Beyond Distraction: Developing Gamified-Smartphone for Active Learning-Teaching through DACDUA Philosophical Model

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DOI: 10.18355/XL.2025.18.03.10

Abstract
The paradigm of learning-teaching has been significantly altered by the incorporation of smartphones into the classroom, which offer interactive learning-teaching techniques, real-time access to information and feedback, and collaborative opportunities. It does, however, also address other issues, such as a loss of academic focus and potential disturbances to the learning-teaching process. Therefore, this research develops a gamified smartphone learning-teaching application model based on the DACDUA (Define, Analyze, Classify, Design, Utilize, and Assess) philosophical model towards learners' participation in the learning-teaching process. This research employs mixed-methods research design, combining qualitative data and quantitative data to develop a learning-teaching application and to evaluate and reflect learners' participation in the learning-teaching. This research, conducted across nine universities in Indonesia with diverse geographical and governmental statuses, as well as state, private, and religious/non-religious affiliations, proves that the gamified smartphone within the DACDUA model significantly engages learners' participation. The DACDUA systematic model aligns with the objectives of learning-teaching, and it can be designed to meet the diverse needs of learners. This study highlights the role of gamification components in promoting active learning-teaching. Thus, this research recommends further scholars to investigate learners' academic performance, motivation, perception, and the enrichment of philosophical values in the implementation of DACDUA gamified smartphones in the learning-teaching process.
Key words: smartphone integration in education, gamified smartphone, DACDUA model, learners' participation, active learning-teaching

Introduction

The rapid advancement of technology, including the internet and smartphones, has revolutionized people's point of view. It indeed influences how they see the world. Pew Research Centre (2024) reports that internet use in South Korea is the highest in the world, with 99% of users having access to the internet, compared to 96% with less education and 99% with more education. Meanwhile, internet use in Indonesia is 78%, with 68% of the population having less education and 93% having more education. Furthermore, a 2025 report by demandsage.com states that smartphone users are divided by age, with 18 to 29 year-olds being the most dominant users at 97%, similar to those aged 30 to 49 year-olds, who are at 89%, and those aged 50 to 64 year-olds at 76%, and those over 65 year-olds at 76% (Kumar, 2025). These data indicate that the Gen Z and Millennial generations are the most frequent users of smartphones, with usage ranges of 5 to 6 hours in 48% of users, more than 6 hours in 18%, and 3 to 4 hours in 22%. In terms of digital media usage, 94% of smartphone usage is primarily dedicated to gaming. Surprisingly, Indonesians spend the most time on their smartphones daily, with 6.05 hours, followed by Thais (5.64 hours) and Argentinians (5.33 hours) in 2025 (Backlinko Team, 2025: https://backlinko.com). Although Indonesia is not the most internet-user country, its inhabitants are among the most smartphone users. Negatively, the Digital Civility Index (DCI) by Microsoft released survey results from 2020 to 2021, stating that Indonesia ranks 29 out of 32

countries surveyed in terms of digital civility and moral ethics, with a score of 76, which is also the score of Mexico, which ranks 30. Indonesia is often regarded as the most disrespectful and uncivilized country in Southeast Asia (Voice of America Indonesia, 2021: www.voaindonesia.com; Microsoft, 2021: www.news.microsoft.com; CNN Indonesia, 2021: www.cnnindonesia.com; Kompas.id, 2021: www.kompas.id). Therefore, it is urgent to facilitate learning-teaching based on technological usage, viz. the internet and smartphones, by adopting philosophical values.

Since technology, such as the internet and smartphones, is being used as a key source for knowledge transformation in the digital age, their integration into the educational sector has fundamentally altered the conventional learning-teaching paradigm. It provides teachers and learners with instant access to a wealth of information from around the globe, offering them dynamic, real-time feedback and learning-teaching materials. To date, numerous scholars have conducted research on technological advancements, including the internet, smartphones, and gamification, as well as their impact on education. Some studies discover how gamified learning-teaching smartphone applications and virtual reality enhance learners' motivation, engagement, and achievement in some contexts, e.g. education, business, language learning, medical training, and endodontic with virtual reality (Ricoy et al., 2022; Phuong et al., 2023; Aponso et al., 2024; Prasad et al., 2023; Teo et al., 2024; Goncharuk-Khomyn et al., 2025; Grávalos-Gastaminza, 2022). Phuong et al. (2023) and Teo et al. (2024) emphasize that teachers' learning-teaching quality, the availability of technology, and learners' perceptions influence the effectiveness of utilizing gamification in the learning-teaching processes. Similarly, gamified smartphone usage in learning-teaching for Gen Z enriches learners' technological literacy while also presenting other negative aspects, such as smartphone addiction, health risks, and impacts on academic performance (Elosua et al., 2023; Peterson, 2024; Stephens, 2024; Singh & Pathania, 2022). Furthermore, Darwin et al. (2025) suggest the use of a hypno-learning-based smartphone application in Mandarin language learning-teaching. This research demonstrates the potential to enhance learners' concentration, focus, and memory retention. Therefore, this research recommends the integration of gamification and artificial intelligence towards effective and enjoyable learning-teaching. In short, earlier studies explore the trend of digitalization in education to globalize access, improve interactivity, unlock pedagogical innovation through technology, and develop gamified smartphone applications for learning-teaching. Therefore, this current research aims to build upon and complement previous studies by creating a gamified smartphone application to enhance learners' participation in learning-teaching, utilizing the DACDUA philosophical model. This philosophical model is considered a new framework or approach, as it encompasses not only motivation, achievement, concentration, literacy, and memory but also emotions, spirituality, attitude, and social aspects, all based on the philosophical values involved in learning-teaching. It is urgent indeed to do since Indonesian smartphone users are considered as the most disrespectful and uncivilized internet citizens.

The Study Framework

Gamified Smartphone in Learning-Teaching

Gamification in learning-teaching, fundamentally, refers to a system that incorporates game-like features to enrich learners' participation and motivation, thereby improving retention rates (Kasurinen & Knutas, 2018). Furthermore, Baptista and Oliveira (2019) acknowledge gamification as the use of game-designed features that support learning-teaching processes within the educational context. It can be in online and offline forms or digital and non-digital forms as long as it utilizes game elements in the context of non-game or educational applications. According to Dahalan et al.

(2024) and Huber et al. (2024), games have been utilized as a teaching technique for several reasons. Gamification, or game-based learning, is growing faster in educational contexts nowadays. Being attentive and involved can significantly enhance a learner's learning experience. Both online and offline, as well as digital and non-digital games can be beneficial for education, training, and learning-teaching. It is used in learning-teaching since it provides playful learning and safe spaces for graceful failure—all of which are essential for learning through games because they let players, in this case, learners, learn from their mistakes through teachers' feedback and advice, and encourage them to keep practicing until they feel comfortable because it also provides challenges, levels, scores, and leaderboard that learners can assess.

Philosophically, the purpose of gamification can differ depending on the context and use. Gamification in non-educational contexts typically aims to provide entertainment or present serious challenges to its users. While gamification in the context of education or learning-teaching, in addition to providing entertainment, also aims to increase learner motivation and participation in learning, not just in non-educational games. In addition to increasing learner motivation and participation, gamified learning-teaching also aim to develop specific skills in learners within an academic context (Li et al., 2024; Zafar, 2024). Furthermore, Li et al. (2024) assert that gamification does not involve the development of game products but rather the application of game elements to motivate participants' behavior in non-game contexts. The view of Li et al. (2024) tends to be in line with this research, which also utilizes game features in learning-teaching, such as challenges using Bloom's Taxonomy, except that the study, in addition to discovering the participation and strengthening of philosophical values of learners' character in learning. This research also develops a gamified smartphone-based learning-teaching product using the DACDUA philosophical model approach.

Participation in Active Learning-Teaching

Participation in learning is the active involvement of learners both cognitively, mentally, emotionally, physically, and behaviorally in the learning-teaching process, which aims to support the achievement of learning goals in general, such as learner academic competence (Bond & Bedenlier, 2019; Fredricks et al., 2004; Anderson et al., 2020). Participation encompasses various aspects, including learners' ability to engage in the discussion process in class, answer questions posed by peers or the teacher (Dubovi, 2022), complete assignments both individually and in groups, and contribute actively in every lesson. Additionally, participation can also mean attending every subject and learning session that takes place. Participation in this study can be interpreted not only as a means to improve learners' academic competence but also as a learning-teaching process that involves learners actively and teachers in the learning-teaching process, utilizing gamified smartphones developed using the DACDUA philosophical model approach. Learner participation in this study is measured using five primary indicators: cognitive engagement, emotional engagement, behavioral engagement, social interaction, and technological engagement.

In this research, cognitive and emotional engagement refers to a psychological situation where learners are emotionally motivated to understand and apply the subject they have learned. Behavioral engagement refers to learners' actions that can be examined, such as attendance, participation, task completion, and obedience to instructions, which function as indicators of active engagement and academic achievement (Finn, 1993; Fredricks et al., 2004). These indicators are influenced by both intrinsic and extrinsic factors, including pedagogic strategies, class environment, and interaction between other learners and the teacher (social engagement), which together create a cooperative and productive learning-teaching environment (Reeve,

2012). Significantly, behavior engagement plays a role as a connector between cognitive and emotional engagement by translating internal motivation and emotional state into a genuine academic attitude (Wang & Eccles, 2012). In the context of modern education, mainly supported by technology (technological engagement), they are increasingly influenced by accessibility and the use of digital learning-teaching tools that support and facilitate learner participation (Sana et al., 2013). Those five indicators underscore the multifaceted character of learners' participation and highlight the significance of teachers in accommodating all these aspects to optimize educational outcomes.

DACDUA: A Philosophical Model in Learning-Teaching

DACDUA—Define, Analyze, Classify, Design, Utilize, and Assess—a model developed by researchers — is a comprehensive framework in educational design that merges a primary methodology to create a holistic learning-teaching approach (Juhansar, 2024; Juhansar et al., 2024). This model integrates four approaches and/or designs. To begin with, Research and Development (R&D) models such as ADDIE (Analysis, Design, Development, Implementation, and Evaluation) and 4D (Define, Design, Develop, and Disseminate) provide a structured process for curriculum development and instructional design (Branch, 2009). Subsequently is CAR (Classroom Action Research) (Kemmis & McTaggart, 2005). This research design is employed to investigate the activities, motivations, situations, and learning outcomes of learners. This design is implemented in a cyclical manner, consisting of a minimum of two cycles, depending on the achievement of learning objectives. Each cycle in its implementation always begins with planning based on the problems to be overcome. After the planning is considered mature and philosophically sound, the problem can be solved. Then, action is taken. During and after the learning process, the research team and/or teacher also conduct observations. Teachers or researchers reflect on the three stages that have been carried out to assess learning achievement, as well as the creativity and innovation that need to be implemented in the next cycle. The four stages are referred to by researchers as PAOR (Planning, Acting, Observing, and Reflecting).

Afterward is Bloom Taxonomy. This approach is a hierarchical structure or conceptual philosophical framework that aims to classify the thinking skills to be achieved in learning-teaching. In general, this framework is grouped into two parts, namely LOTS (Lower Order Thinking Skills), which includes the ability to remember, understand, and apply learning-teaching materials, and HOTS (Higher Order Thinking Skills), which is the ability to analyze, evaluate, and create something new based on the learning materials that have been obtained (Anderson & Krathwohl, 2001). Bloom's Taxonomy is used as a systematic framework to define, analyze, classify, design, utilize, and assess a learning-teaching process. The last is philosophical construction. This philosophical dimentions includes three main elements namely, ontology, epistemology, and axiology. These elements aim to understand the existence of knowledge, how to obtain knowledge, and the values or meaningfulness of knowledge in learning-teaching. In addition to the cognitive outcomes to be achieved in learning, aspects of ethical and moral values also need to be strengthened (Noddings, 2013; Aguas, 2024). The integration of these four designs and/or approaches creates a new philosophical framework, model, or approach in learning-teaching, research, and community service.

Research Method

This present research employs a mixed-methods approach based on the DACDUA philosophical model, which combines qualitative and quantitative data to develop a gamified smartphone application for evaluating and reflecting learners' participation

in learning-teaching. This research was conducted across nine universities in Indonesia, with diverse geographical and governmental statuses—encompassing both state and private institutions, as well as religious and non-religious backgrounds. Data were collected through observation, interviews, and literature studies. The observation was conducted as a preliminary study in the classroom during learning-teaching processes to determine whether learners used smartphones or not. The interview aims to gather data on smartphone usage in the school and obtain input and feedback from experts on the topic of gamification. A literature review was conducted to identify previous studies on the integration of technology into education and to identify gaps in this research. Meanwhile, quantitative data were collected through surveys using questionnaires to examine learners' participation in learning-teaching through DACDUA gamified smartphones. The participation questionnaire has five indicators: cognitive engagement, emotional engagement, behavioral engagement, social engagement, and technological engagement. Each indicator has four dimensions (see Table 1), which are written in positive statements in the questionnaires. Qualitative data were analyzed thematically, while quantitative data were analyzed using a Likert scale by scoring learners' responses. The score has four levels: 4 (strongly agree), 3 (agree), 2 (disagree), and 1 (strongly disagree). The respondent's score of each statement item (dimension) is summed to obtain the mean score.

Results and Discussion

The Work of DACDUA in Developing Gamified-Smartphone Application

DACDUA (Define, Analyze, Classify, Design, Utilize, and Assess) is a philosophical approach to this research with two primary goals. The first is to establish a fundamental framework for developing gamified smartphone-based online learning-teaching media that integrates strengthening national character values. The second is to improve and reinforce learners' participation in learning-teaching through a gamified smartphone model. The goals are co-related to rapid technological advances. Therefore, a teacher is required to be more creative, innovative, and adaptable in developing technology-based interactive learning-teaching media that not only enhance the academic competence of learners but also boost their motivation and participation in the learning-teaching process. The DACDUA approach is a systematic and holistic method for achieving targeted learning-teaching goals. This approach or model has six systematic phases of developing learning-teaching media, including Define, Analyze, Classify, Design, Utilize, and Assess, as shown in Figure 1:

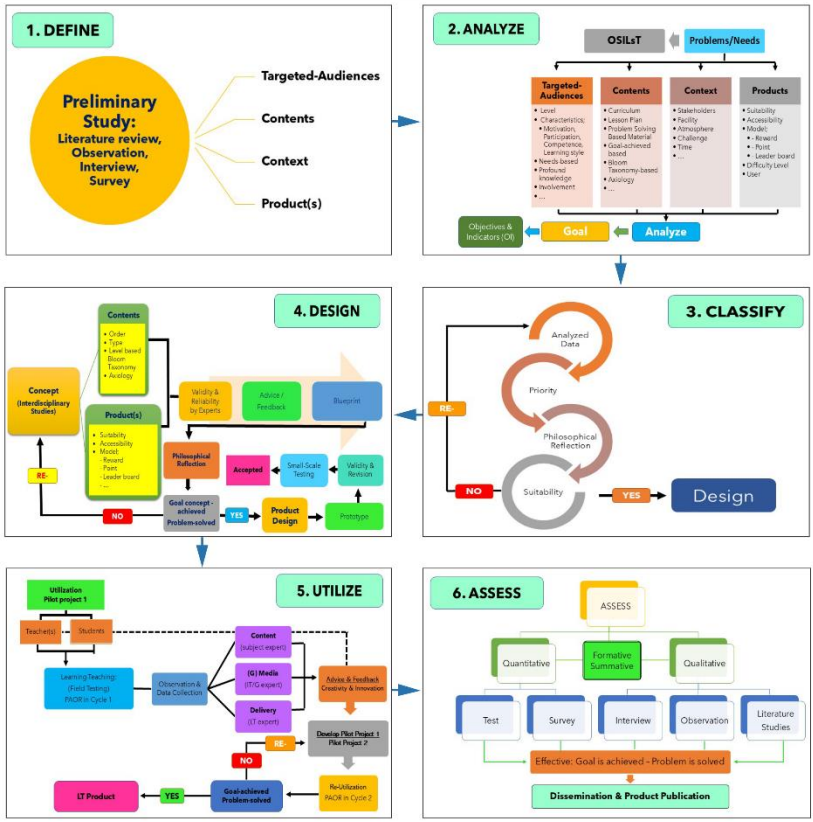


Figure 1 The Work of DACDUA Philosophical Model

Figure 1 illustrates the philosophical model of DACDUA, which outlines six necessary phases for researchers to develop a smartphone-based learning-teaching application that promotes active learning and enhances learners' participation in the learning-teaching process. The first phase is ***Define***. At this phase, researchers conduct preliminary studies through literature reviews, observations, and interviews to define the target audience, context, content, and product for solving a problem. This phase is conducted to philosophically confirm how the product to be developed relates to the issues that occur, including its alignment with the philosophical values. The second phase is ***Analyze***. At this phase, the researchers conduct an in-depth philosophical analysis related to the results defined in the prior phase. At this phase, problems, needs, focus, and learning-teaching goals are formulated. Data that have been collected at the earlier phase are radically and partially analyzed to know the needs of each aspect, for example, the target audience in which the researchers must confirm the related elements to that aspect such as learners' level, characteristics, motivations, engagement in the learning-teaching and the sort of. The same things happen to aspects of content, context, and products. All need to be analyzed to achieve the learning-teaching goals. All actions are conducted to confirm that the goals are formulated based on real problems faced by learners in the learning-teaching process.

The third phase is ***Classify.*** This phase is the continuation of the two earlier phases. The researchers at this phase are tasked with classifying problems and learning-

teaching focuses that are intended to be solved and achieved. This phase is conducted to ensure that the gamified model-based learning-teaching media are not too extensive in terms of content and context. In addition, at this phase, the concept, content, and learning-teaching media are classified based on the complexity of the goals to be achieved and the types of thinking skills required. Bloom's Taxonomy (Anderson & Krathwohl, 2001) serves as the philosophical framework for formulating the complexity of the goals specifically. The thinking skill complexity, according to Bloom's taxonomy, is categorized into two primary levels: the first is LOTS (Lower Order Thinking Skills), or low-level thinking skills, including phases such as memorizing, understanding, and applying concepts. The second is HOTS (Higher Order Thinking Skills), which encompasses high-level thinking skills, including three phases: analyzing, evaluating, and creating. In the context of this research, Bloom's taxonomy plays a crucial role in developing a gamified smartphone-based learning-teaching application model, as its classification serves as the foundation for the complexity and accuracy of the learning-teaching application that is being developed.

The next phase is ***Design***. As the continuation of the three previous phases, this phase is complex because it encompasses aspects necessary for developing a model of gamified smartphone-based learning-teaching materials. The central concept highlighted in this phase is the interdisciplinary study concept, which underscores the urgency of collaboration among various disciplines of study to develop learning-teaching approaches that achieve the established goals. This phase has two primary aspects, viz., content and product. Both aspects must undergo validity and reliability tests conducted by experts before the blueprint for a smartphone-based learning-teaching application or media is created. At this phase, a philosophical reflection is undertaken to determine whether the blueprint created can serve as a solution to the problems previously elaborated. When the goals are considered achievable, the product design begins. The product design must undergo a validity and reliability test again before small-scale testing is conducted. This phase is crucial for confirming that the learning-teaching content and gamification features contribute to strengthening learners' participation in learning-teaching, in addition to achieving other goals.

The fifth phase is ***Utilize.*** At this phase, researchers implement a smartphone-based, gamified learning-teaching application in the learning-teaching process. In the implementation, the researchers employ an action research approach that involves at least two cycles, allowing them to test the effectiveness of the learning-teaching process. It depends on the goals of research that are going to be achieved. Each cycle has four urgent elements viz., Planning, Acting, Observing, and Reflecting (PAOR). This implementation differs from the small-scale testing phase that was conducted during the *Design* phase. The implementation at this phase has more extensive audience coverage. At this phase, researchers or teachers can redevelop the product by applying creativity and innovation when the target goals mentioned in Figure 1 have not been achieved. The result of this fifth phase is then evaluated and reflected upon philosophically in the final phase. The final phase is ***Assess***. This phase can be conducted through various ways, both qualitative and quantitative. It depends on the goals to achieve or the problems to solve. This phase is not only to determine whether the learning-teaching goals have been achieved but also to assess whether the issues formulated in the previous phases have been resolved. This research confirms that a learning-teaching goal, specifically the increase in learners' participation in learning-teaching conducted through gamification-based smartphones, is met. Hence, it requires follow-up research to examine other aspects, such as competition, motivation, character value strengthening, and the effectiveness of test applications, among others.

Developing Gamified-Smartphone Application for Active Learning-Teaching

Generally, the earlier studies indicate that the use of the gamified-based learning-teaching application can improve academic competence and motivation—in addition to other aspects of learning-teaching (Golshah et al., 2020; Mutiaraningrum & Nugroho, 2021; Kim & Yeon, 2021; Iquira et al., 2019; Ahmed et al., 2019). In this research, before developing a smartphone-based learning-teaching application, the researchers conduct preliminary studies through interviews and observation. Initial studies indicate that smartphones have become common in classrooms—although they have positive impacts, as stated previously—they may also become a source of distraction in the learning-teaching process. In this context, smartphones tend to be misused by learners during learning sessions. When teachers explain the material, however, learners focus on operating their smartphones, which are unrelated to the learning-teaching instructions, and they often disobey the ethics (Aguas, 2013) of the learning-teaching process itself. Consequently, their academic concentration and attainment decrease, class management is not controlled, and the actualization of ethics and character values becomes more worrisome.

Furthermore, some teachers' learning-teaching strategies continue to rely on conventional approaches that are typically teacher-centered. Despite their benefits, some learners find traditional approaches to be outdated. Their methods, particularly those of Gen Z, are viewed as irrelevant, which lowers their enthusiasm and involvement in the educational process. To address these issues, a teacher must be able to think creatively, innovatively, and adaptively. The development of smartphone-based learning-teaching applications may become an alternative, as learners often use their smartphones to access content unrelated to the learning material during their learning process. Gamified smartphone-based learning, a learner-centered approach, is considered capable of providing a broader, more interesting, interactive, and flexible learning experience with no boundaries of space and time (Naveed et al., 2023; Razzaq et al., 2019). Meanwhile, the data from interviews with the same kind of application developers also indicates the urgency of the target audience, content, context, product, and goal of learning-teaching adjustment with essential elements in the game such as leaderboard, challenges, leveling, quiz, and etc., can improve learners' enthusiasm in smartphone-based learning-teaching (Interview, JS, 2024). Gamification is the use of game elements to stimulate learner engagement in learning-teaching, resulting in positive learning outcomes. The development of a learning-teaching application using the DACDUA model, smartphone-based gamification, in this research, thus, refers to adding game features such as registration dashboard, login, learning material, quiz, level, challenges, leaderboard, etc., in smartphone-based learning-teaching that are installed in each smartphone of the learner to be able to learn independently, actively, and responsibly.

The DACDUA model (Define, Analyze, Classify, Design, Utilize, and Assess) is philosophically a framework for systematic, holistic, and iterative thinking, as its process involves development phases that incorporate philosophical elements. The phases are arranged in an orderly manner, from definition to philosophical evaluation and reflection on the learning-teaching process that has been, is being, and will be conducted. In the context of developing a gamified smartphone learning-teaching application, the elements of the application, including game features, are formulated based on the user needs identified through the results of preliminary studies conducted previously. In this research, the development of a smartphone-based learning-teaching application emphasizes the learners' engagement aspect in learning-teaching, which is followed up with other elements, such as cognitive and affective competence, motivation, and character value strengthening, in advanced research. Then, the development of a gamified smartphone application is in the following Figure 2:

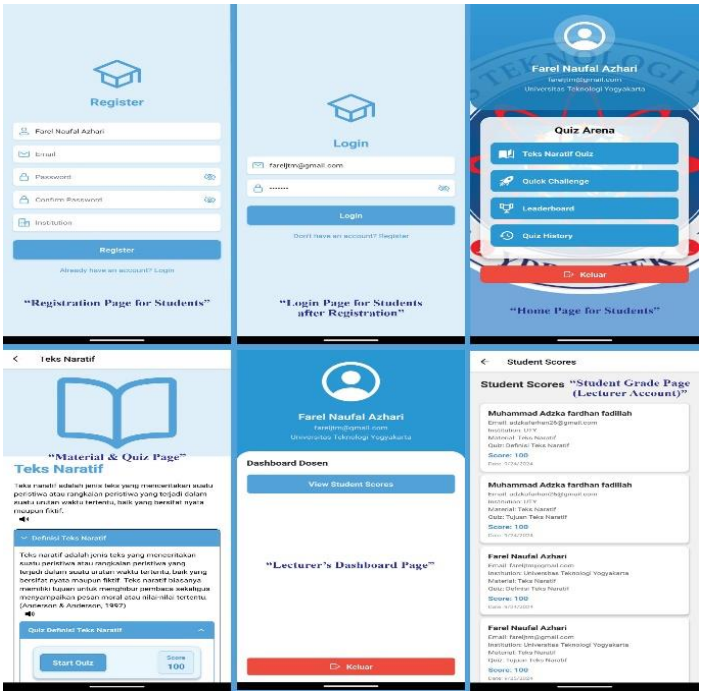


Figure 2 DACDUA Gamified-Smartphone Application Development

Figure 2, DACDUA gamified-smartphone model application development, shown above, indicates that there are at least six parts in the application. The six parts include the main dashboard, main arena, general scoring board, application safety management, learners-teacher accounts, and logout. The first is the main dashboard. This section is divided into two subparts: registration and login. It is recommended that teachers and learners register their names using their email addresses before logging into the service. In addition to safeguarding users' privacy and personalization, it aims to accurately record their data. Furthermore, registration enables users to direct, assess, and consider how to improve their learning-teaching, whether they do so independently or with the assistance of others. Users can log in using their registered accounts. Users can access the second section after logging in successfully.

The second part is the main application arena. Users can enter and observe this part after logging in. This section displays learning-teaching materials, challenges, a ranking board, and a quiz. Learning-teaching can be acquired independently and online beyond space and time. The learning-teaching materials, which include video, text, and interactive elements, consist of several levels, each based on Bloom's Taxonomy. It indicates that as the higher levels are reached, the material becomes more complex. Learners also cannot access level 2 if they do not understand the material of the earlier level. To measure the level of understanding of learners at each level, this application provides quiz features that learners must complete as a challenge to advance to the next level, much like a game. The challenge of each level is considered successful if learners can get a minimum of 80 points. At the sub-part of the leaderboard, learners can view their points and those of other learners. The points are not only based on the correct answers but also on the time duration required to

answer the questions. The leaderboard can become a motivator for learners to perform better by engaging more actively in both independent and guided learning. At the end of this sub-part, learners can view their quiz history.

The general scoring board is the third part. At this point—after all the learning material has been completed—learners take a summative quiz that summarises all the material provided in the smartphone-based learning-teaching application. This quiz aimed to assess the general capability that learners gain through gamified smartphone-based learning-teaching. All learners can view their and other scores, and teachers can provide feedback directly on the achieved results. The updated score is in real-time. It means that each learner who has taken the quiz can see their score directly, including the answers to the questions, whether correct or incorrect. In addition, learners can also interact directly with teachers online to have feedback on their work results. It is essential to encourage learners to actively participate in the learning-teaching process in addition to increasing their participation.

This application also features user management as the fourth part, making application management easier in an effective and structured way. This feature includes an admin dashboard and user management. Through the admin dashboard, users' content and monitoring can be controlled, including the adjustment of Bloom's taxonomy philosophy-based material and its feedback. Additionally, this subpart recommends the development of smartphone-based learning-teaching materials in a sustainable manner. User management, on the other hand, can be used to add, delete, and edit users' accounts based on their role, for example, teacher, learner, and admin. The fifth part is earners-teacher accounts. In this section, teachers can create and manage learning-teaching materials, administer quizzes, assess evaluations, and reflect on learners' progress, providing personalized feedback and support for learning-teaching. Learners, through their accounts, can access learning-teaching materials, challenges, and quizzes, receive feedback, and view their scores, as well as those of other learners. Logout, then, is the final part of the gamified smartphone application, designed to protect the data and privacy of each user.

Learners' Participation in Learning-Teaching through Gamified-Smartphone

To achieve the third goal of this research, namely the participation of learners in gamified smartphone-based learning-teaching, the researchers use five leading indicators as a measuring instrument. The first of those five factors is cognitive engagement, which includes learning strategies, motivation, information processing, and reflection. Interest, emotional connection, support, and engagement are the four components that make up the second category, emotional engagement. The third is behavioral engagement, which includes involvement, attention, active participation, and timeliness. The fourth is social interaction, which encompasses comfort with classmates, collaboration, relationships with lecturers, and participation in group activities. The last is technological engagement, which involves the use of digital tools, understanding of technology, involvement in gamification, and ease of technology use. Each dimension in the participation indicator is evaluated and analyzed using a Likert Scale, as described in Table 1.

Table 1 Learners' Participation in Learning-Teaching

No	Participation Indicators	Dimension	Likert Scale (%)				Participation	
			SA	A	DA	SDA	(+)	(-)
1	Cognitive Engagement	Motivation	50,8	47,6	1,6	0	98,4	1,6
		Information processing	12,7	85,7	1,6	0	98,4	1,6
		Learning strategies	12,7	77,8	9,5	0	90,5	9,5
		Reflection	14,3	77,8	7,9	0	92,1	7,9
						Mean	**94,8**	**5,2**
2	Emotional Engagement	Interest	28,6	69,8	1,6	0	98,4	1,6
		Emotional connection	15,9	73	11,1	0	88,9	11,1
		Support	28,6	66,7	4,7	0	95,3	4,7
		Engagement	30,2	66,7	3,1	0	96,9	3,1
						Mean	**94,9**	**5,1**
3	Behavioral Engagement	Punctuality	50,8	49,2	0	0	100	0
		Active participation	25,4	71,4	3,2	0	96,8	3,2
		Attention	33,3	65,1	1,6	0	98,4	1,6
		Involvement	33,3	65,1	1,6	0	98,4	1,6
						Mean	**98,4**	**1,6**
4	Social Interaction	Comfort with classmates	28,6	69,8	1,6	0	98,4	1,6
		Collaboration	12,7	85,7	1,6	0	98,4	1,6
		Lecturer relationship	25,4	68,3	6,3	0	93,7	6,3
		Group participation	20,6	74,6	4,8	0	95,2	4,8
						Mean	**96,4**	**3,6**
5	Technological Engagement	Digital tools use	36,5	61,9	1,6	0	98,4	1,6
		Technology understanding	38,1	61,9	0	0	100	0
		Gamification participation	15,9	84,1	0	0	100	0
		Technology ease	46	54	0	0	100	0
						Mean in Total	**99,6**	**0,4**
The Percentage of Learners' Participation in Learning-Teaching							**96,8**	**3,2**

Notation:

SA : Strongly Agree
A : Agree
DA : Disagree
SDA : Strongly Disagree

Table 1, which describes learners' participation in the learning-teaching process above, indicates that learners generally exhibit positive participation in learning-teaching using gamified smartphone model developed through the DACDUA approach. The average learner participation presentation proves that 96,8% of learners "agree" and "strongly agree" related to their participation in gamified-smartphone-based learning-teaching applications. On the other hand, only 3.2% of learners "disagree" and "strongly disagree" with the use of gamified smartphones in learning-teaching. This positive result aligns with other research findings, which indicate that in technology-based learning-teaching, 95% of learners participate actively and 96% are motivated, which learning-teaching technology has a positive correlation to learner participation so that the use of technology should be noticed (Gómez-Pablos et al., 2017; Chen et al., 2010; Kurniawan et al., 2020). Out of the five indicators of participation, technological engagement is a participation indicator that primarily determines the roles and involvement of learners in the learning-teaching process. It is proven with 99,6% positive responses and only 0,4% negative responses. The next indicator is behavioral engagement, which yields 98.4% positive responses and 1.6% negative responses. The lower indicators are social interaction (96.4% positive and

3.6% negative), emotional engagement (94.9% positive and 5.1% negative), and cognitive engagement (94.8% positive and 5.2% negative). The following subsection provides a more detailed explanation of each of the five signs.

Cognitive Engagement

Learners' effort in thinking about their assignments is addressed via cognitive engagement. To understand complicated ideas and become an authority on the subject matter, a conscious mental effort is necessary (Fredricks et al., 2004). To investigate learners' participation in gamified smartphone-based learning-teaching, researchers employed four statement items to assess learners' cognitive engagement in the education and teaching process. The statement items include motivation, information processing, learning strategies, and reflection. The descriptions and analyses related to the indicators are presented in Figure 3. This figure illustrates the percentage of engagement levels and learners' responses, categorized as both positive (strongly agree to agree) and negative (disagree to disagree strongly), related to the dimensions of cognitive engagement in learning-teaching. Additionally, the data provide an initial description of how learners respond to the four dimensions. The general percentage of learners' responses can help us understand holistically and radically the gamified smartphone-based learning-teaching patterns, thereby strengthening learners' cognitive engagement.

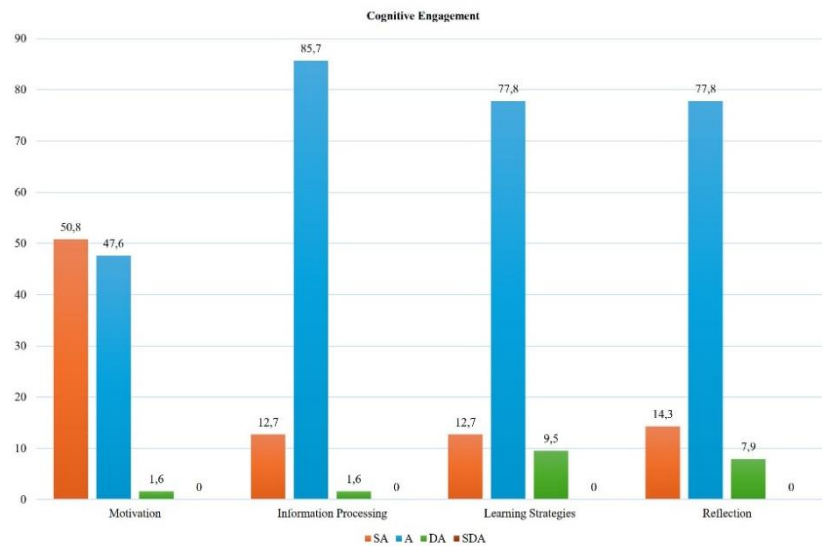


Figure 3 Learners' Cognitive Engagement in Learning-Teaching

The result of quantitative data analysis in Figure 3 illustrates that motivation becomes the most dominant dimension in learners' cognitive engagement. This is supported by 50.8% of learners responding "strongly agree", and 47.6% of learners responding "agree" that learners are motivated to understand gamified smartphone-based learning materials. It differs from the reflection dimension, which reaches 14.3% "strongly agree" and 77.8% "agree." Additionally, the information processing and learning strategy dimension has a percentage of "strongly agree" at 12.7%, "agree" at 85.7%, and "agree" at 77.8%. These data indicate that, in addition to the high motivation of learners to understand the learning material, learners often reflect, analyze, and process information, employing strategies in gamified smartphone-based learning-

teaching. Although learners overall have positive responses to the cognitive engagement aspect of learning-teaching, the dimensions of learning strategies and reflection require special attention. These results align with previous research, which indicates that although learners are highly motivated to learn, some still face difficulties in applying effective learning strategies, particularly those related to technology-based learning-teaching (Wu, 2023). Therefore, learners should not only have high motivation for learning but also be able to manage their time correctly and then process and reflect on the material they have learned.

Emotional Engagement

The second indicator used in this research to measure learners' participation in gamified smartphone-based learning-teaching is emotional engagement. This indicator has four dimensions, similar to the previous indicator, to assess learners' emotional engagement in the learning-teaching process. The dimensions include interest, emotional connection, support, and engagement itself. The elaboration related to this indicator is illustrated in Figure 4. This figure presents the percentage of learners' emotional engagement responses, categorized as both positive (strongly agree to agree) and negative (disagree to strongly disagree), related to the emotional engagement dimensions in learning-teaching. Furthermore, the data presents the overall perspective of learners' answers in all four dimensions. A thorough summary of the gamified smartphone-based learning-teaching patterns that aim to enhance learners' emotional engagement is provided by the percentage of learners' responses, as shown in Figure 4. Learners' emotional engagement makes a significant contribution to achieving the target learning-teaching results. Skinner & Belmont (1993) and Fredricks et al. (2004) emphasize the importance of sustainable emotional engagement in learning-teaching to achieve positive outcomes. This research indicates that learners' emotional engagement in gamified smartphone-based learning tends to be positive, as illustrated in the following figure 4.

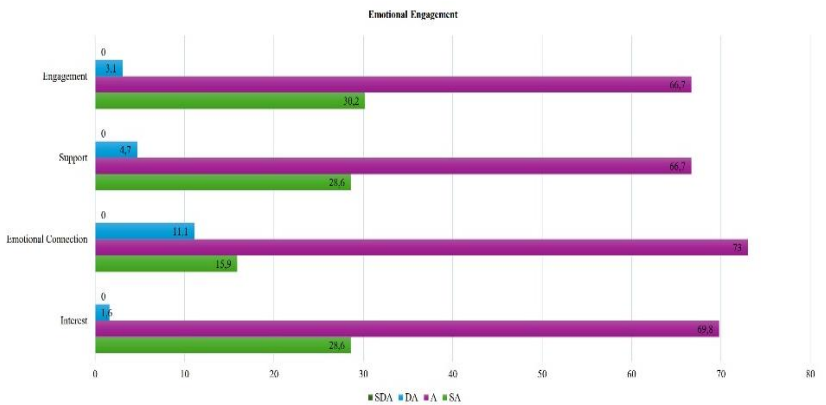


Figure 4 Learners' Emotional Engagement in Learning-Teaching

The data illustrated in Figure 4 reveals that the "strongly agree" response belongs to the engagement dimension, viz. 30.2%, followed by support and interest at 28.6% each, and then emotional connection at 15.9%. It shows that motivated learners should remain active in every session of learning-teaching that utilizes gamified smartphones, as they can learn independently and receive direct feedback on their progress. Besides, learners also feel supported by the environment and the learning-teaching provided media so that they are interested and pay great attention to the learning

material delivered through gamified smartphones. In line with this matter, Reeve (2012), Dubovi (2022), Pekrun (2014), and Taylor & Statler (2013) state that the environment, learning, teaching, and positive interaction can support the learning process to attain optimum results. The responses "agree" tend to choose emotional connection as the primary choice, with a percentage of 73%, and support and engagement as the last choice, with a rate of 67,7%. In general, learners' emotional engagement participation is considered in the positive category. This is demonstrated by the fact that just 5.1% of learners gave negative answers, whereas 94.95% of learners gave positive answers. This research emphasizes that, in addition to learning-teaching resources like gamified smartphones, learners' involvement in learning is greatly aided by engagement, support, and emotional connection.

Behavioral Engagement

Behavioral engagement, as defined by Fredricks et al. (2004), refers to the learner's attention and persistence in completing a task. Behavioral engagement is the third indicator used to measure learners' participation in gamified smartphone-based learning-teaching. This indicator consists of four dimensions, viz. punctuality, active participation, attention, and involvement. The explanations for these dimensions are illustrated in Figure 5. The figure illustrates the percentage of learners' behavioral engagement responses, categorized as both positive (strongly agree to disagree) and negative (disagree to disagree strongly), related to behavioral engagement dimensions in gamified smartphone-based learning-teaching.

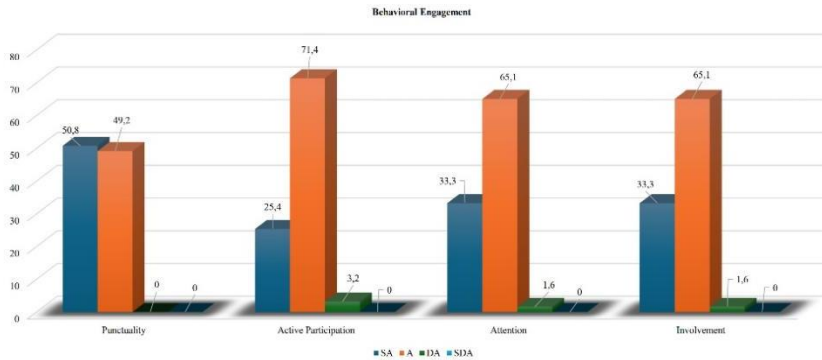


Figure 5 Learners' Behavioral Engagement in Learning-Teaching

The data in Figure 5 above indicate that learners have a high level of responsibility and commitment to attend classes that use gamified smartphones on time. This research result shows that 50.8% of learners respond, "strongly agree," and 49.2% respond "agree" when they consistently attend every session of learning-teaching, both independently and in guided settings. The results of the study align with those of previous studies, which demonstrate that the presence and active participation of learners in learning can enhance their academic abilities (Mikulecky, 2022; Cao & Li, 2020). The data in Figure 5 illustrates that learners' attention and involvement in learning have positive responses. This is demonstrated by 98.4% and 96.8% of learners who stated that gamified smartphones can attract their attention and stimulate them to be actively involved in every learning session. Active involvement in learning can facilitate learners to think critically and comprehensively.

Social Interaction

Social interaction is the attention and involvement of learners in the learning process. These interactions include interactions between fellow learners and interactions between learners and teachers as facilitators (Fredricks et al., 2004). Good social interaction among learners can have a positive impact on the learning process because learners feel comfortable without feeling burdened by carrying out all tasks or projects, both individually and in groups (Hurst et al., 2013; Kreijns, 2003). In line with these matters, this research also indicates that social interaction in learning-teaching plays a crucial role in supporting proper involvement, collaboration, and interaction among teachers and learners, as well as among learners. These data are illustrated in Figure 6.

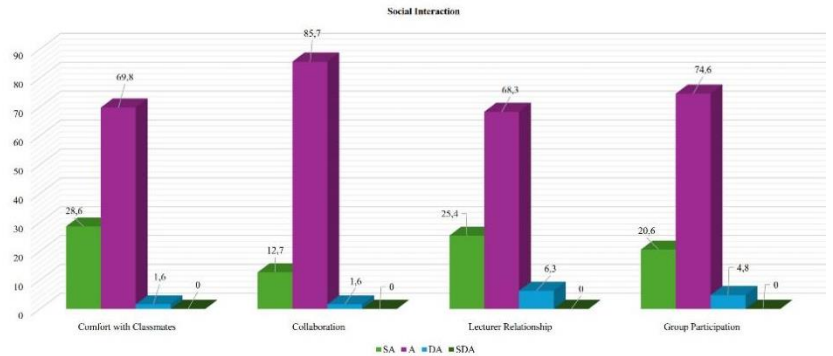


Figure 6 Learners' Social Interaction in Learning-Teaching

The data in Figure 6, which demonstrates learners' social interaction in learning-teaching, show that comfort with classmates and collaboration become key factors in supporting learners' participation in gamified smartphone-based learning-teaching. The quantitative data indicate that both dimensions have an average percentage of 98.4% of learners' positive responses and only 1.6% of negative responses related to those matters. Furthermore, there are, on average, 95.2 positive replies for the group engagement dimension and 93.7% for the teacher-learner interaction dimension. This study's findings are consistent with those of Zhang and Wang (2021) and Anderson et al. (2020), which demonstrate that group learning can enhance learners' academic proficiency, as well as their friendships, motivation, and comprehension. Therefore, in the philosophical context, these four dimensions must run in harmony to support the attainment of optimal learning-teaching. Teachers must position themselves not as facilitators but as "friends" of learners in discussions. Teachers must think critically and be prepared to receive criticism. Epistemically, teachers are not the only sources of knowledge in the learning-teaching process, especially in this digital era.

Technological Engagement

Technological engagement in this research involves the utilization of technology through gamified smartphones, based on philosophical values, to not only increase participation and academic competence but also to strengthen constructive motivation and character in learning-teaching. Therefore, technological engagement in learning-teaching in the digital age, such as the utilization of gamified smartphones based on a philosophical approach, becomes urgent to actualize. Previous research indicates that the use of TEST (Technology-Engagement Teaching Strategy) in learning-teaching

can increase learners' academic performance (Simelane & Mji, 2014). Additionally, this research reveals that technological engagement in learning-teaching can have a positive impact on learners' participation in gamified smartphone-based learning-teaching. It is shown that in Figure 7, earners' technological engagement, in general, the average of learners' response presentation to technological engagement in learning-teaching is 99,6% and only 0,4% negative responses to the four dimensions of technological engagement in learning-teaching, viz. digital tools used, technology understanding, gamification participation, and technology ease.

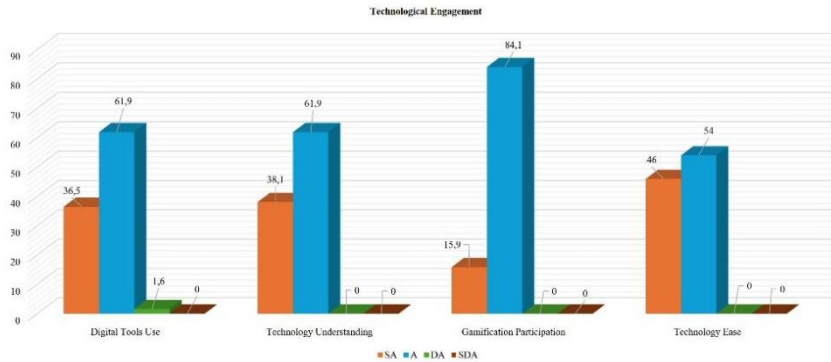


Figure 7 Learners' Technological Engagement in Learning-Teaching

The data in Figure 7 illustrates that only the first dimension, namely digital tool use in learning, receives a negative response of 1.6%. It reveals that before learners use technology in learning, such as gamified smartphones, they must be given a comprehensive understanding of that matter. On the other hand, three different dimensions — technology understanding, gamification participation, and technology ease — have received 100% positive responses. It suggests that learners believe technology can be effectively used in learning-teaching to help them understand the material and actively participate in gamification activities. They also feel assisted by the use of technology in learning-teaching, which helps ease the understanding of learning material, as provided by the features in the gamified smartphone application. This research aligns with previous studies, which reveal that technology integration in learning-teaching facilitates learners' involvement in meaningful learning through various resources and easy access, as well as supporting the current trend in e-learning teaching (Bond & Bedenlier, 2019; Venkatesh et al., 2022; Hurtado & Alvarez, 2022). However, one issue that is necessary to highlight is that learning-teaching are not only limited to competence enhancement and academic achievement but also to the strengthening of emotions, spirituality, attitude, and social aspects based on philosophical values in learning-teaching.

Conclusion

DACDUA is a systematic, radical, and holistic philosophical approach, framework, and/or model for application in learning-teaching, research, and community services. In this research, a philosophical-based model is used to develop a gamified smartphone application that encourages learners—"digital natives"—to participate in the learning-teaching processes. Through its six philosophical phases—Define, Analyze, Classify, Design, Utilize, and Assess—to enhance learners' active engagement in the cognitive, emotional, behavioral, social, and technological aspects of the learning-teaching processes, it ensures a flexible, relevant, and successful

paradigm for creating gamified cellphones. Furthermore, by integrating online game elements, such as levels, challenges, leaderboards, and quizzes that the teacher can oversee and administer, the creation of a gamified smartphone application promotes a learner-centered learning strategy. This research demonstrates that developing gamified smartphones through the DACDUA philosophical model has a positive impact on learners' participation in learning-teaching. Research data indicate that 96.8% of learners responded positively (strongly agree and agree), while only 3.2% responded negatively to the implementation of gamified smartphones in the learning-teaching processes. Meanwhile, this research has some limitations. It focuses solely on measuring learners' participation in learning-teaching through a gamified smartphone developed using the DACDUA philosophical model, despite this research involving nine universities across three main areas—Western, Central, and Eastern—of Indonesia. Therefore, this research recommends further investigation to explore learners' academic performance, motivation, perception, and the enrichment of philosophical values through the implementation of DACDUA gamified smartphones in the learning-teaching processes.

Acknowledgement

This journal article research and publication are fully funded by the Ministry of Higher Education, Science, and Technology of the Republic of Indonesia through the 2024 National Competitive Research Grant under the Fundamental Regular Scheme. This research is initially entitled "*Pengembangan Aplikasi Pembelajaran berbasis Gamified-Mobile Model Guna Meningkatkan Motivasi, Partisipasi, Kompetensi, dan Karakter Mahasiswa melalui Pendekatan DACDUA*". The authors express their sincere gratitude for the funding support, which played a crucial role in facilitating the successful execution and dissemination of this research and publication. Indeed, the authors also declare that this article uses Grammarly for language editing and grammar correcting.

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Words: 8875
Characters: 67 821 (38 standard pages)

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