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Analysis of Wordwall-Based Gamification Design in Science Learning on Force and Motion Material

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ABSTRACT

To improve learning outcomes and student engagement in the digital era, technology integration in the classroom is essential. Wordwall, an interactive platform that allows teachers to design engaging learning activities, has grown in popularity. This study focuses on testing the Wordwall gamification design for science education, especially those related to force and motion. This study aims to determine the feasibility of the Wordwall-assisted gamification learning design on force and motion material. This research method uses The sample of this study consisted of 19 students of class VII B. Data collection was carried out through observation, validity testing, and reliability testing. The results of the study showed that this media design met the feasibility criteria with a validity score of 67. This indicates that this media is feasible to be applied in learning. The reliability test showed a very high level of consistency with a value of 89.38%, indicating that this gamification design can be relied on in learning. Based on the results of the study, it can be concluded that the Wordwall-assisted gamification learning design on force and motion material meets the feasibility criteria for use in the learning process.

Keywords: *Feasibility, Gamification Design, Wordwall, Science Learning*

INTRODUCTION

Several studies have shown that the use of interactive media such as Wordwall can improve understanding and desire to learn language and mathematics (Andriani et al., 2021; Sari & Widodo, 2022), but most applications focus on concrete and procedural materials such as vocabulary, number operations, and sentence structures. This media helps repeated practice and mapping of simple concepts that are relatively easy to visualize and related to students' daily lives. In contrast, physics concepts such as force, field, or laws of motion are often abstract, theoretical, and difficult to visualize, especially for high school students. This challenges learning because it requires strong conceptual understanding and mental representation skills. There is little research looking at how effective Wordwall is in supporting the construction of meaning and representation of concepts. This media helps repeated practice and mapping of simple concepts that are relatively easy to visualize and related to students' daily lives. In contrast, physics concepts such as force, field, or laws of motion are

often abstract, theoretical, and difficult to visualize, especially for high school students. This challenges learning because it requires strong conceptual understanding and mental representation skills. Several studies have shown that the use of interactive media such as Wordwall can improve understanding and desire to learn language and mathematics (Andriani et al., 2021; Sari & Widodo, 2022), but most applications focus on concrete and procedural materials such as vocabulary, number operations, and sentence structures. This media helps with repetitive practice and mapping of simple concepts that are relatively easy to visualize and related to students' daily lives. In contrast, physics concepts such as force, field, or laws of motion are often abstract, theoretical, and difficult to visualize, especially for high school students. This challenges learning because it requires a strong conceptual understanding and mental representation skills. Several studies have shown that the use of interactive media such as Wordwall can improve understanding and desire to learn language and mathematics (Andriani et al., 2021; Sari & Widodo, 2022), but most applications focus on concrete and procedural materials such as vocabulary, number operations, and sentence structures.

Education in the digital era demands the implementation of innovative learning methods to increase student effectiveness and engagement. Gamification is becoming an increasingly popular approach because it can motivate students through game elements in the learning process. One of the media that supports the implementation of gamification in learning is Wordwall. Wordwall provides various interactive game templates that can be used to reinforce learning concepts. In the context of science learning, especially the material of Force and Motion, the gamification approach can help students understand concepts through simulations and fun interactive activities.Over time, progress in the field of science and technology (IPTEK) continues to occur. It was found that the stages of students' cognitive development still lack many stimuli, especially in terms of students' symbolic development (Rejabbilaisyah, et al., 2024). On the other hand, educational technology such as Internet applications and distance education help improve learning and symbolic development, especially for teachers and students (Stošić, 2015). As a form of responsibility, teachers play an important role as facilitators who can encourage new ideas in learning to improve student learning outcomes. Several factors influence students' interest in online games compared to learning activities. Internal factors include the desire for pleasure, instant gratification, and achievement in the game. On the other hand, external factors, such as lack of variation in learning methods and an unsupportive learning environment, can also cause students to prefer playing online games as a way to relieve stress (Natasyah et al., 2024). In Lidyana, et al. (2024) it was found that the use of a learning platform that combines learning and games can improve the learning experience for students.

Depending on the topic being taught, learning objectives, and student characteristics, teachers can use various learning approaches. Educational resources are also increasingly diverse, including textbooks, modules, and digital sources such as the internet and YouTube. With the rapid development of technology, educators must adapt and utilize technology in learning. Creative and innovative teachers are essential to increase students' enthusiasm for learning and prevent them from getting bored and tired during learning. Often, interaction in class is lacking due to conventional learning methods, such as lectures and inquiries, and the use of textbooks as the main source. As a result, students are no longer motivated to learn, and they get bored with lessons more quickly. Although schools have adequate technological facilities, they have not used them well to support more interactive learning. Their interest can be seen from their desire to continue participating in gamification-based learning. The application of this method also shows a positive impact on improving students' critical thinking and problem-solving skills.(Lukman et al., 2023).

Gamification is a learning approach that adopts elements of games or video games to increase learning motivation and create a more engaging learning experience. The learning

approach using interactive gamification can be used as a guide in reading the achievement of lesson content intended for students (Ariyani, 2021). According to Tantowi, et al. (2022), the use of gamification strategies can increase student activity in science learning. This method aims to maintain student involvement during the learning process, while making learning more enjoyable. In addition, the involvement generated through gamification can be used to explore interesting and inspiring things that can increase students' enthusiasm for learning.(Jusuf, 2016). An attractive learning design, both in terms of animation composition, color, and text, has an important role in the effectiveness of gamification. One approach that shows optimal results is a gamification-based learning design with problem-based learning, which combines theory and practice effectively in learning.(Panis et al., 2020). Therefore, the application of gamification-based learning design is very relevant in supporting a more interesting and interactive learning process.

Wordwall is a digital media that can be used in teaching activities with a gamification approach. The development of Wordwall Media has also been able to increase learning interest in online Chemistry learning (Nenohai, et al, 2022). This application can be accessed via a browser and provides various features that allow teachers to implement interactive learning. With so many free templates available, Wordwall can function as a learning resource, teaching medium, as well as a fun evaluation tool for students.(Mohammad Fikriansyah & Idzi' Layyinnati, 2023). According toThe Last of Us (2020), the use of the Wordwall game not only helps students understand the material better, but also allows them to see the highest and lowest scores in the class. According to Augusti, et al. (2022), the implementation of teaching media using the wordwall application has succeeded in significantly improving student learning outcomes..This encourages students' motivation to achieve the best results, while increasing their involvement in the learning process. In addition, indirectly, Wordwall also contributes to improving students' learning outcomes in science subjects.

According to Avandy, et al. (2024), the use of educational game media assisted by wordwalls can increase the effectiveness of learning in terms of interest and learning outcomes. Thematic web-based educational game media Wordwall integrated with Classroom is considered "worthy" of use to improve student learning outcomes.(Hidayah & Prasetyo, 2022). The application of gamification elements in learning applications has been proven to increase students' interest and attraction in understanding the material. The results of validation of the material and media show that the teaching materials and media used have met the eligibility standards.(Sukmawati et al., 2021). In assessing the feasibility of gamification in increasing students' interest in learning, the results of the study showed that the website-based learning media developed was included in the "Very Feasible" category for application in the teaching process.(Aprilasari & Diana, 2024). The website-based Wordwall learning media developed has met the criteria of "very feasible" as a learning tool. This is proven by the assessment results obtained, namely 90% from media experts and 92% from material experts. Thus, this media is highly recommended for use by students in the learning process(Pamungkas et al., 2023).

Although gamification in learning has been widely applied and proven to increase student motivation and learning outcomes, there is still a research gap related to the effectiveness and feasibility of game-based media design, especially Wordwall, in science learning. However, on the other hand, the use of gamification that is not in accordance with the guidelines can have a negative impact, this is in line with what was explained by Almeida (2022) that in the use of gamification, attention must be paid to the relationship between learning design elements and game design that can cause confusion for students in using it. Most previous studies have focused more on the general impact of gamification on student engagement, without specifically examining the feasibility of the design in terms of material validity, interactivity, and integration with learning systems such as Google Classroom. In addition, there are still few

studies that highlight the application of gamification in specific topics, such as Force and Motion material in science, which has the characteristics of abstract concepts and is often difficult for students to understand. Therefore, this study aims to fill this gap by analyzing the feasibility of Wordwall design in science learning, to ensure that this media can be used optimally to improve student understanding and learning outcomes. However, further studies are still needed regarding the feasibility of the media in learning, especially in terms of design and available features. Therefore, this study focuses on evaluating the feasibility of Wordwall media as a gamification-based learning tool, by considering its validity and reliability aspects in supporting an interactive and interesting learning process.

METHODS

The research method that will be used in this study is a quantitative research method. Quantitative research is used to test hypotheses, draw conclusions, and understand how the variables studied interact with each other (Susanto et al., 2024). This type of research is Pre-Experimental Designs (Non Design) with the design used being One-Group Pretest-Posttest Design. In the One-Group Pretest-Posttest Design research design, a pretest (before being given treatment) and a posttest (after being given treatment) will be carried out.

This type of research is included in the category of quantitative descriptive research, which aims to determine the feasibility of Wordwall gamification-based learning media on the material of force and motion. This study does not compare the results before and after using the media, but only evaluates the feasibility of the media based on its validity and reliability. The population in this study were all students of class VII of SMP Angkasa Kupang. The sampling technique used was purposive sampling, with class VII B of SMP Angkasa Kupang as the research sample. The instruments used in this study include expert validation sheets to assess aspects of media feasibility based on predetermined criteria. The following is a flow diagram of the research conducted.

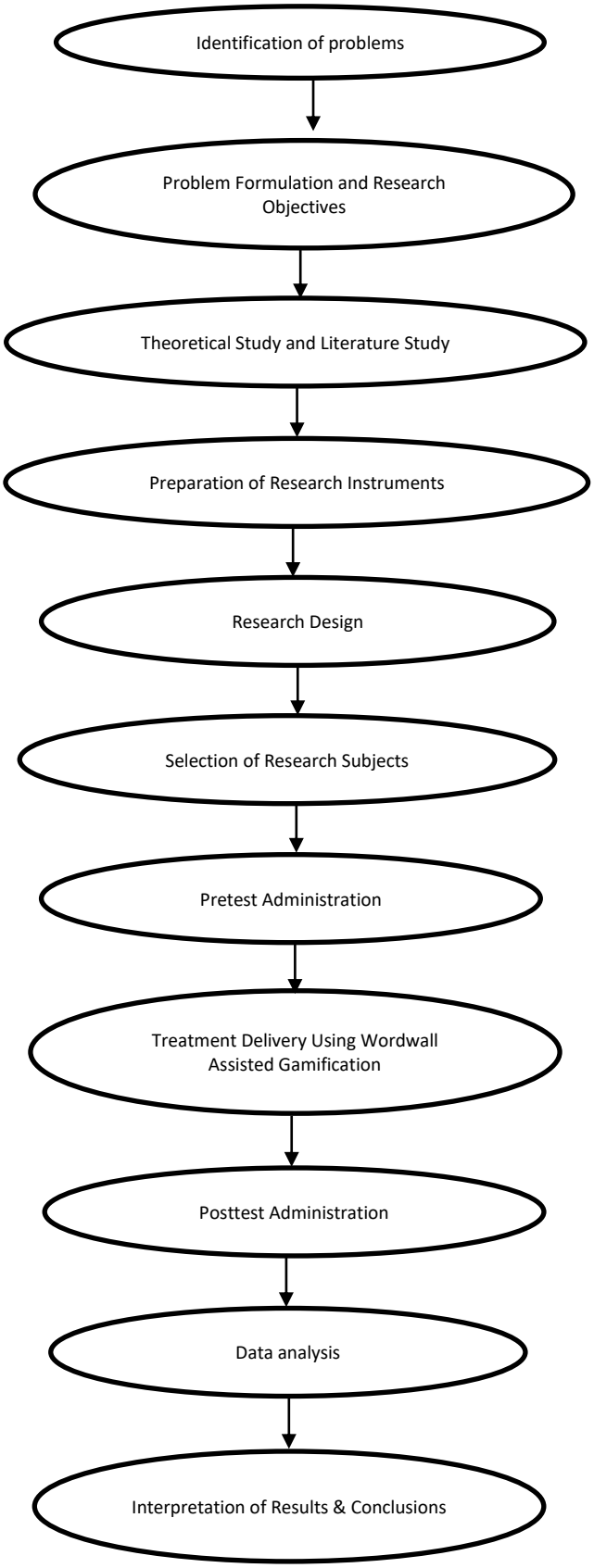

Figure 1. Flowchart of Wordwall-Assisted Gamification Research

RESULTS AND DISCUSSION

Results

The validation process was carried out by two experts, namely a lecturer expert in learning media and a physics teacher. Validation was carried out on aspects of content quality, visual appearance, interactivity, and suitability of the media to learning objectives. The validation and reliability instruments were in the form of an assessment sheet with a Likert scale of 1–4 covering 7 assessment aspects. Based on the results of the assessment recapitulation, the average total validation value was obtained as 0.67 and the percentage of reliability score was 89.38% which was categorized as "Valid" and "Very Reliable" according to Aiken's V criteria. The details of the values per aspect are presented in Table 1 below:

Table 1. Results of Validation of Gamification Learning Design Assisted by Wordwall

Rated aspect	Validators		s1	s2	n(c-1)	$\sum s$	V	Information
	1	2						
1	4	4	3	3	8	6	0.75	Valid
2	1	4	0	3	8	3	0.375	Less Valid
3	4	4	3	3	8	6	0.75	Valid
4	4	4	3	3	8	6	0.75	Valid
5	3	4	2	3	8	5	0.625	Valid
6	4	4	3	3	8	6	0.75	Valid
7	4	4	3	3	8	6	0.75	Valid
Conclusion	**24**	**28**	**17**	**21**	**56**	**38**	**4.75**	**Valid**
	3.42	**4**	**2.42**	**3**	**8**	**5.4**	**0.67**	

Table 2.. Results of the Reliability Test of the Gamification Learning Design Assisted by Wordwall

Rated aspect	Validators		AB	A+B	1-(AB/A+B)	%	Information
	1	2					
1	4	4	0	8	1	100%	Very Reliable
2	1	4	3	5	0.4	40%	Less Reliable
3	4	4	0	8	1	100%	Very Reliable
4	4	4	0	8	1	100%	Very Reliable
5	3	4	1	7	0.857142857	85.71%	Very Reliable
6	4	4	0	8	1	100%	Very Reliable
7	4	4	0	8	1	100%	Very Reliable
Conclusion	**24**	**28**	**4**	**52**	**6.257142857**		**Very Reliable**
	3.42	**4**	**0.57**	**7.42**	**0.89**	**89.38%**	

Discussion

By integrating game elements, students are expected to be more interested in learning physics concepts such as force and motion more interactively. To measure the feasibility of the learning design, a validity and reliability test was conducted on the wordwall-assisted gamification device. The results showed that the developed gamification design was valid for use in learning force and motion. The validity score obtained from the results of the expert

evaluation was 0.67 with a valid category, indicating that this device is feasible to use in the context of physics learning. Meanwhile, the reliability test of the gamification media design showed a value of 89.38% with a very reliable category, indicating a high level of consistency of the gamification learning media design in supporting the learning process.

Based on the results of validity and reliability tests and implementation in learning activities, the gamification learning design assisted by wordwalls on force and motion material has proven to be effective and feasible to use. Validity shows that this device is in accordance with the learning objectives to be achieved, while an adequate level of reliability shows that this device can be relied on for use in the ongoing learning process.

In "The Feasibility of the Results of the Validity and Practicality Test of Interactive Wordwall Media Using the Problem Based Learning Model in Science Learning in Grade V of Elementary School" by(Aprilasari & Diana, 2024), this study shows that interactive media Wordwall is proven to be valid and practical as a learning aid. The results of the validity test reached 93.67%, which is included in the very valid category. Meanwhile, the results of the practicality test also showed a high level of effectiveness, with a teacher response of 91.25% and a student response of 94%. Wordwall-based learning media that adopts the Problem-Based Learning (PBL) model in science learning in grade V of Elementary School is declared feasible and effective for use in the learning process.

Development of Physics Educational Game Learning Media (GEMIKA) Assisted by Wordwall to Increase High School Students' Learning Motivation by(Amalia et al., 2024), through a series of needs analysis, validation by media and material experts, and student responses to the use of educational games in physics learning. Based on the needs analysis, 83% of students strongly agree and feel that physics educational games are needed as an interesting learning medium. Validation from media experts shows a feasibility level of 87.5%, while material experts give an assessment of 77.8%. In addition, student responses to this game reached 84.36%, with an N-gain value of 0.67 indicating an increase in their learning motivation. Thus, it can be concluded that physics educational games are suitable for use as an effective learning medium in increasing student learning motivation. According to de Sousa, et al. (2022), the use of wordwalls can also be used as a component of good mathematical learning in the classroom which can then improve the ability to use technology in education. The use of gamification has also been found to be able to make significant changes in increasing interaction in learning (Dacre, et al., 2021).

According toHerawati et al (2023)The application of Wordwall creates an interesting and interactive learning experience, thereby increasing student participation and understanding of the material being taught. The application of interactive learning games based on Wordwall can increase students' learning motivation and understanding of concepts. This is in line with what was explained by Akbar, et al. (2023) that based on the results of the research conducted, it can be found that the use of Wordwall learning media can increase students' interest and learning outcomes. In addition, the use of this interactive game media also contributes to increasing enthusiasm for learning and understanding of learning materials(Saputri et al., 2023).

Gamification with Wordwall is an innovative approach to learning that integrates game elements to increase student engagement and motivation. Wordwall provides various types of interactive activities, such as quizzes, puzzles, random wheels, and word matching, which can be tailored to the needs of the learning material. With point-based mechanisms, challenges, and direct feedback, Wordwall encourages students to learn more actively and enjoyably. In addition, the use of Wordwall in gamification has been proven effective in improving students' conceptual understanding, memory, and critical thinking skills, making it a very relevant tool in digital-based learning in the modern era. According to Arimbawa (2021), the use of learning media based on wordwalls which are then combined with Google Classroom media can

increase student learning motivation and achievement. A similar thing was explained by Aswidyanigrat, et al. (2024) that a significant effect was found in using game media based on the use of wordwalls in increasing student interest and learning outcomes in science learning. Wordwall educational media integrated with Android can increase learning motivation in students' social history learning (Pahlevi, et al., 2023).

Before being used in learning, a feasibility test of the media design is a very important step to ensure its effectiveness and suitability for learning objectives. Through this process, learning media can be assessed in terms of validity, reliability, and integration of content and design. Validation by experts ensures that the material presented is conceptually correct and the delivery method is appropriate for students. In addition, a feasibility test also helps identify possible deficiencies in the media, so that improvements can be made before being applied in actual learning. Thus, the media used really supports students' understanding and improves their learning experience. The use of wordwall-based educational games can develop learning evaluation designs that can improve student learning outcomes (Prameswari, et al., 2024).

The feasibility test plays a role in adjusting learning media to the needs and characteristics of students. Not all media are suitable for every learning group, so this test helps in determining the level of readability, appeal, and effectiveness in increasing learning motivation. Media that has been tested tends to be more flexible and can be used in various learning contexts, both directly in class and in digital learning models. By ensuring that learning media is feasible before use, the teaching and learning process becomes more optimal and can have a positive impact on students' academic development. As forThis study found a number of limitations that need to be acknowledged so that the results and conclusions drawn can be understood in the right context. Some limitations that have the potential to affect the generalizability and accuracy of the findings are as follows: (1) the sample was limited to one school.;This research was only conducted in one school, namely SMP Angkasa Kupang. SMP Angkasa Kupang has relatively homogeneous learning environment characteristics. This limits the generalization of the results to student populations in other schools that may have different socio-economic backgrounds, learning cultures, or technological infrastructure. Variability between schools, especially in terms of ICT readiness, can affect the effectiveness of implementing Wordwall-based media. (2) no Control group;This research design uses a one-group pretest-posttest design approach without including a control group to compare learning outcomes between students who use Wordwall media with students who follow conventional learning. Without a control group, it is difficult to ensure that the increase in learning outcomes is solely due to the gamification media intervention, not by other external factors such as teachers, internal motivation, or additional learning activities. (3) short intervention duration;the implementation time of the learning intervention with Wordwall media is relatively short. This limits observations on the long-term effects of using the media, including aspects of concept retention, ongoing learning motivation, and the impact on students' critical thinking skills.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the results of the validity test conducted indicate that this design is valid with a score of 0.67 with a valid category. In addition, the reliability test shows a very high level of consistency with a value of 89.38% with a very reliable category.Wordwall-based gamification design is considered very feasible to be used as a learning medium for science materials, especially Force and Motion. This media can increase students' interest in learning and facilitate understanding of concepts through a fun and interactive approach. Recommendations for further research are the application of media on a wider scale and integration with other technologies to enrich the learning experience.

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