



Needs analysis on digital learning objects for university students

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ABSTRACT

Using Digital Learning Objects as learning resources is essential in blended learning. However, the availability is still limited, so there is a need to design and develop digital learning objects to help students meet learning objectives. This study identifies and analyzes students' needs for Digital Learning Objects relevant to the course's characteristics. This study employs the descriptive survey method to provide a quantitative description of students' preferences for different Digital Learning Objects. The data for this study was collected using a questionnaire distributed to 54 students as the sample. The results revealed that the Digital Learning Objects needed for the Audio Media course consisted of digital module (87 percent), video (79,6 percent), and animation (74,1 percent). As for the learning method, practicum (98 percent) and team-based project (81 percent) were preferable to discussion or presentation. It was also found that the digital module was more compatible with the majority of the materials covered in the course. Thus, developing Digital Learning Objects will include digital modules, instructional videos, and animation, which are expected to support students in a blended learning environment effectively.

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ABSTRAK

Pemanfaatan Objek Pembelajaran Digital sebagai sumber belajar merupakan hal yang penting dalam blended learning, namun ketersediaannya masih terbatas oleh karena itu perlu dirancang dan dikembangkan Objek Pembelajaran Digital yang dapat memudahkan siswa dalam mencapai tujuan pembelajaran. Penelitian ini bertujuan untuk mengidentifikasi dan menganalisis kebutuhan mahasiswa terhadap Objek Pembelajaran Digital yang relevan dengan karakteristik mata kuliah yang diambilnya. Penelitian ini menggunakan metode survei deskriptif karena perlu memberikan gambaran kuantitatif tentang preferensi mahasiswa terhadap berbagai jenis Objek Pembelajaran Digital. Data penelitian ini dikumpulkan dengan menggunakan kuesioner yang dibagikan kepada 54 mahasiswa sebagai sampel. Hasil penelitian menunjukkan bahwa Objek Pembelajaran Digital yang dibutuhkan pada mata kuliah Media Audio terdiri dari modul digital (87 persen), video (79,6 persen), dan animasi (74,1 persen). Sedangkan untuk metode pembelajaran, praktikum (98 persen) dan proyek berbasis tim (81 persen) lebih diutamakan dibandingkan diskusi atau presentasi. Ditemukan juga bahwa modul digital lebih kompatibel dengan sebagian besar materi yang dibahas dalam kursus. Oleh karena itu, pengembangan Objek Pembelajaran Digital akan mencakup modul digital, video instruksional, dan animasi, yang diharapkan dapat secara efektif mendukung mahasiswa dalam lingkungan pembelajaran terpadu.

Kata Kunci: blended learning; kursus media audio; objek pembelajaran digital

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INTRODUCTION

The COVID-19 pandemic has significantly changed education, introducing us to digital learning, a learning system that utilizes digital devices that can be flexibly accessed anywhere, anytime, and by anyone. During a pandemic, digital learning is an alternative in education that can provide various services and learning resources during face-to-face learning conditions that cannot be carried out. Online and distance learning is a solution and a challenge for educators and students. The transition from traditional face-to-face learning to online learning can be a completely different experience for students and educators who adopt “Emergency Education” through various online platforms and are forced to adopt systems that were not prepared in advance. Online learning has provided an innovative learning opportunity unlike the usual classroom teaching and learning experience (Pokhrel & Chhetri, 2021).

In today's world, most universities host online courses or lectures on their web platforms (Churi et al., 2022). This is because more and more Universities offer online courses, and faculty need to consider changing aspects of the online learning environment, including course structure, student interaction, and instructor presence (De Grey, 2020; Lim et al., 2021). In tertiary institutions, especially at the Indonesian University of Education (UPI), programs that have been developed to increase the use of ICT in learning have started since 2008 and have since been further improved and improved through the Integrated Online Learning System in Bahasa Indonesia *Sistem Pembelajaran Online Terpadu* (SPOT). This application was made specifically by UPI as a model for using ICT that can be used by lecturers in carrying out learning. SPOT is a mobile application (mobile apps) that allows students and lecturers to conduct discussions in online discussion forums. This allows students to hone their critical thinking skills in expressing opinions. Apart from SPOT, UPI is also developing an Online Learning System (SPADA), a Moodle-based Learning Management System (LMS).

SPADA was developed following the policy of the Ministry of Research, Technology and Higher Education with the Online Learning System Program in Bahasa Indonesia *Sistem Pembelajaran Daring* (SPADA) and 2018, which implements online learning a component of the Higher Education Ranking, so the Ministry of Education and Culture must recognize the implementation of online learning. Therefore, the Curriculum and Learning Division of the Academic Directorate and the Information Technology & Digital Learning Division of the STI Directorate developed an Online Learning System (SPADA) with the Ministry of Education and Culture Standards with the domain spada.upi.edu. Asynchronous learning aims to reduce the learning load within the scheduled time and help students learn through video recordings, webinars, podcasts, and online training courses. Students use Internet resources more significantly than others, such as CD-ROMs, e-books, journals, slides, and audio clips (Alphonse & Mwantimwa, 2019).

Online learning is currently a focus of development for higher education institutions. One of the goals is to support the program launched by the government through the Independent Learning Campus in Bahasa Indonesia *Kampus Merdeka, Merdeka Belajar* (KMMB) program. The KMMB program requires students to be able to seek other learning experiences outside of their study program, both within and outside their tertiary institution, with the same study program. Programs can be carried out either through student exchanges, internships, research, becoming teaching assistants, doing humanitarian projects or individual projects, and becoming entrepreneurs. For the KMMB program to be successful, it is necessary to prepare for the development of learning programs so that students from anywhere can take courses in our study program, both in person and online (Supriati, 2022).

The problem regarding current learning needs is the lack of digital teaching materials that lecturers and students can utilize. This happened because of changes from the COVID-19 pandemic, from face-to-face to online and blended learning. Teaching materials commonly used by students include textbooks and media presentations. In addition, they also take advantage of learning resources available on the internet.

However, because they are not designed according to the purpose, they make it difficult for students to understand and master the material. Students need learning materials that can be personalized according to their needs and teaching materials that are packaged into small parts to make it easier to understand the material being taught (Krouska, 2022).

According to a survey conducted by the Indonesian Internet Service Providers Association in Bahasa Indonesia Asosiasi Penyelenggara Internet Indonesia (APJII) in 2022, most internet users based on the educational level are undergraduate and postgraduate. This is also very relevant to most internet users aged 13 to 34. The average age of undergraduate students is 18 to 24 years. This provides an opportunity to develop digital teaching materials that can be accessed online. However, the average number of Indonesian people who use the Internet to study is still low, only 2.81%. Digital learning resources will be better if developed as learning objects (Blake, 2020). With digital learning resources that can be personalized through digital learning objects, it is hoped that the use of the Internet for learning can increase.

The Institute of Electrical and Electronics Engineers Standards Association (IEEE) working group defines learning objects as "any entity, digital or non-digital, that can be used, reused or referenced during technology-supported learning." This research focused on learning objects in digital form. The characteristics of digital learning objects are accessibility, reuse, interoperability, and adaptability to different software (Sotirova, 2020). Digital learning objects are digital teaching materials divided into the most minor parts: objectives, content, and evaluation. The physical form of learning objects contains digitally formatted learning materials such as graphics, images or photos, audio and video, simulation, and animation technologies, which support students in achieving their learning outcomes (Mei, 2019). Learning objects also support independent learning by applying the principles of self-paced learning materials, self-instruction, self-contained, self-assessment, chunking, learning activity, and personal and conversational. This principle is fundamental to apply in developing digital learning objects because it is used for independent learning where no lecturers deliver lecture material directly, so it must accommodate pedagogic values so students can learn comprehensively. Digital learning objects in online learning must pay attention to learning content, can increase participant motivation, and learning materials must be short and straightforward (Poultsakis, 2021).

Learning objects are digital teaching materials that allow students to study independently. Self-regulated learning is a strategy that directs students to independent learning. The existence of self-regulated learning supports the process of lifelong learning activities by developing students' proactive, independent learning abilities. Self-regulated learning looks at how students play a role in their learning metacognitively, motivationally, and in behavior that can regulate, manage, control, and evaluate their learning according to their characteristics (Daumiller, 2019). This is especially relevant if digital learning objects are designed using a self-regulated learning strategy. In addition, the lecture process is required to produce a product from project-based learning outcomes (PBL). PBL is a relevant learning method for students in higher education. Design of digital learning objects that will be designed based on self-regulated learning to support student project results (Dewi, 2024).

Several studies have confirmed the importance of self-regulation skills in online learning. Research revealed a high correlation between self-regulation and academic achievement in an online learning environment (Blume et al., 2022; Yavuzalp & Bahcivan, 2021). It was found that online learners exhibiting high self-regulation were more motivated to learn and performed better than those with low self-regulation. Motivation is an essential element in project-based learning.

In the Undergraduate Educational Technology study program, one of the core subjects is audio media. Audio media can be used as an exciting and efficient learning media. Audio media can be used in learning materials such as language or music and is broader than that. Audio media can be used as learning media that can convey learning materials. As explained by a previous study, suitable learning materials to be

conveyed through audio media include History, Civics, Sociology, Music, Various animal sounds, stories, and others (Winarto, 2020). The achievements of this course are based on the Semester Learning Plan (RPS). Namely, students can have an attitude of innovative spirit, independence, struggle, and entrepreneurship and understand various aspects of the development of learning audio/radio media and can compile scripts for audio media programs and produce them for the benefit of learning and education, both in formal and non-formal education environments as part of learning achievement in developing, managing media and learning resources. The result of this course is that students can produce audio media. Educational Technology students have the knowledge and skills to produce audio media based on theory, practice, strategies, and learning resources to achieve the course's objectives. With the existence of digital learning objects as self-regulated learning-based digital teaching materials that support the results of student projects, it is hoped that it will facilitate the lecture process so that it reaches its goals. Audio media theory can be studied independently by students online through LMS SPOT/SPADA, and practice can be done directly in class/laboratory. In producing material or content needing further understanding, students can learn again using digital learning objects.

In order to overcome the problems described above, one thing that can be done is to develop digital learning objects for both online and face-to-face learning needs, both synchronously and asynchronously. Digital learning objects should be based on self-regulated learning principles so students can study independently according to their needs. Furthermore, these digital learning objects support students in producing products in project-based learning. Based on the background of the problems described, this research aims to describe the existing learning resources used by students taking Audio Media courses and identify students' needs and preferences regarding digital learning objects compatible with the course's characteristics.

LITERATURE REVIEW

Learning objects are digital or non-digital entities that can be used, reused, or referenced during technology-supported learning. These objects encompass resources such as text documents, images, videos, simulations, and interactive activities related to the learning objectives (Rahayu et al., 2022). Digital learning objects are based on reusability and interoperability, enabling educators to integrate and adapt these autonomous objects into their teaching materials and learning environments (Luís & Marcelino, 2022). One of the key advantages of digital learning objects is their potential for personalized and adaptive learning experiences. By leveraging technologies such as machine learning and augmented reality, digital learning objects can be customized to meet learners' needs and preferences.

Digital learning objects also offer the advantage of scalability and cost-effectiveness (Abdel-Majeed, 2021). Once created, educators and learners can easily share, reuse, and adapt these objects across different contexts and settings. This promotes collaboration and knowledge sharing among educators, enabling them to benefit from each other's expertise and resources. Additionally, digital learning objects can be updated and improved over time, ensuring the content remains relevant and up-to-date. Furthermore, digital learning objects support constructivist learning theories by providing learners with opportunities for active engagement and exploration. Learners can interact with these objects, manipulate variables, and observe the outcomes, which promotes more profound understanding and critical thinking. Moreover, digital learning objects can provide immediate feedback to learners, helping them monitor their progress and identify areas for improvement.

Digital learning objects possess specific characteristics that make them effective and suitable for technology-supported learning. Here are some key characteristics: (1) Reusability: Digital learning objects are designed to be reusable, meaning they can be used, reused, or referenced in multiple learning contexts. This characteristic allows educators and learners to leverage existing resources and adapt them

to different instructional needs, saving time and effort. (2) Interoperability: Digital learning objects are designed to be interoperable, meaning they can be easily integrated into different learning environments and platforms. This characteristic ensures compatibility and seamless integration with various technologies and systems, promoting flexibility and accessibility. (3) Granularity: Digital learning objects are typically designed to be granular, meaning they can be broken down into smaller, self-contained learning units. This characteristic allows learners to engage with specific concepts or skills, providing targeted and focused learning experiences. (4) Multimedia-rich: Digital learning objects often incorporate multimedia elements such as text, images, audio, video, and interactive elements. This characteristic enhances engagement and supports different learning styles, catering to diverse learner preferences. (5) Adaptability: Digital learning objects can be designed to be adaptable, allowing learners to customize their learning experiences based on their individual needs and preferences. This characteristic promotes personalized learning and learner autonomy. (6) Scalability: Digital learning objects can be easily scaled and distributed to many learners, regardless of geographical location. This characteristic enables widespread access to educational resources and supports mass customization of learning experiences. (7) Feedback and assessment: Digital learning objects can provide learners with immediate feedback and assessment opportunities, allowing them to monitor their progress and identify areas for improvement. This characteristic promotes self-regulated learning and supports formative assessment practices. (8) Metadata: Digital learning objects can be accompanied by metadata, which provides descriptive information about the object's content, context, and usage. This characteristic facilitates the search, discovery, and organization of learning resources, enhancing their findability and usability (Goodsett, 2020; Sotirova, 2020).

Digital learning objects can take various forms and serve different purposes in technology-supported learning (Donaldson et al., 2022; Shemy, 2021). Some common digital learning objects include multimedia resources such as videos, audio recordings, images, and interactive simulations that provide visual and auditory content to enhance learning experiences. Interactive modules are self-contained units of instruction that allow learners to actively engage with the content through interactive elements such as quizzes, games, and simulations. E-books and digital textbooks are digital versions of traditional textbooks accessed on electronic devices, offering searchability, annotation, and multimedia integration features. Virtual reality (VR) and augmented reality (AR) experiences involve immersive technologies that provide learners with simulated environments or overlays of digital content onto the real world, allowing for interactive and experiential learning (Beck, 2019; Putri et al., 2024; Rewara et al., 2024). Online assessments and quizzes are digital learning objects that enable learners to test their knowledge and receive immediate feedback, promoting self-assessment and formative evaluation. Lastly, Learning Management System (LMS) tools consist of discussion forums, chat rooms, and collaborative workspaces within an LMS platform, facilitating communication and collaboration among learners and instructors (Devi, 2020).

Digital learning devices provide several advantages in the context of education. They can enhance the learning experience by providing interactive and compelling content that caters to various learning styles. Digital learning objects encourage active learning and enable students to explore and manipulate information, resulting in enhanced comprehension and retention of information. In addition, they offer flexibility and adaptability, enabling students to access and review the material at their tempo and convenience. In addition, digital learning objects can provide instantaneous feedback, allowing students to evaluate their progress and pinpoint areas for refinement. The reusability of digital learning objects permits the cost-effective and efficient use of educational resources (Bradley, 2021). In addition, digital learning objects can be readily revised and updated to ensure the content remains current and relevant. Overall, digital learning objects contribute to the efficacy and efficiency of the learning process, enhancing student engagement and achievement.

METHODS

This research used a quantitative descriptive method with a survey design. As stated by Roni et al. in "Conducting Quantitative Research in Education" a survey design provides a quantitative description of attitudes and opinions of a population. With this method, the researchers could identify students' preferences in different Digital Learning Objects. The sample for this research was students of the Educational Technology Study Program class 2021 who had finished taking the Audio Media course. The sample was taken using total sampling, which involved 54 students. The research was conducted in the even semester of the 2022/2023 academic year at Universitas Pendidikan Indonesia. This research data was collected using an online questionnaire distributed through Google Forms. The questionnaire consisted of seven multiple-answer questions, allowing respondents to check all applicable options. The questions aimed to analyze students' preferences in learning resources, course delivery methods, and course mode. The collected data was analyzed using descriptive statistics, in which responses were analyzed quantitatively and presented in percentages. Charts were also used to compare the student's experience and what they needed.

RESULT AND DISCUSSION

This section first presents the results of students' preferences in digital learning objects suitable for the Audio Media course. The results are then discussed in depth to understand how those preferences can be aligned with self-regulated learning strategies to facilitate students in a blended learning environment effectively. In order to accurately describe students' needs for digital learning objects, it is essential to identify the learning resources currently used before asking about their preferences for learning resources, learning mode, and learning method suitable for the materials covered in the course.

Students' Current Use of Learning Resources.

Students have access to various learning resources in print and digital formats. **Figure 1** shows that the types of learning resources that were mostly used were the ones that were easily available.

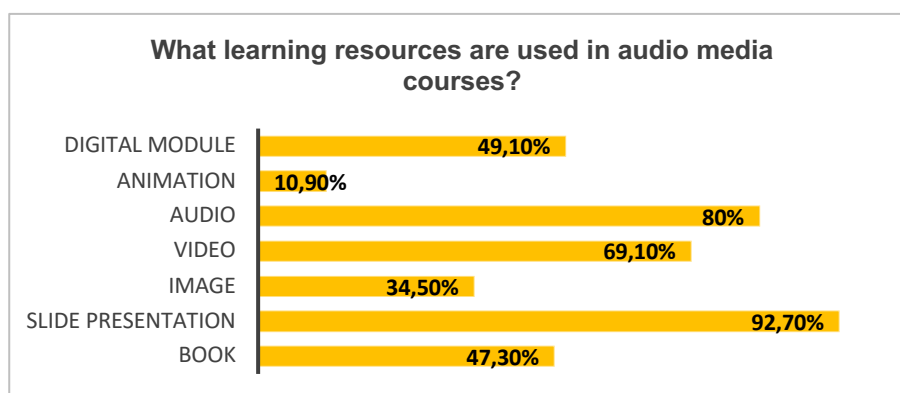


Figure 1. Learning Resources Used in Audio Media Course
Source: Research data 2023

The above chart indicates that the majority of students (92.6%) had access to presentation slides, but only a small number (9.3%) had used animation as learning media. The second learning resource students had access to was audio and video; interestingly, students who had used books and digital modules were less than 50%.

Students' Preference in Learning Resources

Students taking an Audio Media course need different learning resources, including books, PowerPoint slides, pictures, videos, audio, animations, and digital modules. The chart below presents the students' preferences for the types of learning resources that can meet their needs.

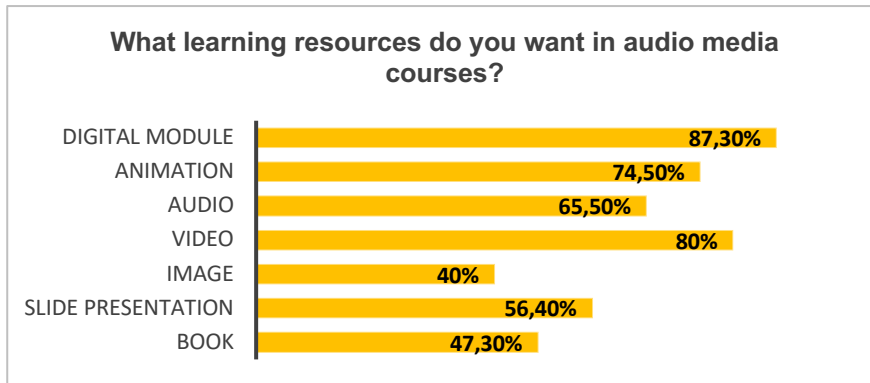


Figure 2. Students' Preference in Learning Resources
Source: Research data 2023

Figure 2 shows that digital learning resources such as digital modules were the most preferable (87%), followed by video (79.6%) and animation (74.1%). On the other hand, printed resources like books (46.3%) and pictures (38.9%) were less preferable.

Students' Preference in Course Delivery Mode

Students' choice of learning resources cannot be separated from the type of learning environment that they are in. The most preferable course modes are identified below.

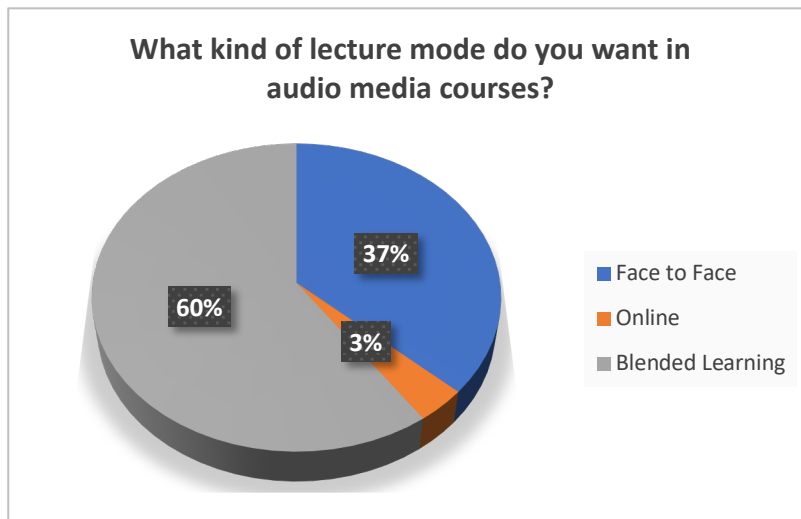


Figure 3. Students' Preference in Learning Resources
Source: Research data 2023

Figure 3 shows that 59.3% of students preferred blended learning, and only 3.7% chose full online learning. In other words, most students taking an Audio Media course chose blended learning over fully online or face-to-face learning.

Students' Preference in Course Learning Method

The learning method employed determines students' learning activities. For the Audio Media course, practicum was the most preferable, as shown in **Figure 4** below.

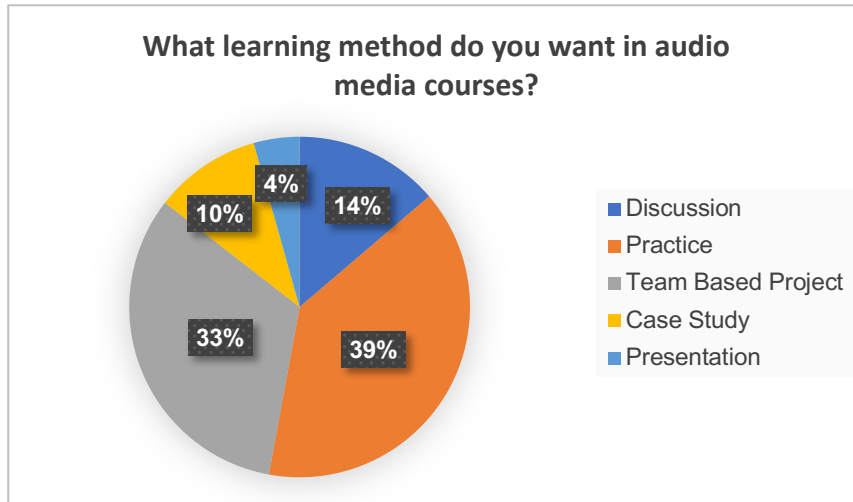


Figure 4. Students' Preference in Course Delivery Method
Source: Research data 2023

The figure above indicates that almost all students (98.1%) chose practicum as the course learning method. The second most preferable method was the team-based project, which accounted for 33%. Discussion and case study methods were less preferable, while presentation methods were the least preferable.

Students' Evaluation of Course Materials

Learning resources are important in helping students understand course materials, tough ones. Hence, identifying which materials are complex for the students will help the instructor select suitable learning resources for effective learning. The topics that were difficult for the students are identified in **Figure 5** below.

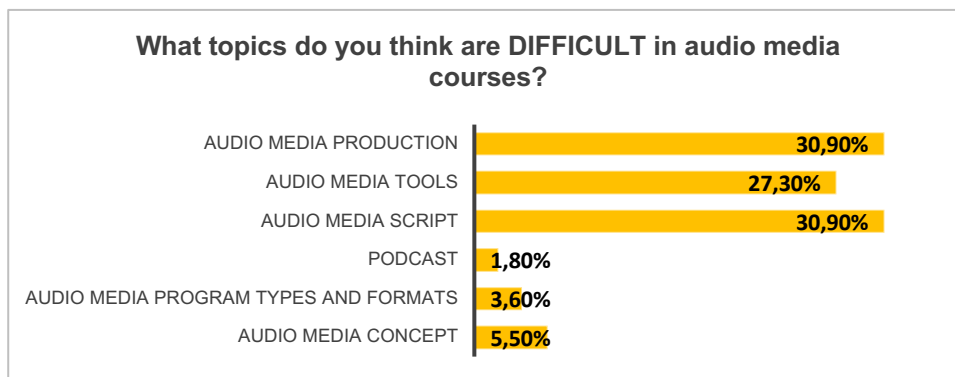


Figure 5. Students' Evaluation of Difficult Course Materials
Source: Research data 2023

The chart shows that a considerable number of students (31.5%) considered the topic of audio media manuscripts the most difficult to understand, followed by audio media production (29.6%) and audio media equipment (27.8%). Other topics were not challenging to study, as identified below.

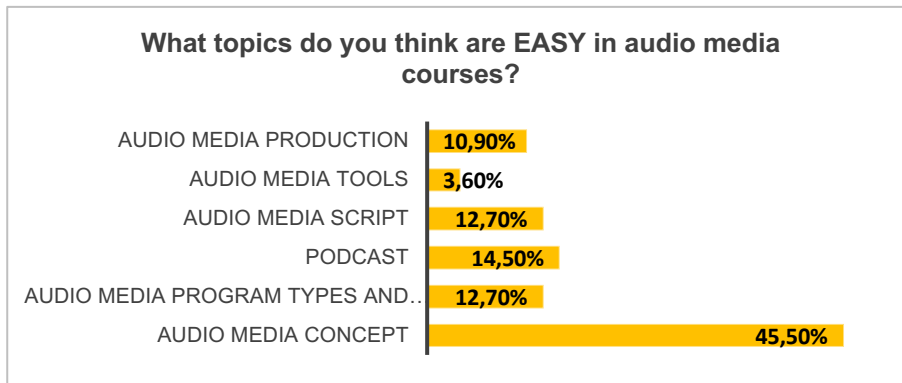


Figure 6. Students' Evaluation of Easy Course Materials
 Source: Research data 2023

As seen in Figure 6, 44.4% of students agreed that the concept of audio media was easy to comprehend compared to other topics. The chart also indicates that audio media and podcast types and formats were more accessible than other topics.

Students Need for Learning Resources by Topic

The selection of learning resources should be based on the characteristics of the content delivered. Complex content will entail different learning resources from the easy ones. The relevant digital learning resource for each topic is identified in **Figure 7** below.

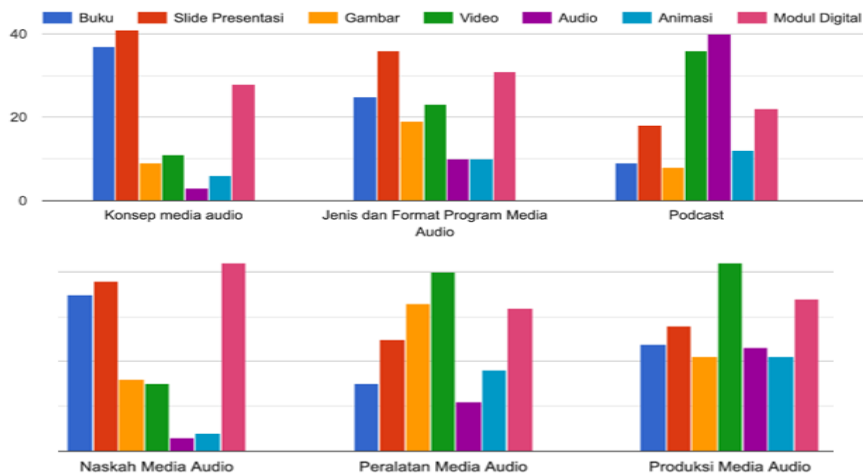


Figure 7. Students Need for Learning Resources by Topic
 Source: Research data 2023

The first and second charts on the left show that for easy topics such as the concept of audio media and the types and formats of audio media, presentation slides were preferable, followed by books and digital modules. The next topic is podcasts and audio media as learning resources, which were the most preferable and indeed the most suitable for the topic, along with videos.

The other three charts show that for complex topics mentioned earlier, students' preference for digital modules, videos, and animations was much higher. The digital module was the first choice for the audio media manuscript topic, followed by presentation slides and animation. As for the audio media equipment topic, videos were preferable, followed by animation and pictures. Lastly, digital modules were the most popular learning resources after videos for audio media production, while other learning resources were moderately preferable.

Discussion

Learning resources play a significant role in ensuring students participate in engaging and interactive learning activities. In an online learning environment, learning content is delivered via the internet. It should, therefore, be made in chunks for easy access and processing, which gives rise to the need for more specific and more straightforward learning resources called Digital Learning Objects (DLO). Unlike learning resources, DLO focuses on specific learning objectives and should be developed based on students' needs. In the context of Audio Media Course, assessing students' needs involves analyzing the types of learning resources, course delivery mode, and course delivery method suitable for the courses. It is also essential to identify which materials students consider easy and complex, which will be the primary consideration in developing suitable DLO for the course.

The first step in assessing students' needs is to analyze the gap regarding the use of learning resources by identifying what learning resources they had used and what learning resources they needed to use to facilitate their learning better. It was found that during the Audio Media course, the students mainly used presentation slides and audio resources with limited access to animation. On the contrary, the students preferred to use digital modules, video, and animation, especially in learning complex topics. Moreover, since the students preferred the blended mode, their learning resources (digital module, video, and animation) should be developed as digital learning objects more compatible with digital learning. Digital learning objects are created in smaller chunks and reusable formats, making them more interoperable and easily manageable at many different levels of complexity throughout the online instructional environment (Watson, 2010). DLO also benefits students as it can be equipped with metadata for easy tracking and searching across a vast catalog of content (Dumitrica & Jarmula, 2022).

Another factor that gives rise to DLO development is students' preference in course delivery methods. The results show that the students preferred practicum and team-based projects for Audio Media course delivery. In this case, using DLO will help students independently learn course materials during online mode. Learning via LMS requires students to be able to regulate their learning because they study without the instructor's supervision. Therefore, developing a DLO that facilitates students' self-regulation of their learning will significantly improve the effectiveness of project-based learning. The success of project-based learning depends on students' ability to plan, manage, and evaluate the project (Janul, 2024). They must also stay motivated during the assignment to complete the project on time. According to previous research, this relates to metacognitive ability, which is the essential foundation of self-regulation in learning (Oppong, 2019).

Zimmerman's self-regulation model consists of three stages: initial planning, performance, and reflection (Anthonysamy et al., 2021). In the initial planning stage, the learner analyzes the task, sets goals, and plans how to achieve the goals that have been set, which in this case includes motivation that will determine the activation of learning strategies in the next stage. During the performance stage, the learner executes tasks, monitors learning progress, and employs several self-control strategies to stay cognitively engaged and motivated. Finally, in the reflection stage, students evaluate how they completed the task and rate their success or failure. If the learner understands what led to the success or failure, this will produce a reaction that can positively or negatively impact how the learner approaches subsequent tasks.

With these in mind, the DLO developed for the Audio Media course will be based on self-regulated learning principles. In project-based learning, self-regulation skills are highly needed because although the project is group work, each individual involved has his or her role, and if one member does not do his or her work due to low motivation, it will impair the result of the project. A previous study found that the use of embedded self-regulation strategies enabled learners to employ their strategies during learning (Wang et al., 2019). In addition, another study revealed that the use of DLO contributed to students' ability to complete their work independently and produce a project that meets or exceeds rubric requirements

(Wong, 2020). Hence, facilitating students' use of self-regulated learning strategies through DLO in a blended learning environment is highly recommended.

CONCLUSION

Digital learning resources may take various forms, including slide presentations, digital modules, animation, audio, and video. Suitable learning resources should be made available for students designed and developed based on students' needs. For university students taking audio media courses in blended mode, digital learning objects (DLO) will enable them to learn complex topics more quickly and efficiently because they have specific learning objectives and smaller sizes to guarantee easy access and optimum utilization. The preferred digital learning resources include digital modules, video, and animation. Digital Learning Objects incorporating self-regulated learning principles play an essential role in project-based learning as they facilitate students studying course materials and completing projects independently and effectively. The self-regulated learning principles assist students in planning, managing, monitoring, and evaluating their projects. Therefore, using self-regulated learning principles in designing DLO for project-based learning will significantly improve students' learning outcomes.

AUTHOR'S NOTE

The authors declare that there is no conflict of interest related to the publication of this article. The authors confirm that the data and content of the article are free from plagiarism.

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