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A literature review of implementing virtual reality in hospitality education

Frederik Jan van der Meulen* & Marit de Vries

Hotel Management School, NHL Stenden University of Applied Sciences, Leeuwarden, The Netherlands
*Correspondence: frederik.van.der.meulen@nhlstenden.com

ABSTRACT: This article provides a systematic view of the published research topics relevant to an understanding of using virtual reality (VR) in hospitality education. The structure of the literature review is based on the PRISMA reporting guidance and reviews two main elements: the status of VR embedded in hospitality education and the learning frameworks best fitting VR in education. Using the Google Scholar, Science Direct, and EBSCO databases, the present review found relevant articles. The included papers were classified with the following dimensions: year of publication, hospitality industry domain and search keywords. A total of 51 articles were deemed relevant and were reviewed. These articles focused on different aspects of the hospitality education, including virtual reality technologies (VRTs), applied learning frameworks, design and evaluation of VR. The results highlight among others that VRT can be integrated in (design-based) teaching and is seen as a valuable addition. Also, VR has a strong effect on student learning, especially the technology itself and classroom design. Fundamentally, a social constructivist learning framework fosters a good basis for including VRT in education. These results provide potential directions for hospitality educators, researchers and practitioners in future research efforts to enhance the correct use of the virtual learning environment in education and training of practical aspects in the hospitality industry. Key implications of this study include the call for determining the appropriate level of VRT most suitable for the development of virtual learning environments (VLE), the online learning programmes and how to motivate the students the most.

KEYWORDS: learning framework, social constructivist education, VR, VR training

Introduction

When VR as an educational tool in a practical training context in undergraduate hospitality management education was introduced, the need surfaced for research into the requirements to be met to successfully embed VR in education. Inspired by Radianti et al. (2020), this realisation led to the review of two main elements: the status of VR embedded in hospitality education and the learning frameworks best fitting VR in hospitality education.

Development of (online) technologies in education

VR has been described as a 21st century learning tool (Radianti et al., 2020). Furthermore, VR is defined as the entirety of hardware and software systems that attempt to generate an all-encompassing, sensory illusion of being in another location (Biocca & Delaney, 1995). In their study, Lei and So (2021) discuss the viewpoints of online learning in tourism and hospitality education, as well as lecturers' acceptance of technological changes. This is demonstrated by the acceptance of online learning as a supplement to classroom learning, which was accelerated by COVID-19. From the standpoint of the students, the increase in online learning allows them to improve their computer skills. In general, society will be confronted with the increasing impact of technology in daily life and therefore the use of technology needs to be embedded in hospitality education as well. As shared by Suh and Prophet (2018), the four domains using the most immersive technologies are education, entertainment, health care and marketing, which have been researched in two main streams. One of these topics looks at how immersive technology might increase user performance and the efficacy of learning and teaching. The theoretical basis of immersive technology has been researched and integrated in current studies (Suh & Prophet, 2018).

Virtual reality in learning frameworks

Leung et al. (2022) share from their research that knowledge construction through the existence of VR is seen as an advantage, but where the overall acceptance of technology is still the largest obstacle. Radianti et al. (2020) state that the learning theories used as theoretical foundations are missing in the research of Suh and Prophet (2018). Therefore, Radianti et al. (2020) constructed a learning framework where learning theory, the way of learning, learning content and what is learned are described. Both Leung et al. (2022) and Radianti et al. (2020) discuss learning theories such as the constructivist learning theory and the cognitive-affective theory of learning, and agree that the constructivist learning design is most applicable for VR-based learning. Another learning environment, described by Geitz and De Geus (2019), called design-based education (DBE), is a further development (i.e. redesign) of the existing concepts of problem-based learning and competence-based education,

which are in turn based on the principles of sustainable education. "Social constructivism is an important foundation for the DBE learning environment" (Geitz & De Geus, 2019, p. 7). Representation of reality and learning constructed from internal representations of one's own version of knowledge are the common threads in the three articles.

The literature review was based on the research questions presented by Radianti et al. (2020). The protocol for preferred reporting items for systematic reviews and meta-analyses (PRISMA) was used for this review. The current study is organised as follows: the research questions and inclusion and exclusion criteria are shared in the methodology section. The results section explains which results were found per research question. The review ends with the conclusion and suggestions for further research.

Methodology

The literature review is based on the reporting guidance called preferred reporting items for systematic reviews and meta-analyses (PRISMA) developed by Liberati et al. (2009). The reporting guidance has been preceded by the following research questions, divided over four main topics based on Radianti et al. (2020). These four main topics are hospitality education and VR, hospitality education and learning frameworks, design and VR, and evaluation. The research questions (RQ) are:

- RQ 1: How can VR be implemented in hospitality education?;
- RQ 2: In what ways are immersive VR technologies embedded into hospitality education?;
- RQ 3: Which learning frameworks support the use of VR in hospitality education?;
- RQ 4: What are the effects of VR on the learning process in hospitality education?;
- RQ 5: Which VR design elements are relevant for the learning content in hospitality education?;
- RQ 6: Which VR design elements are relevant for the use of VR in hospitality education?; and
- RQ 7: How is the use of VR evaluated in hospitality education?

Based on the research objectives described above, keywords for the search string were defined in a peer review environment as part of the search strategy. The search string shown in Table 1 was applied to the EBSCO (Hospitality and Tourism) database on 18 December 2022.

In addition to the EBSCO database, on the same day, Google Scholar, Research Gate and Science Direct were also used. In addition, on 21 December 2022, the EBSCO database was used as a search engine. Different setups of search strings are applicable for each of the separate databases, although all the same keywords have been applied as indicated in Table 1. The results of Research Gate did not match either of the criteria and were therefore excluded from the process.

TABLE 1. Search string used in EBSCO

Keywords	Conjunction
["Virtual reality" or "VR" or "virtual environment" or "VE"]	AND
["hospitality education" or "higher hospitality education" or "professional hospitality education"]	AND
["augmented reality"]	NOT
["educat*" OR "learn*" OR "train*" OR "teach*" OR "learning framework"]	AND
["rehabilitation" OR "therapy"]	NOT

During the identification stage in December 2022, the search string as shown in Table 2 served as a guidance. In January 2023, the screening of the documents included the process of determining the accessibility of the documents which resulted in nine excluded articles. This process was followed in February 2023 by a manual screening of the records done in a peer review setting and based on the following key words: Hospitality education + VR; hospitality education + VR + learning framework; hospitality education + VR + learning framework + VR criterium design; hospitality education + VR + learning framework + VR criterium design + evaluation of learning effects of VR usage. Selection bias was a concern for us and therefore the articles were first screened using the title and abstract of the article. Secondly, bias might occur with inaccurate inclusion or exclusion criteria used in the eligibility stage, so again we separately read the articles in full, resulting in the exclusion of another 53 articles. An illustration of the selection strategy based on PRISMA guidelines is shown in Figure 1.

Fifty-one articles remained in the selection and were added to Atlas.ti to derive the related quotes and to link to the specific research question.

Results

General process
For the processing and qualitative analysis of the 51 articles, Atlas.ti was used. In Atlas.ti, the articles were imported, a text search was done in the articles with the code words resulting from the relevant quotations and the research questions were defined with the corresponding code words. Also, smart codes were created with the corresponding code words. These smart codes generated "co-occurrence" quotations relevant per research question. Finally, the quotations of the smart codes were exported to Microsoft Excel® and segmented per research question. These exports were the basis of the results.

RQ 1: How can VR be implemented in hospitality education?
Based on the co-occurrence of the codes "implementation virtual reality" and "VR in hospitality education", 20 quotes appeared. However, after critical examination, only four quotes appeared relevant. From the other articles, six quotes appeared, of which there were three new quotes.

As indicated by Patiar et al. (2021), limited research has been done on the effect of virtual experiences on a student's learning, and specifically about the impact of the technology itself and the design of the lesson. Furthermore, Lei and So (2021) emphasise the importance of the lecturer's performance and, more specifically, the shift to a different teaching style, which appears to be the strongest predictor in online learning. The importance of the lecturer's behaviour is indicated by Lei and So (2021) by stating that when lecturers do not believe in the effectiveness of transferring knowledge in an online world, although these are strongly related to practice, a decrease in satisfaction regarding teaching online will occur. Barron and Henderson (2002) already indicated that successful VLE requires an appropriate level of VRT. Added to this is the need for deciding upon the educational programme which best fits being taught via VR. Leung et al. (2022) compared in-person hospitality employee training with a VR setup and the only difference was the background used. Two decades ago, Barron and Henderson (2002) stated that seen from the pedagogical perspective, the use of a virtual hospitality
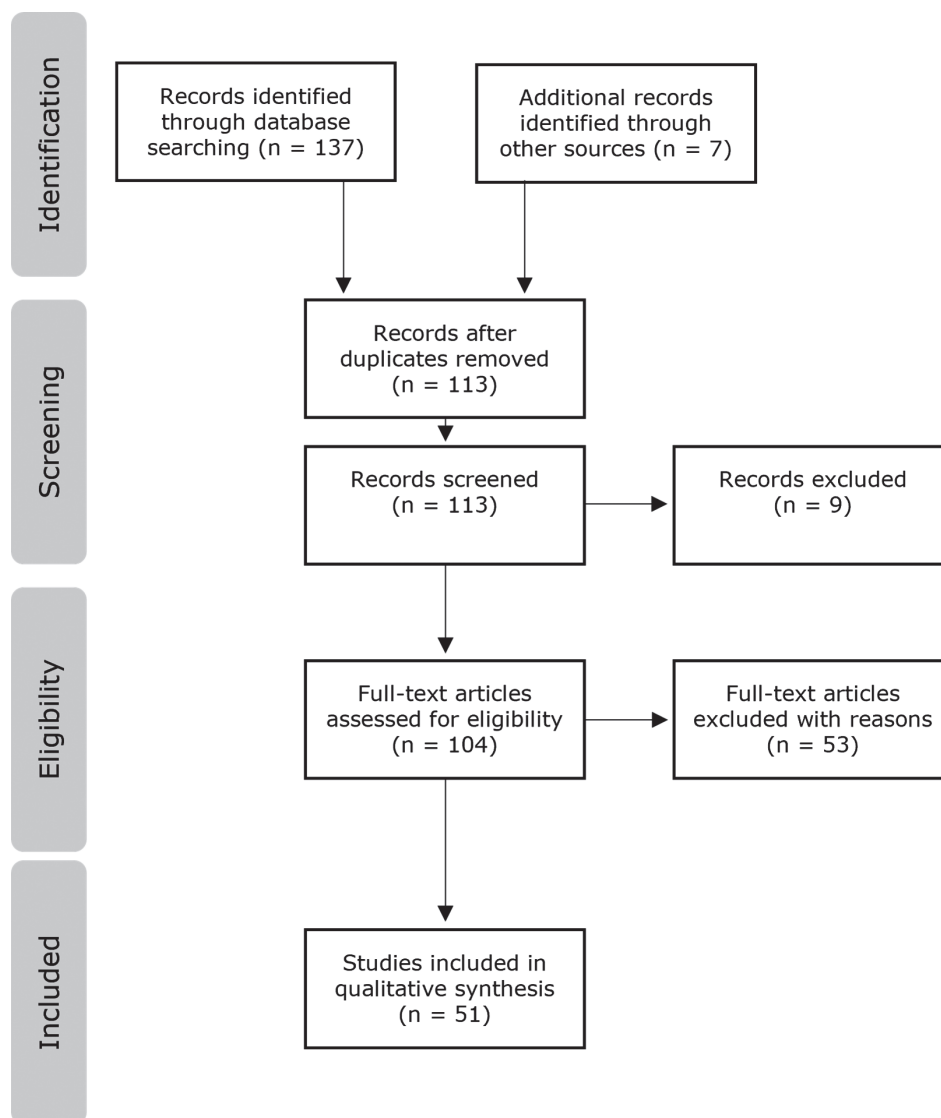
FIGURE 1: Article selection strategy based on PRISMA guidelines

learning environment to educate hands-on experience in a VRT surrounding would be a valuable learning environment. Bilsland et al. (2020) continue research in this same area when discussing the possibilities of virtual internship experiences in which a case-based instruction is used to simulate the real-world setting by using an immersive virtual environment.

RQ 2: In what way are immersive VR technologies embedded in hospitality education?

In total 12 quotes appeared, based on the co-occurrence of the codes "immersive VR" and "VR in hospitality education". However, after critical examination, only two quotes appeared relevant. From the other articles, one quote appeared which was the same quote from the original research question.

In their exploratory research, Barron and Henderson (2002) found that VRT can be integrated in teaching and is seen as a valuable addition. Their main question was on the "how" and which type to use. Almost two decades later, Bilsland et al. (2020) share from their research that in the meanwhile the

hotel industry has embraced the visualisation technology of, for example, VR in guest and marketing strategies; however, in training, the adoption is much lower.

RQ 3: Which learning frameworks support the use of VR in hospitality education?

Based on the co-occurrence of the codes "immersive VR" and "VR in hospitality education", 34 quotes were found. However, after critical examination, only two quotes appeared relevant. From the other articles, five quotes appeared, of which there were two new quotes.

Price-Howard and Lewis (2022) state that it is worthwhile for hospitality programmes to have integrated virtual learning environments like *Second Life*. Applying virtual settings operationalised through digital platforms and offering scalable simulations are ideal in a situation when face-to-face delivery of classroom sessions is not possible, something which was discussed by Wang et al. (2022). Their research related to blending design concepts in tourism and hospitality with

traditional education and how this type of education, including the use of digital platforms, prepares the student for the ever-changing industry. Leung et al. (2022) refer to the use of the constructivist learning theory, to which self-directed interactive learning is related. This type of learning might lead to higher trainee performance and satisfaction, to which VR game training contributes as it allows self-directed learning. In addition, they state that a more positive attitude towards learning is shown when video-based instructions are included and effective knowledge retention is established (Leung et al., 2022).

RQ 4: What are the effects of VR on the learning process in hospitality education?
Based on the co-occurrence of the codes "learning process virtual reality" and "VR in hospitality education" five quotes were found and, after critical examination, all five quotes appeared relevant. From the other articles, 12 quotes appeared, of which there were four new quotes relevant for this research question.

Patiar et al. (2021) have shown that virtual hospitality environments provide a technology-enhanced solution to practice-based knowledge and employability skills acquisition. This is successful in supporting assessment tasks and enhancing learning outcomes, as well as improving knowledge about the functioning of hotels and their ability to operationalise food and beverage systems. The virtual hospitality training environment must consist of three elements – context, people and content – to facilitate knowledge acquisition and skills development. It can also stimulate the use of reflection and authentic assessment tasks to challenge student assumptions, and it provides an opportunity for one-on-one learning encounters (Fitzsimons & Farren, 2016). Although the virtual hospitality experience cannot replicate the real world (Stokes-Thompson et al., 2012), students can experience a full perspective with a well-designed VR environment (Jacobson et al., 2009; Leydon & Turner, 2013).

Leung et al. (2022) conclude that VR training was a more effective method of training for hospitality learners. The constructivist learning theory, following the Kirkpatrick model (Kirkpatrick, 2006), was used to measure knowledge retention and self-directed interactive learning. When using the constructivist learning theory, self-directed interactive learning could lead to better training outcomes such as higher trainee satisfaction and performance (Leung et al. (2022)). Research on the effectiveness of VR training applied in the service industry is limited, specifically around forming employee attitudes and improving knowledge recall.

Finally, the use of VR has a positive effect on the motivation of students to explore creative ideas and to learn speaking skills in a virtual learning environment (Price-Howard & Lewis, 2022). In addition, students show a positive attitude towards adopting VR as an educational tool and a willingness to use it for communicational and interpersonal skills (Shen et al., 2022).

RQ 5: Which VR design elements are relevant for the learning content in hospitality education?
The co-occurrence of the codes "design elements of VR" and "learning content hospitality education" resulted in four quotes. However, after critical examination, only three quotes appeared relevant. From the other articles, eight quotes came up, of which there was one new quote.

Studies like the one of Sagnier et al. (2020) investigated the relevant criteria of the technology acceptance model (Silva,

2015) for the acceptance and use of virtual reality. The criteria of perceived usefulness, playfulness, attitude and behavioural intention boosted the use of virtual environments and related to the willingness of learners to view VR as a learning platform. Deale (2019) found that being able to work and learn together as a group provided interesting opportunities for virtual learning in online hospitality education. Communicational and interpersonal skills were received positively by these students trained in the virtual learning environment (Hsu, 2012). For the hospitality industry, it is important to include the elements of the service mindset (Bilsland et al., 2020). Patiar et al. (2021) showed that virtual learning had a positive influence on hospitality students when the subject matter was supported by the management processes and practices used in the hospitality businesses.

According to Lei and So (2021), not only are hardware and software important factors for the use of virtual learning environments, but also the lecturer's performance is one of the most important criteria for students' online learning satisfaction. Online courses in VR should be redesigned in a totally different way than the traditional "content delivery" so that students can experience the full potential of virtual learning. Sufficient training and support for lecturers in hospitality education is critical. The perceived benefits of online courses significantly affect both lecturers' and students' satisfaction. Hospitality education policymakers should provide resources to both lecturers and students to ensure that they are both convinced that virtual learning is appropriate for hospitality education (Lei & So, 2021).

RQ 6: Which VR design elements are relevant for the use of VR in hospitality education?
The co-occurrence of the codes "design elements of VR" and "VR in hospitality education" resulted in total 19 quotes. After critical examination, only eight quotes appeared relevant. From the other articles, 12 quotes were found, of which there were three new quotes.

Wang et al. (2022) state that it is important to integrate design thinking concepts into the virtual learning courses. Hospitality educators should help the students in this with discussions and reflection on an individual or group level. Wang et al. (2022) also describe the facilitation of a virtual learning environment where face-to-face delivery is not possible (e.g. during COVID-19). In these virtual learning environments, Wang et al. (2022) state that having guests from the industry to share experiences and immersive experiences such as field trips can complement and reinforce the concepts taught in class. These scenarios (through digital platforms and simulations) combined with design thinking principles can offer learning and assessment outcomes that are authentic and scalable (Burdick & Willis, 2011; Vallis & Redmond, 2021).

To achieve satisfaction in online virtual teaching from the lecturer's perspective, perceived benefits is an important factor to implement (Lei & So, 2021). The satisfaction and belief of lecturers in the virtual training potential is crucial for tourism and hospitality students in deciding if a virtual environment may be beneficial in providing practical tourism and hospitality courses (Lominé, 2002).

Hospitality academics in general agree with the potential benefits of online learning. Food and beverage courses are transitioning to the virtual learning environment through a combination of video and simulation (Flaherty, 2020). Practical subjects can benefit the most from the use of virtual reality, even though these are often the most expensive subjects to

deliver in a traditional mode (Barron & Henderson, 2002). Leung et al. (2022) indicate that the amount of arousal by means of adding tension or stimulation to the VR surroundings shows a negative effect on training effectiveness. However, the use of a rich immersive visualisation in tourism education led to a better understanding and engagement in tourism and hospitality education (Schaffer, 2017).

RQ 7: How is the use of VR evaluated in hospitality education?
In total 24 quotes arose out of the co-occurrence of the codes "evaluation virtual reality" and "VR in hospitality education". However, after critical examination, only four quotes appeared relevant. From the other articles, no quotes were found.

To evaluate the use of VR as a training tool, Leung et al. (2022) show the possibilities of surveys with intrinsic motivation-related questions to help better understand intrinsic motivation. Another good practice is to schedule regular one-on-one sessions. Data for evaluation can be collected via an attitudinal questionnaire and a semi-structured interview (Price-Howard & Lewis, 2022), or, pre- (looking at expectations) and post- (perception of actual acquisition of knowledge) open-ended questionnaires (Patiar et al., 2021).

Discussion

Virtual reality in hospitality education
Education is one of the four domains where immersive technology is embedded, according to Suh and Prophet (2018). When reading the 51 articles, the focus lies on using VR for training staff in the hospitality industry instead of training students in hospitality education. This is also reflected by the low number of quotes returning for RQ1, and after examination, the two relevant quotes from our research displayed a recognition of the possibilities of embedding VR in education (Barron & Henderson, 2002), and more recently supported by Patiar et al. (2021), indicating that little further research has been done on this matter. With RQ2, the possibilities of how to embed VR in hospitality education gives more information and addresses the importance of the lecturer's performance and willingness to change their teaching style (Lei & So, 2021). Furthermore, Barron and Henderson (2002) state that it is critical to have an acceptable degree of virtual reality technology present as well as a competent teaching programme. The design element needed in the VR surroundings is described as a rich immersive environment (Deale, 2019) where perceived usefulness, attitude toward and behavioural intention are relevant for students to see the VR surrounding as a useful learning platform (Sagnier et al., 2020). The element of touch added to the VR surroundings is the most researched (Jung et al., 2020), though Leung et al. (2022) suggest minimising the effect of arousal to maximise positive training effectiveness. According to Lei and So (2021), the most essential factor is the lecturer's performance, to which they add the importance of policymakers who must provide enough equipment for both lecturers and students.

Learning framework
The introduction to this article sheds light on the constructivist learning environment that may occur in a design-based education where social constructivism is the basis (Geitz & De Geus, 2019; Radianti et al., 2020; Leung et al., 2022). Leung et al. (2022) indicate the relevance of self-directed interactive

learning, also part of the constructivist learning theory. Patiar et al. (2021) share that context, people and content to facilitate knowledge are the prerequisites which need to be present to promote the virtual learning environment. As indicated by Stokes-Thompson et al. (2012), the virtual hospitality environment cannot replace the real world, but these virtual surroundings can challenge the students' assumptions related to tasks and jobs. Self-directed learning is encouraged by using VR games for training (Upadhyay & Khandelwal, 2022). Learning and, more specifically, knowledge retention are stimulated in a training setting when set up according to the constructivist learning theory (Leung et al., 2022). Students showed their interest in using VR tools like the virtual learning environment to train for communication and interpersonal skills (Shen et al., 2022). Virtual learning environments like *Second Life* are good instances of this (Price-Howard & Lewis, 2022). When designing the VR surrounding, it is important to include design thinking principles (Burdick & Willis, 2011; Vallis & Redmond, 2021).

Conclusion

This article offers a systematic view of the published research topics relevant to the understanding of using VR in hospitality education. The literature review was based on PRISMA reporting guidance. In the end, 51 publications were found to be relevant to the literature evaluation. The research topics comprised a combination of the following topics: hospitality education, VR, learning framework, design and evaluation.

The results highlight that VRT can be integrated in design-based teaching and is seen as a valuable addition to it. Also, VR influences student learning, especially the impact of technology itself, and classroom design. These results provide potential directions for hospitality educators, researchers and practitioners in future research efforts to enhance the use of the virtual learning environment in the education and training of the practical aspects of the hospitality industry.

Limitations

Conducting systematic literature reviews has some limitations. The first limitation is the identification and analysis of published articles in a specific period. The second limitation is the inability to discover relevant individual articles from a limited number of keywords. The third limitation is the use of a limited number of searchable databases to discover articles. Although we have defined some search and tracking keywords according to PRISMA guidelines, it is possible that some articles that met the inclusion criteria were not considered in this review. A review of recent papers on the emerging technology of VR published after 2016 reveals that there are few articles from which to gather knowledge. VR is still a very new technology, especially in hospitality education. Furthermore, focusing on the search term *hospitality education* may limit the number of articles found. Most of the articles mention search terms like hospitality industry, not hospitality education. These articles may therefore not give a clear picture of whether the learner is an employee or a student.

Future research

As the subject of VR in training is relatively new, future research is recommended. First, additional research to determine the

appropriate level and type of virtual reality technologies most suitable for the development of virtual learning environments to teach hospitality management is required. Second, research is needed that identifies the most suitable educational programmes to be taught via VR. Third, despite the debates and uncertainties, tourism and hospitality scholars generally agree that online learning will be an important future trend. Understanding users' perceptions of online learning and how experiences can be better shaped will remain one of the most important topics in future research (Hsu et al., 2012). Fourth, future research into whether being a student or an employee in the hospitality industry makes any difference when using VR training to maximise learning impact is important. Finally, future research can look into how incorporating VR as a training tool in education might increase student motivation, reduce drop-out rates and student completion and impact learning styles for both lecturers and students.

ORCID iDs

Frederik Jan van der Meulen – https://orcid.org/0009–0005–7150–3638
Marit de Vries – https://orcid.org/0000–0002–8027–3169

References

Barron, P., & Henderson, D. (2002). Achieving deep learning in higher education programs: hospitality and leisure management students' perceptions of the potential use of virtual reality technology. *International Journal of Hospitality Information Technology, 2*(2), 63–76. https://doi.org/10.3727/153373402803617728

Bilsland, C., Nagy, H., & Smith, P. (2020). Virtual internships and work-integrated learning in hospitality and tourism in a post-COVID-19 world. *International Journal of Work-Integrated Learning, 21*(4), 425–437.

Biocca, F., & Delaney, B. (eds.) (1995). Immersive virtual reality technology. In *Communication in the Age of Virtual Reality (*chapter 4). Routledge.

Burdick, A., & Willis, H. (2011). Digital learning, digital scholarship and design thinking. *Design Studies, 32*(6), 546–556. https://doi.org/10.1016/j.destud.2011.07.005

Deale, C. S. (2019). Learning preferences instead of learning styles: A case study of hospitality management students' perceptions of how they learn best and implications for teaching and learning. *International Journal for the Scholarship of Teaching and Learning, 13*(2), a11. https://doi.org/10.20429/ijsotl.2019.130211

Fitzsimons, S., & Farren, M. (2016). A brave new world: Considering the pedagogic potential of Virtual World Field Trips (VWFTs) in initial teacher education. *International Journal for Transformative Research, 3*(1), 9–15. https://doi.org/10.1515/ijtr-2016–0002

Flaherty, C. (2020, April 3). Massive increases in LMS and synchronous video usage. *Inside Higher Ed*. https://www.insidehighered.com/news/2020/04/03/%E2%80%98massive%E2%80%99-increases-lms-and-synchronous-video-usage

Geitz, G., & de Geus, J. (2019). Design-based education, sustainable teaching, and learning. *Cogent Education, 6*(1), 1647919. https://doi.org/10.1080/2331186X.2019.1647919

Hsu, L. (2012). Web 3D simulation-based application in tourism education: A case study with *Second Life. Journal of Hospitality, Leisure, Sport & Tourism Education, 11*(2), 113–124. https://doi.org/10.1016/j.jhlste.2012.02.013

Jacobson, A. R., Militello, R., & Baveye, P. C. (2009). Development of computer-assisted virtual field trips to support multidisciplinary learning. *Computers & Education, 52*(3), 571–580. https://doi.org/10.1016/j.compedu.2008.11.007

Jung, S., Wood, A. L., Hoermann, S., Abhayawardhana, P. L., & Lindeman, R. W. (2020). The impact of multi-sensory stimuli on confidence levels for perceptual-cognitive tasks in VR. In *2020 IEEE Conference on Virtual Reality and 3D User Interfaces (VR)* (pp. 463–472). IEEE. https://doi.org/10.1109/VR46266.2020.00067

Kirkpatrick, D., & Kirkpatrick, J. (2006). Evaluating training programs: the four levels. Berrett-Koehler Publishers.

Lei, S. I., & So, A. S. I. (2021). Online teaching and learning experiences during the COVID-19 pandemic – A comparison of teacher and student perceptions. *Journal of Hospitality & Tourism Education, 33*(3), 148–162. https://doi.org/10.1080/10963758.2021.1907196

Leung, X. Y., Chen, H., Chang, W., & Mhlanga, L. (2022). Is VR game training more effective for hospitality employees? A longitudinal experiment. *Tourism Management Perspectives, 44,* 101020. https://doi.org/10.1016/j.tmp.2022.101020

Leydon, J., & Turner, S. (2013). The challenges and rewards of introducing field trips into a large introductory geography class. *Journal of Geography*, 112(6), 248–261. https://doi.org/10.1080/00221341.2013.833279

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *Annals of Internal Medicine, 151*(4), W-65–W-94.

Lominé, L. L. (2002). Online learning and teaching in hospitality, leisure, sport and tourism: Myths, opportunities and challenges. *Journal of Hospitality, Leisure, Sport and Tourism Education, 1*(1), 43–49. https://doi.org/10.3794/johlste.11.13

Patiar, A., Kensbock, S., Benckendorff, P., Robinson, R., Richardson, S., Wang, Y., & Lee, A. (2021). Hospitality students' acquisition of knowledge and skills through a virtual field trip experience. *Journal of Hospitality & Tourism Education, 33*(1), 14–28. https://doi.org/10.1080/10963758.2020.1726768

Price-Howard, L. K., & Lewis, H. (2022). Perceived usefulness of simulation learning in hospitality education. *International Hospitality Review*. https://doi.org/10.1108/IHR-05–2022–0028

Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. *Computers & Education, 147,* 103778. https://doi.org/10.1016/j.compedu.2019.103778

Sagnier, C., Loup-Escande, E., Lourdeaux, D., Thouvenin, I., & Valléry, G. (2020). User acceptance of virtual reality: an extended technology acceptance model. *International Journal of Human-Computer Interaction, 36*(11), 993–1007.https://doi.org/10.1080/10447318.2019.1708612

Schaffer, V. (2017). Enhancing learning to diverse cohorts via immersive visualization. *Journal of Hospitality, Leisure, Sport & Tourism Education, 21*(A), 46–54. https://doi.org/10.1016/j.jhlste.2017.07.001

Shen, S., Xu, K., Sotiriadis, M., & Wang, Y. (2022). Exploring the factors influencing the adoption and usage of augmented reality and virtual reality applications in tourism education within the context of COVID-19 pandemic. *Journal of Hospitality, Leisure, Sport & Tourism Education, 30,* 100373. https://doi.org/10.1016/j.jhlste.2022.100373

Silva, P. (2015). Davis' technology acceptance model (TAM)(1989). *Information seeking behavior and technology adoption: Theories and trends*, 205–219.

Stokes-Thompson, F., Wood, D., Scutter, S., & Dobinson, T. (2012). Researching the potential of the 3D virtual learning environment to complement work integrated learning in higher education. In *Proceedings of the 2012 Australian Collaborative Education Network National Conference "Collaborative Education: investing in the future".* (p. 276). ACEN Inc.

Suh, A., & Prophet, J. (2018). The state of immersive technology research: A literature analysis. *Computers in Human Behavior, 86,* 77–90. https://doi.org/10.1016/j.chb.2018.04.019

Upadhyay, A. K., & Khandelwal, K. (2022). Metaverse: the future of immersive training. *Strategic HR Review, 21*(3), 83–86. https://doi.org/10.1108/SHR-02–2022–0009

Vallis, C., & Redmond, P. (2021). Introducing design thinking online to large business education courses for twenty-first century learning. *Journal of University Teaching and Learning Practice, 18*(6), 213–234. https://doi.org/10.53761/1.18.6.14

Wang, M. J. S., Munoz, K. E., & Tham, A. (2022). Enhancing industry-ready competence and skills through design thinking integration: evidence from a CLIL-based hospitality course. *Consumer Behavior in Tourism and Hospitality, 17*(3), 326–337. https://doi.org/10.1108/CBTH-09–2021–0211