

Level up Learning: A Systematic Review of Gamification in Physical Education

John Louise Marcaida*, Dexk Michael Tayag, Rey Acebes, Carlo Don Daz Perez,
Ryan Dizon, Rene Amaro, Raymart Viray, Sergio Cabrera
Department of Physical Education, Our Lady of Fatima University, Pampanga, Philippines

*Corresponding Author Email: johnlouisemarcaida@gmail.com

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Abstract. Gamification is one of the emerging trends in the digital era, which is bound to apply game-based design to a non-game context for engagement, fun, and user enjoyment. Various disciplines and domains increasingly utilize gamification due to its popularity and promising effect. This study is oriented toward systematically analyzing the given literature and studies published in gamification. A systematic review of the literature approach was applied to circumnavigate the methods and techniques used in physical education and the positive and negative implications of the latter. Of 464 related studies, 42 were carefully assessed using the inclusion and exclusion criteria, quality assessment, and data extraction and synthesis. The trend in the use of gamification started in 2010-2020, and in 2019, gamification reached its highest peak. Most relevant studies come from European and American contexts, while few works have been published in Asian, African, and Oceanian contexts. The results of this study attested that in the field of physical education, four domains frequently used gamification, which included physical activity, sports, student engagement, and learning outcomes. Further exploring its beneficial effects could help maximize its usage and popularity.

Keywords: Gamification; Learning outcomes; Physical Education; Student engagement; Systematic Review.

1.0 Introduction

As the world transcends to the era of modernity and advancement, various innovations and interventions are done to satisfy and optimize humanity's quality of life. As one of man's greatest innovations, technology has been successfully transcended and embedded due to its practicality and usability – a multivariate of disciplines utilized technology due to its beneficial and promising aid. Leveraging and upscaling the efficiency of technology is significant in unleashing its potential fully. One of the sectors that has benefited from technology is education. Incorporating the latter has provided numerous beneficial attributes that elevate teaching and learning.

As one of the technologies used in education, gamification is a concrete example of technological advancement. Gamification has successfully been a growing trend over the past decades. The word "gamification" was first coined by Nick Pelling in 2002, but its growth soared during the second quarter of 2010. As Deterding et al. (2011) mentioned, many designers created new labels for their approach because the term "gamification" was hotly debated in the video game and digital media sectors, and they wanted to prevent misunderstandings about the

process from emerging. While many authors across the context have provided a wide range of definitions of "gamification." Subsequently, Staller and Koerner (2021) defined gamification as the incorporation of the application of game design components to enhanced outcomes (such as increased motivation or competence). This definition provided insight concerning gamification's efficiency in elevating student engagement and learning outcomes. Meanwhile, Fleming et al. (2020) defined the term "gamification" describes the use of gaming elements—like leaderboards, competition, and intermittent reinforcement to non-gaming contexts. However, the term above is connected to related ideas like playful interaction, serious games, and game-based technologies (Deterding et al., 2011). Since serious games are meant to be played for non-recreational purposes, they concentrate on subjects deemed "serious," such as politics, economics, education, health, industry, and the military. Unlike gamification, serious games existed long before computer technologies became widely used. They were defined as "games that do not have entertainment, enjoyment or fun as their primary purpose" or "games that are designed to entertain players as they educate, train, or change behavior." However, gamification is more of a rewards, point system, and merit to accomplish a task, while serious games are more on "serving its purpose." Competition is commonly done in both contexts as it elevates the sense of usability and strategic actions to win. To support this, Park et al. (2021) stated that task visibility and challenge setting are among the strategies employed to encourage competitiveness.

The use of gamification poses a multivariate beneficial context. Many industries use gamification to enhance their productivity, and education is one of those. Oliveira et al. (2023) stated that gamification has been widely applied to improve educational systems to enhance students' focus, motivation, engagement, flow, and other favorable experiences. The use of gamification has rapidly grown since the educational system has successfully transitioned from a traditional to a modern approach using the said technology. Meanwhile, in the words of Mohamad (2020), gamification may be incorporated into any platform and enhance student engagement with learning. To motivate students and boost learning, gamified e-learning platforms that accommodate various learning modalities would create engagement in learning.

In physical education settings, gamification has boosted student engagement and learning outcomes. As mentioned by Yien et al. (2011), numerous studies have revealed a strong relationship between students' motivation and performance in the classroom and physical education practices, particularly in game-based learning (GBL). Gamification significantly shapes the physical education landscape by incorporating additional activities to enhance students' understanding of the lesson. Meanwhile, primary and secondary schools can use gamification to create meaningful and inspiring physical education experiences (Sotos-Martínez et al., 2022). This claim shows that using gamification in physical education supports the holistic experiential learning of the students by giving them the necessary experiences they used to learn. Similarly, students' level of motivation, whether intrinsic or extrinsic, in learning physical education and other subjects is boosted when gamification is applied (Ferriz-Valero et al., 2020).

Significantly, in the statistics provided by Mambo IO (2024), they stated that the test scores of pupils who participate in gamified learning rise by an average of 34%. In North America, about 90% of educators think that gamified learning boosts students' enthusiasm and inventiveness. This clearly shows that gamification can significantly help boost students' learning outcomes. Mee Mee et al. (2020) research revealed that gamification enhanced students' critical, creative, and problem-solving abilities in Malaysia. The advantages of gamification for education are that games are engaging, inspiring, and amusing. The fact that 48.5% of participants "Agreed" with using gamification to increase student engagement and learning outcomes lends credence to this. Meanwhile, in China, Chen and Liang (2022) revealed a 40% increase in students' engagement, which results in good learning outcomes when gamification is applied as an intervention. The above-listed data shows the positive attributes gamification can be a potential catalyst in upscaling students' learning outcomes, engagement, and participation, which can result in better learning acquisition.

Contrast, alongside the beneficial attributes of technology and gamification, has brought to the field of education. There is a growing concern concerning its negative implications. As found by Almeida et al. (2023), the adverse effects that were most frequently cited were insignificance, lack of effect, reduced performance, and concerns with motivation. However, these negative implications may diminish the effectiveness of technology integration in education, specifically gamification. Some ways can be utilized to counterattack these consequences. Given that

the teacher can deviate from the usage of gamification, it means that the latter has direct control of the utilization of gamification to maximize its usage and the profound beneficial effects it could provide in sustaining the level of engagement and learning outcomes of the students.

This study presents results from a systematic review of several research that included gamified applications and serious games. To clearly define the game features used in the field of education, particularly in physical education, this study first attempted to evaluate and assess the previous research outputs. The chosen studies were categorized based on their study categories, application in physical education, research channels, and empirical research investigations. Furthermore, it investigated the perceived advantages and difficulties of integrating gamification approaches into education systems, particularly physical education.

2.0 Methodology

2.1 Systematic Review Methodology

The main intent of this systematic literature review is to provide a more synergistic and comprehensive generalization of the studies published regarding the context of this field of specialization. Considering Gamecho et al. (2015), systematic literature review is a type of secondary research that aims to locate, evaluate, and compile all of the papers that have been published that deal with a specific research subject. Moreover, the study of Wright et al. (2007) proposed seven key steps in doing a systematic review. The following are crucial steps in undertaking a systematic literature review: (1) defining the research questions; (2) creating a research protocol; (3) taking out the literature search; (4) extracting data; (5) evaluating its quality; (6) analyzing and interpreting the data; and (7) interpreting the results. Systematic literature review allows scholars and researchers across the globe to have a common understanding and comprehension of their research topic. Across the context of gamification, many studies have been successfully conducted, and their results show significant beneficial attributes in the field of education.

2.2 Research Question and Search Strategy

Formulating nine questions for this systematic literature review achieved the study's intent. The rationale of each question is provided and presented in the table below.

Table 1. Research questions

Research Questions	Rationale
Which publication sites are the main target for gamification in education, particularly in physical education?	To identify and locate different sites in search for related and relevant studies on gamification in physical education.
What are the studies focused on gamification in physical education based on their publication date?	To determine and explore the publication trends in gamification per physical education.
How manageable is it to locate published works in gamification?	To discover how relevant and appropriate the published work is.
Which domain of physical education has gamification been frequently used?	To recognize what domains in physical education utilized gamification.
What research types have been utilized in gamification in physical education?	To point out the types of research used in publishing papers about gamification.
What challenges have been encountered in utilizing gamification in physical education?	To understand and explore gamification's potential problems and limitations in physical education.
What are the benefits of the use of gamification in physical education?	To determine the potential benefits of the integration of gamification in physical education.

Search strategy significantly determines the latter in locating and exploring relevant studies about gamification in physical education. This is done to retrieve the completeness and relevancy of the related studies accurately. This systematic literature review searched relative studies using different e-libraries and search engines, including Scopus, Google Scholar, IEEE, ScienceDirect, Research Gate, and other relevant sites. The table presents the search strings for each variable to further expand the search strategy. The PICO criteria comprises Population, Intervention, Comparison, and Outcome (Stone, 2002).

As presented in Table 2, each part's alternating words were combined using the Boolean operator "OR," and the three main portions were joined using the Boolean operator "AND." The search string was applied to each digital source's title-keywords-abstract metadata to retrieve the returned papers. Additional modification was required to accommodate each library's search procedure.

Table 2. Search string

Scope	String
Physical Education	physical education* OR PE* OR physical activity* OR physical*
Gamification	gamified* OR games* OR gamified instruction* OR game elements*
Engagement	engage* OR student engagement* OR learners engagement*
Learning Outcomes	learning* OR outcomes* OR student's learning*

2.3 Inclusion and Exclusion Criteria

After a thorough analysis of the relative papers, the inclusion and exclusion criteria were conducted to ensure that there would be no duplicates among the published works. This is done to ensure the relevancy and appropriateness of the research. The author conducted the selection procedure, considering the metadata in the publications. Any discrepancies were resolved by screening the full manuscript. The following criteria were met by the studies that were included:

- IC1. The paper focuses on using gamification in education, specifically in physical education.
- IC2. The paper evaluates the use of gamification in terms of upscaling the learner's engagement.
- IC3. The paper assesses the effectiveness of gamification in student's learning outcomes.
- IC4. The study offers empirical data on the effects and results of gamifying physical education.

In terms of the exclusion, the papers that showed at least one of the criteria were discarded:

- EC1. The papers are not written in the English language.
- EC2. Papers published in 2013 below.
- EC3. Papers published in abstract and conference proceedings with at least 1-2 pages.
- EC4. Research works that exceed the domain of gamification in physical education.

2.4 Quality Assessment

To mitigate potential bias during the systematic literature review, a quality assessment was conducted on all selected publications using a series of closed-ended questions to gauge the relevance and caliber of the papers' contents. In assessing the quality of the papers, the author adapted the quality assessment (Sardi et al., 2017). The prior systematic literature review served as the basis for the formulation of the quality assessment questions and has the following description:

- QA1. Does the paper present a detailed description of the game elements employed? The possible answers were "Yes (+1)", No "(+0)" and "Partially (+0.5)".
- QA2. Does the study present empirical results?
The possible answers were "Yes (+1)" and No "(+0)".
- QA3. Are the limitations of gamification addressed explicitly? The possible answers were "Yes (+1)" and No "(+0)".
- QA4. Does the paper discuss the benefits of gamification? The possible answers were "Yes (+1)" and No "(+0)".
- QA5. Has the study been published in a relevant journal or conference proceedings?

The CORE 2014 and Journal Citation Reports 2014 (JCR) rankings of conferences and journals were considered when rating this quality evaluation question. The following were potential responses to this query:

- for conferences, workshops, and symposia:
 - (+1.5) if it is ranked CORE A
 - (+1) If it is ranked CORE B
 - (+0.5) If it is ranked CORE C
 - (+0) If it is not in the CORE ranking

For journals:

- (+2) If it is ranked Q1
- (+1.5) If it is ranked Q2
- (+1) If it is ranked Q3 or Q4

(+0) if it has no JCR ranking

For others: (+0).

When the paper does not provide specifics regarding the game elements used in the program, Question QA1 receives a partial score. The reason for the distinction in the score for question QA5 is that publishing in ranked journals typically entails more work than publishing at conferences or symposia. A paper could receive a maximum quality assessment score of 6, meaning that the overall score ranges from 0 to 6.

2.5 Data extraction strategy and synthesis method

In this systematic literature review, data extraction is one of the key things that needs to be considered. A structured sheet was utilized to synergistically assess and extract the accuracy and veracity of the related studies. Necessary information from the scholarly works about gamification in physical education is described below:

RQ1. The sites for publication and their sources should be extracted.

RQ2. To determine the significant development among the studies on gamification in physical education, the publication dates and the geographic segmentation of the papers need to be identified.

RQ3. To determine if the papers are still relevant, it is important to consider the publication sources' ranking.

RQ4. Specific domains of physical education should be identified to assess what specific gamification is used.

RQ5. This question refers to the type of research used. Organization of the nature of research can be categorized by the following:

- Basis for intervention – The paper on this category proposes a solution to an existing problem. The domain's needs can be sustained to aid the need for a new strategy or innovation.
- Evaluative study – A series of evaluations is done to assess the potency of the strategy used.
- Systematic Review – An array of research studies conducted to assess the domain critically.
- Others – This includes bio notes, personal experiences, and opinion papers.

RQ6. Studies portray the challenges and hurdles in integrating gamification and gamified instruction in physical education.

RQ7. The benefits of gamifying teaching and learning in physical education should be noted.

The synthesis of the gathered and extracted data aims to methodically synthesize the related studies to answer the questions formulated in this systematic literature review.

3.0 Results and Discussion

This portion aims to uncover the systematic literature review results to answer the research questions showcased in Table 1. The selection process among the related studies was conducted from June 2024 to July 2024. As listed in Figure 1, 464 papers were garnered from the database using the search string presented in Table 2.

After ensuring that three out of four exclusion criteria were identified, 432 research papers were retained and underwent a thorough screening and analysis based on their database (Title, abstract, and keywords). Meanwhile, out of 432 studies, 172 research were removed using the EC4 criteria. On the other hand, 78 studies were assessed considering their full-text nature. Forty-four studies were excluded from the array of literature, while the remaining 64 were retained based on the application of EC4. An additional eight studies were included after applying the snowball technique. Hence, 42 studies were included in the final array of included literature. This is because the latter met the target criteria when selecting the references.

RQ1. Which publication sites are the main target for gamification in education, particularly in physical education?

Papers identified by this systematic literature review come from a range of publication sites. Among the publication sites, five journals were replicated. Meanwhile, eight research papers were published in the Journal of Systems and Software. Ten research papers were published in the IEEE. Additionally, seven studies were published in the Journal of Game, Game Art, and Gamification. 5 papers were published in the International Conference on Advances in Computer Entertainment Technology. Based on the literature review, approximately 72% were published in journals, 24% were published in conferences, and 4% were presented in a symposium.

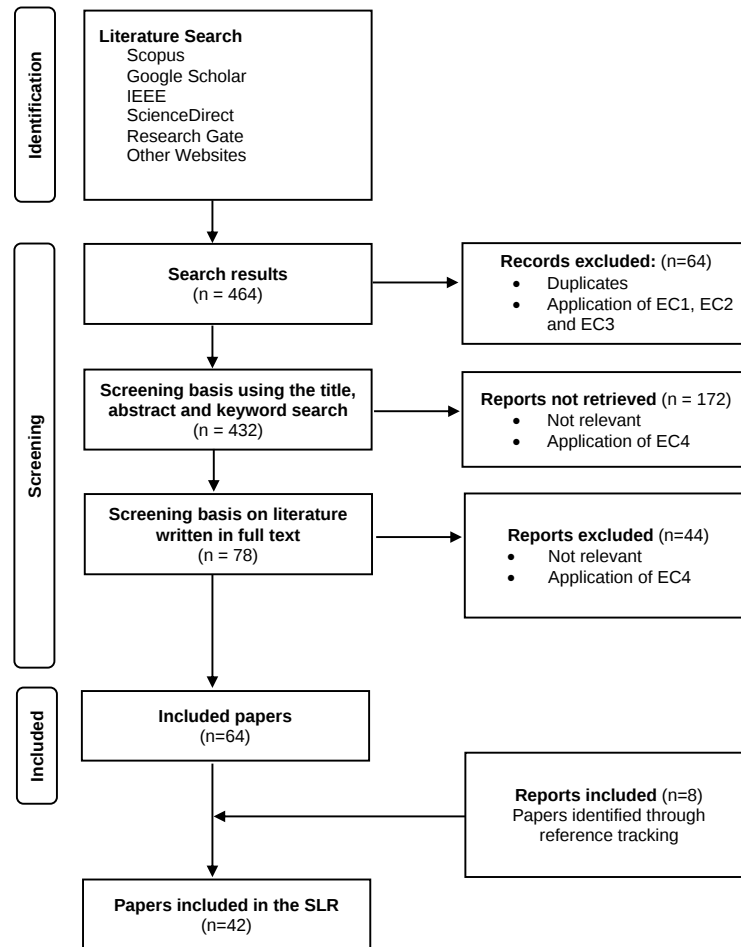


Figure 1. PRISMA flow diagram

RQ2. What are the studies focused on gamification in physical education based on their publication date?

As depicted in Fig. 2, the development of published works in gamification from 2010-2020 can be seen. There is a significant rise in 2019 as studied by Swacha (2021).

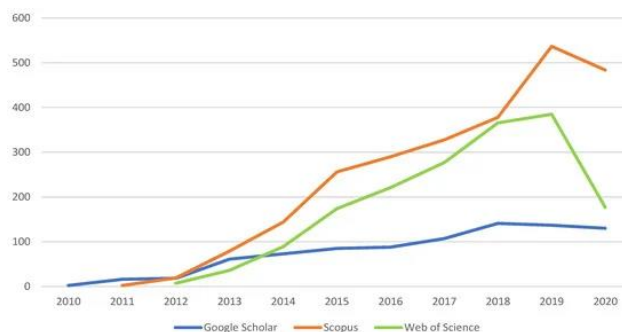


Figure 2. Publication evolution in gamification

RQ3. How manageable is it to locate published works in gamification?

Based on the results of this study, it can be identified that most of the research papers published come from 16 nationalities, where American researchers lead the number of published works, followed by Canadian and Portuguese researchers. Meanwhile, it can be suggested that different countries should craft research based on their continental context. In terms of locating these studies, most of the published works were easy to locate and identify but some are inaccessible. Few related studies exist in the Asian, African, and Oceanian contexts.

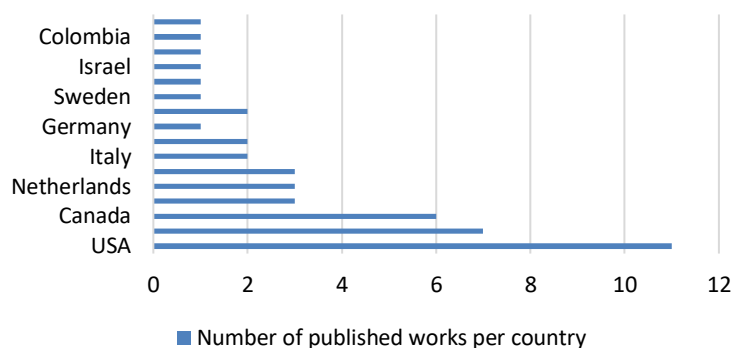


Figure 2. Number of published works per country

RQ4. Which domain of physical education has gamification been frequently used?

As shown in Figure 3, various domains in physical education utilize gamification. The domain that garnered the highest number of publications is teaching and learning. A vast range of literature and studies were conducted to assess the use of gamification in aiding physical education's teaching and learning domain. According to quantitative data, this is attested by the study of Fernandez-Rio et al. (2020), which found that the student's intrinsic motivation to learn significantly increased after experiencing gamification. Accordingly, the field of student engagement garnered 40 published research papers. According to Ferriz-Valero et al. (2020), the idea behind implementing a gamification intervention is that students who take part in this kind of program will be able to build a level of intrinsic and extrinsic motivation—or, on the other hand, student's engagement—more successfully. It can be seen that the use of gamification in physical education could potentially boost the level of motivation and engagement of the students to learn.

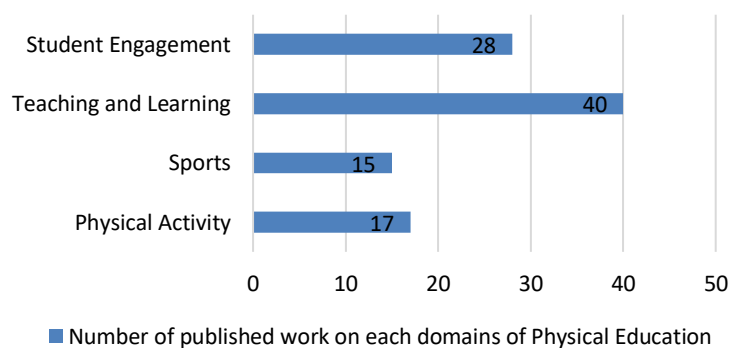


Figure 3. Number of published works on each domain of Physical Education

Consequently, 17 studies were conducted on sports and gamification. According to Tóth and Lógó's (2020) findings, gamification has the least impact on sports application selection. Conversely, game aspects connected to progression had the greatest beneficial effect on the frequency and intensity of workouts. On the other hand, the physical activity domain of physical education attained 17 published works. It can be seen that even though physical activity is more of a person's physical aspect, gamification still took its place in aiding the said domain.

Mazeas et al. (2020) confirmed that gamified methods show promise in encouraging physical activity among different populations. Further investigations showed that this benefit continues beyond the follow-up period, indicating that gamified goods appear more effective than comparable non-magnified PA interventions and that the effect is not merely a novelty effect brought on by the humorous aspect of gamification. RQ5. What research types have been utilized in gamification in physical education?

In conducting this systematic review of literature, the author found out that there is an array of research types published in the context of gamification in physical education. The basis for intervention studies garnered 54% of the published studies. At the same time, evaluative study types gained 23% of the published studies. On the other hand, the Systematic Review type of research got 20%, and other sources gained the remaining 3%.

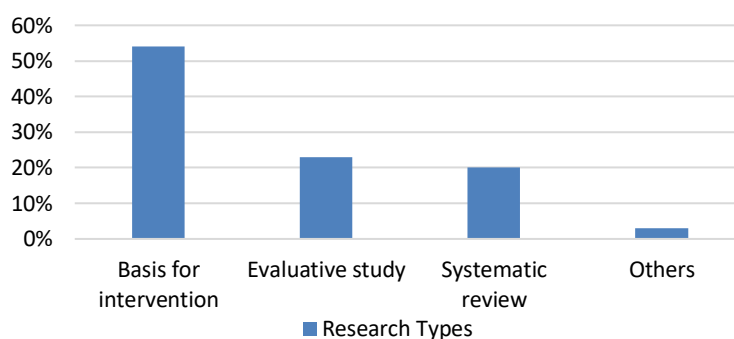


Figure 4. Types of Research published in the context of gamification

RQ6. What challenges have been encountered in utilizing gamification in physical education?

Apart from the beneficial attributes of gamification in education, it can be seen as a shady area of its usability. This claim is supported by various studies published. According to Yaşar et al. (2020), the main issue elementary school instructors have when implementing gamification components is the children's excessively competitive mentality. The issue of regression in kids with low levels is mentioned as the second. In resolving the issues, it has been shown that the best way to use gamification components is to consider other activities besides lesson success. Moreover, Toda et al. (2020) indicated that gamification can pose a serious competition for students. As well as addiction, the engaging game elements and display can alter the learners' attention. The game's length also seems to be a barrier to students' gamified experiences, performance, and engagement in class, as found by Marcaida et al. (2022). Students who initiate games using an application or software find that it does not always work properly on their devices, making class participation more difficult.

RQ7. What are the benefits of the use of gamification in physical education?

The use of gamification has brought numerous positive benefits to different disciplines. One of the aspects that certainly benefitted from the latter is education. Yildirim's (2017) study findings indicate that gamification-based instructional strategies improve student performance and attitudes toward learning. Gamification benefits the learning acquisition as well as the engagement of the students when applied. Many schools across the globe are utilizing gamification to aid their student's learning attainment. Task performance has improved with the help of gamification (Hosseini et al., 2022). Accordingly, Buckley and Doyle (2016), stated that A pre- and post-intervention survey is used to examine how gamification affects learning results. It was discovered that gamified learning interventions. The above-presented literature suggests that gamification in education, specifically physical education, poses various benefits to the discipline.

4.0 Conclusion

This systematic literature review synergistically synthesizes and analyzes existing research on gamification in education. A total of 464 research papers were garnered from different publication sites, and 42 were selected based on the inclusion and exclusion criteria set by the author. The mentioned research papers were explored

by setting eight research questions, which include the sites of publication, their sources, date of publication, the geographic and locality of the published works, domains of physical education that frequently use gamification, the types of research used, and barriers and benefits on the used of gamification in physical education. Regarding gamification trends, it all started in 2010 and reached a higher altitude in 2019. Most of the published works in gamification in physical education rely on intervention, evaluative study/research, systematic review, and other sources of information. In addendum, this systematic literature review also tackled the potential benefits and shady areas of gamification. One of those is that numerous studies have found that gamification is a catalyst that can be used to enhance the learners' learning, engagement, and motivation levels. In terms of the negative effects of it, it can be stated that the use of gamification can foster addiction and increase competition and game design problems. Thus, proper utilization is needed to maximize its potency and decrease its consequences. The utilization of gamification in education, primarily in physical education, shall be considered to maximize its potential beneficial attributes. Thus, future researchers should explore and delve into studying more about gamification.

4.1 Inputs for Future Research

The results and discussions of this study have practical and theoretical recommendations for the teaching and learning domain and future research. As resonated from the results of this study, it can be suggested that teachers should explore an array of gamified applications and instruction methods to foster a more collaborative and fun learning experience which can attained by the students. The localization and contextualization of the games can also be suggested to cater to the diverse needs of the students. In terms of future research, future researchers may explore and delve into research concerning the potency of gamification in education and other aspects and domains. Geographic segmentation shall also be considered. Hence, future research must explore the effects of gamification towards the betterment across disciplines.

4.2 Limitations of the Study

As with any literature review and studies, this study formulated several limitations that can be answered by future research. This study mainly focuses on the different studies about using gamification in education, primarily in physical education. Future studies may explore different subject areas that incorporate gamification. Secondly, this study focuses on the beneficial attributes of gamification in terms of student engagement and learning outcomes; thus, succeeding studies may navigate different domains like participation, knowledge acquisition, and the like. Consequently, in terms of the literature published in the Philippine and Asian context, studies are relatively scarce. Hence, these limitations can be addressed by succeeding studies that wish to expand the horizon of gamification further.

5.0 Contributions of Author

The main author of this study, John Louise Marcaida, formulated the research topic and conceptualized the study. Authors Rey Acebes, Carlo Don Daz, and Dexk Tayag work in the planning phase, where they think of the methodology that will suffice for the study. Meanwhile, Raymart Viray, Ryan Dizon, and Rene Amaro find this study's literature and studies suitable. Sergio Cabrera fixed the tables and graphs of this study. Regarding the results and discussion, the researchers work coordinatively to organize the ideas of this study.

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This is a self-funded research.

7.0 Conflict of Interests

The author declares NO conflict of interest upon crafting this research work.

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