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Needs Analysis of Learning Evaluation Media Development Based on Interactive Educational Games for Elementary School Human Digestive System Material

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Abstract
This study aims to analyze the need for developing interactive educational game-based evaluation media to enhance elementary school students' understanding of the human digestive system. The research is grounded in constructivist learning theory, which emphasizes active, engaging, and student-centered learning. The problem addressed is the dominance of conventional paper-and-pencil evaluations, which are considered less effective and less engaging. This study used a survey method involving 20 fifth-grade students and 5 science teachers as respondents. Data were collected using a Guttman scale questionnaire and analyzed quantitatively. Findings reveal that 75% of students found it easier to understand material through interactive media, and 65% preferred game-based learning over textbooks. Meanwhile, 100% of teachers still use conventional evaluations, with 75% acknowledging that the current media is not engaging for students. The study concludes that there is a strong need to develop interactive educational game-based evaluation tools. These tools can improve student motivation and provide teachers with faster, more accurate feedback, supporting more effective science learning in elementary education.

INTRODUCTION

Technological advancements have significantly transformed education, including how learning is evaluated in elementary schools. In the context of science learning, evaluation plays a vital role not only in measuring students' knowledge but also in developing scientific process skills and attitudes. However, conventional evaluation methods such as paper-and-pencil tests are often perceived by students as monotonous, anxiety-inducing, and less effective in fostering engagement.

In addressing this issue, integrating digital-based media such as interactive educational games into learning evaluation is considered a promising solution. Interactive educational games refer to technology-enhanced applications designed to engage learners in solving problems or completing tasks in a game-like format while achieving educational objectives (Hung et al., 2024; Chiu et al., 2021). These games promote intrinsic and extrinsic motivation, encourage critical thinking, and provide immediate feedback, aligning with the principles of constructivist learning theory, which emphasizes meaningful, student-centered learning through active engagement (Mayer & Fiorella, 2020).

Previous research has shown that digital game-based learning positively impacts student engagement and achievement (Hamari et al., 2019; Sailer & Homner, 2020). Platforms such as Kahoot!, Quizizz, and Wordwall.net have been widely adopted due to their effectiveness in enhancing participation and understanding, especially in science education (Permata & Kristanto, 2020; Elisah et al., 2024). Despite this, the adoption of interactive game-based evaluation in Indonesian elementary

schools remains limited, primarily due to inadequate infrastructure and limited teacher readiness (Wang et al., 2020).

The human digestive system is one of the more abstract and complex topics in the elementary science curriculum. Students often struggle to understand the concept due to a lack of visual, interactive, and contextual support in traditional learning methods. Therefore, innovation is needed in how this topic is taught and evaluated.

This study is guided by the following research objective: **to analyze the need for developing interactive educational game-based evaluation media for the human digestive system material in elementary schools**. The aim is to provide a foundation for designing more engaging and effective evaluation tools that support deeper understanding and foster student motivation.

Moreover, this study identifies both the potential and limitations of existing evaluation practices by assessing student and teacher perspectives. The results will contribute to the design of digital evaluation tools that are pedagogically sound, technologically feasible, and aligned with the characteristics of elementary education.

METHODS

This study used a survey method with a needs analysis model based on the Rowntree approach and Tessmer evaluation. This model consists of three main stages, namely planning, development, and evaluation. Evaluation was conducted using the Tessmer model which includes formative evaluation with stages of self-evaluation, expert review, one- to-one evaluation, small group evaluation, and field test. This approach allows the development of interactive educational game-based evaluation media that is more optimal and in accordance with the needs of elementary school students. Data was obtained through a questionnaire given to 5th grade students and 5th grade teachers with a Guttman scale to obtain firm answers in the form of "yes" or "no" options. Respondents consisted of 20 5th grade students and 5 5th grade teachers.

The material used in the development of this evaluation media is the human digestive system in the 5th grade science curriculum. The source of the material comes from the national curriculum established by the Ministry of Education, Culture, Research and Technology, as well as various scientific references regarding interactive learning media and educational games. With this approach, the research ensures that the evaluation media developed has a strong academic foundation and is relevant to the needs of students.

The data in this study were collected through a questionnaire with a Guttman scale given to students and teachers. The Guttman scale was used because it is dichotomous (answers "yes" or "no") which allows for clearer data analysis related to respondents' needs and preferences for interactive educational game-based evaluation media. This questionnaire covers pedagogical, technical, cognitive, aesthetic, and evaluation aspects related to the effectiveness of using educational games as learning evaluation media. The grid for analyzing student needs and the grid for analyzing teacher needs are described in table 1.

Table 1. The grid for analyzing student needs

No	Aspect	Indicator	Question Number
1	Pedagogical	a. Learning Style	1, 2
		b. Learning Process	3, 4
2	Technical	a. Accessibility	5, 6
3	Cognitive	a. Ability to Understand the Material	7, 8
		b. Ability to Absorb Information	9, 10
4	Aesthetic	a. Preference	11, 12
		b. Visual Appearance	13, 14
5	Evaluation	a. Understanding Measurement	15, 16, 17
		b. Feedback	18, 19, 20

Source: Modification Raharjo, M. et al (2024)

Table 2 : The grid for analyzing teacher needs

No	Aspect	Indicator	Question Number
1	Pedagogical	a. Training	1
		b. Teaching Methods	2
		c. Media Content Appropriateness	3
		d. Media Capability	4
2	Technical	a. Infrastructure	5
		b. Reachability	6
		c. Media Format and Technology	7
		d. Practicality	8
3	Cognitive	a. Capability	9
		b. Comprehension	10
		c. Media Capability	11
		d. Understanding of Visual Elements	12
4	Aesthetic	a. Design	13
		b. Suitability	14
		c. Visual Media Design	15
		d. Appropriateness of Visual Elements	16
5	Evaluation	a. Internal Evaluation Tools	17
		b. Reports and Data	18
		c. Provision of Evaluation Tools	19
		d. Evaluation Media Capability	20

Source: Modification Raharjo, M. et al (2024)

Data analysis was carried out using quantitative methods by calculating the percentage of respondents' answers based on the Guttman scale. The data obtained were categorized and analyzed to determine the pattern of needs and preferences of students and teachers for the evaluation media developed. The results of the percentage analysis were then interpreted to determine the level of urgency in the development of interactive educational game-based evaluation media. This approach allows researchers to get an objective picture of the effectiveness and acceptance of the evaluation media to be developed.

RESULTS AND DISCUSSION

This study is to analyze the need for developing interactive educational game-based learning evaluation media on human digestive system material in elementary schools. Data was obtained through a questionnaire given to 5th grade students and 5th grade teachers with a Guttman scale to obtain firm answers in the form of "yes" or "no" options. Respondents consisted of 20 5th grade students and 5 5th grade teachers. The results of this needs analysis will be the basis for designing evaluation media that are in accordance with the learning needs in elementary schools. Data from the student needs analysis questionnaire is presented in table 3.

Table 3. Student needs analysis questionnaire.

No.	Aspects	Question	Score		Percentage	
			Obtained	Maximum	Obtained	Maximum
1.	Pedagogical	P1	16	20	80%	100%
		P2	14	20	70%	100%
		P3	8	20	40%	100%
		P4	14	20	70%	100%
2.	Technical	P5	16	20	80%	100%
		P6	16	20	80%	100%
3.	Cognitive	P7	10	20	50%	100%

		P8	19	20	95%	100%
		P9	17	20	85%	100%
		P10	14	20	70%	100%
4.	Aesthetics	P11	15	20	75%	100%
		P12	18	20	90%	100%
		P13	14	20	70%	100%
		P14	14	20	70%	100%
5.	Evaluation	P15	11	20	55%	100%
		P16	14	20	70%	100%
		P17	14	20	70%	100%
		P18	15	20	75%	100%
		P19	14	20	70%	100%
		P20	15	20	75%	100%
Average Value					**72%**	**100%**

The analysis of pedagogical data showed that most students found it easier to understand the digestive system material through interactive audiovisual media. As many as 80% of students stated that this approach was more effective than simply reading the text. In addition, 70% of students preferred game-based learning, indicating that this method can enhance their engagement in the learning process. However, only 40% of students felt that the current learning methods were sufficiently interactive, highlighting the need for innovation in teaching approaches. Therefore, the use of interactive media and educational games can be an effective strategy to improve students' understanding and motivation to learn.

In the technical aspect, 80% of students have access to digital devices that support their learning, such as laptops or smartphones. In addition, 80% of students feel comfortable using digital media in the evaluation process. This shows that students are familiar with technology in their daily lives, so the integration of digital-based learning media will not be an obstacle. Students' ability to use digital devices opens up great opportunities for the development of interactive educational game-based evaluations. With adequate access and comfort in using technology, digital learning media can be optimally applied to improve learning effectiveness.

From the cognitive aspect, 95% of students felt that the interactive media was very helpful in understanding the concept of the human digestive system. In addition, 85% of students stated that they found it easier to remember information conveyed through attractive visual media. The game-based evaluation was also considered capable of deepening concept understanding for 70% of students. This indicates that learning approaches that optimize visual and interactive aspects can increase students' absorption of the material. Thus, the development of learning media based on interactive educational games can be an effective solution in strengthening students' understanding and increasing their involvement in the learning process.

In the aesthetic aspect, the majority of students prefer learning media with an attractive and colorful appearance rather than those with only one color dimension. As many as 90% of students stated that attractive visuals increase their interest in learning. In addition, 75% of students felt that the visual design in the learning media influenced their understanding of the material. Animations and illustrations were also considered helpful in understanding the concept of the digestive system by 70% of students. This confirms that aesthetics in learning media have a big impact on the attractiveness and effectiveness of learning, so good visual design needs to be considered in the development of educational media.

From the evaluation aspect, 70% of students felt more confident in answering questions if the evaluation was conducted in the form of a game. In addition, 75% of the students found the game-based evaluation more enjoyable than the conventional written exam. 70% of students also wanted immediate feedback after completing the evaluation, while 70% of students felt that in-game rewards could increase their motivation in learning. Thus, game-based evaluation not only increases students'

enthusiasm, but also provides a more interactive and meaningful learning experience, thus improving the overall effectiveness of learning evaluation.

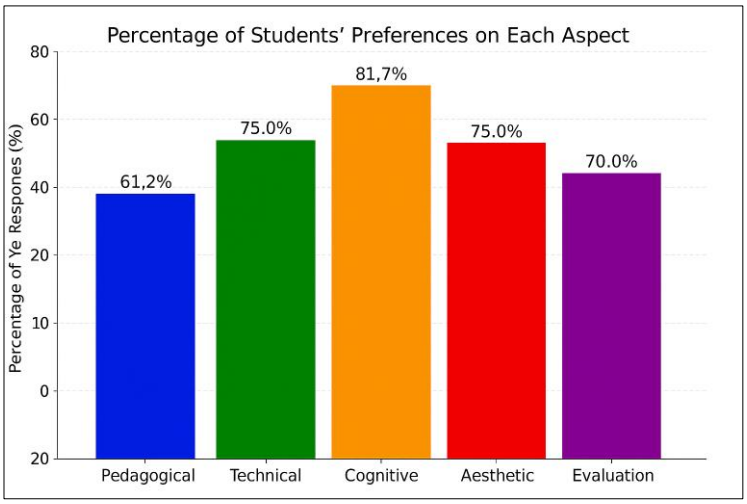

Figure 1. Overall Percentage Diagram of Student Needs Analysis Questionnaire Results

From the figure presented above, it illustrates that the Cognitive aspect (90%) has the highest level of acceptance of interactive media, followed by Aesthetics (85%), Evaluation (70-75%), Pedagogical (40-75%), and Technical (75%). The diagram of the students' needs analysis results illustrates their level of preference for various aspects of learning, namely pedagogical, technical, cognitive, aesthetic, and evaluation. The results show that the cognitive aspect has the highest percentage, indicating that the interactive media is very helpful for students' understanding. The aesthetic aspect also has a high number, indicating that visual design plays an important role in increasing learning interest. In addition, the evaluation and technical aspects show students' readiness to use technology as a game-based evaluation tool. However, the pedagogical aspect has the lowest percentage, indicating that current learning methods still need to be improved to be more interactive and interesting for students.

Based on the analysis of students' pedagogical needs, about 61.7% responded positively to interactive and game-based learning media for understanding the human digestive system. They found audiovisual and educational games helpful for grasping concepts and staying engaged. However, many still viewed current teaching methods as not interactive enough, highlighting the need for more innovative approaches. These findings align with Amiruddin et al. (2022) and Hasnawiyah & Maslena (2020), who showed that interactive digital media improves students' comprehension, participation, and academic performance. Thus, developing educational game-based assessment media is a relevant pedagogical solution to boost motivation and concept mastery in primary education.

Based on the analysis of students' technical needs, around 75% reported access to digital devices and felt comfortable using them for learning and assessment. This suggests strong digital readiness, making the integration of educational game-based assessments feasible. Silvia et al. (2021) support this with their Android-based interactive media on the digestive system, which received high validity scores from experts. Similarly, Hasnawiyah and Maslena (2020) highlighted that interactive digital tools enhance engagement and learning outcomes. Therefore, students' technical preparedness supports the effective use of digital innovations to improve education quality.

The analysis of students' cognitive needs showed that 81.7% found interactive media highly beneficial for understanding the human digestive system. Visual and game-based content helped them retain information and deepen conceptual understanding. These findings align with Widianti (2023), who reported improved science scores and mastery among elementary students using animated

videos, and Tamara et al. (2019), who found a 33% increase in correct answers after using an interactive learning app. Thus, visually engaging interactive media can greatly enhance students' comprehension and memory retention.

The analysis of students' aesthetic needs showed that 78.3% preferred visually appealing and colorful learning media, which increased their interest and aided understanding. Animations and illustrations were seen as helpful for grasping digestive system concepts. Rahmasari and Syofyan (2021) supported this with video-based interactive media that received expert validation scores between 77% and 90%. Similarly, Hasibuan et al. (2022) found high ratings for Flash-based digestive system media, averaging above 84%. Thus, incorporating strong visual design is crucial to enhance both engagement and learning effectiveness in elementary education.

The analysis of students' evaluation needs showed that 70% felt more confident and motivated when assessments were game-based, finding them more enjoyable than traditional tests and appreciating immediate feedback and rewards. Tamara et al. (2019) reported a 33% increase in correct answers using interactive apps, while Widianti (2023) observed improved learning outcomes with animated videos. These findings suggest that game-based assessments enhance motivation, engagement, and learning outcomes in elementary science education.

This result shows that students have a strong preference for interactive, technology-based learning supported by attractive visual design. Therefore, the development of interactive educational game-based evaluation media is very suitable for their needs. The urgency level for developing interactive educational game-based evaluation media, based on the analysis of students' needs, is presented in the table below.

Table 4. Student Responses on the Need for Interactive Educational Game-Based Evaluation Media

No.	Aspects	Percentage	Category
1.	Pedagogical	61,2%	Moderate Need
2.	Technical	75%	High Need
3.	Cognitive	81,7%	High Need
4.	Aesthetic	75%	High Need
5.	Evaluation	70%	High Need
	Average	**72,58%**	**High Need**

Based on the analysis of students' needs, the technical, cognitive, aesthetic, and evaluation aspects exhibit a high level of urgency for the development of interactive educational game-based evaluation media, with percentages of 75%, 81.7%, 75%, and 70%, respectively. Meanwhile, the pedagogical aspect reflects a moderate need at 61.2%. Overall, the average urgency level is categorized as high at 72.58%, indicating a strong demand for such media to enhance the effectiveness and engagement of the learning assessment process. These findings underscore the necessity to prioritize the creation and implementation of interactive game-based evaluation tools to better support student learning outcomes.

Next, analyze the results of the needs analysis questionnaire distributed to 5th grade teachers. The data from the teacher needs analysis questionnaire are presented in table 5.

Table 5. Teacher needs analysis questionnaire.

No.	Aspects	Question	Score		Percentage	
			Obtained	Maximum	Obtained	Maximum
1.	Pedagogical	P1	3	5	60%	100%
		P2	1	5	20%	100%
		P3	1	5	20%	100%
		P4	2	5	40%	100%
2.	Technical	P5	4	5	80%	100%
		P6	3	5	60%	100%

	P7	3	5	60%	100%
	P8	1	5	20%	100%
3. Cognitive	P9	3	5	60%	100%
	P10	1	5	20%	100%
	P11	1	5	20%	100%
	P12	2	5	40%	100%
4. Aesthetics	P13	1	5	20%	100%
	P14	1	5	20%	100%
	P15	1	5	20%	100%
	P16	3	5	60%	100%
5. Evaluation	P17	2	5	40%	100%
	P18	4	5	80%	100%
	P19	0	5	0%	100%
	P20	3	5	60%	100%
Average Value				**40%**	**100%**

The analysis revealed that most teachers have not implemented digital evaluation media, despite 50% having received related training—none have applied it in practice. Only half believe their current evaluation methods meet students' needs or aid understanding of the human digestive system. This highlights a gap between training and application, and a need for more innovative, tech-based evaluation tools. Interactive educational game-based media offer a compelling solution, aligning with student characteristics and making assessments more engaging. Therefore, developing adaptive and teacher-friendly digital evaluation media is essential to enhance learning effectiveness.

In the technical aspect, limited school facilities remain a major barrier to using technology-based evaluation media. Only 25% of teachers reported having adequate infrastructure, and just 25% felt the available technology suits their school's devices. While 75% found current media accessible, only half considered it practical to implement. These findings indicate that despite interest in using digital tools, infrastructure constraints hinder adoption. Therefore, developing interactive educational game-based evaluation media must be supported by adequate infrastructure and technical assistance to ensure effective implementation.

The cognitive aspect plays a key role in evaluating student understanding. While 50% of teachers believe current evaluation media supports thinking skills and comprehension of the digestive system, all agree it lacks interactive features for deeper concept mastery. Half also noted that visual elements aid understanding. These findings suggest that although current tools are somewhat helpful, limited interactivity reduces student engagement. Thus, developing more interactive media—such as educational game is essential to enhance learning experiences more effectively and enjoyably.

From the aesthetic aspect, current evaluation media still fall short. Only 25% of teachers found the design appealing or suited to elementary students, and the same percentage felt the visuals supported understanding. Half stated the visuals met learning standards. This indicates a need to improve aesthetics to better capture students' attention and engagement. Interactive, game-based evaluation media—with dynamic designs, bright colors, and animations tailored to young learners—can effectively boost interest and comprehension.

In the evaluation aspect, traditional methods still dominate, with 100% of teachers using paper-based assessments. Only 25% said current media can record student outcomes, and none reported automatic evaluation features. While 50% found existing tools fairly effective, these findings highlight limited use of technology in enhancing evaluation efficiency. Thus, developing interactive game-based evaluation media with features like automatic result tracking and real-time feedback is essential to improve assessment quality.

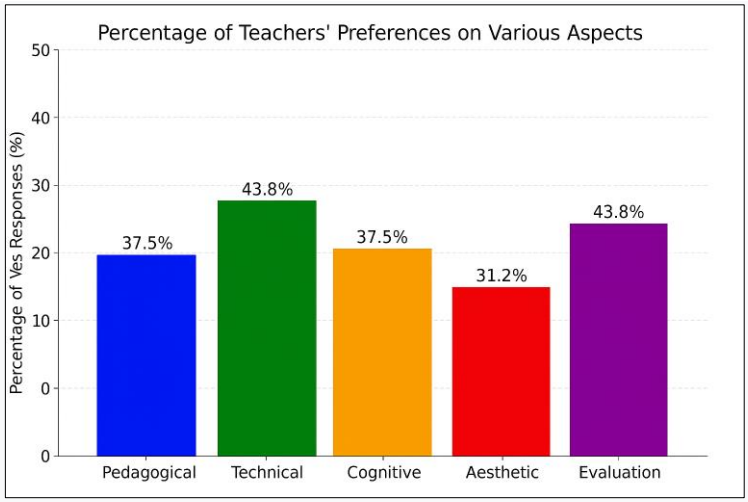

Figure 2. Overall Percentage Diagram of Teacher Needs Analysis Questionnaire Results

The analysis of teachers' needs indicates that the evaluation aspect holds the highest percentage (43.75%), reflecting the dominance of conventional methods and the limited use of digital technology. However, Azzahro and Subekti (2022) found that digital evaluation media can enhance student motivation and learning interactivity, while Komalasari et al. (2023) showed that the use of Plickers increases student participation and conceptual understanding. The main challenges lie in limited infrastructure and teachers' digital competencies; thus, improving facilities, providing continuous training, and developing evaluation media suited to school conditions are essential.

The cognitive aspect represented 37.5% of teachers' needs, indicating that while current evaluation media aid understanding, they often lack interactivity for deeper engagement. Teachers see the potential of tech-based tools for cognitive growth, but without active exploration features, their impact is limited. Winarti et al. (2023) and Asysyura et al. (2023) found that interactive media like e-posters, podcasts, and videos significantly boosted cognitive outcomes. These findings highlight the need for evaluation media that go beyond traditional formats by integrating interactive elements to enrich learning experiences.

The pedagogical aspect also accounted for 37.5%, showing that while some teachers find current evaluation methods adequate, most have not integrated digital tools into their teaching. Despite some training, implementation remains low. Studies by Mansyur et al. (2022) and Myori et al. (2022) found that training on tools like Google Forms and Android-based media improves teachers' assessment and ICT skills. These findings suggest that while awareness of digital evaluation is growing, ongoing training and appropriate media development are essential to build teacher confidence in using technology for assessments.

The aesthetic aspect had the lowest percentage at 31.25%, suggesting that current evaluation media lack visual appeal and fail to engage elementary students. Many teachers noted that the designs are not suited to young learners, which can reduce motivation during assessments. To address this, interactive game-based media should prioritize engaging visuals, colors, and design elements. Research by Rahayu and Luswati (2022) and Wahyudin et al. (2025) confirmed that visually appealing, interactive media significantly boost student motivation, engagement, and participation in learning. The urgency level for developing interactive educational game-based evaluation media, based on the analysis of teachers' needs, is presented in the table below.

Table 6. Teacher Responses on the Need for Interactive Educational Game-Based Evaluation Media

No.	Aspects	Percentage	Category
1.	Pedagogical	37,5%	Moderate Need
2.	Technical	43,8%	Moderate Need
3.	Cognitive	37,5%	Moderate Need
4.	Aesthetic	31,2%	Low Need
5.	Evaluation	43,8%	Moderate Need
	Average	**38,76%**	**Moderate Need**

Based on the analysis of teachers' needs, the pedagogical, technical, cognitive, and evaluation aspects demonstrate a moderate level of need, with percentages ranging from 37.5% to 43.8%. Meanwhile, the aesthetic aspect shows a low level of need at 31.2%. Overall, the average need across all aspects is categorized as moderate at 38.76%. These results indicate that while there is recognition of the importance of developing interactive educational game-based evaluation media, the urgency perceived by teachers remains moderate, suggesting the need for increased awareness and support to enhance adoption and implementation in educational settings.

The results of this analysis show that there are still various challenges in implementing technology-based evaluation media in the school environment. Although teachers are starting to realize the importance of digital evaluation, limited facilities, lack of interactive features, and unattractive evaluation media design are still the main obstacles. This finding is in line with research conducted by Wang et al. (2020), which states that the effectiveness of digital evaluation is strongly influenced by the readiness of school infrastructure and the ability of teachers to adopt technology. In addition, research by Hamari et al. (2019) showed that interactive educational games can increase students' learning motivation by providing a more interesting and challenging evaluation experience than traditional methods.

Expert opinion also supports the importance of innovation in learning evaluation. According to Chiu et al. (2021), game-based evaluation media can increase student engagement as it offers gamification elements that make the learning process more fun and interactive. In addition, research conducted by Mayer & Fiorella (2020) confirmed that the integration of visual and interactive elements in digital evaluation plays an important role in improving students' concept understanding. Therefore, the development of evaluation media based on interactive educational games can be an effective solution to improve the quality of learning evaluation. By integrating technology that is suitable for school devices, providing interactive features that support student understanding, and presenting a more attractive visual design, digital evaluation media can be a more effective tool in improving student engagement and overall learning quality.

CONCLUSION

Based on the results of the needs analysis, the development of interactive educational game-based evaluation media on human digestive system material in elementary schools is needed to improve learning effectiveness. The questionnaire results show that the majority of students (75%) find it easier to understand the material through an interactive approach compared to conventional methods, while 65% prefer game-based evaluation. In addition, 70% of students felt more confident in the game-based evaluation, and the visual and aesthetic aspects were considered to play an important role in increasing their engagement. From the teachers' perspective, the evaluation method used is still dominated by paper and pencil (100%), with 75% stating that the available evaluation media is not engaging enough for students. Although 50% of teachers have received training on the use of digital evaluation media, all of them (100%) have not implemented it in their lessons due to infrastructure limitations, with only 25% of schools having adequate facilities. In addition, there is no automated evaluation system that allows for more efficient monitoring of learning outcomes. Therefore, innovation in the development of evaluation media that is interactive and interesting is needed. Interactive educational game-based evaluation media is expected to increase student

engagement, provide immediate feedback, and simplify the evaluation process for teachers. With an adaptive design, automatic evaluation features, and support in its application, this media can be an effective solution to improve the quality of learning evaluation in elementary schools.

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