

## Developing a digital learning environment team-based project to support online learning in Indonesia

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### ABSTRACT

The purpose of this study is to describe the process of developing learning tools to support a team-based digital learning environment (DLE) project in library management courses. The analyze, design, develop, implement, and evaluate (ADDIE) development model is used in this study to investigate this type of research and development (R&D). The study included 162 students from four universities in Indonesia. Data is gathered through media and material validation questionnaires, learning management system (LMS) user satisfaction questionnaires, and lesson learning outcomes tests. Instruments include media and material validation sheets, LMS user satisfaction instruments, and lesson learning outcomes test instrument sheets. The media validation test and material results show that all media can be used with minor adjustments. Students have responded positively to the DLE application for online learning at universities. Learning tools are critical for raising motivation and accomplishing course learning outcomes. In the future, the evolution of learning media may be accompanied by the evolution of learning designs. As a result, the learning process and learning outcomes can be optimized. This study makes recommendations for revamping learning materials, media, and design to increase student motivation to learn.

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## 1. INTRODUCTION

In Indonesia, lecturers have three main tasks or called as “Tri Dharma” to fulfill higher education goals: education and teaching, research and development, and community service. Each professor must complete each of these features at least once a year. The university academic community’s involvement in “Tri Dharma” is undeniably done to obtain a more qualified university.

The Tri Dharma university’s primary point of contact is education and instruction. These are the two most influential components of student competence. Students can sense the quality of education and instruction in the classroom. According to Article 1 of the Republic of Indonesia’s National Education System Law, Number 20 of 2003, education is a learning process in which students actively develop their potential to have religious and spiritual strength, self-control, personality, intelligence, and noble morals, as well as the skills required by themselves, society, nation, and state, through a conscious and planned process. While teaching is a synthesis of two activities, teaching and learning [1].

Education and teaching are currently required to adopt the development and needs of students. The hopes of change and shifting learning methods are learning systems that can make students active, creative, and innovative. Being in the digital age also causes the teaching process to adapt. Currently, students can access a variety of sources of information from anywhere. This must certainly be encouraged by the ability of lecturers to facilitate the student learning process. Aside from competency in using technology, information, and communication (ICT), a lecturer must surely be skilled in employing the appropriate and up-to-date lecture models and tactics to ensure that students maximize their potential. Teaching is no longer necessary because learning knowledge, skills, and attitudes through experience may be achieved without having to wait for lecturers to teach [2]. As a result, learning strategies that may make use of all available resources to enable a learning environment that can adapt to the demands of learners are required.

Learning strategies are limited to activities and include materials or learning packages [3]. The learning strategy consists of all the components of the subject matter and procedures that lecturers and students use to achieve learning goals. A learning strategy is a lecturer's way of thinking and acting in designing various preparations and applying them in the lecture process to achieve the targets according to the achievement of lectures effectively and efficiently. Organizing teaching materials well, delivering materials through the proper methods, implementing optimal classroom learning management, and using proper evaluation will positively impact students' learning outcomes. Many other factors also influence the success of learning. Learning strategies have a strategic role in lectures. They are an integrated effort of an educator to manage various learning resources. Learning strategies are important because they concern the materials that will be taught, conveyed, controlled in the classroom, and selected using the appropriate evaluation system. Learning solutions that meet the needs of current students are undoubtedly good for following their generation and accommodating students' potential.

During the COVID-19 pandemic, online learning has become the main solution in the implementation of education. Unfortunately, online learning does not work effectively. There are several problems that arise, such as low student motivation, availability of student and teacher facilities, and changes in student learning styles [4], [5]. Student boredom is caused by internal factors that come from themselves, such as unfamiliarity with online systems, and external factors, such as the monotony of lecturers in delivering material [6]. Another problem is the tendency of many lecturers to still use teacher-centered learning in providing teaching materials to students. As a result, students become bored and not interested in following the lecture materials because the lecture materials are presented monotonously [7]. Various online learning challenges posed by teachers, students, parents, or the environment and infrastructure [8].

Furthermore, students' digital literacy skills in online learning are a strategic concern. In Indonesia, data on the youth population's digital literacy in online learning is still scarce [9]. In contrast, digital literacy is required to promote effective online learning. According to the study's findings, student groups responded poorly to online learning. As a result, instructors must be creative in constructing online learning that will boost students' digital literacy and involvement in the learning process. Currently, online learning is dominantly carried out by lecturers in Indonesia by adapting technology as a learning medium. In essence, the use of technology as a learning medium must be followed by the development of other elements, especially in online lecture strategies, including learning methods and techniques [10].

Development in the digital learning environment (DLE) is regarded as most important in today's learning climate. The existence of generation Z has formed the backdrop of today's learning progress. Today's pupils or students require the role of technology and the convenience of access to all demands. Most Indonesian students already own gadgets and laptop computers, and social media access has reached over 130 million users, the majority of them are from the younger age [11], [12]. Currently, students feel better at ease learning new content utilizing technology [13].

DLE provides diverse learning materials and is not limited to time or place [14]. In addition, DLE also prioritizes the broadest opportunity for students with media support to interact digitally [15], [16]. Due to the COVID-19 pandemic, demand for DLE has increased in the last two years. Pandemics in the digital age are a challenge for the education sector. During this pandemic, highly interested students in technology are more adaptable while innovating in distance learning, digital learning, and e-learning [17]. Lecturers are also required to design and organize better learning experiences and create a unique learning environment with the help of digital technology [18]. In the event of a pandemic, DLE becomes a necessity since children born in generation Z require the assistance of a broad learning environment that is adaptable, diversified, and sensitive to the circumstance via digital platforms.

DLE is no longer deemed best for designing relevant courses for today. Nowadays, we face a fast changing (disruptive) environment with great complexity. Students should be provided relevant experience in the job market and industry, and the university should encourage this. To tackle difficult challenges through a team-based project, a plan is required [19].

Students can combine their knowledge and skills through team-based projects to achieve higher productivity and performance [20]. In addition, team-based projects are also the right way to enable student interaction and encourage them to build knowledge through collaborative learning [21]. Furthermore, collaboration is required in 21st-century competence. As a result, the use of team-based learning projects greatly improves students' development of competency. The development and implementation of a DLE team-based project is critical today because students have access to the internet, so lecturers must develop digital-based learning tools to ensure that learning opportunities in the digital era are increasingly diverse and directed. Collaboration between a digital environment and a team-based project is a strategic step because interaction and collaboration activities will be conducted online. This is necessary because many organizations work in a global sphere without physically meeting. All activities are carried out online utilizing the digital environment; members communicate and collaborate using social media [22].

DLE team-based projects must be balanced with digital literacy competencies. Hoax information, privacy violations, cyberbullying, violent content and pornography, and digital media addiction are the latest issues in digital society [23]. Therefore, in the utilization of DLE team-based projects, it takes maturity to use the internet or electronic resources. Digital literacy is the awareness, attitude, and ability to effectively identify, access, manage, integrate, evaluate, and analyze digital tools and facilities to generate new knowledge, communicate, and even construct social action [24]. Through digital literacy, implementing DLE team-based projects will be more optimal.

The implementation of the DLE team-based project in this study involves four universities with library management courses. The four universities are Yogyakarta State University (UNY), Gorontalo State University (UNG), Riau University (UNRI), and Nusantara Islamic University (UNINUS). Students from three universities certainly have a variety of economic backgrounds and different geographical locations to represent the Millennial generation of Indonesia. This study focuses on developing various learning media to support DLE. Compared to previous research, previous research tends to focus on developing one type of learning media without being accompanied by a learning design. Furthermore, prior research has shown that people are more likely to experiment with media in small groups, such as a classroom. This study, on the other hand, focuses not only on the creation of instructional media, but also on the development of instructional design, or DLE, in general. Furthermore, the DLE implementation would involve a huge number of students from numerous universities.

## 2. RESEARCH METHOD

The purpose of this study is to provide a digital learning environment for team-based project lectures in library management courses. The analyze, design, develop, implement, and evaluate (ADDIE) approach was employed for this study's research and development as presented in Figure 1. The first stage seeks to assess the significance of DLE development in course library management. The courses' performance, students, learning objectives, material, and learning media were all analyzed. The design stage is concerned with the planning and creation of teaching materials such as syllabi, instructional media design, learning design, and lecture evaluation. The development stage aims to develop DLE products by making and modifying materials. The implementation stage is done by applying lecture designs in classes with students. In the final stage, evaluation is carried out through formative and summative assessments. The data obtained from the need for DLE development are obtained in the form of qualitative and quantitative data at each phase. The data were analyzed based on the type of data obtained and then used to improve DLE development.

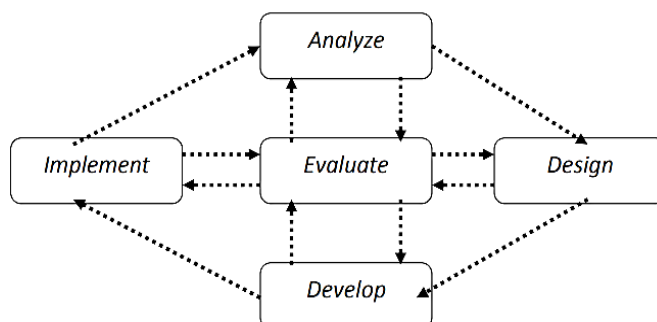


Figure 1. ADDIE model [25]

This model approach is built on the theoretical foundation of learning design and is based on the concept of a team-based digital learning environment project. This model is programmatically structured, with a systematic sequence of actions to handle learning challenges relating to learning resources and the requirements and characteristics of students. The ADDIE model approach is appropriate for developing complex education, particularly in multimedia and online learning environments [26]–[28]. This model consists of five stages, namely: i) Analyze; ii) Design; iii) Development; iv) Implementation; and v) Evaluation.

The study was conducted from May to October. The subjects of this study were students from State University of Yogyakarta, State University of Gorontalo, University of Riau, and Islamic University of Nisantara. The students came from the educational management study program, elementary school teacher education, guidance and counseling, accounting education, German language education, Indonesian literature, biology, and library science because it coincided with the *Merdeka Belajar Kampus Merdeka* (MBKM) program. The total number of students attending this course is 162 students.

The validation questionnaire for materials, media, modules, and assessment instruments is given to validators. These validators include nine lecturers in library science who serve as material validators, eight lecturers in educational technology who serve as media validators, one academic librarian in library science who serves as module validator, and one lecturer in an educational research and evaluation study program who serves as a validator of assessment instruments. In addition, data collection is also carried out through learning management system (LMS) user satisfaction questionnaires to students, tests for students, and forum group discussion (FGD) with lecturers who are experts in library management and school librarians to obtain other information. The data obtained is then analyzed to determine the feasibility of using the DLE team-based project design and the feasibility of media, materials, LMS, and lectures' general success. Student learning outcomes are analyzed by providing test questions using the Quizizz application.

This study's data analysis technique employs quantitative and qualitative description analysis. In the DLE team-based project development process, quantitative analysis was used to get responses to the material and media expert validation questionnaire on the LMS. The LMS validity questionnaire test in the digital learning environment team-based project development process is carried out by calculating the percentage score (P) by comparing the number of ideal scores given by the validator ( $\sum R$ ) with the number of ideal scores that have been set in the LMS validation questionnaire (N). The media eligibility criteria are presented in Table 1. The formula in the expert validation analysis is as (1).

$$P = \frac{\sum R}{N} \times 100\% \quad (1)$$

Table 1. Media eligibility criteria

Score (%)	Categories
<21%	Very poor
21-40%	Poor
41-60%	Acceptable
61-80%	Good
81-100%	Very good

A qualitative description was carried out in three stages, using interactive analysis to describe the findings during the digital learning environment development process, in addition to quantitative analysis via LMS expert validation. These findings were gained from the researcher's experience during the study process, which was documented in research notes, as well as through interviews and questionnaires about student responses to lectures using the DLE team-based project.

### 3. RESULTS AND DISCUSSION

#### 3.1. Results

The development of a digital learning environment in this study is based on the ADDIE model. This model was chosen based on research and is specifically aimed at developing learning systems in a variety of educational contexts. Based on the ADDIE model, the outcomes of this study went through five stages: analysis, design, development, implementation, and assessment.

##### 3.1.1. Analysis

Activities utilizing strengths, weaknesses, opportunities, and threats (SWOT) analysis approaches at this point necessitate the adoption of library management courses. The purpose is to analyze the elements required to solve an issue. The need analysis is carried out through observation and interviews. According to

observations and focus groups with lecturers and practitioners, the resources and media used in library management lectures are minimal and have not changed. According to the findings of LMS observations and interviews with distance learning specialists as validators, they were unable to provide blended lecture models with DLE team-based project designs. Table 2 shows the results of the SWOT analysis of the needs in library management courses at the department of educational management.

Table 2. SWOT analysis of library management courses

Strength	Weakness	Opportunity	Threat
<ul style="list-style-type: none"> <li>- This course becomes a distinguishing feature of graduates of the education management study program.</li> <li>- LMS courses have been developed.</li> <li>- Have lecturers with a background in library science education.</li> </ul>	<ul style="list-style-type: none"> <li>- Teaching materials are rarely updated.</li> <li>- Lectures are still teacher centered.</li> <li>- There are less proportion of information technology material.</li> <li>- Online learning has provided no benefits to LMS.</li> <li>- Lecturer innovation in the learning has not been implemented.</li> <li>- Learning media is monotonous (PowerPoint and lecturer modules)</li> <li>- The employment of technology in education is still limited.</li> </ul>	<ul style="list-style-type: none"> <li>- Some study program graduates work at libraries.</li> <li>- School library practitioners are still scarce.</li> <li>- Many schools, particularly school libraries, and have collaborated with study programs.</li> </ul>	<ul style="list-style-type: none"> <li>- The existence of a study program in information science and library science.</li> <li>- Because of the rapid advancement of science and technology, the library must be accommodated.</li> </ul>

### 3.1.2. Design

Several factors influence the creation and production of material, media, LMS, and problem-solving tools. Materials are created using the most recent library management science and are tailored to the needs of the job. A chunking strategy is used in the design of media [29]. LMS is developed to assist students in learning by utilizing a blended learning strategy that supports the DLE team-based project, an evaluation test instrument for students designed with the needs of high order thinking skills (HOTS) in mind [30].

### 3.1.3. Development

DLE team-based projects necessitate growth in a variety of areas. Material and media aspects are established with the help of validators who are also specialists in their domains. Material created with the inclusion of ICT to the library and the most recent references as a resource. To accommodate DLE, nine different forms of media were created. Learning videos, digital comics, infographics, animated videos, power points, flipbooks, video tutorials, voice power points, and podcasts are among the nine types of media created. The overall number of media developed is 40, with various topics. Every media created must be based on the learning material's features. FGD is commonly used in media development with other academics to control the quality of materials and media generated.

The LMS was created to meet the needs of blended learning team-based initiatives. During the development process, technology and online education specialists provided feedback. Because it includes professionals conducting FGD, the development of HOTS-based evaluation instruments takes time. Based on comments from validators, experts, academics, practitioners, and students, all media, resources, LMS, and evaluation instruments used to conduct DLE team-based library management lectures are "feasible" to be assessed on learning outcomes. Furthermore, during the development phase, professionals assessed the LMS using expert judgment. The media validator team consists of eight educational technology professors which assessed the media according to the indicator in Table 3. The table shows the outcomes of media validation. The percentage of LMS media feasibility scores based on media expert validation are as (2).

Table 3. Media validations results

Indicators		Average score
Media compatibility	Media suitability with the learning outcomes	4.25
	Media suitability with the student characteristics	4.12
	Media compatibility with the use of technological developments	4.25
	Media suitability with the teaching materials	4.25
	Media use efficiency (time efficiency)	4.50
	Ease of use	4.38
Media supporting aspect	The attractiveness of the colors used	3.88
	The appropriate use of the font size	4.35
	The suitability of the use of letter variations (bold, italic, and capital)	4.50
	The appropriate use of the images and illustrations in supporting meaningfulness	3.50
	Design attractiveness	3.88
Creativity	4.25	
Average score		4.17

$$P = \frac{\sum R}{N} \times 100\% = \frac{4.17}{5} \times 100\% = 83.4\% \text{ (Very Good)} \quad (2)$$

Several elements with poor ratings are utilized as a foundation for improving learning media by improving specific aspects. These results will be followed up by the developer in the next stage, which focuses on several aspects such as the use of color and design as well as the use of images and illustrations. Even so, aspects that already in “good” category are still considered to ensure the quality of the media produced. Furthermore, material validation was performed in Table 4, with the following outcomes. The percentage of DLE team based LMS eligibility scores based on the material expert validation are as (3).

Table 4. Material validations results

	Indicators	Average score
Material compatibility with learning outcome Supporting learning materials	The suitability of the material with the learning outcomes	4.38
	Completeness	4.25
	Material clarity	4.44
	Consistent presentation of material	4.69
	Language use	4.62
	Interest in delivering material	4.56
Content novelty	The suitability of the learning media with the material	4.56
	Up to date	4.56
	Reliable	4.62
	Average score	4.52

$$P = \frac{\sum R}{N} \times 100\% = \frac{4.52}{5} \times 100\% = 90.4\% \quad (3)$$

The results of this validation indicate that the content is in the very good category. Specifically, several aspects that require attention are the material’s completeness and its suitability with the predetermined learning outcomes. In other aspects, the material has been assessed as good by the validator. Media developers also need to use some of the latest literature to compile the material given to students, not just focus on media forms. This aims to maintain the quality and essence of DLE development.

### 3.1.4. Implementation

Library management classes are subject to the implementation stage. Students come from various colleges and study programs; they participate in the *Merdeka Belajar Kampus Merdeka* (Independent Learning Independent) campus program. In blended learning, the implementation phase lasts one semester or 16 meetings.

The implementation of a virtual synchronous learning team-based project with up to four meetings utilizing Zoom application. Independent asynchronous learning team-based project with up to four meetings using LMS, collaborative asynchronous learning team-based project with up to one meeting using LMS, collaborative asynchronous learning team-based project with up to eight meetings using Trello software. Students use the online assessment tools platform to analyze and evaluate lectures after 16 meetings based on the specified learning method.

Based on the lecture assessment findings, the average score of the student’s learning outcomes assessment test in library management courses was 86.2 with category A (excellent). While the findings of the lecture evaluation revealed that students were interested and happy when learning about libraries through various platforms and media. Students are driven to learn and understand things more easily when using multiple approaches and media. The samples of media can be found at <https://unyku.id/DLE-Product> [31].

### 3.1.5. Evaluation

The ADDIE methodology concludes with the evaluation stage. This stage is critical for determining the extent to which the system has been developed successfully. At this stage, an evaluation is performed to determine the success of building the DLE team-based research design on student motivation and learning outcomes. Evaluation results can be a reference for system developers, especially DLE. Aspects that are considered low can be improved in the next cycle. Furthermore, after all aspects are good in a small context, the application of DLE is feasible in a wider context.

## 3.2. Discussion

In this library management course, designing learning tools to support the digital learning environment team-based project begins with a SWOT analysis [32] to identify strengths, shortcomings,

opportunities, and threats from various aspects. Based on the results obtained, the analysis stage of the semester lecture plan (SLP) library management courses involves lecturers in library expertise and practitioners in school libraries through FGD. Collaboration between practitioners and academics has an advantage [33], especially in analyzing the Semester Learning Plan so that the learning process follows science development and is relevant to the competencies needed today. The end result is a semester-long learning plan based on outcome-based education (OBE). The list of reference books used in lectures is kept up to date with current issues. Distance education professionals were included in the LMS analysis, which was supported by observational studies of numerous courses that employed LMS. Based on feedback from professionals, professors, and students, the LMS for this learning must be available across many devices and operating systems and have a user-friendly interface.

On a DLE team-based project, nine media types are developed to accompany materials in library management lectures; there were two specialists examined media and materials. DLE team-based library management learning is designed as blended learning. The specifics are four virtual synchronous sessions via Zoom, four asynchronous meetings via the LMS, one collaborative meeting via the LMS, and eight meetings in collaborative asynchronous learning using Trello. The analytical results influenced the design of this investigation. A DLE team-based project is a concept that presents a variety of digital learning tools that are centered on team-based project activities. Besmart, a Moodle-based LMS developed by the State University of Yogyakarta, is used for independent and collaborative foreign online learning in this course. The course is built by offering various digital learning resources and building a collaborative team project-based lecture style. Some of the apps to support it are Zoom used for video conferences; time to improve interaction with students [34]; Trello [35] and Jamboard [36] for team-based projects [35], [37], [38].

The majority of the media used contains learning elements built utilizing the chunking strategy, which divides the material into little chunks to prevent overloading the brain and overcome capacity restrictions. Lecturers organize learning devices with the help of academics and practitioners. As indicated by greater student engagement, learning technologies are also meant to boost student interaction and communication. The primary characteristics that need to be improved in the adoption of online learning in Indonesia are flexibility, engagement with lecturers, and e-learning [39].

The OBE structure is used in SLP development, with an emphasis on team-based initiatives. A team of academics and other lecturers with expertise in library management are involved in the development process. SLP is also designed to generate theoretical and practical competency accomplishments to support course learning through team-based project activities. Application assistance, such as Freepik, Mentimeter, Powtoon, FlipHTML5, and Canva aids in the media development process. Infographics, digital comics, audio PowerPoints, podcasts, flipbooks, animated videos, instructional videos, and training videos are examples of digital media. The creation of teaching materials and learning media is aided. Team-based project learning occurs in virtual synchronous mode, self-contained asynchronous mode, and collaborative asynchronous mode with the use of Trello software, LMS, and Zoom. The development of assessment and evaluation tools for team-based project lectures is carried out by creating case-based instruments about HOTS. The LMS is used for assessment evaluation Quizizz, and Mentimeter are used.

The learning process is based on a semester learning plan that includes 25% virtual synchronous learning methods and 75% autonomous asynchronous and collaborative asynchronous learning strategies. Virtual synchronous tactics allow students to respond, ask questions, and hold discussions at any time. Students can confer with lecturers and tutors regarding the project being worked on, including during the monitoring stage of the team project on collaborative asynchronous tactics. Tutors also aid students who are enrolled in classes with their learning. Tutors also aid professors in delivering timely feedback on team project work using Trello.

The evaluation of media development is done progressively, with the participation of two media specialists and two material experts. In general, the reaction in each media shows that the media is worth testing with small adjustments to the material section. Assessment instruments are evaluated by lecturers from the educational research and evaluation study program. As a consequence, the assessment instrument is worth implementing with some changes to the grammar part in creating the problem-evaluation of learning in general yields positive results. The majority of students are in favor of blended learning. Students benefit from the LMS because of the range of media available. However, the amount of content does not appear to be exhausted. According to Rashid *et al.* [40], a virtual learning environment can boost student interest in the learning process, especially the packaging of the learning materials through creative media [41].

The use of multiple media in DLE team-based library management learning is critical since it makes the material provided more explicit and easier to understand, as well as motivates students to be more passionate about learning. Learning objectives will be met more effectively by delivering a variety of digital media. The value of lesson learning outcomes obtained by students is used to evaluate the success of a learning activity. If students receive a high learning outcomes score, the learning goal has been met; if students receive a low learning outcomes score, the learning goal has not been met.

The results showed that the development of DLE team-based projects could increase the motivation and results of student learning outcomes in library management learning in line with the results of research [42], [43], which shows that team-based projects are the best approach for developing professional skills currently recommended in the university curriculum because they refer to the needs of stakeholders. The needs of these stakeholders are indeed the results of the learning outcomes lessons in the library management subjects. The development of learning strategies using the concept of DLE is very suitable for the needs of students today because they need a stimulus to explore the potential of qualified self [32], [44]–[46] according to workplace needs [47], [48]. In general, DLE is a method for creating a comprehensive learning environment that is adaptable in terms of time and place, the various media employed, and the learning process based on the needs of students by utilizing digital platforms.

The usage of digital platforms undoubtedly necessitates students practicing increasing their digital literacy abilities in a variety of learning contexts, including library management learning. Students must also be able to use IT to school library initiatives. Trello is used to aid in the implementation of the team-based project in building the school library program. The DLE team-based project's implementation must be supported by digital literacy skills, as well as encouraging students' digital literacy skills to grow. Universities play an important role in increasing digital literacy in Indonesia [49], as a result, adopting the DLE team-based project is an important step toward enhancing Indonesia's digital literacy.

#### 4. CONCLUSION

Material aspects, media, LMS, and student assessment instruments are all included in the construction of DLE team-based projects in library management courses using the ADDIE model. Material created using the Chungking method was divided into nine types of media: infographics, digital comics, audio PowerPoints, podcasts, flipbooks, animated videos, learning videos, and tutorial videos. The DLE team-based project approach is used in the LMS to help blended students. To assess student HOTS, student evaluation measures are being revised. Students report to be satisfied and motivated to participate in library management learning organized around the notion of a DLE team-based project, as indicated by an average value of learning outcomes for library management courses of 86.2 with category A (excellent).

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