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The Feasibility of Interactive Multimedia and Online Quiz Based Gamification on Learning Management System (LMS) Thematic Learning Courses

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Abstract: The global Covid-19 pandemic has influenced changing face-to-face learning activities to distance learning using online learning platforms. However, the platform design is still less varied from the type of media, learning applications, the ability to provoke motivation and the active role of students. This research aims to determine the feasibility of interactive multimedia and online quizzes based on integrated gamification learning systems in supporting thematic learning courses. This study used a research and development approach, specifically Branch's ADDIE development model design (2009). The subject of the study is a 2nd-semester student who will take Thematic Learning courses in the Elementary School Teacher Education Study Program. Data collection techniques use questionnaires and interviews. Data analysis uses descriptive analysis. The results showed that the validation results of media experts obtained a score of 3.88 with good categories and material expert validation obtained a score of 3.89 with a good category. Then the results of student responses to interactive multimedia products and online quiz-based gamification during the three stages of the trial had an average of 3.71 very good categories and showed student activity in lectures. This interactive multimedia and online quiz-based gamification integrated LMS in thematic learning courses are said to be feasible. They can increase student motivation and interaction in the lecture process.
Keywords: interactive multimedia, online quiz-based gamification, learning management system, thematic learning

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Introduction

The spread of the COVID-19 virus in China at the end of 2019 quickly impacted various sectors globally, one of which was the education sector. (Dubey & Pandey, 2020). The government issued various regulations and recommendations to suppress the spread of the Covid-19 virus. The existence of rules for working from home and reducing direct contact with others temporarily causes all educational and learning activities to not occur as before. In Indonesia, all students from each unit of education, namely about 170,000 elementary schools, 40,000 junior high schools, 26,000 high schools, and 3,000 universities, are forced to study from home (Churiyah & Sakdiyyah, 2020). As a result, 68.8 million students learn from home, and 4.2 million teachers and lecturers teach from home (Mulyana, A., Mundayat, A. A., Sukmajati, 2022). In response to these circumstances, the government issued an education policy remotely using technology and structured information to facilitate communication between educators and students (Bušelić, 2017).

Based on the Regulation of the Minister of Higher Education and Culture Number 3 of 2020 concerning National Standards of Higher Education (Mendikbud RI, 2020) and the guidebook "Merdeka Belajar–Kampus Merdeka" published by the Directorate General of Higher Education, Ministry of Education and Culture in 2020 (Tohir, 2020), and guidebook for the implementation of online learning for the odd semester 2020 (Direktorat Jenderal Pendidikan Tinggi Kemdikbud RI, 2020), The implementation of distance learning in universities can be done through learning in online courses organized by 1) self-study and guided using various learning resources; 2) use teaching materials in

digital form then combined with other teaching materials in various formats, forms and media; 3) utilizing learning media based on information and communication technology; and 4) conduct learning interactions based on information and communication technology to minimize direct interaction.

Following up on this, the college has developed a platform to facilitate the online distance learning process implementation. Optimization of the use of the platform needs to be supported by several things, namely educators' understanding of the use of technology and the use of multimedia that can motivate and engage students to learn actively (Putri et al., 2021). However, not all learning media can be used in distance learning. The chosen learning medium must be in line with the characteristics of the material, students, and the learning itself (Hsieh & Tsai, 2017).

Based on the experience of teaching lecturers in the odd semester of the 2020/2021 school year, where in conveying the subject of practice and giving examples of its application to thematic or integrated learning courses, usually use examples of simulation videos or tutorials related to materials taught from live simulation practices in the field both at Universitas Negeri Yogyakarta and at Universitas PGRI Palembang. However, in the next school year, the lecture process will be carried out online. The subject matter of the practice is less than optimal if only limited to using textbooks or delivering materials through PowerPoint. In addition, learning media that is less varied also causes low motivation to learn students in attending lectures online compared to when the lecture system is face-to-face. It is also supported by the results of a field survey on 421 students at Universitas Negeri Yogyakarta, showing that student participation in attending online lectures 66.3% (279 students) have participated in 76-100% of meetings, while 25.2% (103 students) only attended students 51-75% of meetings. The remaining 8.5% (34 students) attended online lectures under 50% of meetings from 16 meetings. In addition, the results of a survey of learning platforms that have been used in supporting online lectures at Universitas Negeri Yogyakarta and Universitas PGRI Palembang showed that the majority (80% of students) had used the Learning Management System (LMS) provided by Universitas Negeri Yogyakarta and Universitas PGRI Palembang. However, the design of the LMS used varies less in terms of media and learning technology. Therefore, there needs to be an application or learning media that can be integrated with LMS and foster learning motivation and student participation during online lectures such as interactive multimedia and quiz-based gamification. The LMS used at Universitas Negeri Yogyakarta and Universitas PGRI Palembang are moodle-based, with the name LMS for Universitas Negeri Yogyakarta, namely BeSmart. In contrast, at Universitas PGRI Palembang, it is named SISFO.

Furthermore, based on a survey of learning platforms used at Universitas Negeri Yogyakarta and Universitas PGRI Palembang, it is known that the learning process using the Learning Management System (LMS) is less varied in terms of the use of media and learning technology. Learning design uses only the features already available in their respective LMS without using other multimedia or supporting learning applications. Therefore, there needs to be an interactive application or media that can be integrated into LMS to empower students' learning motivation and active participation during distance lectures. The media can be interactive multimedia and online quiz-based gamification.

Multimedia is a system that supports teacher communication with students during the learning process through text, audio, images, animation, video, and graphics (Ellis-Barrett, 2007). Interactive multimedia can present concepts with an interesting look due to combining images, animations, and even interesting sounds. With such a look, the boredom experienced by students in attending online lectures can be reduced, so students will be more interested in understanding the material provided (Patricia & Zamzam, 2021). While gamification is a learning approach using elements in the game to motivate learners, maximise feelings of enjoyment and engagement in the learning process, attract students' interest, and inspire them to continue learning (Jusuf, 2016). Various types of gamification-based applications can be used as online assessment support. Educators can develop online assessments through various applications such as Quizziz, Kahoot, Educandy, Moddle, Schoology, etc. The application is included in the formative assessment category that teachers can use during pre-test or post-test (Ramadhani, 2020). Gamification-based online assessments can be developed interactively and interestingly through a variety of applications. Both learning media will be integrated into the Learning Management System (LMS) which is moodle-based e-learning so it is easy to use. One of the advantages of moodle-based e-learning is that it can be integrated with various learning media, including gamification applications and interactive multimedia. Using gamification and interactive multimedia

applications in learning can increase student engagement and specific skills in optimizing learning (Smiderle et al., 2020).

Based on this background, it is important to carry out a development related to interactive multimedia and online quiz-based gamification integrated Learning Management System (LMS) in supporting the practice of distance lectures at Universitas Negeri Yogyakarta and Universitas PGRI Palembang. This research aims to produce interactive multimedia and online quizzes based on an integrated gamification learning management system (LMS) suitable for supporting thematic learning courses.

Methods

This study used a research and development approach, specifically the ADDIE development model design (Analysis, Design, Development, Implementation, and Evaluation). This research procedure contains research stages that refer to the steps of the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) development model developed by Branch (2009). In this study, the research procedure was simplified to developing interactive learning media through expert validation and media feasibility trials. This study was conducted from February to May 2022. The research subjects are 2nd-semester students who will take Thematic Learning courses in Elementary School. They were students from elementary school teacher study programs of Universitas Negeri Yogyakarta and Universitas PGRI Palembang.

Selection of the subjects of this study, taking into account the ease of access and experience of researchers related to problems in this study. Media feasibility test subjects are carried out using purposive sampling techniques, namely sampling techniques, by determining certain criteria (Sugiono, 2014). The criteria are students who have stable internet access and have used LMS BeSmart. In detail, the technique of taking research subjects in each trial, according to Suparman (2012)) can be seen in table 1.

Table 1. Sampling techniques

No	Trial	Number of Students
1	*One-to-one trial*	3
2	*Small group trial*	8
3	*Field trial*	20

At the development stage, media validated by material and media experts include the quality of interactive multimedia products and online quiz-based gamification integrated e-learning Besmart. The aspects of the validations are material suitability, material components, language, presentation, media effects on learning strategies and the feasibility of the entire media presentation.

Media and material experts on the validation instrument use a Likert scale of 5 scales (very good, good, enough, less, very less). While on the instrument of student response to interactive multimedia and online quiz-based gamification integrated LMS using four scales, namely strongly agree, agree, disagree, strongly disagree. Data analysis uses descriptive statistics where in providing criteria or category results of the assessment of interactive multimedia products and online quizzes based on integrated gamification LMS, both in the validation of media experts, material experts, and product trials are said to be feasible if at least have good categories. The guidelines for converting the resulting score quantitative data into qualitative data, according to Rofiq et al. (2019), are presented in the following table.

Table 2. Product eligibility value conversion guidelines to qualitative data

Qualitative Data (Product Category)	Quantitative Data (Scale 5)	Quantitative Data (Scale 4)
Very good	$X > 4{,}20$	$X > 3{,}94$
Good	$3{,}40 < X \leq 4{,}20$	$2{,}98 < X \leq 3{,}94$
Enough	$2{,}60 < X \leq 3{,}40$	$2{,}02 < X \leq 2{,}98$
Less	$1{,}80 < X \leq 2{,}60$	$1{,}01 < X \leq 2{,}02$

Very Less	X ≤ 1,80	X ≤ 1,01

Results and Discussion

Interactive Multimedia Concept and Online Quiz Based Gamification Integrated LMS

Interactive multimedia and online quiz-based gamification in this study have different concepts from others. This media can be integrated with the Moodle version's learning management system (LMS) to be used anywhere and anytime. In addition, this developed media can accommodate the process of independent and guided lectures conducted online and face-to-face. Interactive multimedia design and online quiz-based gamification developed has some interesting and complete components or features. It can be seen in figure 1 of the flowchart chart of the interactive multimedia framework and online quiz based on the integrated gamification of LMS.

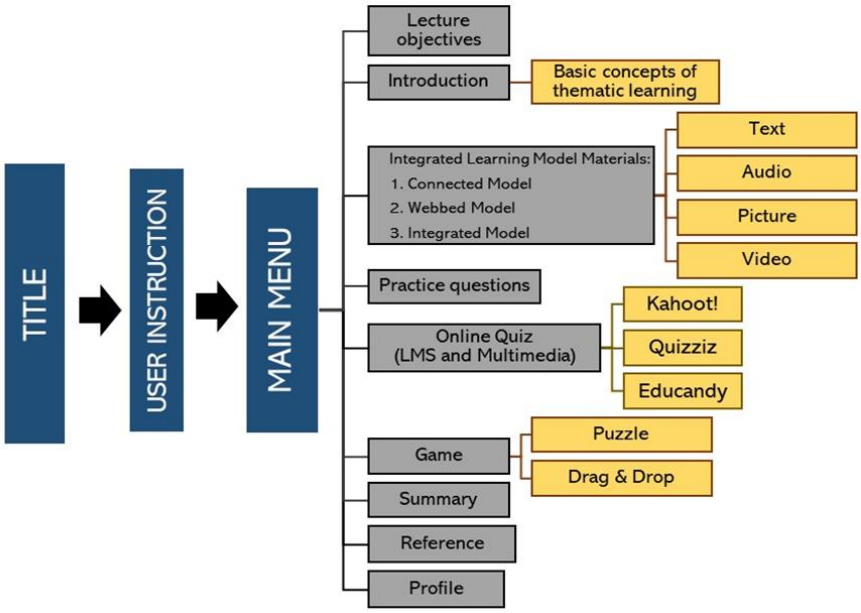

Figure 1. Flowchart interactive multimedia framework and online quiz-based gamification integrated LMS

Some of the interactive multimedia components and online quiz-based gamification above can be explained into 12 components. These components include 1) title, this section contains the title of the interactive multimedia developed; 2) user instruction, this section contains instructions for using interactive multimedia, which includes an explanation of each navigation button and menu; 3) main menu, this section contains several main menus that are the focus of the interactive multimedia content component; 4) lecture objectives, this section is about the objectives of the lecture to be achieved; 5) introduction, this section contains an introduction to learning before entering the material. It is also explained in general about thematic learning in elementary school; 6) material, this section contains material on integrated learning models that include connected models and webbed models, and integrated models can be text/reading material, audio, video, and images or animations relevant to the material; 7) question exercises: this section contains several question exercises related to the material presented as a form of evaluation of student's abilities; 8) online quizzes, this section is an additional question exercise packaged in the form of an online quiz using three online quiz platforms, namely Kahoot!, Quizziz, and Educandy. In addition to interactive multimedia, this online quiz link is also integrated directly into LMS to be a means for students to compete and improve student interaction in lectures; 9) games, this section contains various games or quizzes that are packaged in the form of puzzles, drag & drop, praying, and so on. The goal is to increase student learning motivation based on games; 10) summary, this section contains a summary of the material as a whole; 11) references, this section lists the reference sources used; and 12) profile, this section contains media and developer profiles. Some interactive multimedia displays and online quiz-based gamification can be seen in figure 2.

Figure 2. Main menu display

The main menu of this gamification-based interactive multimedia, which can be seen in figure 2, consists of an introductory menu, material menu, quiz menu, question practice menu, summary menu, and reference source menu. The introductory menu contains about apperception before entering the core material. The material menu is focused on the material of integrated learning models. The practice menu consists of multiple-choice questions consisting of 10 questions and five description questions that can be done in real-time. The quiz menu contains questions integrated with the Quizziz, Kahoot!, and Educandy applications. The last menu is the reference source containing supporting references in the material presented in this media. The selection of each menu icon also needs to describe the content in the menu presented. Then, the colour of each button must also contrast with the background used. It is in line with the opinion of Astuti et al. (2018), who explained that the choice of colours used in media development must be based on the psychological response of students as users because colour plays an important role in the perception and interpretation of students' views on instructional media.

Figure 3. Display of the practice question menu

The question practice menu in figure 3 shows the shape of the question in the form of multiple choice and description. Users can choose the question directly according to the desired answer in the multiple-choice menu. While in the description questions, users can type the answer in the column presented or on their respective sheets of paper. After the user completes all the questions, they will automatically get the score they get.

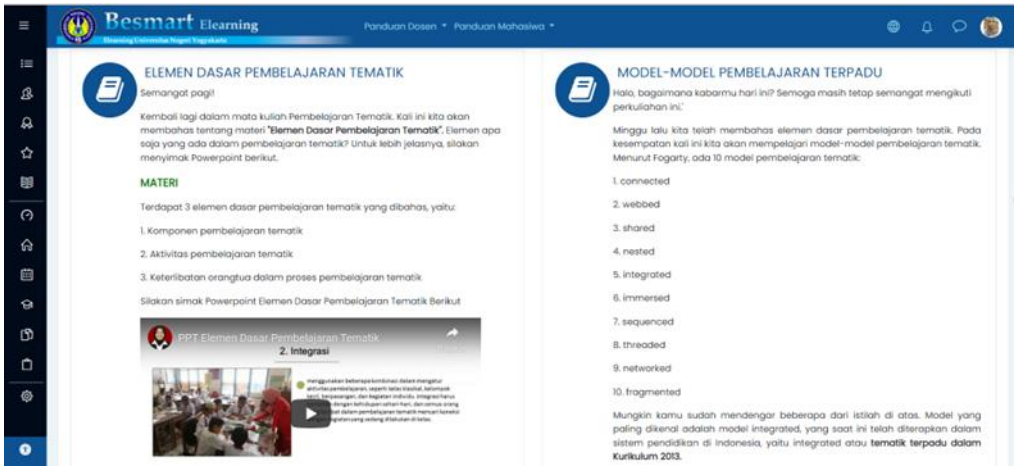

Figure 4. BeSmart LMS display on thematic learning courses in elementary schools

In this development, in addition to interactive multimedia and online quiz-based gamification, content development in learning management systems (LMS) also needs to be done. This study used BeSmart LMS, owned by Universitas Negeri Yogyakarta, in thematic learning courses. This BeSmart LMS uses moodle version 3.11. The content in LMS is designed for as many as 16 meetings. However, this study focused on an integrated learning model. The design of the LMS BeSmart display on thematic learning courses in elementary schools can be seen in figure 4.

Expert Validation Results for Interactive Multimedia and Online Quiz Based Gamification

This research data is obtained by filling out a set of instruments in the form of questionnaires given to media and material experts. The results of validation tests by material experts were analyzed, and the product was revised according to the advice. The results of the validation of the material expert are shown in table 3.

Table 3. Validation results of material expert

No	Aspect	Indicator	Score
1.	Material suitability	Correctness Latest Topic Interesting Sharpness Sequences Material Scope	4.06
2	Material components	Easy to understand Providing evaluations to measure student ability feedback Accuracy of language use User friendly material concreteness Learning exercises	3.72
Average			**3.89**
Category Description			**Good**

Based on Table 3, the average score of 4.06 was obtained from the material suitability aspect, and 3.72 was obtained from the material components aspect. The total average for the material validation is 3.89, indicating the material's validity was considered a good criterion (Rofiq et al., 2019). The results of the validation test by the material expert are in the form of response results and assessments from material experts. The results of the data obtained are analyzed, and product revisions are carried out according to the suggestions. Besides, media is being validated by media experts. The results of

validation tests by media experts were analyzed, and the product was revised according to the advice. The results of the validation of media experts are shown in table 4.

Table 4. Validation results of media expert

No	Aspect	Indicator	Score
1.	Language	Clarity of instructions Language suitability with the user's level of thinking Language suitability to the level of social-emotional development spelling The language used encourages student curiosity Decent language Accuracy of dialogue/text with story/material	3.96
2.	Presentation	Sequenced material Media presentations support the students involved in learning Media presentation, including animated images suitable to the user's characteristics	3.92
3.	Media Effects on Learning Strategies	User friendly Media encourages students to do self-learning Enhancing motivation expanding knowledge Provide the latest topic	3.86
4.	The feasibility of the entire media presentation	Interesting from the first page Organized media design Typing and font selection support media to be more active Media design suitable with material Ease of reading text Colour selection Suitability of stories, images, and materials Operational (easy to operate and does not require too high device specifications)	3.78
Average			**3.88**
Category Description			**Good**

Table 4 of the result of media expert validation shows the total average score of media expert validation is 3.88, categorized as good (Rofiq et al., 2019). All aspects of validation of the interactive multimedia have met the validity score. From the language aspect, the average score is 3.96; the average score of the presentation aspect is 3.92; the average score of media effects on learning strategies is 3.86. The total average score was considered good by both media and material experts. According to experts, the interactive multimedia developed has good quality.

Furthermore, material experts provide comments and suggestions for improvements to pay attention to how to write materials and questions in the media. In addition, material experts also provide advice to adjust the material on the media with program learning outcomes. Similar things have been reported by Arifin (2018) and Aprilia (2021), who stated that the preparation of good materials in learning media must be adjusted to basic competencies and learning indicators, making it easier for students to understand the material learned and the learning process to be more effective.

Moreover, media experts also provide comments and suggestions for improvements to improve the quality of media in terms of appearance, namely in terms of animation quality and contrasting background design to make it clearer and more interesting. A similar thing was reported by Richardson et al. (2014), who stated that selecting the right and appropriate colours for images and backgrounds can increase students' interest in learning and improve students' ability to remember the material that has been learned. In addition, the appearance of interesting and creative learning media greatly affects the learning process. The more attractive the display of media developed, the more motivated students are to follow learning (Resiani et al., 2015).

Interactive Multimedia and Online Quiz Based Gamification on Learning Management Systems (LMS) Thematic Learning Courses are declared suitable for use as a learning media because the media includes three components of media eligibility quality, namely the feasibility of content and purpose, language eligibility, and eligibility for presentation. As Anbia (2013) stated, the media is feasible if it has 3 components of eligibility: the feasibility component of content and purpose, the component of linguistic eligibility, and the feasibility component of the presentation.

Student Response Results to Interactive Multimedia and Online Quiz-Based Gamification

Based on the validation of media experts and materials have done before, interactive multimedia products and online quiz-based gamification are carried out in the repair process before being caught with limited trials. In this test phase, researchers used three trials: one-to-one trial, small group trial, and field trial. The research subjects are 2nd-semester students who take thematic learning courses in elementary schools in grade 2B. In a one-to-one trial conducted, a spread of student response questionnaires to interactive multimedia products and online quiz-based gamification, as many as three students were selected based on high, medium, and fewer abilities (results of midterm score analysis). While the small group trial stage was conducted on eight randomly selected students, and the field trial stage was conducted on 20 students who were also selected randomly. From the three stages of the trial, students received the results of student responses to the media products developed. Details can be seen in table 5.

Table 5. Student response results in interactive multimedia trial and online quiz-based gamification integrated LMS

No	Aspects	Indicator	Score		
			One-to-one trial	**Small group trial**	**Field trial**
1	Motivation	Attention Interest Curiosity	3.56	3.72	4.00
2	Attraction	Giving appeal to students Visual display quality Audio display quality	3.78	3.65	3.88
3	Easiness	Ease of understanding the material Ease of operation Ease of doing exercises about	3.22	3.47	4.00
4	Usefulness	Making an impact on students Add new skills for students Add student references related	3.44	3.92	3.90

to integrated learning model materials			
Average score	3,50	3,69	3,95
Category description	Good	Good	Very good

Table 5 shows that the one-to-one trial test stage obtained a score of 3.50 with a good category, the small group trial stage got a score of 3.69 with a good category as well, and the field trial stage got a score of 3.95 with an excellent category. Assessing student response to interactive multimedia products and online gamification games includes motivation, attractiveness, convenience, and usefulness. (Smaldino et al., 2012). The motivation aspect includes several indicators, including attention, interest and curiosity. Aspects of attractiveness include indicators in giving appeal to students, visual display quality, and audio display quality. Aspects of ease include several indicators: ease of understanding the material, ease of operation, and ease of doing exercises. Finally, aspects of usefulness include indicators about impacting students, adding new skills for students, and adding student references related to integrated learning model materials. From the results of student responses in the three stages above, it can be seen that aspects of attractiveness and motivation have a high impact on the process of conducting thematic learning courses, where the aspect of the average appeal of scores from 3 trial stages gets 3.77 in the good/decent category. The average motivation aspect score from the three trial stages gets 3.76, with good or decent categories.

Interactive multimedia in learning has a different impact by using only non-interactive media such as textbooks, videos, or others. It is in agreement with research that explains that interactive multimedia integrates various elements of text, images, photos, audio (music, narration), video, and animation in one learning application product to make users or learners become not easily bored, interactive, motivated to continue to understand the material in the multimedia (Komalasari, 2019; Nusir et al., 2013; Terentyeva et al., 2019; Wiana, 2018). Therefore, the development of interactive multimedia in this research was designed with various multimedia such as video, images, text, animation, quizzes, question exercises, audio, and discussion forums. Not only that, but this multimedia is also collaborated with several online quiz-based gamification platforms such as Kahoot!, Quizziz, and Educandy and integrated into LMS Moodle, which can be accessed anytime and anywhere independently or guided.

This gamification-based online quiz platform collaboration aims to encourage students not to be saturated in thematic learning lectures with the variations in the types of online quizzes used. It is because learning or quizzes using a gamification approach can impact students by improving learning outcomes, creativity, motivation and student involvement in learning (Alsawaier, 2018; Krisbiantoro, 2020; Welbers et al., 2019).

Interactive multimedia learning and online quiz-based gamification are also integrated into the learning management system (LMS). With the aim that students can access the media independently. However, in using LMS, some obstacles are sometimes faced, such as instability of internet access or limited devices owned. But it does not interfere too much with the lecture process by using interactive multimedia and online quiz based on the integrated gamification of LMS. The selection of LMS as a platform in this learning is because Yogyakarta State University, during distance learning, has used Moodle-based BeSmart LMS so that students are familiar with its features (Azman et al., 2020). In addition, from several research results, LMS has a positive role for educators in helping to plan learning scenarios, managing teaching materials, including this interactive multimedia, managing learners' learning activities, managing values and learners can get results directly (real-time), recapitulating learners' attendance, to display transcripts of grades (Chaw & Tang, 2018; Kraleva et al., 2019; Tinmaz & Lee, 2020). The appearance of LMS in this study is also made as attractive as possible with the addition of learning resources in the form of interactive multimedia and online quiz-based gamification so that students are more interactive, easy, and comfortable in using it, and they can accommodate practical lecture materials.

The combination of image media, videos, online quiz applications and moodle applications adds to the completeness of this gamification-based interactive multimedia. It is in line with Budiarto et al. (2021) and Indah Septiani et al. (2020), who explained that the implementation of learning needs to combine digital and multimedia technology to facilitate the learning process.

Conclusion

Interactive Multimedia and Online Quiz Based Gamification on Learning Management systems (LMS) Thematic Learning Courses are declared feasible. They can be used as lecture media for elementary school teacher education students. According to assessments from media experts and material experts, each gave an average score of 3.89 ratings from material experts and 3.88 from media experts. Scores are categorized as a good category. Then the results of student responses to interactive multimedia products and online quiz-based gamification at the time of the limited trial, which included one to one trial, obtained a score of 3.50 with a good category, small group trial obtained sc 3.69 with a good category, and the field trial received a score of 3.95 with a very good category. In addition, this interactive multimedia product and online quiz-based gamification also impact student learning motivation, understanding and skills in learning steps by using integrated learning models and increasing student interaction in lectures. It can be seen during the lecture process and interviews with several students. So that this media is suitable for use in thematic learning courses for elementary school teacher education study programs at Universitas Negeri Yogyakarta and Universitas PGRI Palembang.

Recommendations for further research, namely the development of gamification-based interactive multimedia and integrated LMS, can be continued for material in other courses. Adding project-based interactive features is necessary, making lectures more interactive and increasing student collaboration. In addition, media formats are integrated into online-based LMS and can be used offline.

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