

Gamification-Based Mobile Learning in Elementary School Learning: Literature Study

Anik Twiningsih

SD Negeri Laweyan Kota Surakarta, Surakarta, Indonesia

*aniktwiningsih91@guru.sd.belajar.id

Abstract

This study aims to examine the implementation of gamification-based mobile learning as a learning medium in elementary schools. The method used is a literature study by analyzing various previous studies related to the concept, benefits, and challenges of implementing this technology-based learning media. The results of the study indicate that gamification-based mobile learning can increase students' learning motivation, develop high-level thinking skills, and provide a flexible and inclusive learning environment. This learning media is designed through stages that include making flowcharts, storyboards, interface development, and product evaluation. Gamification, as a key element, utilizes features such as points, levels, and badges to create an interactive and engaging learning experience. Although it offers various advantages, such as high accessibility and personalization of teaching materials, its implementation requires adequate infrastructure support and curriculum adaptation. With the right design, gamification-based mobile learning can be an innovative solution to improve the quality of learning in elementary schools.

Keywords : Mobile learning, gamification, Elementary School

Background

Current technological developments are experiencing very rapid leaps, this requires every educational paradigm to always be dynamic in developing educational technology.(Ozdamli, F. & Asiksoy, 2016).With the advancement of information and communication technology, there have been changes and improvements in various sectors, especially in the field of education.(Twiningsih, 2022). The role of information and communication technology in the field of education is very important and can provide convenience to teachers and students in the learning process.(Wahyuni, Aulia, & Febrianno Boer, 2021).Educational technology greatly determines the output or outcome that will be produced by each learning process. In addition, good educational technology must be in accordance with the foundation of educational technology, namely it must be designed properly, developed according to the level of urgency of educational technology needs, its usefulness, its management and its feasibility must always be tested.(Haryanto, 2015). Educational technology is very necessary in the learning process, one of which is as a medium in delivering learning materials to students so that they are easily accepted and understood, so that in the end it can have a positive impact on learning.(Elvani Hertati, 2022).

Information and communication technology is currently developing rapidly with diversity in supporting various activities, including greatly supporting the learning process.(Theories & Theories, 2016). Information and communication technology today is not only a means of communication and information but also provides great benefits in the learning process, especially as a learning medium.(Damrongpanit, 2022). Learning media by utilizing technology will provide a different learning climate to students, thereby providing learning motivation. In addition, the existence of media by utilizing technology can stimulate the relationship between one material and another.(Tobergte & Curtis, 2013). So that it makes it easier for teachers to connect learning with factual events that are currently happening.

The current fact is that in the learning process, not many teachers are using information and communication

technology as a learning medium.(Duyen & Loc, 2022). So it is necessary to develop technology-based learning media that can be used by teachers in teaching their students so that it can make it easier for students to learn and understand learning materials. The information and communication technology-based learning media that is developed is expected to provide greater convenience for students in learning, whether learning anywhere, anytime and with anyone.(Wahyuni et al., 2021). In addition, good learning media developed by teachers, in addition to being practical, must be inclusive, meaning that it can be empowered and utilized not only by students in general but also has the advantage of being utilized by students with special needs.Creative learning in the school environment does not only pay attention to the physical condition of students with special needs, but creative learning by prioritizing the principles of inclusive education can be integrated with a variety of learning media, thus creating a learning environment that is friendly to all.(Yuwono & Mirnawati, 2021).

Elementary school students are in a period where learning and playing are one frame in the learning process, so the presence of learning media that is expected is learning media that is interesting and has elements of play. According to Piaget, elementary school students are in a concrete operational phase where each media should be presented holistically or comprehensively.(Marinda, 2020). Learning media can be presented by integrating elements of play in learning. Thus, students will not feel bored and are always motivated to learn because they learn and play they do not feel bored easily. So that in the end it has a positive impact on learning outcomes and has an impact on learning activities.

Learning media that is packaged by integrating elements of play is currently very much needed to increase learning motivation. Gamification-based mobile learning media is one of the media that can be empowered to increase student motivation. Mobile learning is the intersection of Mobile Computing and E-Learning that provides resources that can be accessed from anywhere, powerful search system capabilities, rich interactions, full support for effective learning and assessment based on performance.(Nurhidayat, Wedi, & Praherdhiono, 2020). E-learning has characteristics independent of place and time. Mobile Learning is related to learning mobility, meaning that students are able to engage in learning activities without having to do so in a particular physical location.(Twiningsih, Gunarhadi, & Musadad, 2024). The use of mobile learning media not only increases learning motivation but also builds students' high-level thinking skills.(Damrongpanit, 2022). Mobile learning allows opportunities for critical reflection and can provide access to changing knowledge, effective use of information technology even though students' classroom space is limited.(Aubusson, Schuck, & Burden, 2009).

Gamification-based mobile learning media can improve students' learning activities. Gamification in the context of learning is the design process of adding game elements to change the existing learning process.(Sailer & Homner, s2020). Gamification tends to have positive effects on a variety of types of results learn, even with results which are diverse. Gamification is a process that aims to change non-game contexts (eg: learning, teaching, marketing) to be much more interesting by integrating game thinking, game design and game mechanics (game elements)(Setiana & Hansun, 2017). Thus, gamification-based mobile learning is expected to increase students' learning activities both in learning which ultimately has a positive impact on increasing students' learning motivation.

Research Method

This study uses a literature study approach method, namely research by reviewing literature related to gamification-based mobile learning in elementary school learning. The data source of this study is the results of previous studies using the Google Scholar database by reviewing several relevant research journals and then analyzing them critically.

Result and Discussion

1. Gamification Based Mobile Learning Media

a. Mobile Learning

Currently, mobile learning is one form of learning that is experiencing development. In general, the concept of mobile learning has advantages over other learning media because it is easily accessible at any time and is more interesting. According to Quinn (2000) in Sambung et al., (2018), mobile learning is a type of e-learning that can be accessed via mobile devices, but the advantage of mobile learning is the availability of teaching materials that can be accessed by users anywhere and anytime via mobile devices. Mobile learning or m-learning according to Ardyanto et al., (2022) is a form of learning that utilizes the latest technology through the use of mobile phones or other mobile devices. With m-learning, users can access educational content without having to go to a certain place. Therefore, learning can be done anytime and anywhere without being bound by time and space. The advantages of m-learning are the

availability of materials that are interesting to students and easy to access, as well as useful visualization of materials. In addition, mobile devices as learning media have the ability to present information and display communication between teachers and students.

Crescente and Lee (2011) states that m-learning applications (m-learning apps) can function as optional, complementary, or even substitute learning resource supplements to learning programs. In addition, m-learning provides flexible and easily accessible learning resources for learners, with information packaged in small packages that are easy to update, modify, or add quickly. This facilitates the use of time allocation and personalization of the use of learning resources. Through the use of mobile learning, there is a positive impact on learning because students can interact with teachers and fellow students through an internet connection. Mobile learning offers technology that is not limited to face-to-face schedules, thus providing extraordinary progress in the future in learning. There are two types of mobile learning media development, namely online and offline. Online mobile learning requires an internet network connection (data package) when used, while offline mobile learning is an application that is installed on a mobile device and can be used as a learning resource without the need for an internet network connection (data package). Each mobile learning media has advantages and disadvantages. In online mobile learning, students can access learning and communicate with instructors anytime and anywhere, but the disadvantage is that the cost of learning can increase because it requires a data package (Rahmat, Mursyida, Rizal, Krismadinata, & Yunus, 2019).

According to Warsita, (2018) The implementation of mobile learning as one of the learning models in formal educational units such as schools and universities can provide significant benefits. Imagine if there is a student who cannot attend class due to illness or other reasons. However, the student does not need to worry because he can access his class learning via video streaming or video-calling, use learning applications available on smartphones, download recordings of learning activities in MP3 or MP4 format, take tests via WAP, and do other learning activities. Although it sounds like a futuristic thing, current technology is already quite possible to do this.

Azmi, (2016) think that smartphones may seem to be a very useful learning tool for students. However, in the development of mobile learning, the use of smartphones can be a challenge for developers, especially for educators who must interact directly with their students. On the other hand, the development of mobile learning is highly dependent on the availability of facilities and infrastructure, which is one of the biggest obstacles in the development of mobile learning in Indonesia. Limited facilities and infrastructure in schools can hinder the development of mobile learning.

In my opinion Ardyanto et al., (2022), the development of Android and Windows-based mobile learning is one of the right choices at this time. The Android and Windows systems are easily accessible and have the most users, so they are a driving factor in the development of learning media. In the learning process using this system, students and teachers can carry out the teaching and learning process without having to meet face to face, and can be done from different places. Learning time can be used efficiently without reducing effective learning hours. Android and Windows-based mobile learning can still be developed in creative and innovative ways so that students are more interested in the learning model and more easily accept the learning material. The development of Android and Windows-based mobile learning is a breath of fresh air in the world of education in Indonesia, expected to be able to improve the quality of education in Indonesia with the presence of various other learning media. However, the above depends on the supporting school facilities and infrastructure, especially in terms of the internet and regulations on using mobile phones in schools which are often a problem in efforts to develop mobile learning. Instead of mobile learning being aimed at students in schools, the development is only a pipe dream if schools do not allow students to use smartphones in the classroom. Allowing the use of smartphones in the learning process will actually make it easier for educators to provide comfort to students in finding information. Moreover, with a curriculum that is always developing with a scientific approach in the learning process (Azmi, 2016).

b. Mobile Learning Design Stages

According to Rifai et al., (2020), the design stages of mobile learning development consist of three steps. First, create a flowchart as a description or work scheme of the media to be developed. Second, design the media in the form of a storyboard or illustrated script containing a description of the media content. The last step is to design the User Interface as a display or graphic design in the media, which is also important to increase student interest and motivation.

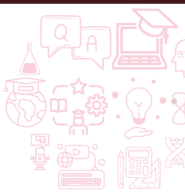
This is explained in more detail by Darmawan (2016) in June, (2019) There are seven stages in mobile learning production design, namely:

- 1) The first stage is the preparation of a flowchart, which is a comprehensive description of the program flow created with certain symbols to determine the flow of presentation of the material from the teaching materials to be developed.
- 2) The second stage is writing a storyboard which is a development of the flowchart, with a more detailed explanation of each flow contained in the flowchart and designed according to the tutorial model, game model, simulation model, and drill and practice model.
- 3) The third stage is collecting graphic and animated materials to make it easier for students to understand the material being taught.
- 4) The fourth stage is programming, namely combining all related items into mobile learning-based teaching materials using applications such as Web Exe, Adobe Air, Appsgeyser, Mit App Inventor, App Inventor, RPG Maker and Adobe Flash.
- 5) The fifth stage is finishing/mastering or rendering, namely publishing mobile learning products in a format that supports running on Android application system devices in Apk format, Windows and iOS devices.
- 6) The sixth stage is the trial, where the quality and suitability of the product for use in learning is checked through evaluation and suggestions from material experts, media experts, teaching materials experts and curriculum experts.
- 7) The final stage is the revision of the final product, where the product is evaluated through questionnaires, observations, and product assessment sheets, then revisions and improvements are made according to suggestions from various parties including users, and mass production of the product is carried out after the final stage of revision according to expert advice and the results of field trials have met the expected criteria.

In designing Mobile Learning as exemplified by Rahmat et al., (2019), software such as Macromedia Flash Animate CC is used to create several displays as follows: (1) The Home page contains a welcome greeting and is the initial display when the application is opened. (2) The menu display is used to access pages and functions in the application, such as learning plans, materials, developer profiles, and evaluation pages. (3) The material page display is taken from the subjects that will be presented according to the learning indicators. (4) The Evaluation page contains questions to measure students' understanding of the material presented in mobile learning.

As for other stage models, namely the William W, Lee and Dianda L. Owens model (2004) with stages, including analysis, design, development, implementation, and evaluation. More details as follows

- 1) Analysis stage, job analysis, needs analysis, and initial and final analysis are carried out. Furthermore, in the initial and final analysis stage, Front-end Analysis is carried out to analyze the data and information that has been collected and determine the data and information that will be used. Some activities in this stage include student analysis, technology analysis, situation analysis, task analysis, critical incident analysis, problem analysis, goal analysis, media analysis, data analysis, and cost analysis.
- 2) The design stage involves planning the product or media to be developed, and some activities that must be carried out in it are activity schedule, project team, media specifications, content structure, and configuration control. The application media to be presented contains materials selected based on learning indicators. Furthermore, product design activities include making storyboards, activity schedules, dubbing recordings, and content structures.
- 3) In the development and implementation stage, the production of android smartphone-based application media is carried out based on a previously designed storyboard. Animation, graphic and audio processing software is used as the main software to create products ranging from animation to application display and sound editing or dubbing. After being combined, the final checking stage is carried out before entering the next stage, namely the media validation test carried out by media experts and material experts. After going through the review stage by developers, media experts, and material experts, the product will be implemented and tested on users, namely students.
- 4) The evaluation stage, including setting evaluation objectives to measure the validity of the product that has been produced and will be tested by media experts, material experts, and students. In addition, it is necessary to prepare and plan an evaluation strategy to provide questionnaires to media experts and material experts before being tested on students. The purpose of measuring



validity is to assess whether the appearance of the product is suitable for use as a learning medium. Furthermore, instrument development and data analysis collection are carried out involving one media expert, one material expert, and students. (Nurhidayat et al., 2020).

c. Gamification

According to Fitri Marisa et al (2022) Gamification is a technique that uses game elements to solve problems outside the game with the aim of improving system performance through higher motivation. Over the past six years, the concept and use of gamification has undergone developments that are widely researched almost every year. Over the last three years, the gamification application domains in education and business have had an even ratio between the two. This phenomenon arises because there are still differences of opinion regarding the definition of gamification because gamification is still considered a relatively new science. Meanwhile, according to Sambung et al., (2018) Gamification is a technique and strategy that applies game elements to situations or contexts outside the game to solve a problem. This approach aims to increase user participation, motivation, and performance by making the material or technology used more interesting and motivating users to engage in the desired behavior. Thus, gamification can improve user performance through the use of more interactive and interesting methods. Nick Pelling introduced the term "gamification" in 2002 when he presented his ideas at a TED (Technology, Entertainment, Design) event. Gamification is a learning approach that uses elements found in games or video games to motivate students and increase their enjoyment and engagement in the learning process. By using this approach, learning media can attract students' interest and inspire them to continue learning. (Jusuf, 2016).

From the three opinions above, it can be concluded that gamification is a technique or approach that applies game elements to situations or contexts outside the game with the aim of increasing user participation, motivation, and performance. Although there are still differences of opinion regarding the definition of gamification, the concept and its use have been widely researched and developed in various fields, especially in education and business. Basically, gamification is able to improve user performance by optimizing the use of more interactive and interesting methods, so that it can motivate and increase the sense of pleasure and involvement of users in the learning process or problem solving.

d. Gamification in Learning

Rabah et al., (2018) argue that gamification in learning is the characteristic of game design elements used with the aim of supporting the achievement of learning objectives. This definition of gamification intentionally excludes serious games or educational games as a whole, because these types of games are very specialized and require large resources to produce. Therefore, gamification in education focuses on the use of game design elements for educational purposes and in the scope of learning. The development of educational technology shows that effectively designed games can stimulate productivity and creativity among learners. A game-based approach can help overcome demotivating factors in learning. However, designing and implementing games to be embedded in interactive teaching concepts is not intended to replace the entire learning. It is intended as a prototype and generic learning content that will be delivered to learners. (Taspinar, Schmidt, & Schuhbauer, 2016).

According to Schöbel et al., (2020) There are five steps used in designing the concept of gamification in learning, namely: (1) identifying objectives, (2) identifying characteristics, (3) selecting elements, (4) refining the concept of gamification, and (5) implementing the concept. In the mobile learning application, learners can choose from various learning module tasks and see a brief description of the tasks and their progress. To achieve the objectives of the mobile learning application, the first step is to identify objectives, which are then used in the second step to identify dimensions and characteristics that are important for the concept of gamification. The third step involves identifying the elements of the concept, with the use of four elements of rewards, punishments, bonuses and levels. The fourth step involves refining the concept of gamification with special characteristics by using badges and avatars as the concept of gamification.

The systematic application of gamification has a specific purpose to influence student involvement in achieving learning outcomes. In the analysis Rivera & Garden, (2021) There are four propositions that can be tested for scientific application and evaluation of gamification. First, gamification is a process by which students' engagement status can be modified to support the achievement of learning outcomes. Second, the achievement of learning outcomes can be measured based on students' engagement in the

affective, cognitive, and behavioral domains. Third, game attributes can be selected to support the achievement of learning objectives categorized into three domains: cognitive, affective, and psychomotor. Fourth, game attributes can be selected in a gamification strategy by identifying psychological domains shared between learning outcomes/educational goals and desired ones, to modify students' engagement experiences such as well-being and satisfaction.

The most common gamification applications to motivate and engage learners are game elements that feature points, levels, goals, and status. Learners tend to compete against themselves rather than with other players. Therefore, gamification systems need to be aligned with students' interactions and behavioral intentions to identify how game elements can enhance student engagement. Some game elements that are widely used by researchers and practitioners to motivate and engage students include points, leaderboards, and badges. Applying gamification and visual technology to computer animation programs to enhance student motivation and engagement. The use of game mechanisms such as points, badges, avatars, and quests in gamified systems with gamified social themes can have an impact on positive perceptions and high motivation among students. (Ofosu-Ampong, 2020).

Nowadays, to overcome resource limitations in creating Android-based mobile learning, Nurul & Mohamad, (2018) reveals the role of gamification integration into all platforms can help increase student engagement in learning. The development of gamified e-learning sites to support various learning styles has been available so that it can encourage learning and increase student engagement. In addition, there are educational websites that use gamification elements to make learning interactive for users and allow users to use the website for a longer period of time. Therefore, the use of gamification elements on educational websites will increase student motivation and engagement in the learning process.

e. Advantages and Disadvantages of Gamification in Learning

The gamification learning model has several advantages and disadvantages compared to other learning models. According to Joseph, (2016) The advantages include: (1) making learning more enjoyable, (2) encouraging students to complete learning activities, (3) helping students focus better and understand the material being studied, and (4) providing opportunities for students to compete, explore, and achieve in class. Other advantages according to Mathematics, (2016). One of its advantages is that teaching materials can be adjusted to the needs of each student through their mobile devices. In addition, students can study the material repeatedly online or offline anytime and anywhere. Teaching materials are also easy to update, modify, and add quickly using various resources. In addition, gamification can also increase learning independence, monitor learning progress and evaluation, and manage learning time allocation more easily. If designed well, gamification can significantly increase learning effectiveness.

Here are the disadvantages of gamification in learning: first, because this game requires good graphics and displays, a strong internet connection is needed. Second, there are many instructions and rules in gamification like in games, so teachers need a lot of time to introduce it to students. Third, a long preparation time is needed for its use in class, including preparing LCD projectors, computers for teachers, and laptops or smartphones for students. This can be a significant obstacle for schools that have limited computer facilities. (Mambang et al., 2022).

Conclusion and Suggestion

Gamification-based mobile learning is an innovation in educational technology that can improve the quality of learning, especially in mathematics subjects in elementary schools. This media is able to increase learning motivation, student engagement, and high-level thinking skills through an interactive and interesting approach. The design process involves systematic steps starting from needs analysis, design development, to product evaluation. Gamification elements, such as points, levels, and badges, provide a fun and effective learning experience. Although it offers many benefits, its implementation requires adequate infrastructure support, curriculum adaptation, and readiness from both students and educators. With careful planning, gamification-based mobile learning has great potential to significantly improve student learning outcomes.

References

- Ardyanto, Y. L., Rahmadian, R., Kholis, N., & Widodo, A. (2022). Media Pembelajaran Berbasis Mobile Learning Dengan Android Pada Mata Pelajaran Elektronika Dasar (Studi Literatur) Yazirwan Latif Ardyanto Reza Rahmadian Nur Kholis Arif Widodo, (1).
- Aubusson, P., Schuck, S., & Burden, K. (2009). Mobile learning for teacher professional learning: benefits,

- obstacles and issues. *Alt-J*, 17(3), 233–247. <https://doi.org/10.1080/09687760903247641>
- Azmi, M. (2016). Pengembangan Mobile Learning Sebagai Alternatif Media Pembelajaran di Masa Depan. *Prosiding Seminar Nasional Teknologi Pendidikan*, (November), 175–187.
- Damrongpanit, S. (2022). European Journal of Educational Research. *European Journal of Educational Research*, 10(3), 1075–1088. Retrieved from https://www.researchgate.net/profile/Suntonrapot-Damrongpanit/publication/356662582_Effects_of_Mindset_Democratic_Parenting_Teaching_and_School_Environment_on_Global_Citizenship_of_Ninth-grade_Students/links/61a6dda685c5ea51abc0f7b6/Effects-of-Mindset-Dem
- Duyen & Loc. (2022). European Journal of Educational Research. *European Journal of Educational Research*, 11(1), 1–16. Retrieved from https://www.researchgate.net/profile/Suntonrapot-Damrongpanit/publication/356662582_Effects_of_Mindset_Democratic_Parenting_Teaching_and_School_Environment_on_Global_Citizenship_of_Ninth-grade_Students/links/61a6dda685c5ea51abc0f7b6/Effects-of-Mindset-Dem
- Elvani Hertati. (2022). Analysis of Android-Based Educational Game Media Development Needs for Social Studies Learning in Elementary Schools. *JTP - Jurnal Teknologi Pendidikan*, 24(1), 1–8. <https://doi.org/10.21009/jtp.v24i1.22552>
- Fitri Marisa, Tubagus Mohammad Akhiriza, Anastasia Lidya Maukar, Arie Restu Wardhani, Syahroni Wahyu Iriananda, & Mardiana Andarwati. (2022). Terakreditasi SINTA Peringkat 4 Gamifikasi (Gamification) Konsep dan Penerapan. *Journal Of Information Technology And Computer Science*, 7(1), 219–228.
- Haryanto. (2015). buku Teknologi Pendidikan.pdf.
- Junita, W. (2019). Penggunaan mobile learning sebagai media dalam pembelajaran. *Prosiding Seminar Nasional Teknologi Pendidikan Pascasarjana UNIMED*, 602–609. Retrieved from http://digilib.unimed.ac.id/38863/3/ATP_69.pdf
- Jusuf, H. (2016). Penggunaan Gamifikasi dalam Proses Pembelajaran. *Jurnal TICOM*, 5(1), 1–6. Retrieved from <https://media.neliti.com/media/publications/92772-ID-penggunaan-gamifikasi-dalam-proses-pembe.pdf>
- Mambang, M., Prastya, S. E., Zulfadhilah, M., Cipta, S. P., Marleny, F. D., Melda, M., ... Maulida, R. (2022). Pendampingan Pemanfaatan Gamifikasi untuk Pendidikan di Masa Depan. *Jumat Informatika: Jurnal Pengabdian Masyarakat*, 3(1), 21–28. https://doi.org/10.32764/abdinas_if.v3i1.2439
- Marinda, L. (2020). Teori Perkembangan Kognitif Jean Piaget Dan Problematikanya Pada Anak Usia Sekolah Dasar. *An-Nisa': Jurnal Kajian Perempuan Dan Keislaman*, 13(1), 116–152. <https://doi.org/10.35719/annisa.v13i1.26>
- Mathematics, A. (2016). 濟無No Title No Title No Title, 1–23.
- Nurhidayat, B., Wedi, A., & Praherdhiono, H. (2020). Pengembangan Multimedia Mobile Learning Berbasis Smartphone Android Materi Huruf Madura untuk SD Negeri 1 Perante Kabupaten Situbondo. *JINOTEP (Jurnal Inovasi Dan Teknologi Pembelajaran): Kajian Dan Riset Dalam Teknologi Pembelajaran*, 6(2), 103–110. <https://doi.org/10.17977/um031v6i22020p103>
- Nurul, S., & Mohamad, M. (2018). *Jurnal Internasional Humaniora*, Seni dan Ilmu Sosial Pertunangan, 4, 22–32.
- Ofosu-Ampong, K. (2020). The Shift to Gamification in Education: A Review on Dominant Issues. *Journal of Educational Technology Systems*, 49(1), 113–137. <https://doi.org/10.1177/0047239520917629>
- Ozdamli, F. & Asiksoy, G. (2016). Educational Technology : Current Issues. *World Journal on Educational Technology: Current Issues*, 8(2), 98–105.
- Rabah, J., B, R. C., & Beauchemin, R. (2018). Gamifikasi dalam pendidikan : Manfaat nyata atau edutainment ? <https://doi.org/10.13140/RG.2.2.28673.56162>
- Rahmat, R. F., Mursyida, L., Rizal, F., Krismadinata, K., & Yunus, Y. (2019). Pengembangan media pembelajaran berbasis mobile learning pada mata pelajaran simulasi digital. *Jurnal Inovasi Teknologi Pendidikan*, 6(2), 116–126. <https://doi.org/10.21831/jitp.v6i2.27414>
- Rifai, A., Sulton, S., & Sulthoni, S. (2020). Pengembangan Media Mobile Learning Sebagai Pendukung Sumber Belajar Biologi Siswa SMA. *JKTP: Jurnal Kajian Teknologi Pendidikan*, 3(1), 10–17. <https://doi.org/10.17977/um038v3i12019p010>
- Rivera, E. S., & Garden, C. L. P. (2021). Gamification for student engagement: a framework. *Journal of Further and Higher Education*, 45(7), 999–1012. <https://doi.org/10.1080/0309877X.2021.1875201>
- 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>
- Sambung, D., Sihkabuden, & Ulfa, S. (2018). Pengembangan Mobile -Dimas- || 121, 121–129.
- Schöbel S. M. Janson A. & Söllner M. (2020) Capturing the complexity of gamification elements: a holistic



- approach for analysing existing and deriving novel gamification designs. *European Journal of Information Systems*, 29(6), 641–668. <https://doi.org/10.1080/0960085X.2020.1796531>
- Setiana, H., & Hansun, S. (2017). Gamified Android Based Academic Information System, 6(2), 164–173.
- Taspinar, B., Schmidt, W., & Schuhbauer, H. (2016). Gamification in education: A board game approach to knowledge acquisition. *Procedia Computer Science*, 99(October), 101–116. <https://doi.org/10.1016/j.procs.2016.09.104>
- Theories, I., & Theories, I. (2016). *Instructional-Design Theories and Models, Volume IV. Instructional-Design Theories and Models, Volume IV*. <https://doi.org/10.4324/9781315795478>
- Tobergte, D. R., & Curtis, S. (2013). Teaching in a digital age. *Journal of Chemical Information and Modeling*, 53(9), 1689–1699. <https://doi.org/10.1017/CBO9781107415324.004>
- Twiningsih, A., Gunarhadi, G., & Musadad, A. A. (2024). *Analysis of the Needs for the Development of Gamification Based Mobile Learning Media*. Atlantis Press SARL. <https://doi.org/10.2991/978-2-38476-301-6>
- Twiningsih, A. T. (2022). Desain Pengembangan Inovasi Pendidikan dalam Peningkatan Daya Saing Sekolah melalui Lima Prinsip Teknologi Pendidikan. *Edudikara: Jurnal Pendidikan Dan Pembelajaran*, 6(4), 272–277. <https://doi.org/10.32585/edudikara.v6i4.261>
- Wahyuni, D. R., Aulia, V., & Febrianno Boer, R. (2021). Instructional Communication Process in Online Learning (School From Home) during Covid-19 Pandemic. *Agustus*, 2021(2), 81–94. Retrieved from <http://journal.unj.ac.id/unj/index.php/jtp>
- Warsita, B. (2018). Mobile Learning Sebagai Model Pembelajaran Yang Efektif Dan Inovatif. *Jurnal Teknodik*, XIV(1), 062–073. <https://doi.org/10.32550/teknodik.v14i1.452>
- Yuwono, I., & Mirnawati, M. (2021). Strategi Pembelajaran Kreatif dalam Pendidikan Inklusi di Jenjang Sekolah Dasar. *Jurnal Basicedu*, 5(4), 2015–2020.