



Virtual Reality in Business Education: Systematic Literature Review

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Article Info

Article History:
Receive 25 November 2021
Accepted 30 March 2022
Published 30 April 2022

Keywords:

virtual reality;
business education;
business skills;
higher education

Abstract

Virtual reality has existed in the education field for quite some time and numerous research including systematic review papers have discussed virtual reality, particularly in STEM Education. However, there has been limited business education literature despite the increasing use of virtual reality in real-world business practices. Students need to keep pace with this technology to better prepare them as future graduates and/or entrepreneurs, and educators need to prepare and evaluate the use of virtual reality in improving students' business skills. To gain a better understanding of the current state of virtual reality in business education and how effective it is in improving business skills, we have performed a systematic literature review of the use of virtual reality in business education within the last ten years. 118 abstracts' screening and evaluation yield 10 selection studies included in the analysis. The result revealed that there has been limited use of a fully immersive type of virtual reality implemented in business education at higher education and most studies use a non-immersive type of virtual reality and belong to serious games categories. In addition, all articles agree that the uses of virtual reality in business education are effective in improving business skills.

INTRODUCTION

Since the Fourth Industrial Revolution and exacerbated by Pandemic Covid-19, the paradigm of doing business changed dramatically (Shabrina Nurqamarani et al., 2020). Business and technology are interconnected (Lee et al., 2018). Such phenomena create a fast-moving business environment and intense competition between companies as products' life cycles are shortened and innovation is needed to accommodate the fast-growing market. This also impacts the education sector in preparing business managers and leaders (Sánchez, 2018). (Aronoff, Craig E & Ward, 2011) argue that traditional discipline cannot foster and nurture future business leaders. With constant dynamic changes in both the economy and the business ecosystem, innovative thinking and lifelong learning should be seen as key success factors in the future business environment (Loureiro et al., 2020). In addition, scholars need more insight into the use of high-tech and innovation context characteristics for technology management and development.

One of the emerging technologies which begun to rise is Virtual Reality (VR). VR is a technology that enables the creation of computer-generated virtual worlds with which the

user can interact and immerse (Velev & Zlateva, 2017). The market for VR is growing accordingly, with research firm Markets and-Markets forecasting industry growth to reach \$20.9 billion in 2025, from \$6.1 billion in 2020 (Kugler, 2021). According to (*Virtual Reality Market Size & Share Report, 2022-2030*, n.d.), the revenue forecast of the VR market will rise to \$87 billion in 2030. Along with its growing market, VR has been used widely in multiple sectors including entertainment, tourism, healthcare, and other areas. However, research regarding the implementation of VR in education is still limited (McGovern et al., 2020). Besides, most implementation of VR in education is in STEM areas (Truchly et al., 2018) and is scarce in business education.

Recent research suggests that individuals can retain more information and can effectively use learned skills and obtained knowledge after participating in virtual reality simulation (Krokos et al., 2019), making computer-generated reality an essential learning instrument. VR and related technologies are making a revolution in education in terms of learning and acquiring skills. Yet, in business education literature, no study reviews the current state of VR-related studies over time. As the adoption of VR continues

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to spread in the education sector, more research is needed to understand the actual value and impact of such technology in higher education, and more specifically, in business education.

(Merchant et al., 2014) used meta-analysis to examine the overall effect as well as the impact of selected instructional design principles in the context of virtual reality technology-based instruction in K-12 or higher education settings. The results show that VR-based instruction is an effective means of enhancing learning outcomes. However, this study lacks essential information so it could not analyze the interaction effects of feedback and type of learning tasks for games and virtual worlds. (Huttar & BrintzenhofeSzoc, 2020) undertook a systematic review on VR and computer simulation in social work education to identify how virtual reality and computer simulation technology are being used to train social workers, and whether they are effective. The result found that among the literature reviewed, the technology is primarily used to teach direct practice rather than macro-level skills and is geared toward the education of students rather than practitioners. (Kavanagh et al., 2017) conducted a systematic review of the use of virtual reality in education, as well as two distinct thematic analyses to gain a better understanding of what these issues are, and what it is that educators hope to gain by using these technologies in the first place. These analyses indicate that most researchers use VR to increase the intrinsic motivation of students and refer to a narrow range of factors such as constructivist pedagogy, collaboration, and gamification in the design of their experiences.

The difference between this study and the previous review study is it encompasses reviews on VR research in the business education context in higher education between 2012-2022. Given the current trends in virtual reality in education, this study is both timely and significant for several reasons. First, to date, there has been no review that primarily focuses on VR in business education in higher education. Thus, it will help advance research in this area. Second, this study studies the last 10 years of VR development, which is crucial since VR started rising within a decade, and the VR annual growth rate of the market is projected to come in at 15 % every year in the next 8 years (*Virtual Reality Market Size & Share Report, 2022-2030*, n.d.). Third, it covers all parts of the world which offer a global perspective of the state of research in virtual reality in business education. The study includes data from four regions of the world—America, Euro-

pe, Australia, and Asia. Finally, this study helps in understanding the current state of VR research in business disciplines in higher education and identifies gaps to advance future research.

Based on the research background earlier, authors formulate the research problems, and these include a) the development of virtual reality in business education within the last 10 years; and b) the effectiveness of virtual reality in improving business skills. Therefore, literature needs to be reviewed critically to have a deeper and more comprehensive understanding of virtual reality in business education. This involved using a systematic approach to examine previous studies related to virtual reality in business education and its effectiveness in improving business skills. The approach has been confirmed to be effective in improving the understanding of a concept by summarizing empirical and theoretical studies. It was used to offer contributions to the field by concisely presenting substantial findings from recent VR studies in business education. The findings are expected to provide up-to-date and well-researched references on VR in business education-related literature, particularly within the last 10 years, as well as to recommend best practices from previous research to business educators.

In this vein, this paper initially gives an outline of VR, conceptualization, and development. It is trailed by the techniques used to gather every one of the significant articles in the journal, to conduct a critical review. An outline of the gathered papers is depicted alongside a basic investigation of the main papers and their references. The following part is devoted to exploring questions and contemplations on future examination headings of VR in business education. In addition, this review paper also discusses business skills which trained and improved through VR technology and how learning becomes more efficient and effective with VR technology integration in business education. Conclusion and recommendation are tended to be in the last segment of the paper.

Concept and Development of Virtual Reality

Virtual reality (VR) is not a recent technology, nor is its application to education. The use of the term “virtual reality” was first used in the mid-1980s when Jaron Lanier, founder of VPL Research, began to develop the gear, including goggles and gloves, needed to experience what he called “virtual reality” (Institute, 2022). However, prior to 1980, technologist developed simulated environment known as “Sensorama” in

1956 which pioneered the VR technology. The Sensorama experience simulated a real city environment which allows multisensory stimulation, founded by Morton Heilig. Heilig also patented a head-mounted display device, called the Telesphere Mask, in 1960.

Applications remained primarily limited to the public sector for several decades, until in 1991 a series of specialized arcade games were released by the company Virtuality Group (Kusumah, 2017). During the 90s, several game producers released virtual reality head-mounted display (HMD) and VR based game system (Kushner, 2014). Recently, VR has been ongoing trends since headsets and VR-capable hardware and software have been readily available to the public and sold by big brands such as Sony, HTC, and Facebook. Many tech companies such as Microsoft, Intel, and Sony have invested large amounts of money into developing and advancing VR and the market is expected to grow more over the next few years (Y. Lin, 2022)

Type of Virtual Reality

The physical configuration of the VR setup is classified as fully immersive systems, semi-immersive systems, and non-immersive systems (Gutiérrez Alonso et al., 2008).

Fully immersive systems require a head-mounted device (HMD) to be worn to isolate the user from the real world and enhance immersiveness. The latest VR technology with HMD allows users to see and hear things, and the motion tracker allows users to interact with objects, but the user can't feel the touch. Now HMD is readily available for public with the offer from brands such as Sony, Facebook, and HTC. The biggest advantage of this type of system is that the participants are completely immersed in the virtual reality scene, yet this kind of VR is the most expensive compared to other types (Zhang et al., 2020).

Semi-immersive systems typically use large projections or screens that surround the user and provide options for multi-user use. Better Cloud produced a 360-degree VR video of the company's launch event to show what the experience was like.

The least immersive type of virtual reality is called Desktop VR (Merchant et al., 2014), where a 3D virtual world is displayed on a standard computer monitor and other input devices include stereo glasses, sensors, mouse, 3D controller, and torque (Zhang et al., 2020). It is not a very immersive environment, but it still acts as a window to the 3D virtual world and usually offered

at an affordable price. Second life 3D virtual world and World of Warcraft are some examples of Desktop VR.

Benefits and Drawbacks of Virtual Reality

(Khandelwal & Upadhyay, 2021) stated that VR is growing in corporate and educational usage as it offers efficiency, engagement, retention, and transition from novice or professional. It also saves travelling time and expense and permit immersive storytelling.

Besides offering numerous benefits, VR also has several drawbacks including it requires technical specifications related to learning spaces and equipment as well as fast Internet speed in order to prevent computers freeze and crash (Duncan et al., 2012). VR also has some issues in relation to health as some people complained about physical and psychological discomfort including strenuous posture demands, repetitive strain injuries, headset weight and fit, simulator sickness, disorientation, hallucination, and dissociation (Merchant et al., 2014).

Regarding the risks and negative aspects of VR in education sector, (Hernandez-Pozas & Carreon-Flores, 2019) reported that there are moments where VR is too entertaining and fun that professors need to monitor students to prevent students draw away from learning purposes. (Fernandez, 2017) also said that the abusive use of this type of applications can entail the personal isolation of individuals from their peers. Another issue that may be further discussed soon is the security of the data that stems from the consumer's behavior while using such environments (Denwagan, 2013).

Business education

Business education refers to education that embraces teaching and learning the skills and knowledge that might be applied in the business industry (Lokhtina & Kkese, 1 C.E.). Added by (Abdel-Meguid, 1 C.E.), business education is a tertiary education field concerned with the study of the financial and non-financial aspects of business enterprises, industries, and markets.

Business education context, various compulsory and elective courses in business education encompasses materials on the way individual employees work, the impact of employee performance on the organization, and the impact of the organization on the larger social and economic environment (Hartley & Young, 2019). However, in an era of constant turmoil, the role of business education is evolving faster than ever. Business education is challenged to create "future-ready"

graduates who have innovative thinking and agility to continually evolve and adapt, while focusing on disruptive innovation through digital transformation (Tarabasz et al., 2018). Consequently, it is essential for business education provider particularly higher education institutions Higher education institutions (HEIs) are required to constantly adapt and respond to the needs of society, both economic and social and cope with current and prospective technology advancement.

Virtual reality in business education

With the advent of new technologies, access to relevant knowledge has become easier and allow individuals to have an effective education and training process (Orel, 2020). Current technological trends include artificial intelligence, big data, mixed reality, augmented reality, and virtual reality. Virtual reality is a computer-generated and immersive simulation of selected learning environment which act as a potentially useful learning tool for business education as it can help individuals to enhance recalls as well as understand people, situations, and events (Rogers, 2019)

The use of VR in education can be considered as one of the natural evolutions of computer-assisted instruction (CAI) or computer-based training (CBT) (Pantelidis, 2010). The potential uses of virtual reality as an educational tool have been the subject of several discussions and studies in the past (Çankaya, 2019; González-Zamar & Abad-Segura, 2020; Hussein & Nätterdal, 2015).

The option of VR being used as a content delivery platform for class material has been explored in a business class. (Hernandez-Pozas & Carreon-Flores, 2019) use VR in teaching International Business class and showed positive result as students welcome VR class activities on negotiation and inter-cultural communication and positively get engaged in learning process. (McGovern et al., 2020) undertook experiment on 71 students in introduction to marketing classes to use VR and the result showed that VR app-

lication allowed students to assess, practice, and upgrade their presentation skills.

Recent research suggests that individuals can retain more information, and can effectively use learned skills and obtained knowledge after participating in virtual reality simulation (Krokos et al., 2019). Virtual reality offers the possibility of familiarizing businesspeople with product development through simulations where products can be tested virtually, skills training where individuals can optimize the product development, and communication with other actors such as users, experts, and customers (Orel, 2020)

METHOD

Research Design

This article employs systematic literature review approach. The “systematic review,” aims to provide a comprehensive, unbiased synthesis of many relevant studies in a single document (Aromataris & Pearson, 2014). Aromataris’s step by step approach in SLR was used, and this includes formulating the research questions and objectives, set the inclusion and exclusion criteria, determine the eligibility of the studies, data collection, appraisal of data collection, assessment of the result validity, analysis, presentation of data and, reporting (Aromataris & Pearson, 2014). This was later modified as presented in Fig. 1.

The following strategies were employed to identify empirical studies to include in the systematic review analysis:

1. Electronic searches were performed through direct searches from publishers including IEEE Explore ,Emerald, Springer, and Taylor & Francis
2. Branching searches were performed using forward and backward search procedures from the reference lists of the empirical studies
3. Search terms for empirical studies included virtual reality, VR, virtual worlds, virtual learning environments, virtual classrooms, immersive learning environment,

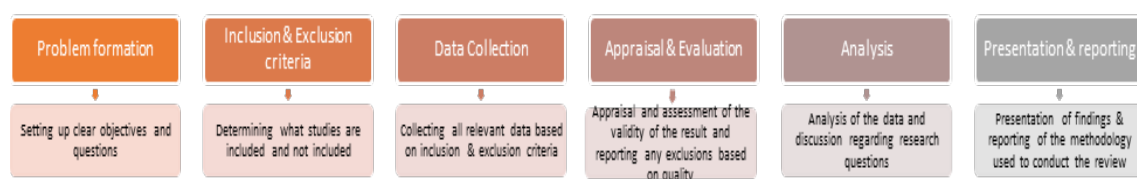


Figure 1. Systematic Literature Review Process , adopted from (Aromataris & Pearson, 2014)
Data sources and search strategies

computer games, game-based learning environment, simulations; these were combined with other terms such as business education, business skills, learning, instruction, and instructional design.

4. Population includes studies related to VR in higher education. Higher education refers to education that is offered at post-secondary schooling and involve various academic institutions such as universities, community, and technological colleges (Tshishonga, 1 C.E.). It also includes both public and private academic institutions that generate and disseminate knowledge. The studies chosen within the last 10 years (2012-2022) used as the population while some inclusion and exclusion criteria were used to select the samples for this research as indicated in Table 1.

Inclusion and exclusion criteria

Authors first search articles through publish and perish applications from Scopus database and the search yields 200 articles based on keywords "Virtual reality" AND "Business education". After thorough examination based on inclusion and exclusion criteria, we proceed to 24 articles for abstract review and after careful examination of the 24 articles, we proceed to 7 articles for full paper review. Among the 7 papers reviewed, only 3 articles are considered into selection studies. Afterwards, authors do manual search on reputable publishers such as Taylor & Francis, Emerald, IEEE, and Springer.

Appraisal & Evaluation

This study used a checklist form which referred from (Salleh et al., 2011) article to assess the quality of the primary studies. The checklist was modified and comprised of six

Table 1. Inclusion And Exclusion Criteria

Criteria	Inclusion Criteria	Exclusion Criteria
Language	Written in English	Written in non-English
Technology	Non-immersive, Semi-immersive & Fully Immersive VR	AR
Population	Business education in higher education	Business education in primary & secondary school, business training in corporate
Type of publication	Journal articles	Conference proceeding Books chapters, opinion and preface, master dissertation
Date	2012-2022	Before 2012
Research Design	Empirical study	Review paper

Table 2. Systematic Review Source: Search Database, Strings, And Number Of Results

Sources	Search Strings	Result		
		Keyword search	Abstract review	Full paper review
Scopus	"Virtual reality" AND "Business education"	200 articles	24 articles	7 articles
IEEE	"Virtual reality" AND "Business education"	24 articles	3 articles	-
Emerald	(content-type:article) AND (Virtual Reality AND (Business) AND (Higher Education) - (Primary Education) - (Secondary Education) OR (VR))	500 articles	25 articles	3 articles
Springer	"Virtual reality" AND "Business education"	103 articles	24 articles	-
Taylor & Francis	[All: virtual reality in business] AND [All: education] AND [All: higher] AND [All: education] AND NOT [All: health] AND NOT [All: stem] AND NOT [All: natural] AND NOT [All: geography] AND NOT [All: medical] AND NOT [All: nursing] AND [Article Type: Article] AND [Publication Date: (01/01/2012 TO 12/31/2022)]	1,149 articles	41 articles	21 articles

Table 3. Appraisal And Evaluation Checklist

No	Item	Answer		
		Yes	No	Partially
1	Was the article refereed?			
2	Were the aim (s) of the study clearly stated?			
3	Were the study participants or observational units adequately described? For example, students' programming experience, year of study, etc			
4	Were the data collections carried out very well? For example, discussion of procedures used for collection, and how the study setting may have influenced the data collected?			
5	Were the approach and formulation of the analysis well conveyed? For example, description of the form of original data, rationale for choice of method/tool/package?			
6	Were the findings credible? For example, the study was methodologically explained so that we can trust the findings; findings/conclusions are resonant with other knowledge and experience			

Adopted from: (Salleh et al., 2011)

general questions (Table 1) to measure the quality of studies according to the following ratio scale: Yes $\frac{1}{4}$ 1 point, No $\frac{1}{4}$ 0 points, and Partially $\frac{1}{4}$ 0.5 point. The resulting total quality score for each study ranged between 0 (very poor) and 7 (very good).

Two of the authors (Adisthy & Sarah) were responsible for reading and checking based on the checklist form for each of the primary studies. To ensure the validity, a random sample comprised of 20 percent of the total number of primary studies had their data extracted by the first and second authors, and then compared in a review meeting which attended by all authors. If the data extracted differed, such differences were discussed until consensus was reached. Based on the primary searches, 10 studies (8,47 percent of 118f studies) were accepted for the synthesis of evidence after a detailed assessment of abstracts and full text and exclusion of duplicates.

Only articles that satisfied the following criteria were included in the selection study: (1) Articles which focus on Virtual Reality in the form of Immersive VR or Non-Immersive VR (3D desktop-based simulations, games, and virtual worlds). Non-immersive VR is included as it can offer similar learning benefits as immersive VR and were widely disseminated in education (Merchant et al., 2014), (2) Conducted in the con-

texts of business education in higher education. Articles regarding other educational contexts out of business education and higher education scope were excluded, (3) Peer-reviewed empirical studies. The peer-review process ensured the quality of the selected articles, and thus excluded publications such as reports and dissertations. Empirical studies include quantitative, qualitative, mixed-methods, survey, and design-based research. Additionally, duplicated records or records missing full text were also identified and removed from the search.

After conducting the appraisal and evaluation step, Table 4 shows the shows quality scores of the articles based on the checklist mentioned in Table 3. All achieved above average quality: 3 studies (30 percent) and 7 studies (70 percent) were deemed very good and good quality, respectively. In addition, All articles in selection studies are belong to high rank journal, in Q1 and Q2 which guarantees the quality of the articles in addition to the appraisal and evaluation step in carrying out this SLR study.

SLR Procedure

The screening process lasted about 4 months and involved three researchers. The second and third authors led the initial screening, and the first author supervised the process. After

Table.4 Quality Scores

Scale of Quality	Very Poor (<1)	Poor (1-<2)	Fair (2-<4)	Good (4-≤5)	Very Good (>5)	Total
Number of Studies	-	-	-	3	7	10
Percentage (%)	-	-	-	30%	70%	100%

Source: Analysis

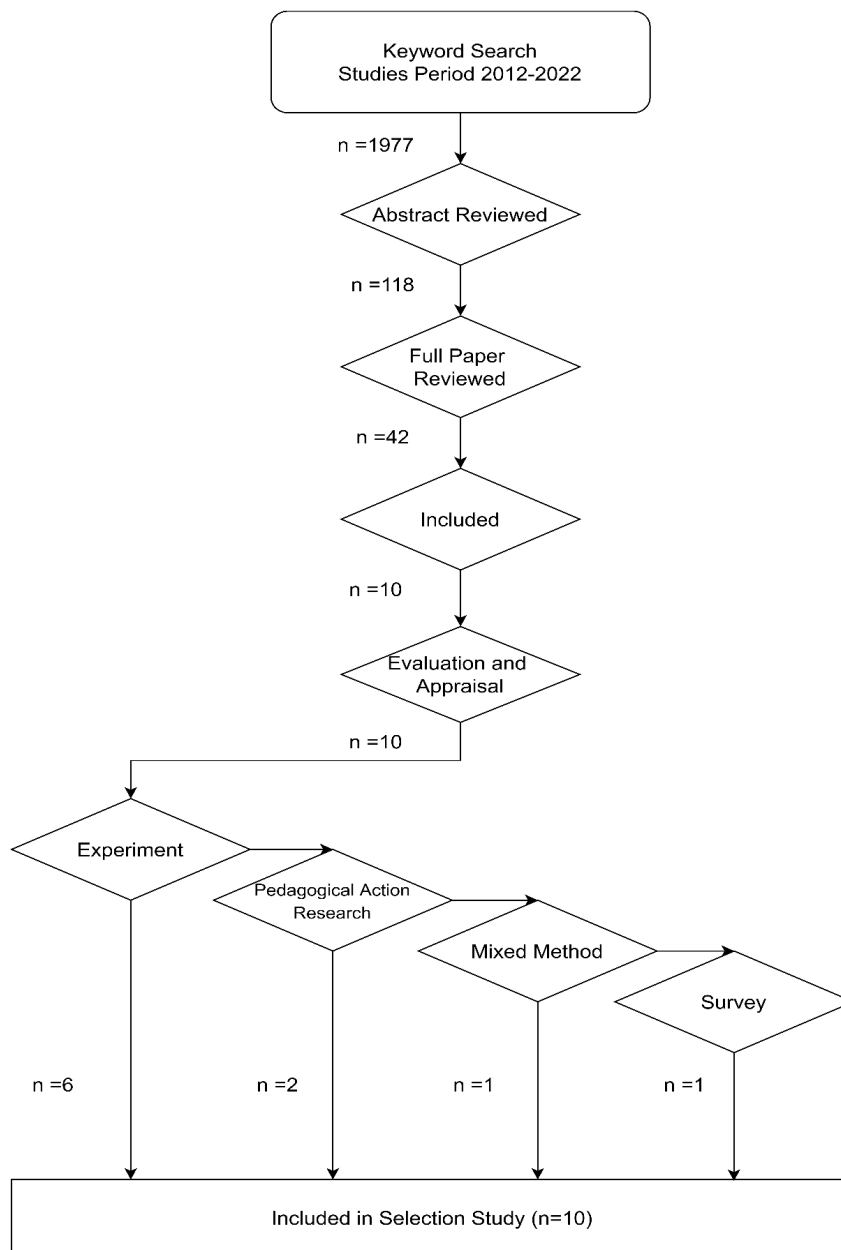


Figure 2. SLR Procedure (analysis)

the manual screening, second and third authors conducted appraisal and evaluation of the quality of the studies. A total of 10 articles were deemed to have met all the criteria and were included in the main library for further analysis.

Figure 2 shows the SLR process started from screening stage to the inclusion of selection study. We manually screened the 1977 articles (200 publish perish Scopus search + 1776 direct search+1 citation search=1977 articles), then proceed into evaluation and appraisal which resulted into 10 articles for study selection.

RESULTS AND DISCUSSION

Results

Figure 2 shows various methods used in VR on Business Education Research. Experiments were found to be the most popular research approach used (60 percent), followed by pedagogical action research (20 percent) and other methods with the same percentage; mixed method and survey (11 percent). This can be assumed that most researchers who studied VR on business education use experiment to evaluate the use of VR on business student, followed with pedagogical action research.

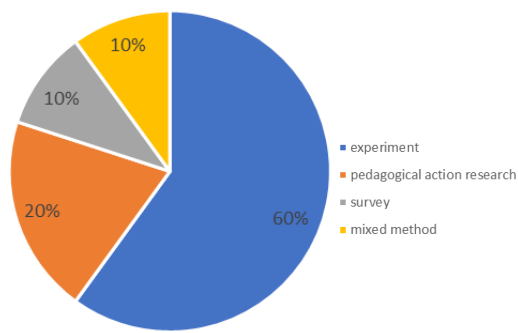


Figure 3. Methods used in VR on Business Education Research

Figure 4 shows selection studies based on journal. Based on the topic of Virtual Reality in Business education, most articles belong to education journal, with Interactive learning environment as the journals who published more articles related to the topic compared to others. This indicates that topics related with VR in business education are mostly published in educational journal and followed with IT-related journal.

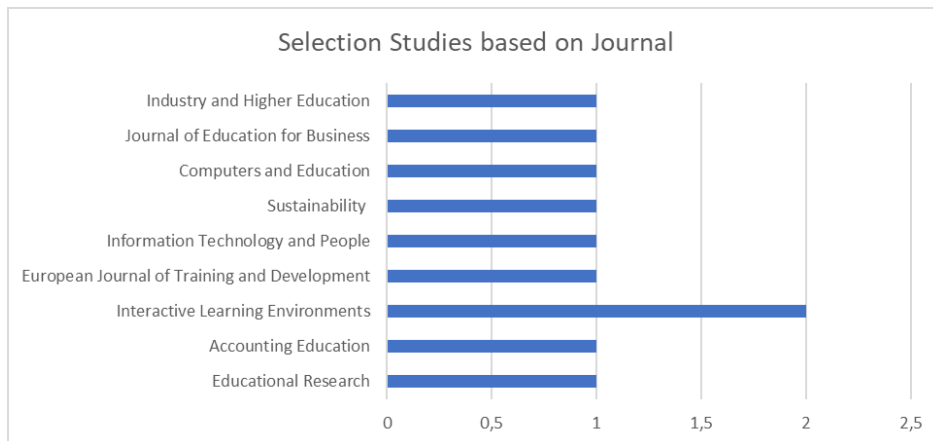


Figure 4. Selection Studies based on journal

DISCUSSION

The use of virtual reality and computer simulation has entered the business educational arena but has room for growth. These ten articles demonstrate that students are receptive to this type of instruction, as shown through the articles with an evaluation component. None of the articles presented the use of virtual reality and simulation in the distance-learning programs that are growing in the world post-pandemic era.

Development of VR in Business Education Within 10 Years

Of the nine final articles included in the review, not many significant changes in number of articles since 2012-2020. Some of the articles were varied in technology used yet some were in common. All studies were specific to the virtual reality in business education. Regarding VR technology, most use non-immersion type which merely rely on computer based. However, in 2019, there is an improvement of study of VR in business education by using Oculus for Ovation VR which is the type of fully immersive VR. All were conducted in higher education settings.

Table 5. Recap of Selection Studies

Year	Number of Articles	Technologies
2012	1	Second life
2015	2	Sim Venture TM & Second life
2016	1	Sim Venture TM
2017	2	Open TTD & Machinima
2018	2	VBR and Second Life
2019	2	Ovation VR & VR Educational Environment
2020	1	VBR

Regarding the topic of the studies, four articles discussed use of VR in marketing studies (Lin et al., 2018; Sánchez, 2018; Yen & Lin, 2020), one article discussed use of VR in entrepreneurship education (Grivokostopoulou et al., 2019), one discussed VR in logistic study, one discussed data communication and networking management study (Peng & Abdullah, 2018), and two discussed VR in business strategy and management (Donovan, 2015).

The SLR identified 9 studies conducted in higher education settings that investigated

the use of virtual reality on undergraduate and graduate business students. The context of investigation varied from virtual reality on Second Life, simulation games in marketing fields, business process simulation, international business simulation, investment simulation, logistic and supply chain video game-based, games on data communication and networking management, entrepreneurship intent and skill-based game, retail-focus simulation study, and VR in enhancing communication skill.

The SLR's goal was to understand how virtual reality trends in business education within the last 10 years. During the period of 10 years, not many studies conducted in fully immersive type of VR on business education. Of the 9 studies analyzed, 2 studies use VBR software in VR studies, 2 studies use Second Life, and the rest are varied including Ovation VR Software, Virtual Reality Educational Environment, Sim Venture TM, Machinima, and Open TTD) (Donovan, 2015).

Second Life is used to allow students to investigate how business branding practice were used for product promotion in this virtual world environment. As a virtual world, second life is used in higher education as a tool for augmenting the subject curriculum and providing additional learning experiences for students (Alrayes & Sutcliffe, 2011). In addition, one study integrated Machinima into Second life and found that use of Machinima compared to DVDs in Second life leads to higher concentration and less distraction. This allows students to concentrate more into the message of the learning sequences

VBR Software is a retailer simulation-based learning environment which allow students to apply theoretical knowledge of retailing into practical application through computer simulation (Lin et al., 2018). VBR allows for educational purpose in terms of learning charts and graphs for analysis, trend spotting, future prediction for project design, business decision making, cost calculations, profits and purchasing volumes, business terminology, and collaborative learning in virtual world (Lin et al., 2018). Regarding retailing, VBR allows students to make decisions about store location, store opening, and closing times, product lines to carry, physical inventory levels, shelf space arrangements and allocation, pricing and promotion, market research, staffing levels, purchasing, and borrowing.

Ovation VR is a software application which allow users to train its presentation and public speaking skills at virtual public events. It provide students with an immersive virtual learning

experience and unbiased detailed real time feedback during and after practice session (McGovern et al., 2020).

Virtual Reality Educational Environment in the selection study is entrepreneurship educational environment based on 3D virtual worlds which allows students to choose from range of various courses in entrepreneurship. The designed VR Educational Environment provide platforms for communication and collaboration between students and tutors.

Sim Venture TM is a computer-based platform through which students take on the management of a small company producing computers (Newbery et al., 2016). Students will run a virtual startup business and decide based on their determination of current performance. The Sim Venture game allows users to set up and run their own virtual company and help anyone who are keen to learn about business and/or entrepreneurship (SimVenture, 2022).

Open TTD is an open-source simulation video game based on Transport Tycoon Deluxe which allows players to act as logistic manager and manage the supply chain operation (Liu, 2017). The use of Open TTD as a teaching tool allows students to gain realistic experiences as they receive feedbacks regarding their decisions as well as train students' decision-making skills. Moreover, its high level of flexibility in operations is suitable for various teaching plans (Liu, 2017)

Virtual Business Retailing (VBR) Software is a business simulation system which used for business-related learning and allows students to engage in the virtual world and interact with peers during marketing-related decision making (Yen & Lin, 2020). Students are allowed to make decision about store location, opening, and closing times, and other retailing functions in a virtual world.

Effectiveness of VR in Improving Business Skills

Virtual reality has a role in improving business skills (9 of 9). Williams (2015) found that Virtual reality through SimVenture increased student awareness of the interconnectivity of different areas of the business as well as effective in developing business and management skills.

Lin (2018) on his study using VBR software showed that VBR provided students with an initial set of problems, students attempted to solve these problems by making decision based on their own perspectives and knowledge. Thus, it is effective in increasing decision making and problem-solving skill.

In online learning the simulation is the effective method to deliver course content. It also found that the learning process is influenced by the realistic simulation and computer efficacy (Peng & Abdullah, 2018). In other study, Challenge-skill balance and playability play a critical role in increasing the flow experience (Yen & Lin, 2020). The increasing flow experience affected learning performance and entrepreneurial self-efficacy in a business simulation context. Better understanding of educators and developers to student expectation and needs as well as providing the guidelines will increase the student's entrepreneurial self-efficacy (Yen & Lin, 2020).

Machinima when integrated into virtual world is chosen by students more than instructional video for mechanism of learning delivery. Machinima can increase student ability to concentrate on the message that deliver on Machinima learning sequence (Donovan, 2015).

The gamified entrepreneurship education can increase the student knowledge level of entrepreneurship. The gamified entrepreneurship gives the students experience to stimulate in real-world situations, by act as professional, cooperate with their peers, analyze situations, and make proper decisions. Beside increasing student knowledge of entrepreneurship, student also feel more confident, better self-esteem, and possess the necessary skills to open their own business (Grivokostopoulou et al., 2019).

The study of (H. H. Lin et al., 2018) investigate the effect of learning method and learning motivation in the context of business simulation system. The result found that the individual mode resulted in a higher learning performance. It can be explained that the individual student tends to more focus to the development of the retailer business simulation system. While the collaborative groups, the students need to participate in additional activities, like explanations, disagreement, and mutual regulation, even though the collaborative group has benefit of diverse perspective. Other findings, motivation doesn't have significant effect on learning performance. Learning motivation is an important moderator for the effect of learning method on learning performance.

The using of virtual reality technology application can enhance the quality of students' learning experience. The VR application can help students in assessing their presentation skills, upgrading their skills, and increasing confidence in delivering effective presentations (McGovern, Enda Moreira, Gerardo & Luna-Nevarez, 2019).

The study of (Liu, 2017) investigate the using of video game to teach supply chain and logistics management. Students had more positive attitudes and learning experiences toward video games-based learning than traditional learning.

Impact of VR On Entrepreneurial Intent and Self-Efficacy

Of the 10 articles, there are three articles which studies use of VR on entrepreneurial intent and the result were varied. (Grivokostopoulou et al., 2019) examined the impact of a gamified entrepreneurship education framework in higher education at 3D technology context and found that gamification based virtual reality increased knowledge level off entrepreneurship, self-efficacy, as well as attitude and intention. (Newbery et al., 2016) found that serious games as a start of entrepreneurship education have lowered entrepreneurship intention. The using of serious game in the beginning stage helps the students in getting realistic version of entrepreneurship world, eliminate prejudice, ground hope, and provide a solid foundation for the next steps in student learning. The authentic and powerful learning tools of serious games might cause lower entrepreneurship intention.

(Yen & Lin, 2020) analysed the impact of flow experience on learning performance and entrepreneurial self-efficacy on virtual business retailing (VBR) software and it revealed that learning performance affect entrepreneurial self-efficacy, flow experience affects learning performance, as well as challenge-skill balance and playability affect flow experiences.

Effect of learning method and learning motivation on learning performance in simulated environments

(Lin et al., 2018) explores the relationship between learning method, learning motivation, and learning performance in a simulation-based learning context. They conducted an experiment with a 2x2 factorial design on sample of two classes of undergraduate students in marketing major. The data were collected through experimental scenarios and achievement test trough VBR, and motivation scale with MSLQ which developed by Pintrich et al in 1991.

The result shows that students in individual groups exhibits significantly higher learning performance than those in collaborative group. Plausible explanation for the result of individual mode is higher than collaborative mode on learning performance is that individual students tended to pay more attention to deve-

lopment of retailer business simulation system while collaborative groups were required to participate in additional activities (explanation, disagreements, and mutual regulation). Although building explanation together contributes to learning and construction of knowledge, it can become detrimental in the case of cognitive overload. Another explanation by (Dillenbourg et al., 2009) pointed out that group members do not always construct mutually shared cognitive and social processes of collaboration despite of their group participation. This explains phenomena when more thoughtful members had no residual force to help other members to learn, while less thoughtful members may display free member tendencies. Besides, it can be also associated with mismatched personalities within groups, discrepancy in knowledge or viewpoints, as well as emotional regulation process. However, the collaborative work within the study is not clearly mentioned whether the collaborative task is done through virtual or physical since it stated the group participants shared a computer while playing the VBR game and discussed the gaming task together.

Regarding learning motivation on learning performance, this study showed that it did not have significant impact on students' learning performance yet as a moderator variable, there was significant interaction between learning motivation and learning method for learning performance. Students with high level of learning motivation exhibit higher learning performance than those with low level of learning motivation under collaborative mode. However, it also shows that no matter whether learning motivation was low or high, learning performance for individuals was higher than collaborative group.

LIMITATION OF THE RESEARCH

There were several limitations including the use of abstracts as a first step in the review process. This may have eliminated articles that only included the key words in the main text of the article. Second, we only include one article which found from citations from initial selection study due to time limitation. The third limitation is that although all authors participated concurrently in the initial abstract and full article reviews and in final decisions regarding article inclusion, the 118 abstracts selected from the initial selection process were equally divided between us for review. Following this separate review, we discussed inclusion decisions to minimize bias. However, because of the independent work conducted in the research process, this is a

noted limitation. Last, the inclusion of only published articles and English-language articles limited the selection prospects for this systematic review, increasing publication bias.

CONCLUSIONS

This paper described an SLR targeted at empirical studies of virtual reality in business education in higher education settings. Due to the absence of studies on VR adoption on business education in higher education, this SLR analyzed the current studies that involved the non, semi, and full immersive type of virtual reality. Therein, 10 up-to-date studies retrieved from reputable publishers and databases (Taylor & Francis, Emerald, MDPI, SAGE, and Scopus) were critically analyzed in the period between 2012 and 2022. The review concluded that the implementation of virtual reality in business education was found to be effective in improving business skills, found to bring positive learning experience, affect significantly to entrepreneurial self-efficacy yet there have not been many articles discussed practice of virtual reality in fully immersive mode and most studies have only adopted non-immersive type of virtual reality.

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