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Teachers' Perceptions of the Application of Digital Gamification-Based Problem-Based Learning (PBL) to Increase Student Engagement

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Teacher Perceptions; Problem-Based Learning; Digital Gamification; Student Engagement

Abstract

This study aims to describe teachers' perceptions regarding the implementation of problem-based learning (PBL) through digital gamification to enhance student engagement. Specifically, it examines teachers' views on the effects and challenges of applying digital gamification-based PBL to improve student activity. The research employs a mixed-methods approach with a sequential explanatory design. Findings indicate that teachers generally hold positive perceptions of integrating PBL with digital gamification. Teachers report that gamification makes learning more engaging and fosters active participation, including questioning, discussion, and opinion expression. Additionally, teachers observe increased enthusiasm, collaboration, and student independence in problem-solving. However, the study also identifies challenges such as limited internet access and devices, varying levels of teachers' digital proficiency, and the need for professional development to design effective digital gamification-based PBL scenarios. Factors supporting successful implementation include adequate school facilities, teacher creativity, and student motivation. Overall, the study concludes that digital gamification-based PBL has the potential to enhance student activity, although its effectiveness depends significantly on technological readiness, institutional support, and teacher pedagogical competence.

Kata kunci:
Persepsi Guru; Problem-Based Learning; Gamifikasi Digital; Keaktifan Siswa

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Abstrak

Penelitian ini bertujuan untuk mendeskripsikan persepsi guru terhadap penerapan problem-based learning (PBL) berbasis gamifikasi digital untuk meningkatkan keaktifan siswa, mendeskripsikan persepsi guru mengenai pengaruh penerapan problem-based learning (PBL) berbasis gamifikasi digital untuk meningkatkan keaktifan siswa, dan mendeskripsikan persepsi guru terhadap tantangan yang dihadapi guru dalam penerapan problem-based learning (PBL) berbasis gamifikasi digital untuk meningkatkan keaktifan siswa. Penelitian menggunakan pendekatan campuran dengan desain sequential explanatory. Hasil penelitian menunjukkan bahwa guru memiliki persepsi positif terhadap integrasi PBL dan gamifikasi digital. Guru menilai bahwa gamifikasi membantu meningkatkan membuat pembelajaran lebih menarik, serta mendorong partisipasi aktif seperti bertanya, berdiskusi, dan menyampaikan pendapat. Selain itu, guru mengamati adanya peningkatan antusiasme, kolaborasi, dan kemandirian siswa dalam memecahkan masalah. Namun, penelitian juga mengungkapkan tanganyan berupa keterbatasan perangkat dan jaringan internet, variasi kemampuan digital guru, serta kebutuhan akan pelatihan untuk merancang skenario PBL berbasis gamifikasi digital secara efektif. Faktor pendukung keberhasilan mencakup dukungan fasilitas sekolah, kreativitas guru, dan motivasi dari siswa. Dengan demikian, penelitian ini menegaskan bahwa penerapan

PBL berbasis gamifikasi digital berpotensi meningkatkan keaktifan siswa, namun efektivitasnya sangat dipengaruhi oleh kesiapan teknologi, dukungan institusi, dan kompetensi pedagogis guru.

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INTRODUCTION

The development of digital technology over the past two decades has led to significant changes in various sectors of life, including education. Rapid digital transformation has not only affected the way humans communicate, work, and access information, but has also changed the paradigm of learning in schools. Today's students are growing up in an environment familiar with digital devices, interactive applications, and internet-based systems. This condition encourages educators to innovate in learning practices to make them more relevant, interesting, and suitable for the needs of the 21st century generation (Dito & Pujiastuti, 2021; Isma et al., 2022). One such innovation is the use of the *problem-based learning* (PBL) model combined with digital gamification to increase student activity in the teaching and learning process (Mambang et al., 2022; Nurbaya et al., 2022; Palupi et al., 2020). The PBL model is known as a *student-centered learning* pedagogical approach.

PBL encourages students to solve problems that are relevant to real life. Through a process of investigation, discussion, analysis, and reflection, students are expected to develop critical thinking skills, creativity, and active engagement in learning (Yeni, 2021). Unlike traditional lecture methods, which tend to be passive, PBL requires students to be directly involved in the learning process, making their active participation an important factor in the success of learning (Rahmandani et al., 2024). However, despite the many advantages of PBL, not all students immediately demonstrate optimal participation. Some students still find it difficult to focus, lack the confidence to express their opinions, or feel bored quickly when faced with complex tasks without the support of interesting stimuli (Ginting et al., 2024; Siswanto et al., 2025).

The lack of student participation was evident at SMAN 1 Nusa Penida and SMA Muhammadiyah Limbung. Initial observations show that most students only listen during lessons. Students tend to wait for the teacher's explanation without trying to ask questions, respond, or take the initiative to participate in class discussions. This dependence on the teacher's explanation makes learning a one-way process, so that students rarely practice critical thinking or express their opinions. This shows that the way of learning in the classroom is still dominated by the old method, where the teacher is the main source of information and students only follow instructions. As a result, the students' potential to actively participate has not been developed properly. Student activity is an important indicator in assessing the quality of learning, as it reflects the extent to which students are actively involved in the learning process (Amalia & Sitompul, 2021; Istiningtyas et al., 2022; Pitriani et al., 2022).

Active students usually display enthusiasm, participate in discussions, ask questions, express their opinions, work together in groups, and are able to present their ideas well (Herawati et al., 2023; Pitriani et al., 2022). Low student activity is often a major challenge for teachers at various levels of education (Hidayati, 2020; Yuliastri et al., 2022). This condition is

influenced by a number of factors such as monotonous learning methods, lack of motivation to learn, an unsupportive learning environment, and students' lack of understanding of the material being presented (Astuti et al., 2021; NU'MAN et al., 2024). In line with the need to increase student activity, digital gamification has become one of the approaches widely adopted in learning innovation (Ananda et al., 2024; Bashir & Bramastia, 2023).

Gamification refers to the use of game elements such as points, levels, *badges*, *leaderboards*, challenges, and *rewards* in a *non-game* learning context (Husnawati & Carina, 2023; Shaliha & Fakhzikril, 2022). When gamification is effectively integrated with learning materials and objectives, it can increase intrinsic and extrinsic motivation, strengthen student focus, and create an enjoyable learning experience (Qiao et al., 2022; Valentinna et al., 2024). In the digital context, gamification is increasingly easy to implement through learning applications, interactive platforms, and Learning Management Systems (LMS) that support game features (Elisyah et al., 2024). The integration of digital gamification into PBL results in a more interactive, adaptive, and challenging learning approach.

Through this integration, students are not only faced with real problems that they need to solve, but are also stimulated through game elements to stay engaged and motivated throughout the learning process. For example, when students complete the problem identification stage, they can earn certain points or badges. When they successfully present creative solutions or contribute to group discussions, the system can provide additional rewards, which serve to increase student motivation to learn (Handayani et al., 2021; Puspitasari & Arifin, 2023; Sailer & Homner, 2019). In addition, leaderboards can create healthy competition between student groups (Chans & Castro, 2021; Handayani et al., 2021). The successful integration of PBL and digital gamification does not only depend on technology or learning models, but is also closely related to teachers' perceptions. Teachers play an important role in designing learning activities and selecting appropriate gamification platforms, which greatly influence classroom dynamics that support PBL (Mårell-Olsson, 2022; Sailer & Homner, 2019).

Teachers' perceptions of the benefits, ease of use, and effectiveness of digital gamification greatly influence their decisions to implement this approach (Antonaci et al., 2019; Puerta, 2024). Teachers with positive perceptions of technology tend to be more willing to innovate with new strategies, while teachers who consider gamification complicated or unsuitable for their students' characteristics tend to be reluctant to adopt it (Aguilar et al., 2023; Fissore et al., 2023). However, there is still little research that specifically examines teachers' perceptions of the application of gamification-based PBL, especially in the context of learning in Indonesia. Most studies only highlight the effectiveness of gamification in general or the implementation of PBL separately. Research on the integration of the two is still relatively limited, even though understanding teachers' perceptions is very important to ensure the success and sustainability of its application. Teachers need to feel that this approach is beneficial, easy to implement, relevant to students' needs, and not too burdensome in lesson planning.

Based on this description, research on teachers' perceptions of the application of digital gamification-based PBL is highly relevant and important. To understand this condition in greater depth, this study aims to answer several questions. First, how do teachers perceive the application of digital gamification-based *problem-based learning* (PBL) to increase student activity? Second, how do teachers perceive the effect of applying digital gamification-based

problem-based learning (PBL) to increase student activity? Third, how do teachers perceive the challenges faced in applying digital gamification-based *problem-based learning* (PBL) to increase student activity? This study aims to describe teachers' perceptions of the implementation, influence, and challenges of implementing digital gamification-based *problem-based learning* (PBL) to increase student activity. By understanding teachers' perceptions, this study is expected to provide practical recommendations for the development of more effective, interactive learning strategies that are in line with the demands of 21st-century education.

RESEARCH METHOD

This study used a mixed methods approach with a sequential explanatory design. The study was conducted in two high schools, namely SMAN 1 Nusa Penida in Klungkung Regency, Bali Province, and SMA Muhammadiyah Limbung in Gowa Regency, South Sulawesi Province. The research subjects were 10 social studies teachers, 5 from each school. The research subjects consisted of 2 male teachers and 8 female teachers. Seven teachers had 5-10 years of teaching experience, 1 teacher had > 10 years of teaching experience, and 2 teachers had < 5 years of teaching experience. There were 4 teachers who taught economics, and 2 teachers who taught geography, history, and sociology.

Data collection was carried out using two main techniques, namely a closed questionnaire using a 1–4 Likert scale, consisting of 25 statements grouped into five main aspects: (1) understanding of PBL and gamification concepts, (2) attitudes and views on implementation, (3) teacher readiness and ability, (4) perceptions of student activity, and (5) barriers and support for implementation. Interviews were conducted online, recorded, transcribed, and analyzed thematically. Quantitative data were analyzed descriptively by calculating the percentage of each indicator. Qualitative data were analyzed using the Miles and Huberman model, which includes three stages: data reduction, data presentation, and conclusion drawing/verification.

Each teacher quote was coded (G1–G10) to maintain confidentiality and facilitate thematic tracking. Data validity was ensured through method triangulation and source triangulation, by comparing the results of questionnaires, interviews, and comparisons between research locations. In addition, member checking was conducted with informants to ensure that the researchers' interpretations were consistent with the actual meaning of the teachers' narratives.

RESEARCH RESULTS AND DISCUSSION

Results

Teachers' Perceptions of Digital Gamification-Based PBL

Teachers at both schools showed positive perceptions of the implementation of gamified digital PBL. Conceptual understanding ranging from 72.5% to 80% indicates that teachers have a good understanding of the steps involved in PBL, from problem identification and investigation to discussion and presentation of solutions. This understanding is important because the effectiveness of PBL is highly dependent on the competence of teachers as facilitators. As stated by G1, "PBL is student-centered learning to develop critical thinking and problem-solving skills," indicating that teachers understand the pedagogical foundations of this model.

In addition to understanding the concept of PBL, teachers also understand the essence of digital gamification as a learning strategy that can increase student motivation. The

understanding of gamification, which reached 77.5%, reinforces this finding. G4 states that gamification is "digital game design to increase student engagement, motivation, and learning outcomes," which shows that teachers do not only see gamification as entertainment, but as a strategic instructional approach. Teachers' understanding of the potential of gamification is an important basis for effectively integrating it into PBL.

Teachers' perceptions of the application of PBL combined with digital gamification were also very positive. They assessed that this integration helped to create a more lively, interactive, and enjoyable classroom atmosphere. G3 emphasized that this approach "greatly helped teachers to create a pleasant learning atmosphere," which was then reflected in the students' increased enthusiasm throughout the learning process. This statement illustrates that teachers saw a transformation in the learning atmosphere through the combination of PBL and gamification.

Teachers also believe that gamification provides additional stimuli that reinforce the implementation of PBL. Point systems, levels, and challenges help guide students to follow the problem-solving process without feeling burdened. The role of gamification as a motivational strategy is also recognized by G5, who states that "each stage of the project is assessed through Quizizz and Wordwall as level challenges," so that students are more actively involved in investigation and discussion activities. Thus, teachers believe that gamification enriches the PBL experience without diminishing the essence of problem solving.

Furthermore, teachers felt that students responded very positively to digital gamification-based PBL. The application of this model shifted the classroom dynamics from passive learning to active learning. As stated by G1, learning tended to be passive before, but after the application of gamification-based PBL, "learning activities became more active, interactive, and fun." This change proves that teachers not only understand the concept but also feel the direct impact of its application in the classroom.

The Effect of Implementing Digital Gamification-Based PBL on Student Activity

Teachers' perceptions of the impact of implementing digital gamification-based PBL show that this model has a significant impact on student activity. Student activity levels ranging from 77.5% to 80% indicate a high level of activity during learning. Teachers assessed that students became more involved in the learning process, more courageous in asking questions, and more open in expressing their opinions. G2 reinforced this finding by saying that "with this learning model, students are more active... games keep students from getting bored," describing the direct impact of gamification in building classroom energy.

The application of gamification-based PBL also increases student enthusiasm in participating in learning. This is in line with G3's statement that "their enthusiasm for playing games while learning is very evident." This enthusiasm is not only reflected in their expressions, but also in their perseverance in going through the stages of PBL, such as identifying problems, searching for information, and formulating solutions. Thus, gamification serves as a driver of students' intrinsic motivation to be fully involved in the PBL process. In addition to increasing enthusiasm, teachers also observed an increase in students' active participation in discussions, question and answer sessions, and group work. G1 said that students were "very active in finding solutions and expressing their opinions," indicating that gamification encourages students to take an active role in the investigation process. This participation shows an increase

in the cognitive, affective, and social aspects of student activity, which is the main objective of problem-based learning.

The use of game elements such as points, levels, *leaderboards*, and *badges* also creates healthy competition among students, which in turn strengthens social interaction and cooperation. G5 revealed that students became "actively discussing, collaborating, and competing healthily to earn points or badges," describing a significant change in classroom dynamics. Thus, gamification not only increases individual activity but also student social interaction. Teachers also noted an increase in student independence during the learning process. G10 stated that students "move quickly to find information because they want to earn points," which shows that gamification can change students' learning attitudes from passive to active and proactive. Thus, this model encourages students to take the initiative in understanding problems and finding solutions independently, in line with the main objectives of PBL.

Challenges in Implementing Digital Gamification-Based PBL to Increase Student Engagement

The implementation of gamified digital PBL faces several complex challenges, particularly related to technical aspects, which are the most dominant obstacles. Seven teachers (G1–G4, G6, G7, G10) reported that unstable internet connections were a recurring obstacle in the learning process. This condition caused gamification activities to often be interrupted or run suboptimally. G3 emphasized that "*some students did not bring their cell phones so they could not participate in gamification activities,*" indicating an inequality in learning resources among students. G2 also stated that "*students sometimes experience network problems,*" reinforcing the fact that digital infrastructure is not yet evenly distributed. These technical obstacles are the basis for why technical obstacles in the research instrument are in the sufficient category, at 67.5%. Thus, device readiness and internet network quality are the main foundations that determine the smooth implementation of this learning model.

In addition to technical challenges, teachers also face various pedagogical obstacles in designing PBL scenarios that are integrated with gamification elements. Five teachers (G1, G2, G4, G7, G10) assessed that they needed special training to understand how to combine PBL steps with digital game mechanisms such as points, levels, and leaderboards. G4 revealed obstacles that included "*pedagogical, technical, and psychological aspects,*" which required teachers to understand how to organize game activities so that they remained in line with learning objectives, rather than being merely additional activities. Without proper design, gamification risks distracting students from the problem-solving process and leading them to simply chase rewards. Awareness of this potential distraction has made teachers more cautious in designing learning steps.

Teachers also highlighted the importance of managing students' focus so that gamification continues to support critical thinking and does not dominate their attention. G7 emphasized that teachers must manage the reward system consistently so that "students are not only interested in the game," but also understand the core learning objectives. Another challenge is the need for students and teachers to adapt to the time required. G6 stated that implementing this model "*takes time to adjust,*" especially for students who are not yet accustomed to using digital applications as a learning medium. Teachers also face additional work related to preparing game levels, game rules, and determining points in accordance with PBL stages. All

of this shows that implementing gamification-based PBL requires mental preparedness, technical skills, and strong classroom management.

On the other hand, teachers realize that competency readiness is a very important part of the success of this model. G1 suggests that schools "*conduct socialization or training so that its implementation can be maximized,*" while G10 emphasizes that teachers need to understand how *to* "*design levels and point systems that are in line with the PBL stages.*" G4 even adds that teachers "*still need to learn a lot*" to optimize the use of digital gamification. All of these statements illustrate that teachers need space to improve their digital literacy so they can utilize gamification appropriately and not just use applications as a formality or mere variation of activities.

Despite the considerable challenges faced, teachers still believe that there are various factors that support the successful implementation of gamified digital PBL. Most teachers (G1, G2, G5, G6, G7, G10) emphasized that the support of digital facilities and infrastructure from schools is a key aspect. G5 stated that "*the school's network and facilities are decisive factors,*" and G6 added that the support of school leaders and the availability of technology "*are very helpful*" in implementing this model. Teachers' creativity in adapting learning media to students' needs also contributes to its success. G7 conveyed that teachers need *to* "*adapt media to students' preferences so that learning remains enjoyable and meaningful.*" In addition, student motivation is a very strong internal factor. G10 mentioned that "*high student motivation is the main driver of success,*" while G3 emphasized that students' enthusiasm in using games "*makes the classroom more lively.*"

Discussion

Based on the results of research conducted through questionnaires and interviews, it was found that teachers have a positive perception of the application of the digital gamification-based Problem-Based Learning (PBL) model. Teachers assessed that this model makes the learning process more interesting and is able to increase students' active involvement in learning activities. These findings are consistent with recent research results showing that the integration of PBL with gamification can improve 21st-century skills, such as creativity, collaboration, and critical thinking skills (Handikaningtyas et al., 2024). Thus, the positive perceptions of teachers in this study support the view that PBL naturally encourages student activity, especially when combined with pedagogically designed gamification elements.

The integration of gamification elements is also perceived as a factor that triggers motivation and increases student participation. Teachers explain that the use of points, badges, levels, challenges, and direct feedback makes students more enthusiastic about learning, including students who were previously passive (Aziz & Amir, 2025). This effectiveness is in line with the findings of studies that mention that gamification has a positive impact on motivation, engagement, and academic achievement at various levels of education (Nurhayati & Fathurrohman, 2025). Recent quasi-experimental research in the field of science also shows a significant increase in student engagement and academic achievement after the application of gamification in learning (Maragañas & Dioso, 2025).

In line with the teachers' experiences in this study, gamification is not only an element of entertainment, but also a pedagogical mechanism that strengthens student activities during the learning process. The results of the study found that although student activity increased, some

teachers were concerned that students were more focused on game aspects such as points and levels, rather than on the core of learning such as problem solving and conceptual understanding. This finding is consistent with the literature, which states that gamification can increase initial engagement and motivation, but does not always guarantee deep understanding or the transfer of critical thinking skills if the game elements are not well designed (Khoshnoodifar et al., 2023). Therefore, the role of teachers as learning designers is very important.

Gamification elements need to be tailored to learning objectives so that they not only motivate, but also truly support meaningful thinking and learning processes. The results of the study also found major obstacles in terms of technical aspects and teacher readiness. Some teachers are not yet accustomed to using digital platforms, and infrastructure such as the internet and devices in schools is still limited. This is consistent with findings that the effectiveness of gamification is highly dependent on context, such as the availability of technology, institutional support, and teacher readiness as key factors for success (Nurhayati & Fathurrohman, 2025). So, even though perceptions of gamification in PBL are positive, its implementation is not an instant solution. Effective implementation requires teacher training and adequate facilities.

From a pedagogical perspective, teachers stated that designing PBL situations that incorporate game elements requires time, creativity, and instructional design skills. This finding is consistent with other studies showing that the success of PBL and gamification greatly depends on teachers' ability to create meaningful and relevant learning scenarios (Handikaningtyas et al., 2024). Therefore, developing teachers' abilities in designing learning is an important requirement for schools to be able to implement this model effectively and sustainably. Field findings in the two schools where the research was conducted show that technological readiness and school environmental conditions also influence the success of implementing this model.

In schools with adequate digital facilities, teachers tend to be more confident in fully utilizing gamification. Conversely, in schools with limited networks and devices, teachers choose to simplify the digital elements used. Recent literature also confirms that the effectiveness of gamification is contextual and influenced by institutional conditions and student characteristics (Nurhayati & Fathurrohman, 2025). This shows that learning innovations need to be tailored to the capabilities and readiness of each school. Thus, this study shows that digital gamification-based PBL has great potential to increase student activity, motivation, and engagement. However, its effectiveness is greatly influenced by the quality of instructional design, technological readiness, and teacher competence in designing learning. Therefore, training, technical support, and careful pedagogical planning are needed so that gamification can be implemented optimally and sustainably in the context of PBL learning.

CONCLUSION

Based on the results of the study, it can be concluded that the application of digital gamification-based *problem-based learning* (PBL) is perceived positively by teachers and is considered capable of increasing student activity and motivation in the learning process. However, the success of implementing this model is greatly influenced by technological

readiness, teacher pedagogical competence, and institutional support in providing adequate facilities. The findings of this study underscore the importance of training, innovation in learning media, and improving digital literacy for teachers so that the implementation of digital gamification-based PBL can run optimally. Thus, this study is expected to be a reference for policy development, training programs, and innovative learning practices that support equal quality of education in various schools. This study has several limitations, namely that the number of respondents was only 10. The data was obtained from teachers' perceptions and did not directly measure student learning outcomes. The study did not examine the long-term impact of implementing digital gamification-based PBL. Further research is recommended involving a broader sample, experimental design, and direct measurement of learning outcomes and student participation.

DAFTAR PUSTAKA

Aguilar, G. F., Grau, M. P., Gavira, J. F., & Llerena, A. M. (2023). "I learned more because I became more involved": Teachers' and students' voice on gamification in physical education teacher education. *International Journal of Environmental Research and Public Health, 20*(4), 3038. https://doi.org/10.3390/ijerph20043038

Amalia, A. R., & Sitompul, D. N. (2021). Penerapan model pembelajaran Problem Based Learning untuk meningkatkan keaktifan belajar siswa di SMK Pustek Serpong dalam mata akuntansi dasar kelas X tahun pelajaran 2020/2021. *Jurnal Penelitian Pendidikan dan Pengajaran (JPPP), 2*(3), 269. https://doi.org/10.30596/jppp.v2i2.7448

Ananda, N. P., Rahmah, F. T., & Ramdhani, A. R. (2024). Using gamification in education: Strategies and impact. *Hipkin Journal of Educational Research, 1*(1), 1–12. https://doi.org/10.64014/hipkin-jer.v1i1.7a

Antonaci, A., Klemke, R., & Specht, M. (2019). The effects of gamification in online learning environments: A systematic literature review. *Informatics, 6*(3), 32. https://doi.org/10.3390/informatics6030032

Astuti, P. H. M., Bayu, G. W., & Aspini, N. N. A. (2021). Penerapan model pembelajaran Problem Based Learning untuk meningkatkan hasil belajar matematika siswa. *Mimbar Ilmu, 26*(2), 243. https://doi.org/10.23887/mi.v26i2.36105

Aziz, M. B., & Amir, A. N. (2025). Evaluating Value-Based Vocational Education Using Logic Model: A Qualitative Inquiry in Islamic Higher Education. *Tafkir: Interdisciplinary Journal of Islamic Education*, *6*(3), 700–715.

Bashir, F. A., & Bramastia, B. (2023). Implementasi game based learning berbasis digital. *Edukatif: Jurnal Ilmu Pendidikan, 4*(6), 8070–8083. https://doi.org/10.31004/edukatif.v4i6.3819

Dito, S. B., & Pujiastuti, H. (2021). Dampak revolusi industri 4.0 pada sektor pendidikan: Kajian literatur mengenai digital learning pada pendidikan dasar dan menengah. *Jurnal Sains dan Edukasi Sains, 4*(2), 59–65. https://doi.org/10.24246/juses.v4i2p59-65

Elisyah, N., Fatwa, I., Widya, W., Hutabarat, D. A., & Humaira, Z. (2024). Pelatihan gamifikasi: Implementasi permainan edukatif untuk meningkatkan kualitas pembelajaran di SD Swasta Srikandi Lhokseumawe. *Pusaka, 1*(2), 29–37. https://doi.org/10.62945/pusaka.v1i2.164

Fissore, C., Fradiante, V., Marchisio, M., & Pardini, C. (2023). Teachers' strategies and difficulties in designing gamification activities. *IADIS International Journal on WWW/Internet, 20*(2). https://doi.org/10.33965/ijwi_2023210206

Ginting, D. A., Suprayetno, E., Rosmen, Marpaung, F. D. N., & Hasan, M. (2024). Pelatihan implementasi model pembelajaran Problem Based-Learning bagi guru SMP Swasta Mulia Hamparan Perak. *Jurnal Abdimas Maduma, 3*(1), 1–8. https://doi.org/10.52622/jam.v3i1.224

Handayani, P. W., Raharjo, S. R., & Putra, P. O. H. (2021). Active student learning through gamification in a learning management system. *The Electronic Journal of E-Learning, 19*(6), 601–613. https://doi.org/10.34190/ejel.19.6.2089

Handikaningtyas, T., Kenya, P. B. M., Ramadhan, A., Fajarianto, O., & Nurlia, T. (2024). Implementation of Problem Based Learning with gamification approach. *International Journal of Education and Social Science, 5*(2), 327–334. https://doi.org/10.56371/ijess.v5i2.364

Herawati, D., Basori, B., & Wulansari, A. (2023). Model Problem Based Learning berbantuan media Sway untuk meningkatkan keaktifan belajar siswa pada mata pelajaran Dasar-Dasar Desain Komunikasi Visual materi desainer yang kreatif di SMKN 1 Dukuhturi. *Journal of Informatics and Vocational Education, 6*(2). https://doi.org/10.20961/joive.v6i2.65895

Hidayati, A. (2020). Penerapan model pembelajaran Problem Based Learning dan Team Games Tournament untuk meningkatkan keaktifan peserta didik. *Sosearch, 1*(1), 39–45. https://doi.org/10.26740/sosearch.v1n1.p39-45

Husnawati, Z., & Carina, A. (2023). Gamification (Kahoot) and its usage in teaching and learning process for primary education of SD/MI. *Social Humanities and Educational Studies (SHES) Conference Series, 6*(3). https://doi.org/10.20961/shes.v6i3.82331

Isma, C. N., Rahmi, R., & Jamin, H. (2022). Urgensi digitalisasi pendidikan sekolah. *At-Ta'dib: Jurnal Ilmiah Prodi Pendidikan Agama Islam*, 129–141. https://doi.org/10.47498/tadib.v14i2.1317

Istiningtyas, D., Anugrahana, A., & Saptoro, A. (2022). Penerapan model Problem Based Learning dalam meningkatkan keaktifan belajar siswa kelas IV SD N 2 Kebondalem Lor pasca pandemi COVID-19. *Jurnal Pendidikan dan Konseling (JPDK), 4*(4), 5710–5715. https://doi.org/10.31004/jpdk.v4i4.6247

Khoshnoodifar, M., Ashouri, A., & Taheri, M. (2023). Effectiveness of gamification in enhancing learning and attitudes: A study of statistics education for health school students. *Journal of Advances in Medical Education & Professionalism, 11*(4), 230–239. https://doi.org/10.30476/jamp.2023.98953.1817

Mambang, M., Prastya, S. E., Zulfadhilah, M., Cipta, S. P., Marleny, F. D., Melda, M., Maulida, N. M., Putri, P., Ayuba, M. S., Rismawati, R., Wulandari, I., Fikri, R. M., Rahmini, R., Rinjani, H. S., & 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/abdimas_if.v3i1.2439

Maragañas, N., & Dioso, E. (2025). The impact of gamification on enhancing student engagement and science achievement. *International Journal of Interdisciplinary Viewpoints, 1*, 401–421. https://doi.org/10.64612/ijiv.v1i4.26

Mårell-Olsson, E. (2022). Teachers' perception of gamification as a teaching design. *Interaction Design and Architecture(s), 53*, 70–100. https://doi.org/10.55612/s-5002-053-004

Nu'man, M. A., Nursyahidah, F., Fatonah, F., & Artharina, F. P. (2024). Pengaruh model PBL berbantuan multimedia untuk meningkatkan hasil belajar kognitif siswa kelas IV SD. *Edutech: Jurnal Inovasi Pendidikan Berbantuan Teknologi, 4*(3), 183–192. https://doi.org/10.51878/edutech.v4i3.3308

Nurbaya, N., Syarifuddin, S., & Madani, M. (2022). Pengaruh model pembelajaran berbasis masalah terhadap penguasaan konsep IPS dan kemampuan pemecahan masalah sosial murid SD Gugus 3 Kecamatan Kahu Kabupaten Bone. *Edutech: Jurnal Ilmu Pendidikan dan Ilmu Sosial, 8*(2). https://doi.org/10.30596/edutech.v8i2.11390

Nurhayati, N., & Fathurrohman, F. (2025). Gamification in school education: A systematic review of its effectiveness in improving student motivation and academic outcomes. *Al-Ishlah: Jurnal Pendidikan, 17*(2), 2356–2368.

Palupi, B. S., Subiyantoro, S., Rukayah, R., & Triyanto, T. (2020). The effectiveness of guided inquiry learning (GIL) and Problem-Based Learning (PBL) for explanatory writing skill. *International Journal of Instruction, 13*(1), 713–730. https://doi.org/10.29333/iji.2020.13146a

Pitriani, P., Parenrengi, S., & Tune, I. L. (2022). Penerapan model pembelajaran Problem Based Learning untuk meningkatkan keaktifan siswa kelas X APAT SMKN 1 Ciasem. *J. Pendidikan, 2*(1), 79. https://doi.org/10.59562/progresif.v2i1.30074

Puerta, L. G. (2024). Exploring if gamification experiences make an impact on pre-service teachers' perceptions of future gamification use: A case report. *Societies, 14*(1), 11. https://doi.org/10.3390/soc14010011

Puspitasari, I., & Arifin, S. (2023). Implementation of gamification on learning motivation: A meta-analysis study. *International Journal of Progressive Sciences and Technologies, 40*(1), 356. https://doi.org/10.52155/ijpsat.v40.1.5596

Qiao, S., Yeung, S. S., Shen, X., & Chu, S. K. W. (2022). The effects of a gamified morphological awareness intervention on students' cognitive, motivational and affective outcomes. *British Journal of Educational Technology, 53*(4), 952–976. https://doi.org/10.1111/bjet.13178

Rahmandani, F., Hamzah, M. R., Handayani, T., & Fatimah, S. (2024). Penerapan Problem Based Learning (PBL) dalam peningkatan keaktifan dan motivasi belajar peserta didik pada mata pelajaran Pendidikan Pancasila di SMAN 2 Batu. *Jurnal Pendidikan dan Pembelajaran Indonesia (JPPI), 4*(3), 1016–1027. https://doi.org/10.53299/jppi.v4i3.674

Sailer, M., & Homner, L. (2019). The gamification of learning: A meta-analysis. *Educational Psychology Review, 32*(1), 77–112. https://doi.org/10.1007/s10648-019-09498-w

Shaliha, M. A., & Fakhzikril, M. R. (2022). Pengembangan konsep belajar dengan gamifikasi. *Inovasi Kurikulum, 19*(1), 79–86. https://doi.org/10.17509/jik.v19i1.43608

Siswanto, E., Rahayu, W., & Meiliasari, M. (2025). Optimalisasi kemampuan pemecahan masalah matematika melalui implementasi pembelajaran Problem Based Learning (PBL):

Systematic literature review. *SJME (Supremum Journal of Mathematics Education), 9*(1), 181–195. https://doi.org/10.35706/sjme.v9i1.185

Valentinna, C. R., Kurnianti, E. M., & Hasanah, U. (2024). Media belajar gamifikasi terhadap peningkatan motivasi belajar siswa sekolah dasar. *Jurnal Basicedu, 8*(3), 1722–1732. https://doi.org/10.31004/basicedu.v8i3.7476

Yeni, Y. (2021). Pengembangan lembar kerja siswa kimia berbasis Problem Based Learning untuk meningkatkan partisipasi dan hasil belajar siswa SMA kelas X. *Jurnal Pendidikan MIPA, 11*(2), 105–112. https://doi.org/10.37630/jpm.v11i2.500

Yuliastri, A., Oktavia, M., & Nuranisa, N. (2022). Perbandingan model pembelajaran PBL (Problem Based Learning) dan model pembelajaran Discovery Learning terhadap keaktifan belajar siswa di SMA PGRI 2 Palembang. *JPG (Jurnal Pendidikan Geografi), 9*(2). https://doi.org/10.20527/jpg.v9i2.13762