage system continuity, enhancement, and improvement.

B. The SMILE Model

The LMS design framework is generally based on the ADDIE learning design model and the Waterfall system development model, which are used as guidance in designing learning materials and infrastructure that support student learning processes. The waterfall model is a method used in software development. The stages begin with analysis, which then proceeds to the stages of design, coding, testing, and support [11]. It can be seen that the waterfall model intersects with the ADDIE model. The ERD of SMILE is shown in Fig. 4, while the conceptual database SMILE is shown in Fig. 5.

Fig. 6 to 11 depict a few of the SMILE user interfaces, including the Login page, User Profile page, Admin's dashboard, Student's Detail page, Lesson Plan page, and the Syllabus page.
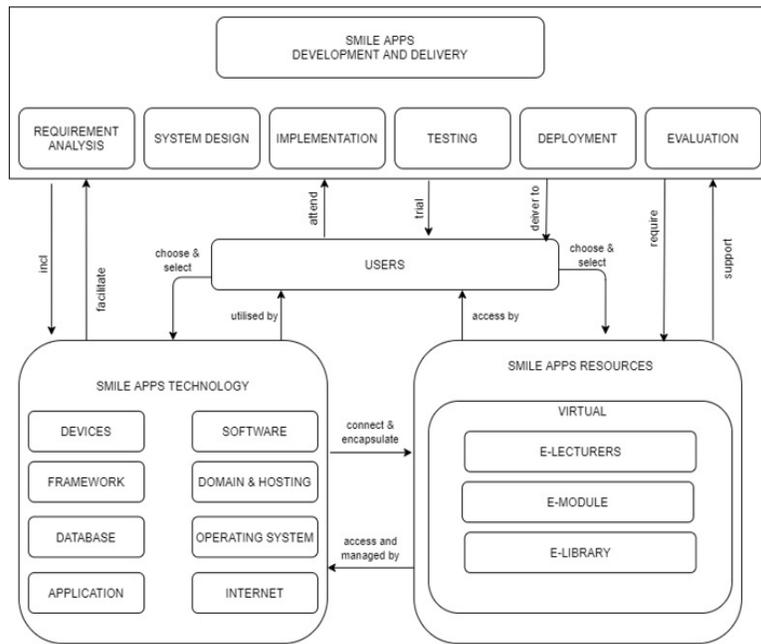
Fig. 3. SMILE Design.
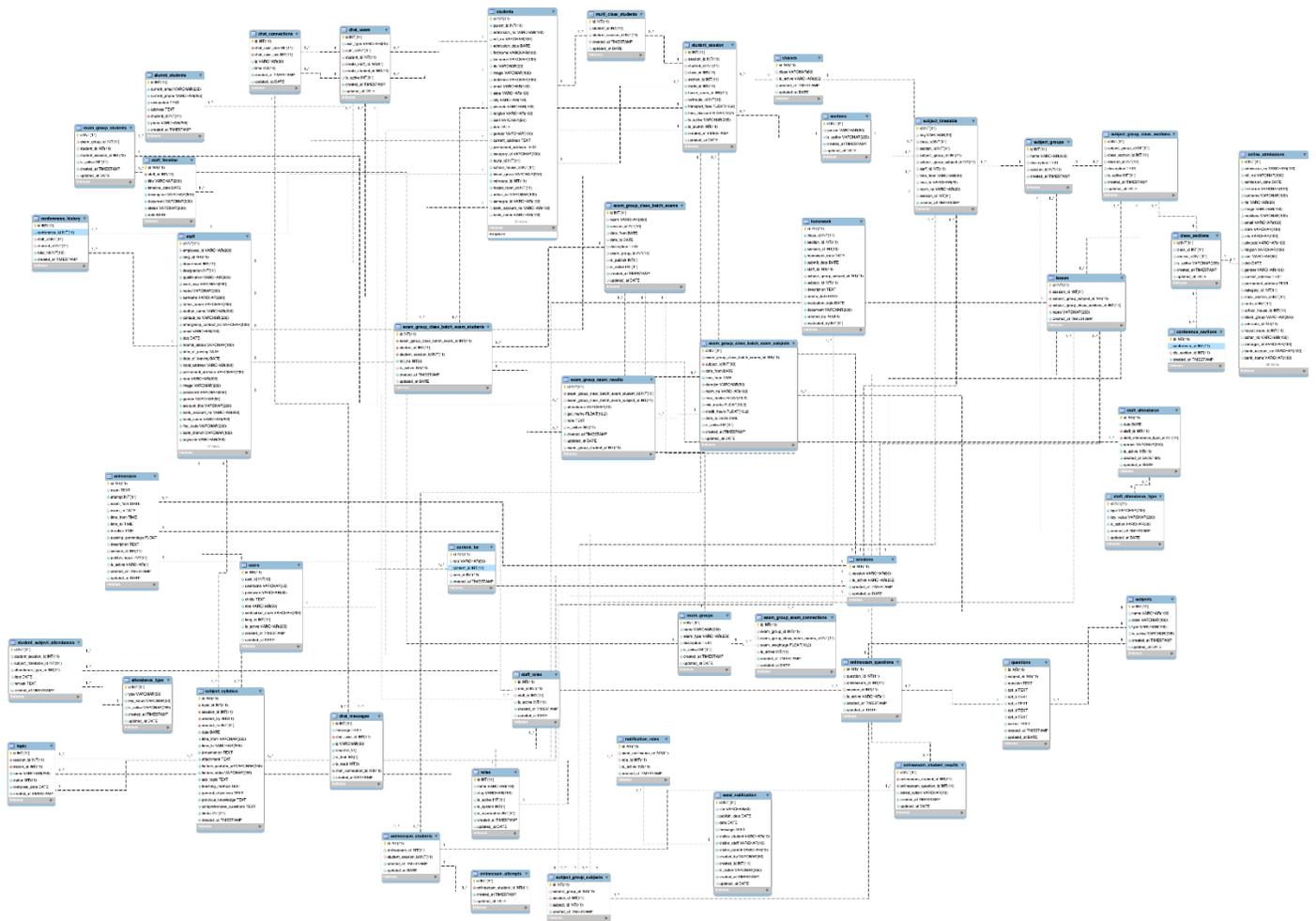

Fig. 4. SMILE's Entity Relationship Diagrams.

Fig. 5.   SMILE Conceptual Database.
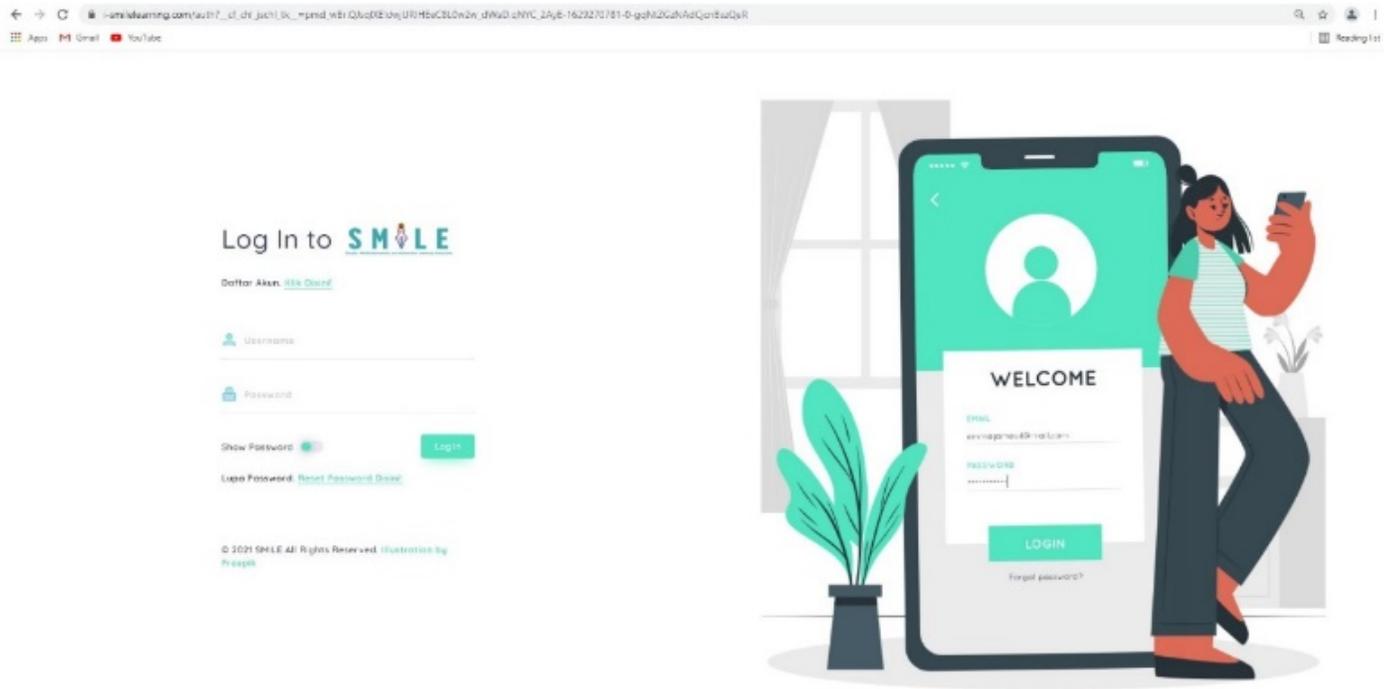
Fig. 6.   Login Form for SMILE.
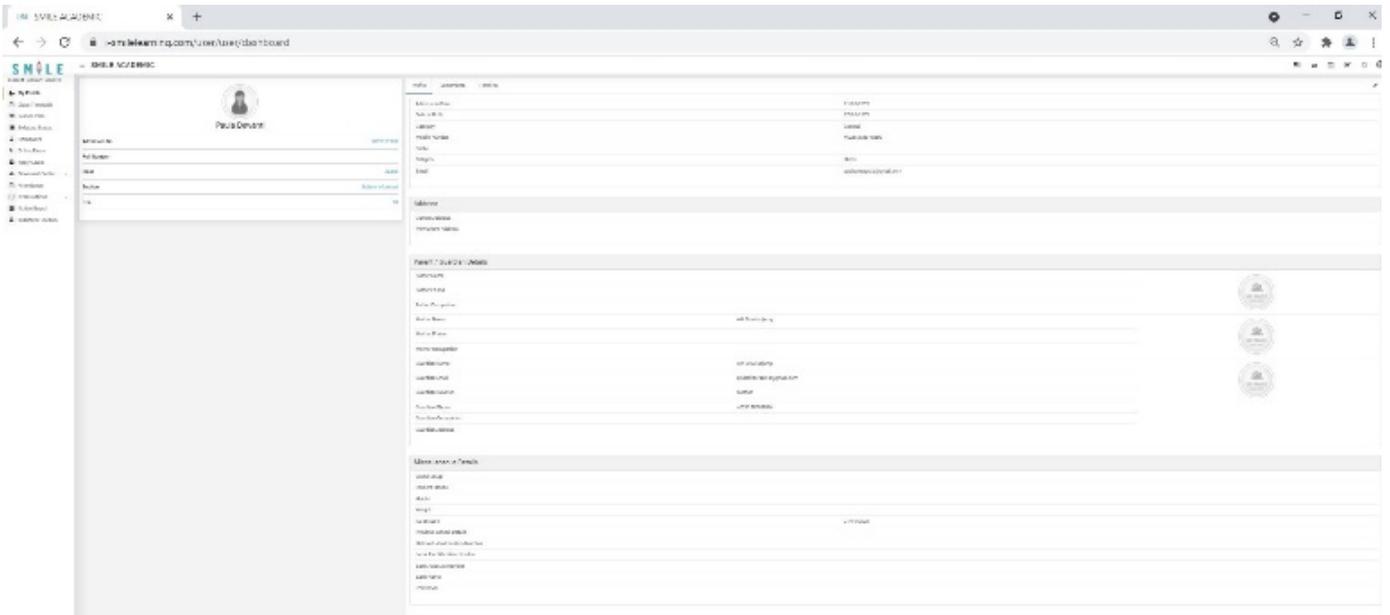
Fig. 7.   User Profile Page for SMILE.
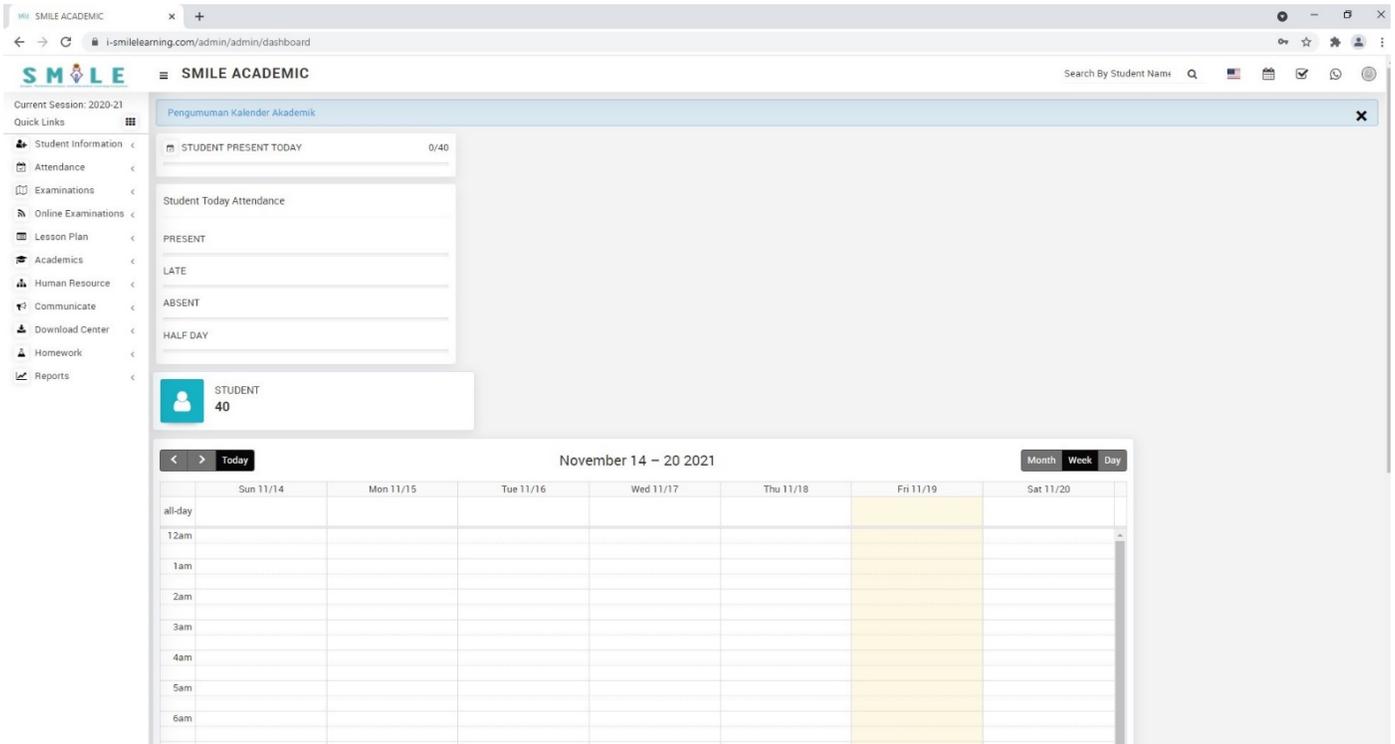
Fig. 8. Admin Dashboard Page for SMILE.
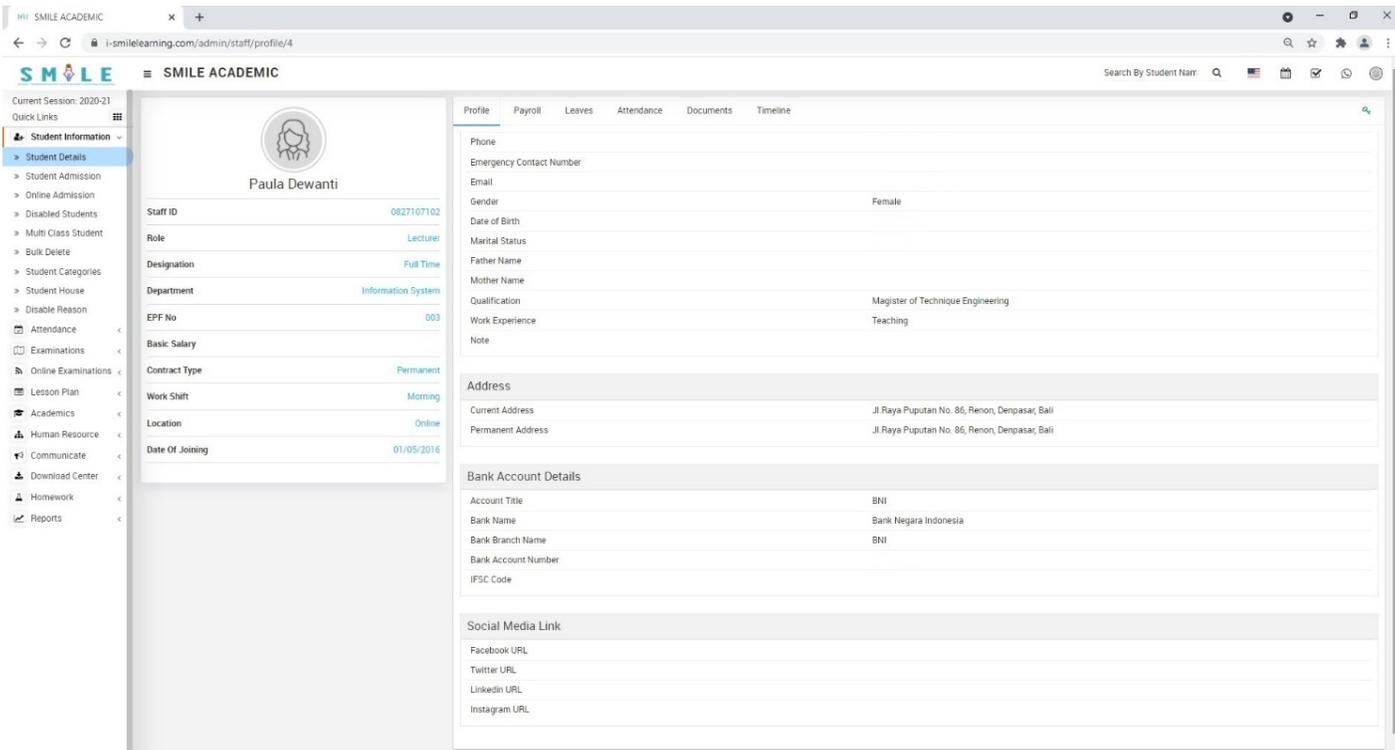
Fig. 9. Student Details Page for SMILE.
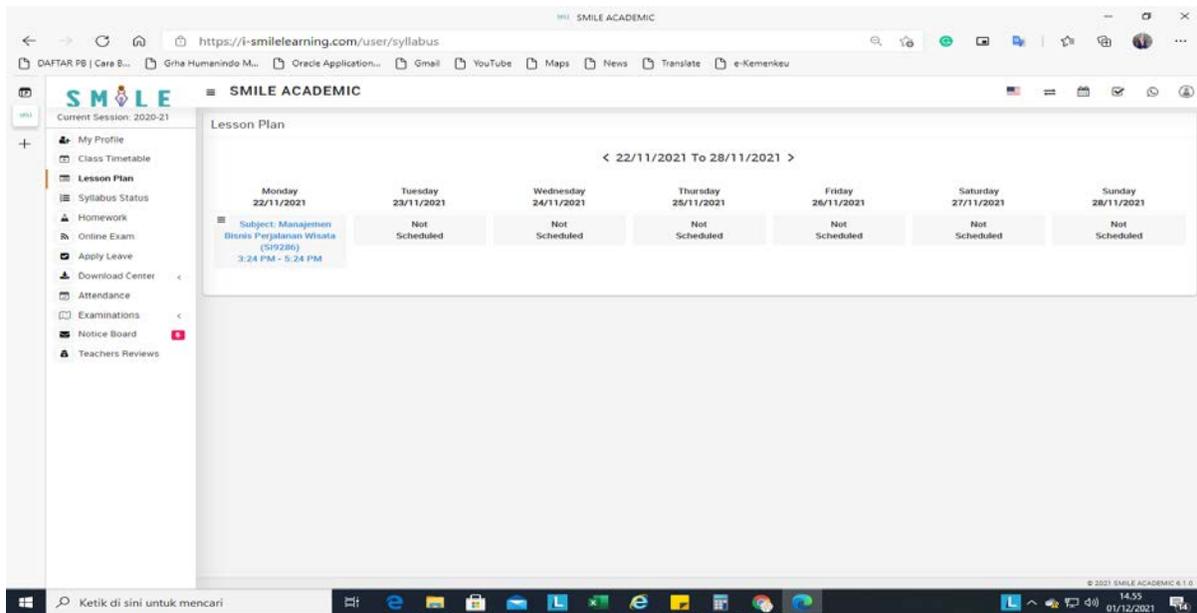
Fig. 10. Lesson Plan Page.
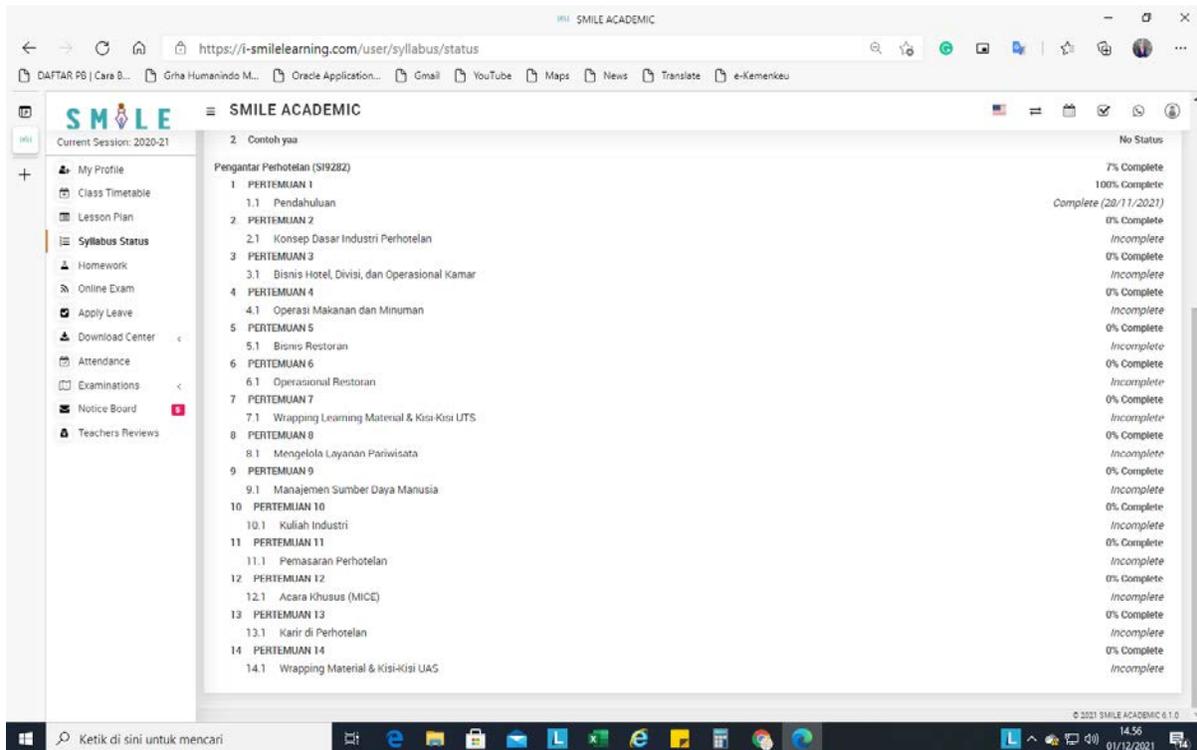
Fig. 11. Syllabus Page.

C. Experimental Findings

Three material experts and three media experts used an evaluation sheet to assess the content and media validity of SMILE, which was then tested using Gregory's cross tabulation. The evaluation results show that the SMILE Learning Management System meets the requirements for validity. The system's usability was evaluated using questionnaires distributed to students and teachers, as well as observation sheets. The results of the usability tests show that the developed SMILE Learning Management System meets the expectations of both students and teachers.

1) Expert findings: Tables I and II list the instruments and indicators that were measured.

The following steps were taken to obtain the validity data from the assessment by material experts and media experts [13].

TABLE I.   LEARNING OBJECT REVIEW INSTRUMENT V. 1.4 [12]

No.	Rated Aspects
1	Content of Quality
	It is necessary to have veracity, accuracy, a well-balanced presentation of ideas, and an adequate level of detail.
2	Aligning Learning Objectives
	Learning objectives, activities, assessments, and student characteristics should all be interconnected.
3	Adaptation and Feedback
	Variability learner input or learner modeling motivates adaptive content or feedback.
4	Motivation
	Abilities to inspire and evoke interest or curiosity.
5	Design of Presentation
	Creating visual and auditory information to aid in learning and mental processing.
6	Usability of Interaction
	The user interface's predictability, ease of navigation, and the quality of the UI that supports features.
7	Accessibility
	Provide learners' support.
8	Reusability
	The ability to link various courses or learning contexts without modifying them.
9	Comply with Standards
	In accordance with international standards and requirements.

TABLE II.   CYBER PEDAGOGY INDICATORS [1]

No.	Variable	Indicators
1	Mobility	The process method for learning resources is ubiquitous and can be from anywhere, anytime, and in various ways.
2	Location Awareness	The technology component is capable of providing information about the physical location of the device to other users or applications.
3	Interoperability	Users have the ability to exchange and use information. Learning takes place in a multi-way, egalitarian, inclusive, and non-bureaucratic way. Applications can interact with other applications through a mutually agreed protocol over various communication lines.
4	Seamlessness	Every student can access various learning resources freely and independently 24/7. Internet resources are dynamic, and are updated collectively every second.
5	Situation Awareness	The process of learning is intuitive, contextual, and critical in nature. a) Emotional self-awareness. b) Assertiveness. c) Self-esteem. d) Independence. e) Self-actualization.
6	Social Awareness	a) Effective communication. b) Effective learning.
7	Adaptability	Interaction and feedback can take place when and where it is desired–formally or informally. Evaluation of the learning procedure can be

No.	Variable	Indicators
		performed as many times as necessary.
8	Pervasiveness	Learners have full control over the learning and learning process.

a) To convert qualitative data to quantitative data, apply the Gregory content validity provisions as shown in Table III.

TABLE III.   CROSS TABULATION OF THREE RATERS

Rater I	Irrelevant				Relevant			
Rater II	Irrelevant		Relevant		Irrelevant		Relevant	
Rater III	Ir-relevant	Relevant	Ir-relevant	Relevant	Ir-relevant	Relevant	Ir-relevant	Relevant
	A	B	C	D	E	F	G	H

b) The Gregory Formula is then used to calculate the score to generate the content validity.

$$Vi = \frac{H}{(A+B+C+D+E+F+G+H)} \tag{1}$$

where,

Vi = Content Validity

c) Convert the average score to a qualitative value using the assessment factors listed in Table IV below.

TABLE IV.   GUILFORD'S TABLE OF RELIABILITY COEFFICIENTS

Score Range	Classification
$\bar{X} > 0,80$	Very High
$0,60 < \bar{X} \leq 0,80$	High
$0,40 < \bar{X} \leq 0,60$	Moderate
$0,20 < \bar{X} \leq 0,40$	Low
$\bar{X} \leq 0,20$	Very Low

The SMILE LMS instrument has a coefficient of content validity of 1, which is classified as very high based on the conversion of the Guilford table.

2) User Usability Analysis: The Usability Testing method is applied using Nielsen's approach, which is classified into five instruments: learnability, memorability, efficiency, errors, and satisfaction. Using the 5-point Lickert Scale, from strongly disagreeing (1) to strongly agreeing (5). Tabel V shows the result from the lecturer's perspective.

TABLE V.   USABILITY ANALYSIS

No.	Assessment Aspects	Likert Scale				
		1	2	3	4	5

A.	Learnability					
A1	Learning Management System SMILE can be studied easily.				33.3	66.7
A2	I am pleased with the ease and speed with which information is accepted in detail, as well as with the SMILE Learning Management System in particular.				50.0	50.0
A3	I can easily comprehend the content and information presented in the SMILE Learning Management System.			16.7	33.3	50.0
A4	I can easily understand and comprehend plots from the SMILE Learning Management System's navigation.				50.0	50.0
A5	I was able to learn how to use the SMILE Learning Management System without any written instructions or a manual book.				50.0	50.0
B.	Memorability					
B1	I have no trouble recalling how to use the SMILE Learning Management System.				50.0	50.0
B2	I can easily find and remember navigation directions and features on the SMILE Learning Management System.			16.65	16.7	66.65
B3	I find the SMILE Learning Management System easy to use.					100
C.	Efficiency					
C1	I can easily access the menu on the SMILE Learning Management System.				50.0	50.0
C2	I can easily obtain the available information on the SMILE Learning Management System.				66.7	33.3
C3	I can quickly find the information I need by starting my search in the SMILE Learning Management System.				66.7	33.3
D.	Errors					
D1	I haven't found an error when using the SMILE Learning Management System.			16.65	66.7	16.65
D2	I did not encounter any menu errors or mismatched functions while using the SMILE Learning Management System.				16.7	83.3
D3	In the SMILE Learning Management System, I can quickly locate the features and menus I'm looking for.			16.7	50.0	33.3
E.	Satisfaction					
E1	I am pleased with the SMILE Learning Management System's overall interface design.				50.0	50.0
E2	I feel comfortable using the SMILE Learning Management System.				33.3	66.7
E3	The color mix and layout of the				66.7	33.3

	content on the SMILE Learning Management System are convenient to see.					
E4	When I saw the display on the system's dashboard, the SMILE Learning Management System exceeded my expectations.			16.7	33.3	50.0
E5	I found other supporting equipment such as file sharing, communication features such as chat and e-mail, as well as feature support.				50.0	50.0

The same approach was also used against the student's perspective. In the learnability aspect, 50.0% strongly agreed that the Learning Management System SMILE can be easily studied (A1), while the remaining 50% agreed. For (A2), 37.5% stated they strongly agreed, while 62.5% agreed. It follows with (A3) at 50.0% stated strongly agreed and 50.0% agreed. The (A4) got 37.5% strongly agreed, 50.0% agreed, while 12.5% tended to agree. I was able to learn how to use the SMILE Learning Management System without any written instructions or a manual book (A5); 37.5% of the students said they strongly agreed, while 62.5% said they agreed.

From the memorability aspect (B1), I have no trouble recalling how to use the SMILE Learning Management System. It is equally 50.0% between "strongly agreed" and "agreed". The results obtained from the student's perspective are in order: (B2) 37.5% strongly agreed, 50.0 agreed, and 12.5% tend to agree; and (B3) I find the SMILE Learning Management System easy to use; all the students stated that they strongly agreed.

The assessment continued with efficiency aspects; (C1) I can easily access the menu on the SMILE Learning Management System. It was strongly agreed upon by 50.0%, agreed upon by 37.5%, and tended to agree upon by 12.5%. I can easily obtain the available information on the SMILE Learning Management System; 37.5% strongly agreed, 50.0% agreed, with 12.5% inclined to agree. (C3) I can quickly find the information I need by starting my search in the SMILE Learning Management System; 37.5% strongly agreed, 50.0% agreed, and 12.5% tended to agree.

In terms of the errors' aspects, the result shows that 25.0% strongly agreed, 62.5% agreed, and 12.5% tend to agree on (D1). I haven't found an error when using the SMILE Learning Management System. It is followed by (D2). I did not encounter any menu errors or mismatched functions while using the SMILE Learning Management System; 37.5% strongly agreed, 50.0% agreed, and 12.5% tended to agree. On (D3), In the SMILE Learning Management System, I can quickly locate the features and menus I'm looking for, it stated that 37.5% strongly agreed, 50.0% agreed, and 12.5% tend to agree.

The assessment concludes with a satisfaction aspect, generating the following result: (E1). I am pleased with the SMILE Learning Management System's overall interface design. 25% of them strongly agreed, 62.5% agreed, and 12.5% agreed. (E2). I feel comfortable using the SMILE Learning Management System. 37.5% stated they strongly agreed and 62.5% agreed. (E3). The color scheme and layout of the content on the SMILE Learning Management System

are easy to understand. 37.5% strongly agreed, 50.0% agreed, and 12.5 agreed with some reservations. (E4). When I saw the display on the system's dashboard, the SMILE Learning Management System exceeded my expectations; 25.0% stated strongly agreed and 75.0% agreed. (E5). I discovered additional assistive equipment such as file sharing, communication features such as chat and e-mail, and feature support received 50.0% strongly agreed, 37.5% agreed, and 12.5 percent tend to agree responses.

D. Relevant Work

The developed Learning Management System (LMS) is identified as SMILE, which stands for Simple, Multi-dimensional, and Interactive Learning Ecosystem. It is designed to assist students in understanding learning in a relatively simple, insightful, and unique way in order to maximize their potential and competencies. It is accessible via mobile devices, personal computers (PCs), and various browsers [4].

Mcgreal's research outlines the organizational context that motivates the use of Open Educational Resources (OER) in teaching and learning, including policies, practices, development processes, and resources [14].

Meanwhile, Wang, Woo, Quek, Yang, & Liu explored the use of Facebook Groups in LMS development based on the availability of prospective pedagogical, interpersonal, and technical capabilities that enable the exchange of ideas, resources, announcements, and online discussions. Directly uploading files in various formats presents challenges, but this discussion lacks meaningful structure. Students can communicate and interact with one another with ease. Despite this, there is a failure to provide a safe social environment due to a lack of privacy [15].

Shin and Kang used a mobile application-based LMS to conduct research on student acceptance and its impact on learning objectives. Students at online universities, according to their findings, are open to the use of mobile technology as a new learning tool. Acceptance has a direct or indirect impact on student achievement. These findings help to improve our understanding of the use of mobile learning systems in higher education and provide useful guidelines for the development and implementation of mobile application-based learning management systems [16].

Mtebe claims that the use of LMS in universities in Sub-Saharan Africa is expanding, and the majority of the universities' limited resources are being used to develop LMS. Mtebe conducted a review of the literature on LMS use in Sub-Saharan Africa, as well as proposed strategies to assist institutions in using LMS more effectively while saving money [17].

The ideal didactic curriculum, according to Toohey, Wray, Wiechmann, Lin, and Boysen-Osborn, should include a mix of asynchronous and synchronous learning. A Learning Management System (LMS) such as Schoology, Canvas, or Blackboard can manage a Learning Resource Center (LRC) program, which provides students with video menus, interactive education modules, articles, quizzes, didactic recordings, and other assignments. Implementing an LMS in a residency program can range from free (Schoology) to a per-student fee that may be covered by the university [18].

V. CONCLUSION AND FUTURE WORK

In this study, we look at how to design, validate, and determine the efficacy of a learning management system that relies on cyber pedagogy and national educational standards in the higher education e-learning ecosystem. The SMILE Learning Management System model was developed by integrating various learning resources based on the characteristics of the current generation of learners.

Usability testing was used to evaluate the efficacy of the SMILE prototype. The results are consistent with the observed initial objective of delivering a productive learning process in simple, interesting, and interactive ways through the use of various multi-dimensional educational resources inside the corridor of Cyber Pedagogy and National Education Standards.

This research can be enhanced in a number of different ways. This type of prototype can be developed in other universities with features tailored to the needs of each campus, including lecture content that is wide and varied, as well as the use of learning media that is simple to understand and tailored to the needs of students, to support an effective and efficient learning process.

REFERENCES

[1] R. Indrajit, "The Ecosystem Framework for U-Learning Implementation Through Courseware Development and Management," no. 2000, pp. 245–254, 2017.

[2] P. Pyöriä, S. Ojala, T. Saari, and K. M. Järvinen, "The millennial generation: A new breed of labour?," SAGE Open, vol. 7, no. 1, 2017, doi: 10.1177/2158244017697158.

[3] T. A. Conklin, "Making It Personal: The Importance of Student Experience in Creating Autonomy-Supportive Classrooms for Millennial Learners," Journal of Management Education, vol. 37, no. 4. 2013. doi: 10.1177/1052562912456296.

[4] P. Dewanti, I. M. Candiasa, and I. M. Tegeh, "Designing a Learning Management System based on Cyber Pedagogy for Higher Education," International Journal of Computer Applications, vol. 183, no. 27, 2021, doi: 10.5120/ijca2021921656.

[5] H. Shafiq, Z. A. Wani, I. M. Mahajan, and U. Qadri, "Courses beyond borders: A case study of MOOC platform Coursera," Library Philosophy and Practice, vol. 2017, 2017.

[6] P. S. Aithal and S. Aithal, "Impact of On-Line Education on Higher Education System," 2016.

[7] M. H. Arifin, "The role of student support services in enhancing student persistence in the Open University Context: Lesson from Indonesia Open University," Turkish Online Journal of Distance Education, vol. 19, no. 3, 2018, doi: 10.17718/tojde.445116.

[8] I. Jung, G. A. G. Mendoza, J. C. Fajardo, R. B. Figueroa, and S. E. Tan, "MOOCs in six emerging apec member economies: Trends, research, and recommendations," MOOCs and Open Education in the Global South: Challenges, Successes, and Opportunities, no. January, pp. 199–211, 2019, doi: 10.4324/9780429398919-21.

[9] R. Eller, "Implementing Design into Instruction: Intersections Between the Waterfall Model and Addie Model," vol. 1, no. 1, pp. 63–69, 2015.

[10] Gharajeh MS, "Waterative model: An integration of the waterfall and iterative software development paradigms," Database Systems Journal, vol. X, no. 15, pp. 75–81, 2019.

[11] V. Rastogi, "Software Development Life Cycle Models- Comparison, Consequences," International Journal of Computer Science and Information Technologies, vol. 6, no. 1, pp. 168–172, 2015.

[12] A. Gordillo, E. Barra, and J. Quemada, "An easy-to-use open source authoring tool to create effective and reusable learning objects," Computer Applications in Engineering Education, vol. 25, no. 2, 2017, doi: 10.1002/cae.21789.

[13] H. Retnawati, "Proving content validity of self-regulated learning scale (The comparison of Aiken index and expanded Gregory index)," Research and Evaluation in Education, vol. 2, no. 2, 2016, doi: 10.21831/reid.v2i2.11029.

[14] R. Mcgreal, "A survey of OER implementations in 13 higher education institutions," International Review of Research in Open and Distance Learning, vol. 20, no. 5, 2019, doi: 10.19173/irrodl.v20i5.4577.

[15] Q. Wang, H. L. Woo, C. L. Quek, Y. Yang, and M. Liu, "Using the Facebook group as a learning management system: An exploratory study," British Journal of Educational Technology, vol. 43, no. 3, pp. 428–438, May 2012, doi: 10.1111/j.1467-8535.2011.01195.x.
S. Shin and M. Kang, "The Use of a Mobile Learning Management System at an Online University and Its Effect on Learning Satisfaction and Achievement."

[16] J. S. Mtebe, "Learning Management System success: Increasing Learning Management System usage in higher education in sub-Saharan Africa," International Journal of Education and Development using Information and Communication Technology, vol. 11, no. 2, pp. 51–64, 2015, [Online]. Available: http://ijedict.dec.uwi.edu/viewarticle.php?id= 2005.

[17] S. L. Toohey, A. Wray, W. Wiechmann, M. Lin, and M. Boysen-Osborn, "Ten tips for engaging the millennial learner and moving an emergency medicine residency curriculum into the 21st century," Western Journal of Emergency Medicine, vol. 17, no. 3. 2016. doi: 10.5811/westjem.2016.3.29863.