The Use of Virtual Environments and Simulation in Teacher Training

Oğuz Yılmaz (iD)
Necmettin Erbakan University, Turkey

Mustafa Tevfik Hebebci (iD)
Necmettin Erbakan University, Turkey

To cite this article:

The Use of Virtual Environments and Simulation in Teacher Training

Oğuz Yılmaz, Mustafa Tevfik Hebebci

Article Info	Abstract
	This study examines the scientific studies on the use of virtual environments and simulation programs in teacher training programs. Firstly, a search was made in the Web of Science database using the keywords simSchool and TeachLive. Four of the studies obtained as a result of the screening were excluded for various reasons (such as duplicate or off-topic publication) and the study was conducted with 22 scientific publications. The research results showed that virtual environments and simulations, which are widely and effectively used in many disciplines, also have a crucial potential in teaching and training. Most of the studies subject to analysis suggested that the use of virtual environments and simulation in education has positive effects such as self-confidence, time management, and classroom management. The research findings were discussed within the framework of the relevant literature, and suggestions were made.

Introduction

Various pedagogical courses are provided as well as content knowledge training in the education of prospective teachers. Based on these courses, there are subjects such as understanding student behavior, motivating the class, effective classroom management, communication techniques, and effective teaching. These topics are offered to prospective teachers in faculties that train teachers theoretically. Since the teaching profession includes human education and raising students at its center, it is a field of expertise that requires experience in matters such as applying the theoretical knowledge that needs to be experienced practically. To this end, the definition of the "*Practice Teaching*" course in the undergraduate programs of the education faculties of YÖK (The Council of Higher Education in Turkey) is given as follows:

> *Observing field-specific teaching methods and techniques, doing micro-teaching practices using field-specific teaching methods and techniques, planning a lesson independently, developing lesson-related activities and materials, preparing teaching environments, managing the classroom, measuring, evaluating, and reflecting.* (YÖK, 2018).

It is only possible with practice to transfer these experiences to prospective teachers in their education and help them experience managing the possible classroom environments and student behaviors they may encounter when they start the teaching profession. In order for prospective teachers to gain experience in these matters, studies are carried out with students in an authentic classroom environment within the scope of Practice Teaching course in specific periods in teacher training faculties. However, it is known that there are some problems with the full effectiveness of these applications (Deale & Pastore, 2014). Many other issues such as not being able to give

enough practice time to a prospective teacher, practicing with a limited number of students and courses at certain times, having to practice in courses outside the field most of the time, not being able to establish classroom dominance due to the reservations experienced by the prospective teachers in the teaching profession, which they experienced for the first time, are some of these problems. (Kale, 2011; Koç & Yıldız, 2012).

On the other hand, as mentioned above, the fact that such training, which requires one-to-one practice, could not actually be carried out in 2020 due to the COVID-19 pandemic that spread over the world, has urgently brought the use of digital platforms in teacher training as in all educational environments. With the technological developments, 3D models and simulation applications are used in a wide variety of fields such as medical education, logistics sector education, pilot training, and experimental environments of science (Çakaloz, 2008; Demirel, 2015; McLean et al., 2016; Şeker, & Yeşiltaş, 2021; Yıldırım, et al., 2019). For example, thanks to simulation applications in the field of medicine, prospective doctors can acquire knowledge, attitudes, and behaviors towards professional qualifications in laboratories within ultrarealistic scenarios before going to the clinics.

Virtual classroom environments created with 3D modeling were also available for prospective teachers regarding practice teaching topics. However, as in every application, these applications can have many positive and negative as well as deficient aspects (Doğan et al., 2019; Şeker & Yeşiltaş, 2021). In this sense, the prevalence of simulation applications seems to depend on certain factors such as the belief and support of the educators in the necessity of this application, as well as providing the necessary opportunities such as cost, technical infrastructure, and trained human resources to maintain the application (Deale, & Pastore, 2014). In order to determine the effectiveness of simulation applications from an academic point of view, it is crucial to carry out comparison studies with traditional methods of teaching practice at an adequate level. Moreover, *simSchool* and *TeachLivE* applications are among the primary and widespread virtual classroom and simulation tools.

Method

The number of academic publications regarding teacher training rises exponentially every year. It is clear that we are faced with an increasing abundance of information (Glass, 1976). Besides, determining gaps in the field related to the researched subjects and reporting the findings obtained in the current research present substantial difficulties for researchers in terms of time in this information-intensive environment. Various methods are needed to collect the relevant information from numerous individual studies and summarize the studies in an organized manner. Literature review studies provide essential opportunities to overcome these difficulties and give a comprehensive answer to this question (Linnenluecke, Marrone, & Singh, 2020). Review studies play a crucial role in collecting information in the subject area and evaluating the current situation with descriptive data. An arbitrary literature review does not provide enough information about the situation in the relevant research subject. Hence, reviews need to be carried out in a reproducible, transparent, and scientific manner and involve certain systematic steps. In this research, the studies published in the Web of Science database were examined using the document analysis method, one of the qualitative research methods, and the search terms that were previously determined (see Table 1).

Search Term:

Table 1. Criteria for Web of Science Search Filtering

Topic	TS=(("SimSchool*" or "teachlive"))
Documents Type	Article, Book Chapter, Early Access
Time Span	All years
Indexes	SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI

Search Link: https://www.webofscience.com/wos/woscc/summary/f785c61b-675c-4ade-9d2c-8e5d7da613e1-2121fdcc/relevance/1

Inclusion Criteria:

Within the scope of using virtual environments in teacher training, studies should:

- Be published in any year,
- Include book and article studies
- Give access to the full text
- Be available in the Web of Science electronic database

Exclusion Criteria:

- Off-topic studies
- Duplicate research

In this direction, the Web of Science database was reviewed, 26 publications were listed, and a total of 22 publications, including 19 articles and 3 book chapters meeting the inclusion criteria of the research, were included in the study.

First scan
- Web of Science
- n=26

→

Abstract scan
- duplicate=1
- n=25

→

Full text scan
- off-topic=3
- n=22
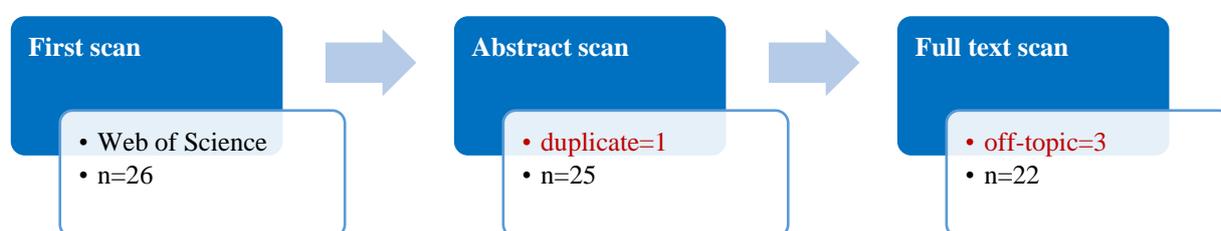
Figure 1. Flowchart for Web of Science Review

Publications Examined within the Scope of the Research

Tyler-Wood et al. (2015) examined the use of *simSchool* as an educational tool for educators working with students with special needs and concluded that teachers who participated in online professional development improved their knowledge levels, increased their personal capacity for research-based practices, and included more research-based transition practices in their classrooms. *SimSchool* has features that could be suitable for an online training program for rural educators.

Deale and Pastore (2014) focused on the effectiveness of simSchool teaching simulation using theory-based design principles. In the research, simSchool software was evaluated in general, and then a comprehensive literature review was done in simulation and evaluation. simSchool is a web-based simulation designed to imitate various students (reactions) to provide prospective teachers with practice planning, evaluating, and communicating instruction. Within the scope of the research, the theory "Model-Centered Instruction" framework was used to analyze the simulation based on the teaching objectives and design models. This framework provides a detailed model for examining the seven functional layers of a simulation. There were 13 participants, 11 women and 2 men, aged 18-22 and one participant aged over 55. The r research results indicated that simSchool offers a valid simulation environment model for prospective teachers to implement teaching activities.

Another study is the book chapter titled "simSchool and the Conceptual Assessment Framework" by Gibson (2007). This study (Almond, Steinberg, & Mislevy, 2002) used simSchool as a Conceptual Assessment Framework (CAF) example application to present and discuss as a general model to generate assessments of the knowledge users learn through simulations and games. CAF organizes teaching theories as well as inferential frameworks used in simSchool to provide users with feedback on their knowledge level and abilities as teachers. The researcher argues that the relevant framework is functional for planning how to evaluate the course objectives achieved by users while playing games or using simulations.

Another study by Gibson (2005) was carried out in the context of modeling learning in simSchool. The research emphasized how the theoretical frameworks for leadership, learning theory, interpersonal psychology, and behavioral teaching models were combined in a new synthesis model of classroom learning in the simSchool environment. The model used controls how simulated students learn and behave in response to a task, teacher, and peer interactions, and provides a complex network of relationships to experiment with teaching approaches.

The change to include students with disabilities in regular schools requires general classroom teachers to have basic skills in educating students with various needs and abilities. In the study conducted by Rayner and Fluck (2014), the perspective of prospective teachers towards the simSchool software was examined. Within the scope of the research, two-hour online sessions were organized to address student diversity and the educational needs of students with autism spectrum disorders. The research data collected from 15 prospective teachers were obtained through an 11-item measurement tool. In the study, qualitative and quantitative data were collected together. The collected data suggested that simSchool has significant potential. It is also among the research results that this approach has some current limitations in the context of Australian teacher training courses.

Rural schools face limitations in training and retaining qualified teachers, especially special education personnel. The study by Dieker et al. (2015) is about the development processes of TLE TeachLivE™, an interdisciplinary team at the University of Central Florida. This software is a virtual reality application designed to serve as a classroom simulation to support teachers and administrators in applying their teaching and management skills. Within the scope of the research, information was given about the past, present, future, and areas of use of TLE TeachLivE.

One of the challenges educators face in teaching students with autism spectrum disorder is applying evidence-based practices accurately and effectively. In a study conducted in this context (Garland et al., 2016), the individualized clinical coaching of TLE TeachLivE™ simulation reality, from least to maximum in the learning environment, was examined. In other words, when individualized clinical coaching is provided in TLE TeachLivE™, it reflects the accuracy of teachers' minimal use of prompts. Study participants consisted of six educators aged 23-30 enrolled in a postgraduate special education course focused on evidence-based practices for teaching students with autism. The results show that individualized clinical coaching in TLE TeachLivE™ is effective in improving the accuracy of participants using a minor hint system.

Developing the basic teaching skills of less experienced teachers in their profession is vital to effectively manage the lessons in the classroom environment and understand student behavior. In this regard, TLE TeachLivE™ simulation lab is a virtual classroom used in teacher training programs to support field experiences and traditional didactic teaching. Another study in this context was carried out by Dawson and Lignugaris Kraft (2017) and the research analyzed the effectiveness of TLE TeachLivE™ intervention sessions on the prospective special education teachers' core target skills in behavioral and academic domains, and to what extent they generalize them. The study results deduced that TLE TeachLivE™ is a promising tool in terms of revealing feedback and repeated application forms on basic teaching skills.

In the book chapter titled "Teacher Training with simSchool" by Gibson (2013), an innovative online learning platform for training teachers through simulation environments is explained by addressing some of the problems in teacher training in the USA. This chapter summarizes the rationale for the new approach based on self-direction and self-validation in a complex but repeatable practice environment, supported by emerging interdisciplinary knowledge of digital media assessment and the unique possibilities of social media. The relevant study compares the simulation approach with traditional course-based online learning experiences in teaching and learning concepts, organization of knowledge, practices, outcomes of assessment, and engagement of communities of practice. SimSchool as a simulation application is used as an exemplary model that concretely explains the new approach.

Another recent study in the literature was carried out by Fraser et al. (2020). The research aimed to investigate the effects of stand-alone didactic education and coaching in a mixed reality environment (TeachLivE), the application of discrete trial teaching of special educators with students in their classrooms in accordance with the originality. The research was conducted with five special educators who had previously received training in discrete experimentation but did not apply evidence-based practices in their classrooms. The results indicated that didactic education alone is not sufficient by combining discrete trial teaching with private educators. However, after a one-hour session in TLE TeachLivE™, participants were able to implement discrete trial teaching in their classrooms similar to the original.

In the study by Christensen et al. (2011), the basic components of the simSchool dynamic simulator, which is a simulated teaching environment to train prospective teachers, are presented. The research results suggested that prospective teachers gained a faster sense of instructional self-efficacy (confidence in their efficacy) by using the

simulator compared to traditional teacher preparation classes and related activities. This result includes prospective teachers working with simulated students covering the normal range of personality traits and sensory abilities and prospective teachers working with students with disabilities.

In teacher training programs, simulation and similar environments as teaching methods are increasing. Simulations provide an opportunity to avoid the risk of harm and to be implemented in a controlled environment. Another study focusing on this context was done by Dalinger et al. (2020). The research, which was conducted in a case study design, was carried out with 13 prospective teachers who participated in a session with Mursion®, a mixed reality simulation developed with TLE TeachLivE™, and had field experience (who enrolled in at least one teacher training course). As a result of the data analysis, four themes were revealed: (1) Opportunity for an authentic practice, (2) Perceived transfer of learning, (3) Perceived trust, and (4) Difficulties in using mixed reality simulation. The use of simulations increased the confidence of some participants in applying their skills in a classroom setting. Additionally, in the related research, suggestions were made for the future use of mixed reality simulations for teacher training.

On the other hand, Kaufman and Ireland (2016) discussed ways to equip better graduates of teacher training programs for future professional challenges. Accordingly, they used literature and practical examples to emphasize that simulations can strengthen critical aspects of teacher preparation. Researchers state that more effective and widespread use of simulations is important in teacher training.

Dieker et al. (2014) discussed the use of simulation in teacher training in their study titled "The Potential of Simulated Environments in Teacher Education: Current and Future Possibilities." The researchers also examined in detail the factors that need to be considered for the development of simulated environments. In this context, information was given about the special studies conducted in two universities that use a specific virtual environment called TLE TeachLivE™ in teacher education. The study findings underlined that the ultimate goal of simulation-based teacher education should be student and learning outcomes.

Discrete trials training (DTT) is an evidence-based practice used in education programs for children with autism spectrum disorder (ASD). Garland et al. (2012) investigated the effectiveness of teacher training in the TLE TeachLivE™ virtual classroom environment on teachers' discrete trial teaching practices. The study was conducted with participants aged 23 to 54. The research results showed that the TLE TeachLivE™ virtual classroom environment has significant potential to teach educators discrete trials training.

Meletiou-Mavrotheris and Mavrou (2015) analyzed web-based simulations for the training of mathematics teachers. The study is a qualitative research based on a case study. In the research, the possibilities offered by digital simulations to contextualize prospective teachers' learning of mathematics content and pedagogy were examined. Using simSchool as a simulated classroom, the authors aimed to bridge the gap between teacher preparation and practice by creating reality-based learning environments that strengthen prospective teachers' skills on how to implement standards-based mathematics teaching in complex classrooms.

Another case study was carried out by Orna and Flavian (2020). This study focused on the learning processes experienced by prospective teachers while participating in simulation-based learning environments. The study's main goal is to identify the aspects of peer learning inherent in simulation-based learning that are useful in the teacher-education process to facilitate the development of effective teacher-training modules. As a result of the research, it is seen that prospective teachers expressed their opinions on four benefits related to the application of simulation-based learning in the context of peer learning. These benefits include (1) readiness to provide and accept feedback, (2) analysis of observers' experiences, (3) broadening one's perspective on a situation, and (4) collegial bonding. These findings are relevant to teachers worldwide and demonstrate the importance of simulation-based learning within the framework of teacher education, particularly in the context of peer learning.

Virtual simulations are increasingly seen as an opportunity, as they provide prospective teachers with unique opportunities to experience examples of classroom life in a controlled and structured way. Another study in this context was conducted by McGarr (2020). The research investigated the use of virtual simulations in training prospective teachers regarding developing behavior and classroom management skills.

Another study conducted by Larson et al. (2019) is about prospective teachers' management of behavioral problems in the classroom. The study was conducted with 62 prospective teachers using the TeachLive™ mixed reality teaching simulator. The study used TeachLive™ in a university-based traditional teacher training program and examined its acceptability for use in teacher training. In this context, variables such as basic anxiety and belief were researched. The results indicated that mixed reality environments reduce stress and performance anxiety.

A relatively recent study investigated the effects of immersive virtual reality training on prospective teachers' classroom management skills (Chen, 2022). In the study conducted with 5 female and 5 male participants, the design of the training situations was made with the immersive virtual reality system of Breaking Bad Behaviors. The results revealed that the immersive virtual reality experience improved the speed and effectiveness of participants in managing challenging behaviors in students and enabled participants to transfer what they learned to an authentic classroom environment.

Kelleci and Aksoy (2021) looked into the experiences of prospective teachers and academics in the use of SimInClass, a game-based virtual classroom simulator. The case study, in which focus group interview, one-on-one interview, and observation techniques were used, involved 16 senior prospective teachers and two academicians, determined by the criterion sampling method. Within the scope of the study, a 14-week teacher training was carried out using SimInClass simulation. Then, the results indicated SimInClass simulation effectively provides clear directions and gives feedback. User input, usage control, and screen size are among the preferences to use SimInClass simulation on the computer.

Another study aims to reveal the opinions of prospective teachers on the usability of three-dimensional simulation-based teacher training simulations (Doğan et al., 2019). For this purpose, opinions were collected from prospective teachers regarding the use of three-dimensional teacher training simulation (SimInClass). The research sample group involved 39 university students who took a multi-user virtual environment design course. The students used

the Start Tutorial part of the simulation for a short time (10 minutes) for orientation to the environment, and then they experienced the teacher training simulation for 60 minutes. The research results deduced that the teacher training simulation is easy to use and has the opportunity to experience a real classroom. Additionally, the simulator creates awareness for situations such as lesson plan preparation, classroom and time management, classroom control, and strategy development in managing undesirable behaviors.

Discussion and Conclusion

The use of simulations as a teaching method for prospective teachers in teacher training programs is continuously increasing (Dalinger et al., 2020). In this research, scientific studies on virtual environments and simulation in teacher education reviewed on the Web of Science were evaluated. To this end, the studies covered within the scope of simSchool and TLE TeachLivE™, which are leaders in virtual environments and simulation, are limited in number. However, in recent years, researchers have notably a great interest in this field (Chen, 2022; Dalinger et al., 2020; Fraser et al., 2020; and Kelleci & Aksoy, 2021). As a matter of fact, approximately one-third of the studies were conducted between 2020 and 2022. It is a notable fact that studies on the use of virtual environments and simulation in education, which is still a new research area, were generally conducted by the US-based "State University System of Florida." This result is not surprising considering the opportunities and opportunities offered by the USA to universities and scientists.

Another result of the research is the interest of researchers working in special education in this field. One of the reasons for this situation is the change toward including students with disabilities in regular schools (Rayner & Fluck, 2014). Another is to enable educators to be more prepared for the problems they may encounter, especially with students with an autism spectrum disorder. Moreover, the relevant studies were analyzed by quantitative, qualitative, and mixed methods, and according to the method used, the studies are structured as surveying, experimental, case study, and reviews. Besides, the sample groups and the participants were generally prospective teachers in those studies. However, in studies on special education, this situation differs considerably in terms of education and age (Garland et al., 2012; Garland et al., 2016).

As a result, virtual environments and simulations, which are widely and effectively used in many disciplines, have a fundamental potential in education and training. Most of the studies examined suggest that virtual environments and simulation in education have positive effects such as self-confidence, time, and classroom management. Hence, simulations provide environments that do not contain the risk of harm and offer significant opportunities to practice in a controlled environment (Dalinger et al., 2020). In this context, it should be noted that practitioners and researchers have essential duties in creating an effective educational climate.

In line with the results obtained from the research findings and the data obtained from the literature, suggestions are presented as follows:
- This study was based on the Web of Science database. Data can be compared by reviewing different studies from databases such as Scopus and Eric.
- New analysis methods (such as meta-analysis and bibliometric analysis) can be used.

• More detailed and in-depth results can be obtained by narrowing down the relevant subject.

Acknowledgements

References

Almond, R., Steinberg, L., & Mislevy, R. (2002). Enhancing the design and delivery of assessment systems: A four-process architecture. *The Journal of Technology, Learning and Assessment*, *1*(5).

Chen, C. Y. (2022). Immersive virtual reality to train preservice teachers in managing students' challenging behaviours: A pilot study. *British Journal of Educational Technology*. https://doi.org/10.1111/bjet.13181

Çakaloz, B. (2008). *Lojistik Yönetiminde Simülasyon Temelli Eğitim Yaklaşımları [Simulation-Based Training Approaches in Logistics Management]*. (Yüksek Lisans Tezi [Master Thesis]). Dokuz Eylül Üniversitesi [Dokuz Eylul University]. Retrieved from http://hdl.handle.net/20.500.12397/11258

Dalinger, T., Thomas, K. B., Stansberry, S., & Xiu, Y. (2020). A mixed reality simulation offers strategic practice for pre-service teachers. *Computers & Education*, *144*, 103696. https://doi.org/10.1016/j.compedu.2019.103696

Deale, D., & Pastore, R. (2014). Evaluation of simSchool: An instructional simulation for pre-service teachers. *Computers in the Schools, 31*(3), 197-219. http://doi.org/10.1080/07380569.2014.932650

Demirel, S. (2015). *Hava trafik kontrol bölümündeki simülasyon eğitiminin öğrenciler tarafından değerlendirilmesi [Evaluation of the simulation training in the air traffic control department by the students]*. Available from ProQuest Dissertations & Theses Global. (2563685320). Retrieved from https://www.proquest.com/dissertations-theses/hava-trafik-kontrol-bölümündeki-simülasyon/docview/2563685320/se-2?accountid=159111

Doğan, D., Yiğit, M. F., Alır, A., Fidan, A., Özbay, Ö., & Tüzün, H. (2019). Examining pre-service teacher opinions on using a teacher training simulation. *Pamukkale University Journal of Education Faculty*, 46, 150-174. http://doi.org/10.9779/pauefd.450501

Fraser, D. W., Marder, T. J., deBettencourt, L. U., Myers, L. A., Kalymon, K. M., & Harrell, R. M. (2020). Using a Mixed-reality environment to train special educators working with students with autism spectrum disorder to implement discrete trial teaching. *Focus on Autism and Other Developmental Disabilities, 35*(1), 3–14. https://doi.org/10.1177/1088357619844696

Garland, K. M. V., Holden, K., & Garland, D. P. (2016). Individualized clinical coaching in the TLE TeachLivE lab: Enhancing fidelity of implementation of system of least prompts among novice teachers of students with autism. *Teacher Education and Special Education*, *39*(1), 47-59. http://doi.org/10.1177/0888406415600769

Garland, K. V., Vasquez, E., & Pearl, C. (2012). Efficacy of individualized clinical coaching in a virtual reality classroom for increasing teachers' fidelity of implementation of discrete trial teaching. *Education and Training in Autism and Developmental Disabilities*, *47*(4), 502–515.

Glass, G. V. (1976). Primary, secondary, and meta-analysis of research. *Educational researcher, 5*(10), 3-8

Kale, M. (2011). Öğretmen adaylarının öğretmenlik uygulaması dersinde karşılaştıkları sorunlar [Problems faced by pre-service teachers in teaching practice course]. *Türk Eğitim Bilimleri Dergisi [Turkish Journal of Educational Sciences]*, *9*(2), 255 - 280.

Kelleci, Ö., & Aksoy, N. C. (2021). Using game-based virtual classroom simulation in teacher training: User experience research. *Simulation & Gaming*, *52*(2), 204-225. https://doi.org/10.1177/1046878120962152

Koç, C., & Yıldız, H. (2012). Öğretmenlik uygulamasının yansıtıcıları: Günlükler [Reflectors of teaching practice: Diaries]. *Eğitim ve Bilim [Education and Science]*, *37*(164), 224-236.

Linnenluecke, M. K., Marrone, M., & Singh, A. K. (2020). Conducting systematic literature reviews and bibliometric analyses. *Australian Journal of Management, 45*(2), 175–194. https://doi.org/10.1177/0312896219877678

McLean, G. M. T., Lambeth, S., & Mavin T. (2016) The Use of Simulation in *Ab Initio* Pilot Training, *The International Journal of Aviation Psychology*, *26*(1-2), 36-45, https://doi.org/10.1080/10508414.2016.1235364

Rayner, C., & Fluck, A. (2014). Pre-service teachers' perceptions of simSchool as preparation for inclusive education: a pilot study. *Asia-Pacific Journal of Teacher Education*, *42*(3), 212-227. https://doi.org/10.1080/1359866X.2014.927825

Şeker, G., & Yeşiltaş, E. (2021). Sosyal bilgiler öğretmen adaylarının bilgisayar simülasyonlarıyla sınıf yönetimi becerisi kazandırılmasına ilişkin görüşlerinin değerlendirilmesi [Evaluation of the opinions of social studies teacher candidates on gaining classroom management skills with computer simulations.]. *Turkish Studies-Educational Sciences, 16* (2), 1275–1292. https://doi.org/10.47423/TURKISHSTUDIES.47424

Yıldırım, D., Özer, Z., Kocaağalar, E. & Pınar Bölüktaş, R. (2019). Eğitimde inovasyon: Sağlık eğitiminde simülasyon kullanımı [Innovation in education: Using simulation in health education]. *Bilgi Ekonomisi ve Yönetimi Dergisi [Journal of Information Economy and Management], 14* (1), 33-41

YÖK. (2018). Yeni öğretmen yetiştirme lisans programları, bilgisayar ve öğretim teknolojileri öğretmenliği [New teacher training undergraduate programs, computer and instructional technologies teaching]. Retrieved from https://www.yok.gov.tr/Documents/Kurumsal/egitim_ogretim_dairesi/Yeni-Ogretmen-Yetistirme-Lisans-Programlari/Bilgisayar_ve_Ogretim_Teknolojileri_Ogretmenligi_Lisans_Programi.pdf

Reviewed Studies

Chen, C. Y. (2022). Immersive virtual reality to train preservice teachers in managing students' challenging behaviours: A pilot study. *British Journal of Educational Technology*. https://doi.org/10.1111/bjet.13181

Christensen, R., Knezek, G., Tyler-Wood, T., & Gibson, D. (2011). SimSchool: An online dynamic simulator for enhancing teacher preparation. *International Journal of Learning Technology*, *6*(2), 201-220. http://doi.org/10.1504/IJLT.2011.042649

Dalinger, T., Thomas, K. B., Stansberry, S., & Xiu, Y. (2020). A mixed reality simulation offers strategic practice for pre-service teachers. *Computers & Education*, *144*, 103696. https://doi.org/10.1016/j.compedu.2019.103696

Dawson, M. R., & Lignugaris Kraft, B. (2017). Meaningful practice: Generalizing foundation teaching skills from TLE TeachLivE™ to the classroom. *Teacher Education and Special Education*, *40*(1), 26-50. https://doi.org/10.1177%2F0888406416664184.

Deale, D., & Pastore, R. (2014). Evaluation of simSchool: An instructional simulation for pre-service teachers. *Computers in the Schools, 31*(3), 197-219. http://doi.org/10.1080/07380569.2014.932650

Dieker, L. A., Hynes, M. C., Hughes, C. E., Hardin, S., & Becht, K. (2015). TLE TeachLivE™: Using technology to provide quality professional development in rural schools. *Rural Special Education Quarterly*, *34*(3), 11-16. http://doi.org/10.1177/875687051503400303

Dieker, L. A., Rodriguez, J. A., Lignugaris Kraft, B., Hynes, M. C., & Hughes, C. E. (2014). The Potential of simulated environments in teacher education: current and future possibilities. *Teacher Education and Special Education, 37*(1), 21–33. https://doi.org/10.1177/0888406413512683

Doğan, D., Yiğit, M. F., Alır, A., Fidan, A., Özbay, Ö., & Tüzün, H. (2019). Examining pre-service teacher opinions on using a teacher training simulation. Pamukkale University Journal of Education Faculty, 46, 150-174. http://doi.org/10.9779/pauefd.450501

Fraser, D. W., Marder, T. J., deBettencourt, L. U., Myers, L. A., Kalymon, K. M., & Harrell, R. M. (2020). Using a Mixed-reality environment to train special educators working with students with autism spectrum disorder to implement discrete trial teaching. *Focus on Autism and Other Developmental Disabilities, 35*(1), 3–14. https://doi.org/10.1177/1088357619844696

Garland, K. M. V., Holden, K., & Garland, D. P. (2016). Individualized clinical coaching in the TLE TeachLivE lab: Enhancing fidelity of implementation of system of least prompts among novice teachers of students with autism. *Teacher Education and Special Education*, *39*(1), 47-59. http://doi.org/10.1177/0888406415600769

Garland, K. V., Vasquez, E., & Pearl, C. (2012). Efficacy of individualized clinical coaching in a virtual reality classroom for increasing teachers' fidelity of implementation of discrete trial teaching. *Education and Training in Autism and Developmental Disabilities*, *47*(4), 502–515.

Gibson, D. (2005). Modeling Learning in simSchool. *Learning Technology*, *7*(2), 9-12. https://tc.computer.org/tclt/wp-content/uploads/sites/5/2016/12/learn_tech_april2005.pdf

Gibson, D. (2007). simSchool and the conceptual assessment framework. In D. Gibson, C. Aldrich, & M. Prensky (Eds.), *Games and simulations in online learning: Research and development frameworks* (pp. 308-322). IGI Global.

Gibson, D. (2013). Teacher Education with simSchool. In R. Hartshorne, T. Heafner, & T. Petty (Eds.), *Teacher Education Programs and Online Learning Tools: Innovations in Teacher Preparation* (pp. 437-453). IGI Global. https://doi.org/10.4018/978-1-4666-1906-7.ch023

Kaufman, D., & Ireland, A. (2016) Enhancing teacher education with simulations. *TechTrends* 60, 260–267. https://doi.org/10.1007/s11528-016-0049-0

Kelleci, Ö., & Aksoy, N. C. (2021). Using game-based virtual classroom simulation in teacher training: User experience research. *Simulation & Gaming*, *52*(2), 204-225. https://doi.org/10.1177/1046878120962152

Larson, K. E., Hirsch, S. E., McGraw, J. P., & Bradshaw, C. P. (2019). Preparing preservice teachers to manage behavior problems in the classroom: The Feasibility and acceptability of using a mixed-reality simulator. *Journal of Special Education Technology, 35*(2), 63–75. https://doi.org/10.1177/0162643419836415

Levin, O., & Flavian, H. (2020). Simulation-based learning in the context of peer learning from the perspective of preservice teachers: a case study. *European Journal of Teacher Education*. https://doi.org/10.1080/02619768.2020.1827391

McGarr, O. (2020). The use of virtual simulations in teacher education to develop pre-service teachers' behaviour and classroom management skills: implications for reflective practice. *Journal of Education for Teaching*, *47*(2), 274-286. https://doi.org/10.1080/02607476.2020.1733398

Meletiou-Mavrotheris, M., & Mavrou, K. (2015). Web-based simulations for the training of mathematics teachers. In I. A.D. Ritzhaupt, & S. Kumar (Eds.), *STEM Education: Concepts, Methodologies, Tools, and Applications* (pp. 437-460). IGI Global. https://doi.org/10.4018/978-1-4666-7363-2.ch024

Rayner, C., & Fluck, A. (2014). Pre-service teachers' perceptions of simSchool as preparation for inclusive education: a pilot study. *Asia-Pacific Journal of Teacher Education*, *42*(3), 212-227. https://doi.org/10.1080/1359866X.2014.927825

Tyler-Wood, T., Estes, M., Christensen, R., Knezek, G., & Gibson, D. (2015). SimSchool: An opportunity for using serious gaming for training teachers in rural areas. *Rural Special Education Quarterly*, *34*(3), 17-20. http://doi.org/10.1177/875687051503400304

Author Information

Oğuz Yılmaz

(iD) https://orcid.org/0000-0001-5842-0778

Necmettin Erbakan University

Distance Education and Application Center

Konya

Turkey

Contact e-mail: *oguz.yilmaz@erbakan.edu.tr*

Mustafa Tevfik Hebebci

(iD) https://orcid.org/0000-0002-2337-5345

Necmettin Erbakan University

Distance Education and Application Center

Konya

Turkey