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**DIGITAL GAME DESIGN ACTIVITY: IMPLEMENTING
GAMIFICATION WITH CHILDREN IN THE CLASSROOM**

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Abstract

The idea of applying gamification approach is very beneficial to the 21st century education especially to teacher and student. However, this approach is still a stigma in our society today in terms of acceptance, implementation and implication in the classroom setting for children. In this paper, we present a qualitative study through participant observation and semi structured interview involving 20 children. Gamification concept that applied in this study is project based in which children need to design a digital game. Analysis of the data showed an interesting, promising finding, suggesting that the learning approach that is integrated with digital games is realizable through digital games gamification, the implementation of which relies on a systematic instructional planning; its suitability with the learning objectives and the implication of gamification approach towards 21st century education. The gamification approach is expected to exert a significant positive impact on both students and teachers, which is gradually, but surely, becoming an important learning approach in the 21st century education

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1. Introduction

The world is witnessing digital games being passionately embraced by users from all walks of life, be they young or old, men or women. To underscore such interesting observation, the annual report produced by the Entertainment Software Association (Association, 2016) highlighted that a huge amount of money – US 22.41 billion to be exact – were spent by users worldwide in the digital game industry. Undeniably, this colossal figure bodes good news to the industry players, and more importantly, this rapidly expanding digital game development has caused ripples that would radically change the social, economic, and education aspects of the society. Among the society members, children (being the digital natives) would be most susceptible to these changes given their predilection for new, novel technologies that ubiquitously imbue their lives. Such technologies have spurred many important changes; for example, the mobile technology, such as tablets and smart phones with their touch screens, has accelerated the use of digital games almost exponentially.

Without fail, a majority of the society members, notably parents, see digital games purely from the entertainment perspective, engendering extreme joy or fun to their children that could invariably distract the latter from learning (Wartella, Rideout, Lauricella, & Connell, 2013). This negatively perceived notion can be reversed by helping parents to see the positive side of digital games as a learning tool that is not only enjoyable but highly interactive that can help motivate students in the learning process. One of the methods to transform games into a potent learning tool is gamification, which is an approach that utilizes the “entertaining” element in such a way that engages students in learning (Kapp, 2012). With gamification, learning becomes more engaging as game elements that are designed and developed using relevant educational psychological precepts that can ultimately help improve students’ motivation and interest.

1.1. Gamification in design activity approach

Arguably, a learning approach that has edutainment elements can make the teaching and learning process more enjoyable and efficacious. In the digital era, active learning involving cooperative and interactive learning can be made possible through digital integration. The existence of educational digital games has paved the way for educators to adopt gamification as an alternative to existing learning approaches. In using digital games in the classroom, children’s involvement in design activity of such games results in a potent learning approach that helps induce a creative process that can have a huge impact on their intellectual development and attitudes toward learning (Baytak et al., 2011; Lim, 2008; Prensky, 2008). This assertion is also reinforced by Froebel cited in (Resnick, 2007), who contends that the learning process can become effective in enjoyable situation in which children can design, develop, and create while playing.

These days, gamification become a term that has garnered wide attention in the community of educators. The gamification process implements the concept of Game-based Learning, which is apply for to be fitting as one of the approach in the 21st century teaching and learning process (Tan, 2015). From previous study, researchers approve that digital games can accentuate the children’s competency more comprehensively, particularly their technology skills learning skills, and social skills (Qian & Clark, 2016). Design activity enable children to become creative and independent, the impact of which helps them experience an engaging learning, gain new skills, and improve their critical thinking (Ibhari & Yatim,

2014; Neo & Neo, 2013). The above attainments are, of course, to be expected as children partaking in the design process of digital games need to understand the gaming concepts before applying them in the digital form. By involving in such a process, these children are able to enhance their thinking skills and technological expertise (An, 2014). The same process also plays an important role to ensure the teaching and learning process, which uses digital games design activity, occurs in a systematic learning setting based on actual design process. Such a case is demonstrated in a study by Moser, who introduced an approach called Child-Centered Game Development as a new approach based on the design and development of educational digital games (Moser, 2013). With this approach, children can learn and play in an environment that nurtures their creativity and skills, which are important in leading their daily lives in the future.

Such a learning process that hinges on design activity entails a relevant pedagogy such that it can yield a positive impact on children learning. To help teachers and instructors to plan and implement such pedagogical approach involving design activity, several guidelines and references (which are available online) have been introduced, such as *Game on Exhibition* (<http://www.gameonweb.co.uk/education>) and *Gamestar Mechanic for Teacher* (<https://gamestarmechanic.com/teachers/resources>), among others. In addition to these references, Cheng (2009) introduced a new instructional model called *Game Making Pedagogy* (GMP), which helps guide the game design activity by focusing on student-centred constructivist learning (Cheng, 2009). Nonetheless, a majority of guidelines and instructional models available are generic in nature. Given the dearth of specific guidelines, the present researchers thus proposed a new procedure for digital games design activity, in which children not only learn about the contents but also explore alternative learning methods. In this type of learning environment, the children take the central role in learning, relegating their teacher to facilitating role. Providing children with such a learning setting is in line with the requirements of the 21st century learning, which enables children to learn collaboratively, think creatively, work in team, self-manage, and learn actively.

1.2. Children as designer of digital games

Children of this generation are quite different from the children of earlier generations in many aspects of life. The former is referred to as “digital generation” that lives in a ubiquitous environment. Virtually, without these technologies, every facet of life can become cumbersome and dull. In the digital games context, the use of technology and multimedia enables children to assume the role of an author or a creative designer that ultimately steers them towards the desired learning trajectory (Neo & Neo, 2013). In addition to support Child-Centered Game Development approach, the methodology applied in the design and development process should aligned with Child-Centered Design model (CCD) adopted from User-Centered Design (UCD) (Druin, 1999; Henry, 2000). Children are actively involved in the design process to fulfill their requirement and expectation of the product for themselves.

In this respect, Druin has identified four main roles of children in new technology design process, particularly in interactive multimedia products, in which children are the user, tester, informant, and designer (Druin, 2002). In addition to performing these roles, children too have the potential to design and develop digital games themselves (Ibharm & Yatim, 2015). This contention of children as the designer is best exemplified by Garzotto’s (2008) study involving 10- and 11-year-old children, in which these children were found to possess novel ideas, vivid imagination, and vast technological experience in helping them to

become good designers. His main finding is suggestive of children's talents, interest, and skills that enable them to create their own digital games, the impact of which makes the children learn more effectively. Naturally, such learning efficacy is realizable, as children that actively partake in the design process will always strive to find clear, accurate information (Garzotto, 2008). Furthermore, they will also be deeply involved in research and design process in the development of digital games. From the HCI standpoint, research in multimedia digital games provides an avenue for researchers to explore the potential impact of such games on learning effectiveness and the ability of children as designer (Earp, Dagnino, & Ott, 2014).

In this regard, children not only can play, but they can express their ideas, recommendations, or comments on games that they are playing almost spontaneously. This spontaneity of ideas or feedback is the result of their mental model, experiences, and creativity, which makes playing digital games an exciting educational experience. Such an experience provides the space and opportunity for researchers to further explore the potential of children to become the designer and the developer of digital games.

2. Problem Statement

Previously, children were regarded as mere players, who just used games for entertainment. Now, with new technology, their role has changed in which they are also becoming more involved in games development. In fact, they become the designer of the games themselves, the effectiveness of which heavily depends on their cognitive, affective, and social skills (Baytak, Land, & Smith, 2011; Good & Robertson, 2004; Kafai, 1995; Prensky, 2008). From the gamification perspective, children, besides playing, can also be exposed to digital games design activity, in which the teaching and learning process can be more engaging and efficacious. In this regard, design activity using digital games have the potential to achieve the desired level of interactivity. Nonetheless, to use this project based approach in the classroom is challenging given the relatively large class size (typically numbering more than 35 students per class), time limitation, and lack of suitable facilities (Omar & Bakar, 2013). Despite these constraints, the implementation of such an approach is not insurmountable as there are several means or ways that can be adopted by researchers.

3. Research Questions

In order to achieve the research objectives, the following research questions were formulated:

- What aspect require for student's acceptance to implement gamification through game design activity?
- How suitability and implementation of digital games design activity in the classroom can be enhance?
- What implication of game design activity in the classroom environment?

4. Purpose of the Study

This article discusses the objective of the present study by focusing on the digital games design activity using tablet in the classroom especially on student's acceptance, activity's suitability and implication. Using this activity in such a teaching and learning process, both the teacher and students would

be able to enhance their knowledge, as well as their soft skills, which are highly needed for learning in this millennium.

5. Research Methods

In this study, the researchers used a qualitative research design using participant observation and semi-structured interview. Such an approach allows researchers to explore a certain phenomenon meaningfully in a real-world setting, thus enabling them to understand the studied event in greater details (Creswell, 2013). The study participant comprised 20 (10 girls and 10 boys) Year Four primary school pupils, with a mean age of 10 years. The participants were randomly selected by their teacher regardless of education achievement and level of technology literacy. The selection of this participant was appropriate based on the selected children's cognitive stage, which was at the Concrete Operation of the Cognitive Development Theory (Piaget, 1964). At this stage, children are capable to think creatively and apply learned concepts or new knowledge in a new event. Specifically in this study, the design activity were carried out in small group. Such activity run parallel with the recommendations by Moser (2013), who advocates the use of small groups, typically made up of two to three children, that enables all of them to contribute in the dynamic design process in terms of sharing of ideas, experiences, and skills.

The children were divided into 10 groups, each consisting a girl and a boy to eliminate any possibilities of gender bias. The groups carried out their learning activity in the actual classroom, thus ensuring the children were in a conducive and familiar environment, in which they were able to perform their tasks without any kind of pressure, such as being watched or being tested. In addition, the classroom setting was selected because it had all the necessary equipment and facilities to facilitate the observation process. Data were collected by using two research instruments, namely an observations checklist and an interviews checklist. The main constructs for each checklist are i) student's acceptance of digital game design activity; ii) the suitability and implementation of digital game design activity; and iii) the implication of game design activity in classroom setting. The validity and reliability of both research instruments were verified through expert judgments and a pilot test, respectively. The researchers recruited four facilitators to help observe and record all the activity performed by the children in the classroom.

The present researchers used five pedagogical approaches, as recommended by Markopoulos et al., (2008), for the observations of children's activity. Specifically, these approaches were exploration through interaction, reflection, imagination, immersion, and teamwork (Markopoulos, Read, MacFarlane, & Hoysniemi, 2008). To guide the observation process, semi-structured interviews were used as part of the instrumentation to elicit detailed information pertaining to the process, feelings, suggestions, and comments by the participants in this study. The interviews were carried out in two categories, namely an interview with the participants and an interview with the teacher. Based on two days workshop setup, each group was given a task to produce a digital games design using an authoring tool for game development namely iBUAT (Innovation Board Unique Authoring Tool) developed from previous research (Ibharam & Yatim, 2014). The participants have to design a game base on adventure theme. The Child-Centered Game Development approach was used to ensure the activity performed were relevant with the learning environment of a classroom. To further improve the observation process, the researchers used several principles based on the combination of the guidelines of the Game Making Pedagogy (Cheng, 2009). Table

01 summarizes the testing procedure used in the study while the Figure 01 and Figure 02 shown the testing session.

Table 01. Testing procedure of the digital games design activity in the classroom

Day	GMP model (Stage)	Activity and duration
First	Topic exploration	Induction set and tutorial session (30 minutes)
	Knowledge acquisition	
Second	Goals setting	Planning session and brainstorming of ideas (20 minutes)
	Contents creation	Development of digital design (30 minutes)
	Components synthesis	
	Peer survey	Sharing session with peers and assessment by the teacher (5 minutes for each group)



Figure 01. Introduction and tutorial session



Figure 02. Digital game design activity in group

Essentially, this study involved both descriptive and interpretative analysis. With both methodological approaches, the researchers were able to obtain a holistic picture of the characteristics of a particular situation, the behaviours of the research participants, and pertinent information during testing. Using the *Atlas. Ti.* software, the qualitative data were analysed based on the triangulation approach and the typology approach using a thematic analysis. The holistic analysis of the field data helped yield the research findings that were precise and reliable.

6. Findings

6.1. The acceptance of students to the implementation of gamification through game design activity require the support of literacy competence of teachers on learning approach, skill, knowledge, and technology.

Each group were provided with a tablet, which had been installed with iBUAT. Throughout the designing session, each participant was given the liberty to perform the task in group without any interventions from the researchers, facilitators, or the teacher. The interviews with the participants revealed that they were capable to design the game using the tablets and iBUAT. In fact, the children could hardly conceal their extreme excitement in using the tablets during the digital games design process. Such state of exhilaration experienced by them was visibly evident in a recorded video, showing abundant traces of profound enjoyment, such as friendly gestures and smiling faces.

Apparently, with each group being in its allocated space, all the participants were able to remain focused on completing their tasks. Such concentration of effort helped them complete the design task in a shorter time, thus avoiding the feeling of tiredness or boringness. Generally, the participants had not encountered any major problems in undertaking digital games design activity. Arguably, their strong interest and enjoyment in engaging such activities were so immense that any problems that cropped out seemed trivial. Such is the potential benefit of digital games that engenders edutainment that can help students to learn with a greater sense of accomplishment (Kapp, 2012). Interestingly, the designing session proceeded smoothly despite the situation being a bit noisy.

However, at some situation they also ask for help when they got problem to handle the iBUAT and game design as they expected. Teachers have to have capability to give alternative idea and suggestion to solve the problem. To ensure gamification can be efficacious, teachers too need to be proficient in using the learning approach by familiarising with the relevant software and hardware. Put simply, the competency of teachers is of paramount important, which needs to be addressed appropriately.

Undisputedly, teachers who lack technological knowledge or skills (such as the ability to play digital games using the tablet) would perceive using such a device in their classroom awkward, at best, or problematic, at worst. This perception is quite natural given that they would be compelled to learn something new, and that is deemed burdensome to them. Such a scenario could result in the teachers becoming less articulate in their teaching, the outcome of which the learning objectives would not be fulfilled (Omar & Bakar, 2013). To address this precarious learning situation, the researchers propose that teachers' competency needs to be gauged before implementing a new teaching and learning approach. In essence, the competency of teachers is envisaged to contain five components to assist the implementation of digital games design activity as Figure 03.

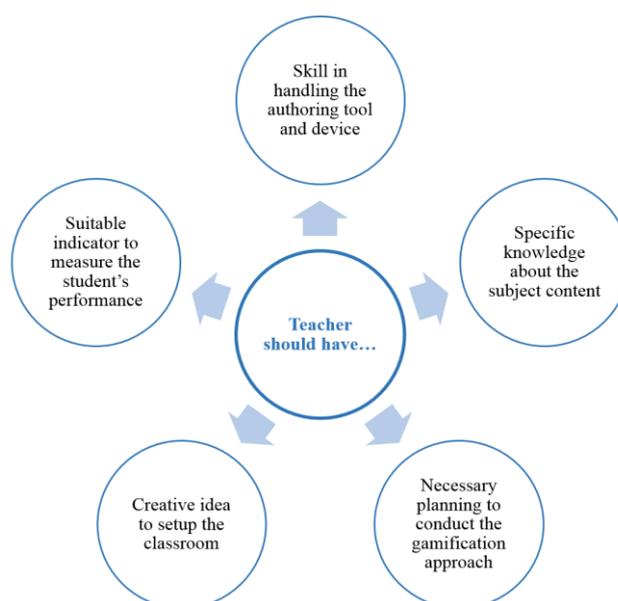


Figure 03. Five components to assist the implementation of digital games design activity

In light of the above findings, which parallel with others research findings, such as Moser's (2013) study, a Child-Centered Game Development approach, which is part of gamification could be made more effective, as well as entertaining, using digital games design activity as part of its learning activities. This

approach could positively complement the pedagogy practiced by teachers. Thus, teachers need more practice and exposure to such learning activities such that they could become competent and creative, ideally surpassing their students' skills and creativity (Neo & Neo, 2013). In this 21st century, teachers are compelled to strike a delicate balance among important aspects of learning (i.e., learning contents, pedagogy, knowledge, and technology), so that learning occurs efficaciously.

6.2. The suitability and implementation of digital games design activity in the classroom can be enhanced with a proper teaching preparation planning guideline

Based on the interviews with two teachers, who acted as silent (passive) observers, the digital games design activity was found to be interesting, unique, and appropriate for the participants, who at the mean age of 10 years were primed to learning through all sorts of games. Candidly, the first teacher contended that learning activity using tablet should be implemented in school subjects such as English, Bahasa Malaysia and Science. Nonetheless, she cautioned that deploying such learning approach entails teachers to select relevant topics, in which not only students' creativity and skills could be enhanced but the use of technology in learning could be heightened further. From the implementation perspective, the teachers believed that all the participants had the necessary knowledge and skills in using tablets. At this level of expertise and experience, the participants had no major problems in completing the activity using tablets in the classroom.

However, the second teacher harbored a strong opinion that educators should first develop a strong interest and acquire adequate competency in using tablets and digital games before contemplating to adopt the games-based approach in their teaching. He also added that educators should be brave enough to use the tablet and to learn the concept of digital games design before applying them in the classroom. As reinforced by the findings of interviews, the teachers were deemed ready and capable in integrating technology in their teaching process. Their readiness and capabilities would provide educators with the opportunity to diversify their teaching styles, which may include the use of digital games design activity as one of the teaching approaches.

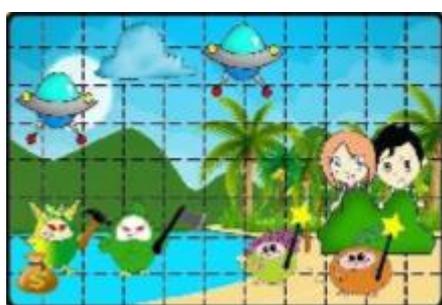
In this regard, teachers need to be bold and smart in trying to diversify their teaching strategy. Using such diversified strategy, students can acquire knowledge with greater ease and they too can become highly motivated to learn. To implement such a gamification approach, teachers can use several well-established instructional models, including Game Making Pedagogy (Cheng, 2009). With this model, teachers will be able to develop appropriate and systematic teaching schemes, which when applied will help create effective learning settings. In view of the importance of a sound teaching strategy, the researchers propose a teaching preparation planning guideline to guide teachers in implementing digital games design activity. Table 02 shows the proposed guideline by which such learning activity can be carried out systematically in the classroom.

Table 02. The procedure of the digital games design activity in classroom

Step (Duration)	Activity content	Proposed teaching and learning activity
Induction set (20 minutes)	Introduction to digital games authoring tool	<ol style="list-style-type: none"> 1. The teacher introduces several digital games for educational purposes to his/her students. 2. The teacher inquires his/her students about their experiences in playing digital games. 3. The students share their experiences and knowledge in digital games. 4. The teacher relates the learning topic with digital games design activity and states the intended learning objectives after the completion of the teaching and learning process.
Tutorial (45 minutes)	Exposure to games development authoring tool and tablet	<ol style="list-style-type: none"> 1. The teacher introduces the interfaces, icons, features, and functions of the games development authoring tool, which are vital in the design process. 2. The teacher provides some examples of or demonstrates the correct use of the authoring tool using a tablet in developing a digital games design. 3. The students explore the use of the authoring tool using the tablet.
Activity (60 minutes)	Digital games design activity	<ol style="list-style-type: none"> 1. The teacher divides the students into small groups and assign each group with a task to produce an educational game based on a learning topic. 2. The students in each group perform brainstorming to find the appropriate design. 3. The students are designated with specific roles in carrying out the design process. 4. The teacher acts as a facilitator to monitor the activity performed by the students throughout the whole session. The teacher will also help students who face technical problems related to the authoring tool and tablet.
Evaluation (10 minutes for each group)	Presentation of the digital games design output	<ol style="list-style-type: none"> 1. The members of each group present their digital games design output to their teacher and friends. 2. The students ask questions, exchange ideas, and provide suggestions to further improve their designs. 3. The teacher provides constructive comments, recommendations, and distributes the marks of their designs based on a rubric or a checklist. 4. The students exchange their designs with others and test such designs accordingly.
Close (20 minutes)	Reflection	<ol style="list-style-type: none"> 1. The teacher summarizes the learning outcomes based on the digital games design activity performed. 2. The students share with friends the learning output achieved after performing the digital games design activity. 3. The teacher commends the efforts made by the students in developing their designs. 4. The teacher encourages and motivates the students by presenting them with token gifts or presents.

6.3. The implication of game design activity in the classroom environment

Based on the observation of the participants' designing activity, the researchers found that the design produced by each group contained all the necessary storytelling and games elements. Commendably, each design had its own uniqueness in terms of realistic display and discernible storytelling shown in Figure 04. This accomplishment was not only unexpected but also laudable given that the children were mere players before engaging in such activity. Amazingly, against all expectations, they became good designers as evidenced by their skills, creativity, and talent in producing good digital games. To add credence to this finding, the interviewed teachers strongly opined that the use of tablet in the designing activity had made their students more skilful and competent. Furthermore, these teachers believed that diversifying the teaching method, especially with the use of technology, could attract students to focus on their learning.



On one beautiful evening, Mail and Syila came to a beach to swim. Suddenly, two bad aliens came down to earth and steal their money. Fortunately, two good aliens came and try to save them. The aliens fight until the bad aliens died because good aliens have magic wand. Mail and Syila say thanks to good aliens for their kindness. The good aliens go back to their planet using their spaceship.

Figure 04. Digital game design of Group 3

Nonetheless, these teachers asserted that guidance and support from educators were still important and not to be downplayed to guide their students to achieve the desired learning objectives. In this respect, educators should play the role of facilitator in this gamification approach. Based on the above promising findings, the researchers could confidently vouch the huge educational potential of using the tablet in designing activity, in which the learning process that is taking place could improve children's knowledgeable, skills, and creativity. Moreover, designing activity not only can serve as part of the learning activity but also can become an effective training platform to help children become good digital designers in the future (Earp et al., 2014).

This study highlights a new perspective with which a learning approach based on digital games can be applied using appropriate technology in the classroom. Using gamification, children will benefit from digital games design activity in which they can attain the highest cognitive development level of the Bloom's cognitive taxonomy – creating (Churches, 2009). By engaging in such design activity in a collaborative learning context, children become critical and creative thinkers. With such improved minds, they will be able to formulate new, novel solutions in solving problems. Thus, children should be given every opportunity available to help them develop their intellectual ability. Such learning approach can help nurture a new generation of children (aptly called digital generation) that is highly skillful, creative, innovative, and competitive —traits that are important in the 21st century learning. Likewise, teachers too can benefit from the learning approach using digital games design activity. With such learning approach, they will be able to diversify their teaching in a number of ways to improve students' cognition. By applying such diversified teaching strategy, teachers can improve their creativity, skills, and competency as they can assume multiple roles, such as a facilitator or a mentor, in the teaching and learning process. This

diversification of roles entails teachers to plan their teaching method carefully in which the process of teaching and learning can transpire meaningfully, thus leading to the fulfilment of the learning objectives.

In this study, the researchers found that digital games design activity had a huge impact on the participants' learning performance. This main finding can be explained from the relevant theories, namely the constructivist learning theory (Papert & Harel, 1991) and children cognitive development model (Piaget, 1964). Cognitively, the participants were at the concrete operation stage in which they were able to think critically and creatively. Together with the constructivist learning approach, they were able to work in team in carrying out the learning activities effectively as they could share and scaffold one another, thus leading to a successful collaboration.

In today's learning paradigm, students are expected to learn by interacting with their peers and teachers using appropriate technologies. This learning approach will become a common trend in many nations across the globe as technology becomes persuasively pervasive in the society, affecting a wide spectrum of peoples, especially children. With constant and persistent exposure to technology, children become astute and articulate in using all sorts of novel learning tools. Inevitably, their technological exploits will make them more skillful and experienced, thus making the transition from mere players to serious designers of digital games a smooth process. This contention is not a pipe dream as such transformation has been taking place gradually, as attested by a number of research findings (Baytak et al., 2011; Howe, 2012; Kafai, 1995; Prensky, 2008).

7. Conclusion

This study highlights the imperative to adopt a new learning paradigm by emphasizing the integration of gamification in education. The effort to use such a learning approach has to start now as learning in the new millennium poses new challenges and demands. In all probability, there is a need to revise or reform the current thinking concerning the learning theories, learning styles, and teaching techniques so that they become more relevant to the 21st century learning. As demonstrated in this study, new technologies, such as digital games, can exert a tremendous impact on the learning process. Used in a proper learning context, digital games can help create a learning environment that is not only efficacious but entertaining as well. From the instructional design perspective, a gamification approach can provide the opportunity for students and teachers to implement design activity in their learning and teaching practices, respectively. Through these activities, students can become motivated, independent, and creative in solving problems. Overall, this study demonstrates that embedding digital games design activity into the learning process will be able to create a learning environment that helps improve students' knowledge, skills, and motivation to learn.

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