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Developing a Gamified Digital Learning Media to Cultivate Singing Skills for Junior High School Students

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Abstract

Digital learning media based on gamification is rarely found in singing education, yet the impact of utilizing such learning tools cannot be underestimated. Therefore, this study aimed to develop a gamified digital learning media product for cultural arts education in junior high schools. The research adopts a Research and Development (R&D) approach using the ADDIE model, focusing on the development and validation process of gamified digital learning media suitable for educational purposes. The research subjects consist of media experts, content experts, and cultural arts teachers from State Junior High School 3 Grogol, Sukoharjo. Data collection techniques involve a media validation questionnaire, which is then analyzed using percentages and described to provide an overview of the suitability level of this gamified media. The research results indicate that the average validation results obtained from media experts I and II are 86%, while the average results from content experts I and II are also 86%. After being validated by the cultural arts teachers, the gamified media received an average total score of 87% from three teachers, all falling under the 'very good' qualification. Therefore, based on the assessments of media experts, content experts, and teachers, it is concluded that the gamified digital learning media product is categorized as 'suitable' for use as an alternative cultural arts learning media in State Junior High School 3 Grogol. The existence of this appropriate media undoubtedly stands as an innovative learning tool, incorporating gaming elements to enrich the process of singing skills.

Keywords: gamification; art and culture; digital; leraning; learning media

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INTRODUCTION

Gamification in digital learning has emerged as a powerful tool to enhance educational experiences by integrating game elements into non-game contexts (Lam & Tse, 2022). By incorporating elements such as challenges, rewards, and competition, gamification aims to increase user engagement and motivation (Palaniappan & Noor, 2022). This approach is in line with the user-centered design philosophy, which emphasizes the importance of meeting the needs and desires of learners. In the field of education, the incorporation of gamification is especially significant, particularly in junior high school settings. Studies have demonstrated that the use of gamified learning environments can have a positive impact on student engagement, knowledge retention, and overall learning outcomes (Sailer & Sailer, 2021). By creating interactive and immersive learning experiences, gamification has the potential to enhance the educational process, making it more

enjoyable and effective for students (Idris et al., 2020). This is particularly crucial in subjects such as art and culture, where fostering creativity and critical thinking skills is of utmost importance.

Furthermore, the application of challenge-based gamification has been found to enhance intrinsic motivation and improve learning outcomes (Palaniappan & Noor, 2022). By introducing elements that satisfy the innate psychological needs of individuals, such as autonomy, competence, and relatedness, gamification can create a conducive environment for effective learning (Uaidullakyzy et al., 2022). This approach not only motivates students but also promotes a deeper understanding of the subject matter. Incorporating gamification in junior high school education can also help in developing essential skills such as problem-solving, collaboration, and decision-making (Bennani et al., 2022). By leveraging game mechanics and digital tools, educators can create dynamic learning experiences that cater to the diverse learning styles of students (Dečman et al., 2022). Additionally, gamification can support the development of digital competencies and foster active engagement through a constructivist approach (Sailer & Homner, 2020).

Gamification has emerged as a powerful tool in enhancing learning experiences across various subjects. In the realm of art and culture education, the application of gamification offers a unique opportunity to engage students in interactive and immersive learning experiences (Lam & Tse, 2022; Aries et al., 2020). For instance, the integration of gamified elements in art history lessons can transform traditional teaching methods into dynamic and captivating sessions. By incorporating game mechanics such as challenges, rewards, and storytelling, students can delve deeper into the world of art and culture, fostering a deeper appreciation and understanding of the subject (Basak, 2021). Similarly, in the context of developing singing skills, gamification can be utilized to make vocal training more engaging and effective, by gamifying vocal exercises and techniques, students can practice and improve their singing abilities in a fun and motivating way, leading to enhanced skill development and performance outcomes (Aldalur & Perez, 2023).

The benefits of gamification in education extend beyond mere engagement; it has been shown to significantly enhance the learning process. By integrating gamified elements into educational settings, students are not only motivated to actively participate in learning activities but also experience increased retention of information and improved problem-solving skills (Lavoué et al., 2019). Research has indicated that gamification can positively impact students' motivation, academic performance, and overall learning outcomes (Zabala-Vargas et al., 2021). Furthermore, the use of adaptive gamification in learning environments has been recognized for its ability to cater to individual learning styles and preferences, ensuring a personalized and effective learning experience for students (Puritat, 2019). Overall, the application of gamification in education presents a promising avenue for transforming traditional teaching practices and fostering a more interactive and engaging learning environment for students across various subjects.

However, it is interesting to note that many teachers are not prepared for the integration of digital games into the learning process. Based on the results of a questionnaire distributed to art and culture teachers in Solo Raya, it was identified

that 93.8% of teachers still use printed books as their teaching media, while the use of digital platforms such as the internet, YouTube, or PowerPoint is still significantly lower. This finding suggests that teachers still prioritize one-way learning, which involves delivering materials and assigning tasks based on the provided printed books. In line with this, interviews with art and culture teachers also revealed that the majority of them have not utilized interactive digital media for art and culture learning in the classroom, but rather limit themselves to watching YouTube videos.

Referring to field facts and relevant findings about the potential of gamification that can be integrated with digital media, it is important for teachers to embrace technological advancements, even though they are faced with the challenge of integrating technology into their teaching practices to meet the evolving needs of learners. This requires a deep understanding of instructional design principles and the effective use of technology to enhance teaching effectiveness (Yılmaz, 2021). Educators acknowledge the benefits of technology in engaging students, personalizing learning experiences, and promoting collaboration (Demir & Zengin, 2023).

The incorporation of gamification into the subject material of art and culture offers a promising avenue for enhancing educational experiences and encouraging active student engagement. Gamification entails integrating game elements and mechanics into non-game contexts to motivate and incentivize desired behaviors (Zhang et al., 2021;(atheeswari, 2018). In the field of art and culture education, the implementation of gamification offers a distinct opportunity to enhance the learning experience by increasing interactivity, immersion, and enjoyment (Lam & Tse, 2022). Moreover, gamification allows for the exploration of complex cultural concepts and artistic expressions in a playful and interactive manner, thus making learning more accessible and relatable for students (Bennani et al., 2022). Through gamified activities, students actively participate in the learning process, collaborate with their peers, and develop a deeper appreciation for the diverse realm of art and culture.

In general, the integration of gamified digital learning tools into the educational system of junior high schools holds immense potential for transforming traditional teaching methods into engaging and interactive learning experiences for students. This research, however, distinguishes itself from previous studies as it focuses specifically on the field of arts and culture education, which has been relatively underexplored in the existing literature. Consequently, the aim of this research is to develop a gamified digital learning media product for arts and culture education in junior high schools, with the hope of stimulating students' singing abilities and serving as an innovative learning resources.

METHODS

Our research adopts a research and development (R&D) approach and method, with the aim of designing and developing interactive game-based learning media to support learning activities. We also aim to evaluate the feasibility of the products resulting from this research (Sugiyono, 2018)). The ADDIE model, which

stands for Analysis, Design, Development, Implementation, and Evaluation, is chosen based on a relevant research framework. Several previous studies have adopted this model to design learning products (Pribadi, 2016). However, the main focus of this research is on the Development stage, specifically in evaluating the feasibility level of the game-based learning product that we have developed. During this stage, the activities carried out involve analyzing the needs and then developing game-based media products for junior high school students. The following is the research diagram using the ADDIE model adopted for this research and development..

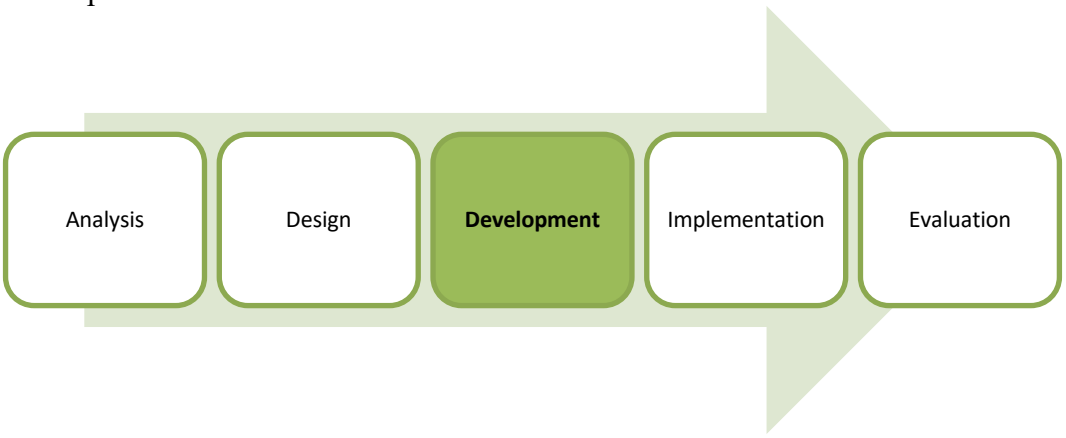

Figure 1. ADDIE Model

The subjects in this study will consist of validators who are experts in media, validators who are experts in content, and Arts teachers at State Junior High School 3 Grogol. The data collection technique employed in this research is a non-test technique (Hamid et al., 2020), Utilizing a data collection instrument in the form of a validation questionnaire for the game-based learning product or game-based learning media that we have created. The questionnaire employed in this study follows a hierarchical structure based on the Likert scale ranging from 1 to 5, encompassing statements such as Very Poor, Poor, Fair, Good, and Excellent (Syauqi et al., 2020). Before being used as a data collection tool, the instrument undergoes a validation process. The validity of the instrument we use is ensured by consulting with experts, where each instrument is consulted and validated by competent experts in their respective fields (Amini & Usmeldi, 2022).

Meanwhile, the instruments for each validator and practitioner were adopted from several relevant research, for validation media experts adopted research (Perdana et al., 2021; Rejekiningsih et al., 2021) which contains two aspects of assessment, namely: 1) Software, and 2) Visual Communication which includes indicators attached to it. In the validation instrument, material experts and teachers (practitioners) adopted Adapted from research (Sari et al., 2021; Ningtyas & Jati, 2018), with assessment aspects consisting of: 1) Learning, and 2) Media Navigation accompanied by indicators attached to each of these aspects.

The results of the validation process are subsequently investigated descriptively and qualitatively using percentages as a form of analysis. Below are the criteria and categories of suitability for interactive media that have been derived and adapted from previous research conducted by (Bustanil S et al., 2019;

Dinayusadewi & Agustika, 2020), The following is an analysis of the percentage of feasibility of toy-based learning media which is presented in table 1.

Table 1. Interactive Media Eligibility Criteria

No	Percentage	Qualification	Decision
1	81 – 100%	Very good	Eligible
2	61 – 80%	Good	
3	41 – 61%	Enough	Eligible with Revision
4	21 – 40%	Deficient	Not Eligible
5	<20%	Very less	

RESULTS & DISCUSSION

This research is a continuation of the previous stage, where briefly the initial stage, namely needs analysis, showed that the use of instructional media and teaching materials used tends to be limited and less innovative. It is unfortunate that digital technology, whether it be smartphones, laptops, computers, cannot be optimized to support the learning process that has been taking place so far. The existence of innovation using game-based or electronic learning applications can be an alternative that can be utilized during the learning process, with the hope of facilitating students to achieve the competencies they need in the 21st century. Referring to the brief findings from the preliminary study, it was identified that schools currently need innovative game-based learning media. This is highly relevant considering that game-based media is highly favored by junior high school students. The interactive appeal and enjoyable learning experience offered by game-based media can motivate students to actively engage in the learning process. With the use of game-based media, it is expected to provide a strong stimulus to improve the singing skills of junior high school students. In addition to achieving learning outcomes, game-based media can also assist in the development of students' singing skills and enhance their self-directed learning. Thus, game-based learning media is expected to not only enrich students' learning experiences but also make a significant contribution to the achievement of students' singing skills.

From the preliminary study, an idea emerged for the development of an innovative product suitable for use as a learning media. In the next phase, a plan is executed to enhance the media, resulting in a structure of content that will be included in the media, as well as the media flowchart. Meanwhile, the research objective is to create a game-based learning media for the subject of Arts and Culture in secondary schools. In this section, the assessment and development results of the product will be presented. The testing phase is conducted according to the research procedure, which includes validation by media experts, subject matter experts, and subject teachers.

After distributing the questionnaire containing assessment items for the feasibility of the game-based learning media product to each evaluator, the following are the product assessment results by media experts.

Table 2. Media Expert Validation Results

No	Expert	Percentage	Qualification	Decision
1	Media Expert I	88%	Very good	Eligible
2	Media Expert II	84%	Very good	
3	Media Expert III	82%	Very good	
	Average Media Expert	85%	Very good	

Upon examining Table 2 above, it is identified that game-based learning media products have received positive assessment results. For instance, the evaluation from media expert I obtained a total percentage of 88%, falling under the category of "excellent", where this evaluation is a summary of two aspects, namely software aspect and communication design aspect, as well as derivative indicators that serve as the basis for assessment. Subsequently, the evaluation results by media expert II garnered a percentage score of 84%, also classified as 'excellent'. Next is the percentage score obtained from media expert III, obtaining 82% of the total media assessment percentage, which is included in the 'very good' category. The results from all media experts were then analyzed for an average, revealing a score of 85% as the average result of these two evaluations, falling under the 'excellent' category and receiving a 'Eligible' decision. Therefore, these results indicate that the components comprising game-based learning media products meet one of the requirements as learning media based on the perspective of media experts.

The subsequent evaluation phase is conducted by subject matter experts, who assess to observe and measure the quality of the materials presented in this game-based learning media. Even though it is a game, the educational elements and the timeliness of the materials cannot be disregarded. The overall results of the content or material experts' assessment were displayed in the table below.

Table 3. Material Expert Validation Results

No	Expert	Percentage	Qualification	Decision
1	Material Expert I	86%	Very good	Eligible
2	Material Expert II	90%	Very good	
3.	Material Expert III	88%	Very Good	
	Average Material Expert	88%	Very good	

Table 3 describes the results of the assessment of game-based learning media by two subject matter experts. From the table, it can be identified that the game-based learning media product has obtained satisfactory assessment results. The assessment from material expert I obtained a total percentage of 82%, which falls under the category of "very good". This assessment is a recapitulation of two aspects, namely the learning aspect and the media navigation aspect, as well as derivative indicators that serve as the basis for assessment. Furthermore, the assessment results by material expert II obtained a percentage score of 90%, which also falls under the qualification of "very good". Meanwhile, the material expert III obtained a total percentage of the assessment of the material contained in the product, which amounts to 88%, falling under the category of 'Very Good'. The average analysis of all experts' assessments revealed a score of 88%, which falls under the qualification of "very good" and obtained the decision of being "Eligible". Therefore, these results indicate that the components of the Cultural Arts subject

matter incorporated in this game-based learning media have successfully met one of the requirements as a learning media from the perspective of subject matter experts.

After obtaining an assessment and determining that game-based learning media falls into the category of suitability based on the validation results of media experts and subject matter experts, the next step is the assessment of the media by learning practitioners or art and culture teachers at the junior high school level or SMP Negeri 3 Grogol. The following are the overall results obtained from the assessment by each visualized subject teacher in table 4.

Table 4. Validation Results by Practitioners

No	Practitioners	Percentage	Qualification	Decision
1	Teacher I	86%	Very good	
2	Teacher II	84%	Very good	
3	Teacher III	90%	Very good	Eligible
	Average Score from Teacher	87%	Very good	

Referring to Table 4, it is identified that teacher I provided an assessment with a percentage score of 86%, which falls under the category of 'very good'. Subsequently, teacher II assessed with a total score of 84%, also falling under the 'very good' qualification. Moving on to teacher III, an assessment was given with a percentage score of 90%, also falling under the 'very good' qualification. The results from these three teachers were then analyzed for the average, revealing that 87% was the average result of the analysis of these assessments, which falls under the 'very good' qualification and received a 'worthy' decision. Therefore, the information, navigation, and content contained in this product align with the needs of competency, ease of use, relevance, and factual accuracy of the material, thus not conflicting with the implementation of the national curriculum and learning. Consequently, it can be concluded overall that the game-based learning media product is deemed 'eligible' by all validators and practitioners as a cultural art learning media in junior high schools, and is eligible for testing on students in further research or stages. The media products that have been validated are displayed in Figure 2.

Figure 1. Product Mobile game-based learning 1

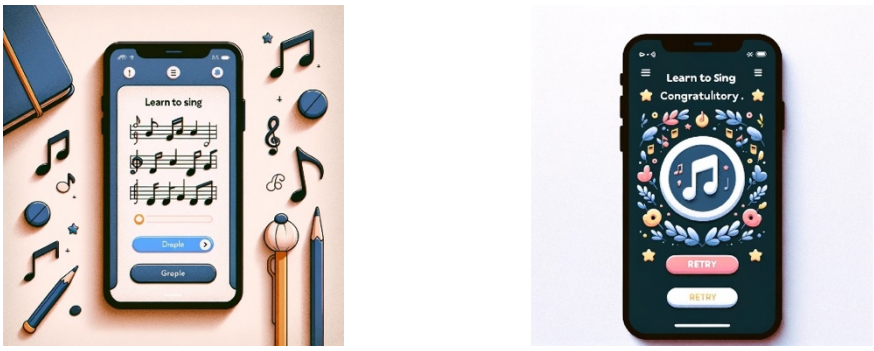

Figure 2. Product Mobile game-based learning 2

The research findings indicate that mobile game-based learning has been declared feasible for integration into learning activities, supported by validation from experts and teachers. Through rigorous validation processes conducted by educational experts and experienced teachers, the suitability of mobile game-based learning in enhancing student engagement and learning outcomes have been demonstrated (Anastasiadis et al., 2018). Expert validation ensures that the educational content and design of mobile games align with curriculum objectives and pedagogical principles, while teacher validation provides insights into the practicality and relevance of incorporating mobile games into classroom instruction. These validations serve as a testament to the potential of mobile game-based learning as a valuable educational tool that can effectively supplement traditional teaching methods and cater to the diverse learning preferences of students in the digital age (Nisiotis, 2021; Emerson et al., 2020).

In recent years, there has been an increasing amount of research that highlights the successful implementation of game-based learning (GBL) in junior high schools (Qian & Clark, 2016). Several relevant studies have revealed that before game-based learning media is implemented into the learning process, it is necessary to be validated by experts and practitioners (Jin et al., 2020), the purpose of this is to ensure that the developed product can facilitate students in achieving their learning goals. As a result, the benefits of using games in learning are truly felt by students and can serve as a stimulus to enhance their skills, motivation, and even academic achievements (Irmansyah et al., 2020; Partovi & Razavi, 2019). The interactive and immersive nature of the games not only captured students' interest but also stimulated many skills that student should acquire.

In recent times, there has been a notable increase in interest regarding the utilization of gamification as an educational approach to enhance student engagement and improve learning outcomes in various educational settings (Wardoyo et al., 2021). Gamification involves the incorporation of game elements, such as points, badges, leaderboards, and challenges, into non-game contexts with the aim of motivating and incentivizing desired behaviors (Aries et al., 2020). Extensive research conducted by (Palaniappan & Noor, 2022) has provided evidence of the positive impact of gamified learning environments on student motivation, participation, and knowledge retention. By integrating elements of competition, achievement, and progression, gamification taps into students' inherent motivation, fostering a sense of autonomy and mastery over their learning

journey. The utilization of gamified learning activities was shown to boost students' sense of competence, autonomy, and connectedness, leading to increased engagement and success in academic endeavors (Legaki et al., 2020; Sailer & Homner, 2020). These results highlight the effectiveness of gamification in fostering active learning and creating a conducive learning atmosphere that supports student progress.

The discourse surrounding the implementation of game-based learning in middle schools has shed light on the potential advantages of integrating gaming components into the academic curriculum (Tong et al., 2022; Gao et al., 2020). Research has demonstrated that game-based learning can enhance student engagement, motivation, and knowledge retention by providing interactive and immersive learning experiences that cater to a variety of learning styles (Noroozi et al., 2020). By incorporating gamification techniques, such as rewards and progress tracking, educators can incentivize students to actively participate in their educational journey.

Furthermore, by harnessing the intrinsic motivational aspects of games and gamification, teachers can create interactive and immersive learning experiences that deeply resonate with the technologically proficient students of today. As technology continues to advance, game-based learning offers exciting opportunities to transform traditional classroom instruction and empower students to embrace lifelong learning in the modern age.

CONCLUSION

In summary, the successful validation of mobile game-based learning (MGBL) as a pedagogical tool for junior high school students highlights its potential to innovative education. By combining interactive gameplay with educational content, MGBL engages students in dynamic learning experiences that foster deeper understanding, critical thinking, and skill development across various subjects. Its scalability and accessibility enable educators to provide personalized instruction, facilitating learning anytime and anywhere. Looking ahead, MGBL holds great promise in transforming traditional classroom practices and equipping students with the necessary skills for success in the digital era. Furthermore, conducting research on the impact of game-based learning on critical thinking, problem-solving, and overall academic achievement can offer a comprehensive understanding of the outcomes associated with these initiatives. Comparative studies comparing traditional teaching methods with game-based learning approaches can also yield valuable insights into the effectiveness of incorporating games into the junior high school curriculum, which should be a priority for future researchers.

REFERENCES

Aldalur, I., & Perez, A. (2023). Gamification and discovery learning: Motivating and involving students in the learning process. *Heliyon*, *9*(1).

https://doi.org/10.1016/j.heliyon.2023.e13135

Amini, R., & Usmeldi. (2022). Developing the Interactive e-Module Based on Integrated Learning for Primary School Students. *International Journal of Information and Education Technology*, *12*(4). https://doi.org/10.18178/ijiet.2022.12.4.1615

Anastasiadis, T., Lampropoulos, G., & Siakas, K. (2018). Digital Game-based Learning and Serious Games in Education. *International Journal of Advances in Scientific Research and Engineering*, *4*(12), 139–144. https://doi.org/10.31695/ijasre.2018.33016

Aries, Vional, Saraswati, L. A., Wijaya, L., & Ikhsan, R. B. (2020). Gamification in learning process and its impact on entrepreneurial intention. *Management Science Letters*, *10*(4), 765–768. https://doi.org/10.5267/j.msl.2019.10.021

Basak, R. (2021). Teacher Opinions and Perspectives of Visual Culture Theory and Material Culture Studies in Art Education. *Journal of Education in Black Sea Region*, *6*(2). https://doi.org/10.31578/jebs.v6i2.242

Bennani, S., Maalel, A., & Ben Ghezala, H. (2022). Adaptive gamification in E-learning: A literature review and future challenges. In *Computer Applications in Engineering Education* (Vol. 30, Issue 2, pp. 628–642). https://doi.org/10.1002/cae.22477

Bustanil S, M., Asrowi, & Adianto, D. T. (2019). Pengembangan Media Pembelajaran Interaktif Berbasis Video Tutorial Di Sekolah Menengah Kejuruan. *JTP - Jurnal Teknologi Pendidikan*, *21*(2), 119–134. https://doi.org/10.21009/jtp.v21i2.11568

Dečman, N., Rep, A., & Titgemeyer, M. (2022). Who is more eager to use Gamification in Economic Disciplines? Comparison of Students and Educators. *Business Systems Research*, *13*(2), 96–116. https://doi.org/10.2478/bsrj-2022-0017

Demir, M., & Zengin, Y. (2023). The effect of a technology-enhanced collaborative learning environment on secondary school students' mathematical reasoning: A mixed method design. *Education and Information Technologies*. https://doi.org/10.1007/s10639-023-11587-x

Dinayusadewi, N. P., & Agustika, G. N. S. (2020). Development Of Augmented Reality Application As A Mathematics Learning Media In Elementary School Geometry Materials. *Journal of Education Technology*, *4*(2), 204. https://doi.org/10.23887/jet.v4i2.25372

Emerson, A., Cloude, E. B., Azevedo, R., & Lester, J. (2020). Multimodal learning analytics for game-based learning. *British Journal of Educational Technology*, *51*(5), 1505–1526. https://doi.org/10.1111/bjet.12992

Gao, F., Li, L., & Sun, Y. (2020). A systematic review of mobile game-based learning in STEM education. *Educational Technology Research and Development*, *68*(4), 1791–1827. https://doi.org/10.1007/s11423-020-09787-0

Hamid, M. A., Yuliawati, L., & Aribowo, D. (2020). Feasibility of electromechanical basic work e-module as a new learning media for vocational students. *Journal of Education and Learning (EduLearn)*, *14*(2), 199–211. https://doi.org/10.11591/edulearn.v14i2.15923

Idris, M. I., Mohd Said, N. E., & Tan, K. H. (2020). Game-based learning platform

and its effects on present tense mastery: Evidence from an ESL classroom. *International Journal of Learning, Teaching and Educational Research*, *19*(5), 13–26. https://doi.org/10.26803/ijlter.19.5.2

Irmansyah, J., Lumintuarso, R., Sugiyanto, F. X., & Sukoco, P. (2020). Children's social skills through traditional sport games in primary schools. *Cakrawala Pendidikan*, *39*(1), 39–53. https://doi.org/10.21831/cp.v39i1.28210

Jin, G., Nakayama, S., & Tu, M. (2020). Game based learning for safety and security education. *Journal of Education and Learning (EduLearn)*, *14*(1), 114–122. https://doi.org/10.11591/edulearn.v14i1.14139

Lam, P., & Tse, A. (2022). Gamification in Everyday Classrooms: Observations From Schools in Hong Kong. *Frontiers in Education*, *6*. https://doi.org/10.3389/feduc.2021.630666

Lavoué, É., Monterrat, B., Desmarais, M., & George, S. (2019). Adaptive Gamification for Learning Environments. *IEEE Transactions on Learning Technologies*, *12*(1), 16–28. https://doi.org/10.1109/TLT.2018.2823710

Legaki, N. Z., Xi, N., Hamari, J., Karpouzis, K., & Assimakopoulos, V. (2020). The effect of challenge-based gamification on learning: An experiment in the context of statistics education. *International Journal of Human Computer Studies*, *144*. https://doi.org/10.1016/j.ijhcs.2020.102496

Ningtyas, R. K., & Jati, H. (2018). Project-Based Electronic Module Development As A Supporting Learning Media For Basic Programming Learning. *Journal of Educational Science and Technology (EST)*, 221–227. https://doi.org/10.26858/est.v1i1.6999

Nisiotis, L. (2021). Utilising mobile game based learning methods effectively to support education. *Educational Technology Research and Development*, *69*(1), 177–180. https://doi.org/10.1007/s11423-020-09887-x

Noroozi, O., Dehghanzadeh, H., & Talaee, E. (2020). A systematic review on the impacts of game-based learning on argumentation skills. *Entertainment Computing*, *35*, 100369. https://doi.org/10.1016/j.entcom.2020.100369

Palaniappan, K., & Noor, N. M. (2022). Gamification Strategy to Support Self-Directed Learning in an Online Learning Environment. *International Journal of Emerging Technologies in Learning*, *17*(3), 104–116. https://doi.org/10.3991/ijet.v17i03.27489

Partovi, T., & Razavi, M. R. (2019). The effect of game-based learning on academic achievement motivation of elementary school students. *Learning and Motivation*, *68*, 101592. https://doi.org/10.1016/j.lmot.2019.101592

Perdana, M. A., Wibowo, D. E., & Budiarto, M. K. (2021). Digitalization of Learning Media through Digital Book Development Using the Flipbook Application. *Jurnal Pendidikan Dan Pengajaran*, *54*(2), 263. https://doi.org/10.23887/jpp.v54i2.34639

Pribadi, B. A. (2016). Desain dan Pengembangan Program Pelatihan Berbasis Kompetensi Implementasi Model ADDIE. In *Kencana*.

Puritat, K. (2019). Enhanced Knowledge and Engagement of Students Through the Gamification Concept of Game Elements. *International Journal of Engineering Pedagogy (IJEP)*, *9*(5), 41. https://doi.org/10.3991/ijep.v9i5.11028

Qian, M., & Clark, K. R. (2016). Game-based Learning and 21st century skills: A

review of recent research. *Computers in Human Behavior*, *63*, 50–58. https://doi.org/10.1016/j.chb.2016.05.023

Ratheeswari, K. (2018). Information Communication Technology in Education. *Journal of Applied and Advanced Research*, *3*(S1), 45. https://doi.org/10.21839/jaar.2018.v3iS1.169

Rejekiningsih, T., Budiarto, M. K., & Sudiyanto, S. (2021). Pengembangan multimedia interaktif berbasis potensi lokal untuk pembelajaran prakarya dan kewirausahaan di SMA. *Kwangsan: Jurnal Teknologi Pendidikan*, *9*(2), 167. https://doi.org/10.31800/jtp.kw.v9n2.p167--185

Sailer, M., & Homner, L. (2020). The Gamification of Learning: a Meta-analysis. *Educational Psychology Review*, *32*(1), 77–112. https://doi.org/10.1007/s10648-019-09498-w

Sailer, M., & Sailer, M. (2021). Gamification of in-class activities in flipped classroom lectures. *British Journal of Educational Technology*, *52*(1), 75–90. https://doi.org/10.1111/bjet.12948

Sari, S. E., Susilawati, S., & Anwar, L. (2021). E-Module Development on Hydrocarbon Compounds Material for Class X Agricultural Vocational High School. *Journal of Educational Sciences*, *5*(1), 36. https://doi.org/10.31258/jes.5.1.p.36-52

Sugiyono. (2018). Metode penelitian kuatintatif , kualitatif dan R & D. In *Bandung: Alfabeta*.

Syauqi, K., Munadi, S., & Triyono, M. B. (2020). Students' perceptions toward vocational education on online learning during the COVID-19 pandemic. *International Journal of Evaluation and Research in Education*, *9*(4), 881–886. https://doi.org/10.11591/ijere.v9i4.20766

Tong, L. C., Tong, L. C., Rosli, M. S., Rosli, M. S., Saleh, N. S., & Saleh, N. S. (2022). Enhancing HOTS using Problem-Based Learning and Digital Game in the Context of Malaysian Primary School. *International Journal of Interactive Mobile Technologies*. https://doi.org/10.3991/ijim.v16i02.27677

Uaidullakyzy, E., Gulnara, R., Khalima, S., Zeinep, B., Turmanov, R., & Rysbayeva, G. (2022). Creating Integration Situations of Students' Computer Lesson and Learning with Gamification. *International Journal of Emerging Technologies in Learning*, *17*(19), 207–223. https://doi.org/10.3991/ijet.v17i19.32177

Wardoyo, C., Satrio, Y. D., Narmaditya, B. S., & Wibowo, A. (2021). Do technological knowledge and game-based learning promote students achievement: lesson from Indonesia. *Heliyon*, *7*(11). https://doi.org/10.1016/j.heliyon.2021.e08467

Yılmaz, A. (2021). The effect of technology integration in education on prospective teachers' critical and creative thinking, multidimensional 21st century skills and academic achievements. *Participatory Educational Research*, *8*(2), 163–199. https://doi.org/10.17275/per.21.35.8.2

Zabala-Vargas, S., García-Mora, L., Arciniegas-Hernández, E., Reina-Medrano, J., de Benito-Crosetti, B., & Darder-Mésquida, A. (2021). Strengthening Motivation in the Mathematical Engineering Teaching Processes – A Proposal from Gamification and Game-Based Learning. *International Journal of Emerging Technologies in Learning*, *16*(6), 4–19.

https://doi.org/10.3991/ijet.v16i06.16163

Zhang, Q., Yu, L., & Yu, Z. (2021). A Content Analysis and Meta-Analysis on the Effects of Classcraft on Gamification Learning Experiences in terms of Learning Achievement and Motivation. In *Education Research International* (Vol. 2021). https://doi.org/10.1155/2021/9429112