IJIE

http://penerbit.uthm.edu.my/ojs/index.php/ijie
ISSN : 2229-838X e-ISSN : 2600-7916

The International Journal of Integrated Engineering

# Research Opportunities for Application of Gamification Models with VR for Crop Cultivation: A Systematic Literature Review

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DOI: https://doi.org/10.30880/ijie.2023.15.03.030
Received 21 June 2023; Accepted 17 July 2023; Available online 2 October 2023

**Abstract:** The learning delivery model in the increasingly developing information technology era and the era of teaching and learning between students and lecturers during the Covid-19 pandemic requires lecturers' creativity. The application of gamification using virtual reality is an alternative solution that can be applied to fill the saturation of online learning using Google Meeting or Zoom meeting. This review of the literature aims to see how many gamification applications using virtual reality are specifically applied to plant cultivation. The process of obtaining this literature review is based on the systematic literature review (SLR) method. The assessment process is carried out through four online databases based on the keywords gamification and virtual reality. The results obtained are 32 relevant literature on gamification using virtual reality although gamification using virtual reality for plant cultivation is not found and only one paper on forestry only discusses the concept. However, the results of this process become the basic literature for further research on the application of virtual reality gamification in plant cultivation.

**Keywords:** Gamification, VR, agriculture, cultivation, PRISMA

## 1. Introduction

Learning about plant cultivation is not only done by farmers but also by students, and household members. This activity will support the addition of vegetable crops to be consumed in residential communities. The Indonesian Central Statistics Agency stated that the production-consumption of one of the favorite vegetables such as shallots in 2021 reached 2 million tons, an increase of 10.42% (189.15 thousand tons) from 2020 [1]. The data provides reasons for people who consume vegetables such as onions. They will think about how to plant shallots in their settlements. How find information from the public, in general, is still sourced from reading books, newspapers, and the internet. What about the information presented in the form of gamification with virtual reality, a form of interactive information delivery with the feel of a game, and with a virtual environment such as the introduction of military equipment [2].

The successful application of gamification with virtual reality for simulating various human activities has become an alternative source of interactive game models with virtual reality [3]. The application of gamification with virtual reality is applied in a video game project [4] if this is applied in various human activities, it will have an impact on the success of the goal [5]. Gamification in education has proven to be a good in strategies to motivate students as well as promote their activeness for participation [6]. The application of the gamification model is effective in promoting the

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quantity of work [7]. The definition of virtual reality technology is a kind of computer simulation system that can create and experience the virtual world as in the real world [8].

Trying to use the gamification model with virtual reality information technology, this study aims to systematically search the research literature that discusses gamification using virtual reality to get the results of whether research on the application of gamification with virtual reality, especially for plant cultivation, has been widely studied. The results of this systematic literature review will be the basis for further research on the gamification of plant cultivation with virtual reality.

This paper consists of several discussion chapters. The discussion of the first chapter regarding the introduction which explains the background of this research is carried out. The second chapter discusses the explanation of the research phase regarding a systematic literature review using PRISMA. The discussion of the third chapter will show the results of the SLR with PRISMA. The discussion of the fourth chapter presents the conclusions of the findings from the previous chapter.

## 2. Methodology

Figure 1 describes a systematic literature review (SLR) that was carried out systematically regarding gamification using virtual reality using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [9]. A systematic literature review describes a review method that uses multiple processes to minimize bias in the review.

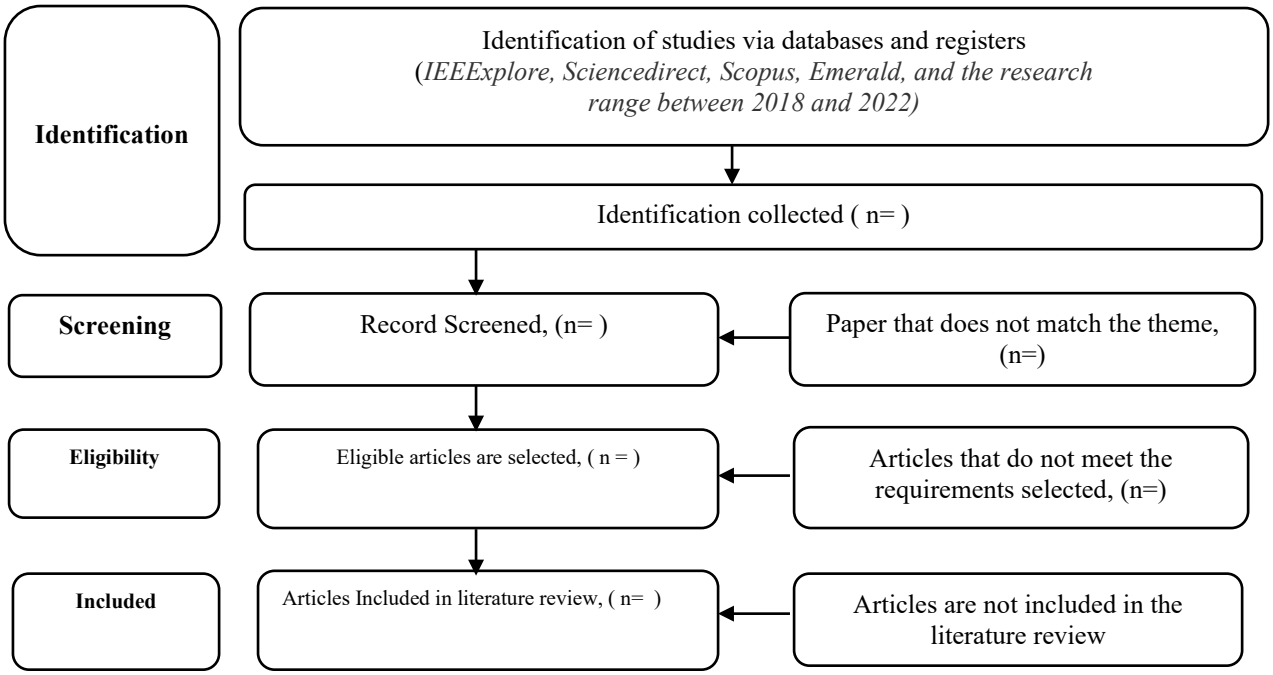


**Fig. 1 - Diagram of the systematic literature review process using PRISMA**

The systematic literature review using prisms in this study has 4 screening processes, namely paper identification, screening, eligibility, and inclusion [9]. The first stage is to identify the research literature in the journal database using the keywords gamification with virtual reality. The second stage is to filter the literature from the results of the identification collection that has been collected to be selected according to the research theme, namely gamification using virtual reality. If it is not by the theme of gamification with virtual reality, it will be eliminated. The third stage is to select literature that meets the requirements according to the theme of gamification with virtual reality, seen from the abstract that provides an explanation of gamification with virtual reality that is used to provide benefits for an activity. If it does not match the theme, it will be eliminated. The fourth stage is to take the appropriate literature to be used as a research reference seen from the results of the research content. If they don't match, they will be eliminated.

Research Identification Questions To search for keywords in the database "gamification with virtual reality" to answer research identification questions, the paper must have the keyword. The keyword will be used for 4 databases IEEExplore, ScienceDirect, Scopus, Emerald, and research range between 2018 and 2022.

Inclusion criteria are paper criteria that meet filtering requirements while exclusion criteria are paper criteria that meet the requirements with exceptions. The following Table 1 shows the criteria for inclusion and exclusion. This criterion is explained with a flowchart to be used as a filtering criterion in figures 2.

**Table 1 - Inclusion and exclusion criteria**

| Inclusion criteria | Exclusion criteria |
|---|---|
| The paper discusses the application of gamification with virtual reality for plant cultivation. | Application of gamification with virtual reality for agriculture. |
| The paper discusses the impact of applying gamification with virtual reality for plant cultivation | Application of gamification with virtual reality for other fields of science. |
| Category of conference results. | |

Table 1 explains that included in the inclusion are papers that discuss the application of gamification with virtual reality for plant cultivation. While the second inclusion is a paper that discusses the impact of applying gamification with virtual reality for plant cultivation. Meanwhile, the first exclusion is a paper that discusses the application of gamification with virtual reality for agriculture. The second exclusion is a paper that discusses the application of gamification with virtual reality for other fields of science.

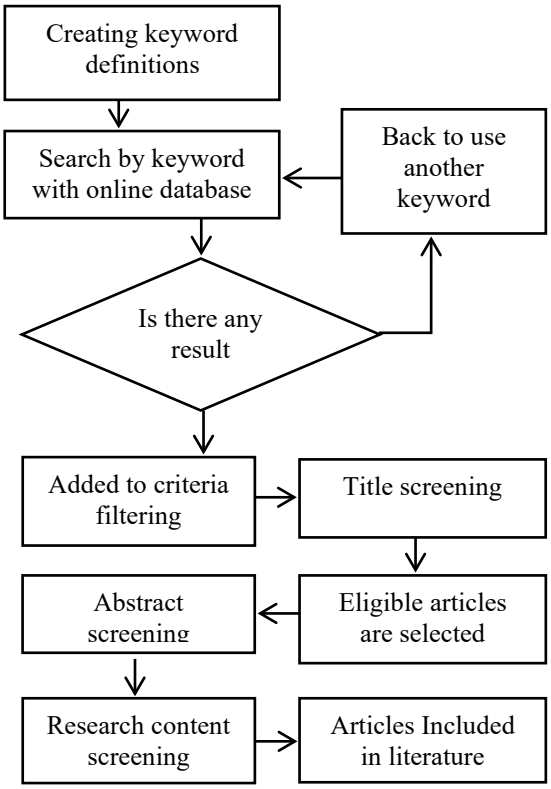


**Fig. 2 - Literature search process**

Figures 2 is the flow of the literature search process with an online database that starts by writing down keywords. Writing the right keywords will produce a number of the desired set of papers according to the keywords. The results of the collection of papers are then filtered manually based on the titles that match the requirements in Table 1 of inclusion and exclusion. The results of the screening were then checked based on the abstract by the inclusion and exclusion in Table 1. The results of the abstract screening were then analyzed based on the research to be used as literature in gamification research on plant cultivation using virtual reality.

## 3. Results

The process of identifying the literature search after obtaining the research theme uses four online databases, namely ieexplore.ieee.org, sciencedirect.com, Scopus.com, and emerald.com. The keyword used in each of these online databases is "gamification with virtual reality" to obtain gamification research literature using virtual reality. When using the keyword gamification with virtual reality cultivation, the search is not successful, the first keyword is "gamification with virtual reality". While the type of publication is conference from 2018 to 2022. The search results obtained a total of 1060 articles consisting of IEEExplore as many as 145 titles, Sciencedirect as many as 29 titles, Scopus as many as 345 titles, and Emerald as many as 541. Then all articles were checked manually to determine the suitability research theme with the research to be carried out.

The articles selected in this screening process are those related to gamification research with virtual reality. The research was conducted between 2018 and 2022. The research theme relates to human activities gamified using virtual reality. The results of this screening obtained 140 articles consisting of IEEE 48 articles, Sciencedirect 6 articles, Scopus 45 articles, and Emerald 41 articles. The number of articles that do not match is 920 because the title of the literature article does not match the theme of gamification with virtual reality. IEEExplore a total of 97 articles, Sciencedirect a total of 23 articles, Scopus a total of 300 articles, Emerald a total of 500 articles.

The process of selecting the feasibility of research articles from the research theme is determined by the research title that is by the research theme, namely gamification with virtual reality. The results of the literature feasibility study process obtained a total of 59 articles with a total of IEEE 24, Sciencedirect with a total of 3, Scopus with a total of 20, and Emerald with a total of 12. Meanwhile, 81 articles did not match the feasibility of the research theme. with IEEExplore with 24 articles, Sciencedirect with 3 articles, Scopus with 25 articles, and Emerald with 29 articles.

The results of the feasibility of the literature that has been selected will then be seen as whether the abstract is by the research with the theme of gamification with virtual reality. The total results entered as literature research were 32 articles consisting of 14 articles from IEEE, 2 articles from Sciencedirect, 13 articles from Scopus, and 3 articles from Emerald. While not meeting the criteria, as many as 27 articles with details of IEEExplore as many as 10 articles, Sciencedirect as many as 1 article, Scopus as many as 7 articles, and Emerald as many as 9 articles. The 32 literature articles will be used as literature in research on the gamification of plant cultivation with virtual reality.

The systematic literacy review process using PRISMA was carried out in four steps, namely the identification process with the results obtained from 1060 articles. The screening process succeeded in getting 140 selected articles to be seen for eligibility. It was found the feasibility of the 59 articles obtained which were then viewed as abstracts and the contents of the articles for use in the study. The results of the abstract selection and article content obtained 32 articles to be discussed. The results of the article selection process with a more structured number of 32 can be seen in Table 2 below.

**Table 2 - Data extraction**

| Source | Identification | Screening | Eligibility | Included |
|---|---|---|---|---|
| IEEExplore | 145 | 48 | 24 | 14 |
| Sciencedirect | 29 | 6 | 3 | 2 |
| Scopus | 345 | 45 | 20 | 13 |
| Emerald | 541 | 41 | 12 | 3 |
| **TOTAL** | **1060** | **140** | **59** | **32** |

After the 32 papers were selected, the fields of knowledge were divided into the fields of education, health, arts, military science, agricultural science midwives, marketing science, and industrial science. The number of available papers in this field can be seen in Table 3.

Based on the results of the literature screening in Table 3, it is known that the grouping of fields of science consists of the fields of education, health, arts, military, agriculture, marketing, and industry. Based on Table 3 obtained from 4 online databases IEEExplore, Science direct, Scopus, and Emerald, there are a total of 6 educational papers that use gamification with VR for education in the IEEExplore database, namely [10], [11], [12], [13], [14], [15]. As for Science direct, there is 1 paper, namely [16].

**Table 3 - Paper findings by field of science**

| No | Database | Educational Science | Health Science | Art Science | Militer | Agriculture | Marketing | Industry |
|---|---|---|---|---|---|---|---|---|
| 1 | IEEExplore | 6 | 4 | 3 | 0 | 0 | 0 | 0 |
| 2 | Science direct | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 3 | Scopus | 4 | 6 | 0 | 1 | 1 | 1 | 1 |
| 4 | Emerald | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| | **TOTAL** | **12** | **12** | **3** | **1** | **1** | **1** | **2** |

The Scopus database contains 4 papers that discuss gamification with VR in the education sector, namely [17], [18], [19], [20], and from the Emerald database, namely [21]. Gamification with VR for the health sector in the IEEExplore database is [22], [23], [24], [25]. In Science Direct, there is 1 paper that discusses gamification with VR for the health sector, namely [16]. The Scopus database for papers discussing the health sector using gamification with VR has 6 papers [26], [27], [28], [29], [30], [31], while the Emerald database contains 1 paper, namely [32]. There are 3 papers in the field of art, which are only on IEEExplore [33], [34], [35]. The military field of VR gamification exists only in the IEEExplore database which is used for simulating war equipment management [36]. The main purpose of this literature search is actually in the agricultural sector which uses gamification with VR, it's just that the search only gets 1 paper,

which is in the Scopus database [37]. There is 1 paper that discusses the field of marketing science in the Scopus database [38]. For the application of gamification with VR in the industrial sector, there are 2 papers in the Scopus [39] and Emerald databases [40].

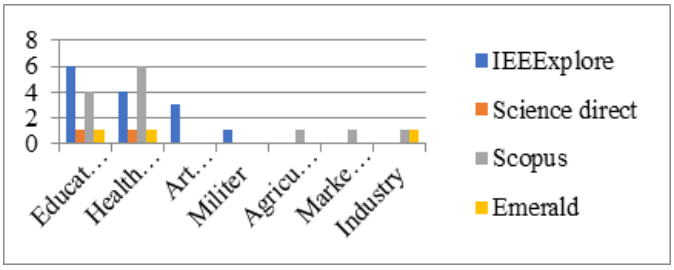


**Fig. 3 - Graphic database paper for 7 fields of science**

Based on figures 3 on the graph, it is explained that the most widely applied papers discuss the application of gamification with VR in the fields of education and health care. The application of gamification with VR in the fields of military science, agriculture, marketing, and industry still needs special attention from researchers to take the opportunity to take this research field.

## 4. Conclusions

The results of the systematic conclusion of the literature review using PRISMA from 1026 papers that were identified regarding gamification with VR obtained 32 papers that would be used. The number of gamification papers with VR used consists of 12 papers in the field of education, 12 in the health sciences, 3 in the arts, 1 in the military, 1 in agriculture, and 1 in marketing, and industry. 2 papers. That the paper relating to the application of gamification with VR for agriculture is only one paper, so it can be concluded that research on the application of gamification with VR for the four database papers is still difficult to find and becomes an opportunity for further research.

## Acknowledgement

The researchers thank the entire Academic Community of Universiti Tun Hussein Onn Malaysia and Nurul Fikri College of Technology, Depok, Indonesia.

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