



Virtual reality check: A realist evaluation protocol for exploring the use of Immersive Virtual Reality (IVR) to support pre-service teachers' understanding of approaches to behaviour management

Helen Woodley ^A	A	Assistant Professor, Northumbria University
Kirstin Mullholland ^B	B	Assistant Professor, Northumbria University
David Nichol ^C	C	Assistant Professor, Northumbria University
Chris Counihan ^D	D	Assistant Professor, Northumbria University
Carl Luke ^E	E	Lecturer, Northumbria University
William Gray ^F	F	Assistant Professor, Northumbria University
Sophie Mellor ^G	G	Assistant Professor, Northumbria University
Deborah Herridge ^H	H	Assistant Professor, Northumbria University
Arlene Anderson ^I	I	Assistant Professor, Northumbria University
Joleen Ross ^J	J	Lecturer, Northumbria University

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Abstract

Amidst international challenges in teacher recruitment and retention, understanding how best to prepare pre-service teachers for professional practice is of the utmost importance. Managing pupil behaviour is of particular concern due to a rise in reported challenges experienced by teachers following the COVID-19 pandemic, with consequences for the wellbeing of teachers and pupils, as well as for teacher retention. Simulation-based learning (SBL) within Immersive Virtual Reality (IVR) environments provides a means by which pre-service teachers can be supported to develop essential skills in a safe, supportive environment. However, the use of SBL for Initial Teacher Training (ITT) remains in its infancy, with few previous studies in this field of enquiry. In addressing these issues, this research protocol proposes to target pre-service teachers undergoing an ITT programme in a realist evaluation to further understand how they embrace behaviour management strategies in an IVR environment. Adopting a sequential mixed-method approach, we plan to collect qualitative and quantitative data with stakeholder groups in the development of a holistic evaluation framework. Our intended outcomes are to synthesise data to explore the key factors needed to design, implement, and evaluate IVR within SBL approaches to better understand their potential as a form of professional learning.

Correspondence

helen.woodley@northumbria.ac.uk ^A

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Background

Reports of teachers experiencing difficulties in managing pupil behaviour in English schools are increasingly frequent, with evidence suggesting a significant increase in primary-age pupils' emotional and behavioural difficulties following the partial school closures during the Covid-19 pandemic (Blanden et al., 2021), as well as a rise in pupil mental health and wellbeing problems as a result of the pandemic (Nelson et al., 2021). These challenges are also reflected in an annual survey conducted by the UK government's Department for Education (DfE) which indicates that 62% of teachers and school leaders reported disruptions to lessons in the past week, with an average of 6.3 minutes of lost learning for every 30 minutes of lesson time (Department for Education, 2021).

This is of particular concern when situated within the wider context of a national and international teacher recruitment and retention crisis. In England, one-third of teachers leave the profession in the first five years following qualification (Department for Education, 2021; Long & Danechi, 2022), and these challenges are also replicated internationally, with estimated attrition rates of 13.5% in Australia (Kelly et al., 2019), 28% within Europe (Federičová, 2021), and reports of mounting teacher shortages in the United States (Miller & Young, 2021; US Bureau of Labour Statistics, 2022).

Whilst the underlying causes for this crisis are multiple and complex, it is likely to be influenced by these challenges. For example, research conducted by the Department for Education (2018) to explore factors affecting teacher retention identified that some teachers identified a specific 'trigger' point, such as a particular behavioural incident involving pupils or their families, as their reason for leaving the profession. Similarly, 60% of teachers and school leaders reported that pupil behaviour negatively impacted their health and wellbeing (DfE, 2023).

Early Career Teachers (ECT) are more likely to experience challenges in managing pupil behaviour (Mayer et al., 2015; Pfitzner-Eden, 2016; Department for Education, 2019), with some teachers expressing dissatisfaction with the extent to which initial teacher training prepared them for practice in this regard (Department for Education, 2018). There is also some evidence to suggest that, when experiencing difficulties, pre-service teachers may be more likely to resort to autocratic approaches which can escalate disruptive behaviour, rather than lead to a positive resolution (McGarr, 2021).

Simulation in education

In response to these challenges, one area that has the potential to enhance authentic learning experiences for pre-service teachers lies in simulation-based learning (SBL). In its broadest terms, SBL provides training opportunities to practise responding to a realistic imitation of a real-world situation in controlled and safe environments (Kim et al., 2016; McGarr, 2021). Pedagogically, it is used within training programmes across various professional disciplines, such as health (Chernikova et al., 2020), social work (Craig et al.,

2017) and medical education (Heitzmann et al., 2019). It takes form through different guises, whether physical, virtual or a hybrid of both conditions (Frei-Landau & Levin, 2023), and typically involves students taking part in predetermined activities that reflect their professional field (Rayner & Fluck, 2014). For example, in Dalinger et al. (2020)'s study, pre-service teachers were physically placed in lab-based sessions that involved using software to simulate parent-teacher discussions, where adult avatars played the role of parents. A similar approach was adopted in Ledger et al. (2019)'s study that investigated preferred teaching strategies of pre-service teachers delivered through a combination of virtual and physical interactions.

Whilst SBL in Initial Teacher Training (ITT) is still in its infancy (Fischetti et al., 2021; Frei-Landau et al., 2022), there are encouraging signs of its use in developing pre-service teachers' skills and knowledge. Recently, two systematic reviews reported skill and knowledge enhancements in response to taking part in SBL activities. The review by Theelen et al. (2019) found studies that reported students' classroom management and generic teaching skills to be positive following exposure to various forms of computer-based classroom simulations. They find consensus across studies that report students feeling better prepared because simulation experiences were authentic and mirrored real classroom environments. Similarly, in Ade-Ojo et al. (2022)'s review, they report the benefits of mixed-reality simulations, where students take part in simultaneous physical and computer-based simulations. They find benefits to students' pedagogical thinking skills, self-efficacy, and confidence in using professional language. Both reviews argue for the expansion of SBL research, particularly focusing on the potential of how SBL can form teacher-training practice and be embedded into professional curricula. Moreover, Judge et al., (2013) have called for research to consider the role of teacher trainers or faculty staff involved in preparing, delivering, and evaluating SBL activities. Perhaps more significantly though is Ade-Ojo et al. (2022)'s call for UK-based studies in this field of enquiry given their complete absence.

Virtual reality research in education

Higher Education (HE) continues to be transformed through technological advancement and change across all its activities (Ingleby et al., 2019). Within learning and teaching, the development of increasingly sophisticated web-based applications, delivered through an assortment of smaller, portable, and more powerful technologies and devices, facilitates the progressive use of creative pedagogical approaches (Englund et al., 2017).

These developments, amongst several other factors, have ensured an increased expectation that users are able to access learning from anywhere and instantaneously (Dholakia et al., 2004) whilst, in teacher education programmes, teacher educators hope to maximise the parity of learning opportunities offered to large cohort student groups. The reliance on traditional face-to-face lecture modes of learning is being superseded by greater accessibility to alternative delivery mechanisms, with SBL being one such opportunity

for providing parity of experiences, in an inclusive, safe environment, for students to access (Pelly et al., 2020; Walsh et al., 2017; Kaufman & Ireland, 2019; Siddiqui et al., 2021; Yu et al., 2021).

However, for staff and students to engage successfully with SBL, there is a need, from a practical, theoretical, and pedagogical base, for a deeper understanding of the benefits rather than the 'potential' that has been promoted for many years (Goodchild & Speed, 2019). The nature of knowledge, what is worth knowing and what is valued, has been and will be, dramatically affected by technology. The dynamic and changing nature of technology informs and influences pedagogical models and their application to practice. The holding of knowledge is no longer good enough; information is too freely available, so the traditional model of education will need to adapt to embrace the underlying change in the way we perceive and interact with theory, knowledge and information, and its application to practice. The simulated practice has, for several years, been a pedagogical approach favoured by a range of professional disciplines, namely social work (Meredith et al., 2022), health (Platt et al., 2021) and, more recently, teacher education (Kaufman & Ireland, 2019; Mulholland et al., 2022; McGarr, 2021).

Perhaps the most recent developments around SBL, have progressed through the more creative use of technology-driven advancements. According to Steuer (1992), Virtual Reality (VR) refers to those technologies that highlight the sense of existence in a simulated, online, computer-generated, graphical environment, whilst Immersive Virtual Reality, (IVR) is described by Hamilton et al. (2021) as the presentation of a simulated environment that replaces users' real-world surroundings convincingly enough that they can suspend disbelief and fully engage inside the created environment. Simulated IVR, as a vehicle for pedagogic delivery in ITT, can therefore, redefine the traditional learning environment. Students are given the opportunity to explore complex topics in ways that traditional didactic, theory-driven learning and teaching methods cannot, using immersive content through a creative graphical interface and head-mounted-displays (HMD), for example, the Meta Quest or Apple's much anticipated Vision Pro.

There is promising evidence to strengthen the use of IVR simulation in ITT. For example, a pilot study by Chen (2022) found the use of IVR technology improved the classroom management skills of pre-service teachers. In their study, the students improved the time to locate and manage challenging behaviours of classroom avatars. These skills were applied to real-world classrooms with sustained effects compared to the VR immersive experience. The use of technology, however, is not without threat or compromise. Cost (Ingleby et al., 2023), negative impact on users' mental health (Haidt & Allen, 2020) and the impact on cognitive load (Dror et al., 2011) are just a selection of challenges facing educators tasked with application, and all need thorough examination prior to implementation.

This article offers insight into how this drive towards a form of SBL, namely IVR technology, is experienced and interpreted by pre-service teachers, together with an understanding of the intentions behind the materials that teacher educators

make available via these platforms. Working in partnership, this collaboration with an education technology business whose vision is to create revolutionary virtual reality learning experiences that are accessible to all staff in schools and children including those with special educational needs (SEN) and who may be at risk of permanent exclusion, we aim to bring our collective vision to life through the development of a prototype, immersive, interactive VR environment. The SBL and focus for this development is to provide an opportunity for pre-service teachers to experience the virtual reality of decisions they make, in real-time, that impact behaviour management. Ultimately, by combining virtual reality technology with a deep understanding of the unique challenges faced by teachers, we aim to create a learning platform that is both educational and empowering to those involved.

Methods and analysis

Objectives

1. To develop a realist evaluation framework to conceptualise and assess contextual factors relevant to the use of IVR within SBL approaches to ITT.
2. To undertake qualitative and quantitative data collection with stakeholder groups (teacher educators and pre-service teachers) to determine the acceptability, feasibility and relevance of outcomes proposed in the evaluation framework.
3. To synthesise data to understand the key factors needed to design, implement, and evaluate IIVR within SBL approaches.

Research questions

1. What value do pre-service teachers and teacher educators place on the learning which takes place in IVR SBL as a method of relating the theory of behaviour management to practice? For example, do they perceive that IVR simulation has enhanced their ability to transfer theory to practice?
2. What specific mechanisms are effective which can be transferred into the development of the IVR SBL software from a prototype to a fully developed pedagogical tool?

Methods

Location of the research

ITT is a core part of the subject offered at the Higher Education Institution (HEI) where the research team are located. The Bachelor of Arts (BA Honours) in Primary Education prepares trainee students to teach children ages 3-11 years in the UK. Specific to this research, we will undertake a robust recruitment process with trainees from the Year 2 cohort of the BA programme and the staff involved with their training during this academic year (approximately

100 students, 10 staff). This Year 2 cohort has been identified due to the existing teaching focus and input on behaviour and behaviour management at this stage of their training. This cohort has had no prior experience of SBR as part of their ITT studies.

Theoretical approach

Realism is a philosophical position located between positivist and constructivist stances. It seeks to know what is working, in what circumstances is that the case, and why it is working (or not) in those circumstances (Pawson, 2006). Therefore, a realist evaluation methodology has three key foci: the context of an intervention, the mechanisms used, and the recorded outcomes. These are often referred to as the context-mechanism-outcome (CMO) configuration (Pawson & Tilley, 1997). Context refers to the specific conditions and reality where an intervention is applied and takes place. Within a Higher Education environment, it is crucial that the pre-existing social context of the programme is acknowledged (Graham & McAleer, 2018). Mechanisms refer to the 'what happens and why' of an intervention that leads to a particular set of outcomes; there is a focus on the future potential the mechanisms can afford (De Souza, 2013) if they are applied. Finally, outcomes refer to the consequences, both planned and unplanned, of the mechanisms applied to the specific context of the research.

Realist evaluation stages

The proposed realist evaluation has three distinct stages:

1. Theory generation
 - Generation of initial theories from existing academic literature, including the use of IVR SBL as a pedagogical tool both within ITT and a wider educational context such as health education and training.
 - Questionnaires for stakeholders' pre-use of IVR SBL.
 - Use of the IVR SBL tool by the pre-service teachers and teacher educators.
2. Theory refinement
 - Questionnaires for stakeholders' post-use of IVR SBL.
 - Focus group interview with a proportion of stakeholders who have completed both the questionnaires and attended the VR SBL session.
 - Refinement of the theories based upon the focus groups and interviews.

3. Theory development

- Development of theories into a definitive set.
- Proposed theories to be shared with stakeholders in a focus group interview.

Using literature already published on the use of IVR SBL within ITT and wider educational contexts, and the pre-IVR SBL questionnaire, we will develop a set of initial theories which will seek to define the contexts, mechanisms, and outcomes of using IVR SBL within ITT. The pre-service teachers and teacher educators will then take part in an IVR SBL focusing on dealing with challenging behaviour in a classroom environment. The theories will then be tested and refined through focus group interviews with both pre-service teachers and teacher educators as well as the analysis of the post-IVR SBL questionnaire. The data collected will then be used to develop the proposed VR SBL theories into a definitive set. The proposed theories will then be shared with the focus group for discussion and final development. This definitive set of theories will be used as the basis for future large-scale research utilising a fully developed IVR SBL package with pre-service teacher students across multiple HEI contexts.

Data analysis

Data from both pre- and post-IVR SBL questionnaires will be analysed using SPSS software. Pre-IVR SBL questionnaires will focus on understanding the participants' pre-existing knowledge and awareness of both IVR SBL and behaviour management. Post-IVR SBL questionnaires will be used to gauge both the value placed on the IVR SBL experience as well as any development of knowledge and awareness of behaviour management. These questionnaires will be used to develop a range of starting point questions for the focus group interviews. The focus group interviews will be recorded with the consent of the participants and the data will be transcribed and uploaded into NVivo analysis software. A thematic analysis of this data will then be conducted by one of the research teams adhering to the Braun and Clarke (2006) framework to identify and code initial emergent themes. This thematic analysis will follow an inductive process where themes will be directly driven by the data collected as opposed to being led by theory. These themes will then be discussed with the whole research team, and a set of emergent themes will be refined into a definitive set of theories which will be shared and evaluated with the focus group.

Ethics and governance

All procedures involving human participants will be approved by the host University's Ethics Committee. Data collected from this work will be managed in accordance with the General Data Protection Regulation (GDPR) (Regulation 2016/679) (Official Journal of the European Union, 2016). In specific relation to the focus group interviews with pre-service teachers and teacher educators, the authors will ensure participant confidentiality and no identifiable

information will be published in any subsequent work. Written consent will also be obtained from all participants prior to the start of the research.

Results

This project will enable our collaborating external partner to better understand the IVR SBL prototype they have created to further develop the software to meet the needs of the intended users. The project will also contribute to the growing body of knowledge on the use of IVR and SBL with pre-service teachers within the HEI context. We seek to inform the development of the ITT curriculum within England and the training of teachers internationally. We will, therefore, disseminate our findings to national and international colleagues.

Discussion

This project builds upon previous simulation projects in which several members of the research team have been involved where a series of SBL scenarios and resources were developed to help bridge the theory-practice divide that pre-service teachers have identified, to give added realism and relevance to their university-based experiences.

These simulations were framed within a 'virtual' school context which consisted of Year 2 and Year 6 class cohorts. The 'simulated' children all had personal profiles and backstories including assessment data, Special Educational Needs and Disabilities (SEND) and pupil premium information. Simulation scenarios were developed in collaboration between both teacher educators and a group of pre-service teachers working as 'pedagogic consultants' and were drawn from collective experiences of practice (Luke et al., 2023). They were designed to reflect lived realities and include video and audio materials, simulated documentation (such as emails and school planning and policies), and live interactive role-play.

Adopting the position that having a detailed, shared understanding of the same class allows staff and students to have meaningful and insightful discussions about potential barriers to and opportunities for learning, teaching and assessment, this innovative approach is currently being embedded across the ITT programmes at the HEI. The initial research received enthusiastic support from pre-service teachers, and participant accounts from that pilot project (Mulholland et al., 2022) reported increased engagement, confidence, and feelings of preparedness, indicating that SBL promotes parity of experience for pre-service teachers through offering authentic contexts to rehearse essential skills within a risk-free environment.

Conclusion

This project will further develop an understanding of SBL by looking specifically at the use of IVR technology as a pedagogical tool which may enable pre-service teachers to bridge the gap between theoretical understanding and

professional experience in practice. This research will be used to create an exploratory theoretical understanding of how to plan, implement, and evaluate IVR SBL within the ITT curriculum. We aim to identify potential strengths and limitations of the use of IVR SBL within the HEI context and make recommendations for how such an approach can be embedded within existing ITT provisions.

References

- Ade-Ojo, G. O., Markowski, M., Essex, R., Stiell, M., & Jameson, J. (2022). A systematic scoping review and textual narrative synthesis of physical and mixed-reality simulation in pre-service teacher training. *Journal of Computer Assisted Learning*, 38, 861–874. <https://doi.org/10.1111/jcal.12653>
- Blanden, J., Crawford, C., Fumagalli, L., & Rabe, B. (2021, March 8). *School closures hit children's mental health hard*. <https://www.nuffieldfoundation.org/news/new-evidence-shows-how-school-closures-hit-childrens-mental-health-hard>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Chen, C. Y. (2022). Immersive virtual reality to train preservice teachers in managing students' challenging behaviours: A pilot study. *British Journal of Educational Technology*, 53(4), 998–1024. <https://doi.org/10.1111/bjet.13181>
- Chernikova, O., Heitzmann, N., Stadler, M., Holzberger, D., Seidel, T., & Fischer, F. (2020). Simulation-based learning in higher education: A meta-analysis. *Review of Educational Research*, 90(4), 499–541. <https://doi.org/10.1080/10437797.2017.1288597>
- Craig, S. L., McInroy, L. B., Bogo, M., & Thompson, M. (2017). Enhancing competence in health social work education through simulation-based learning: Strategies from a case study of a family session. *Journal of Social Work Education*, 53(sup1), S47–S58. <https://doi.org/10.1080/10437797.2017.1288597>
- Dalinger, T., Thomas, K. B., Stansberry, S., & Xiu, Y. (2020). A mixed reality simulation offers strategic practice for pre-service teachers. *Computers and Education*, 144, 103696. <https://doi.org/10.1016/j.compedu.2019.103696>
- Department for Education. (2018, March). *Factors affecting teacher retention: Qualitative investigation*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/686947/Factors_affecting_teacher_retention_-_qualitative_investigation.pdf
- Department for Education. (2019, January 28). *Teacher recruitment and retention strategy*. London: DfE. <https://www.gov.uk/government/publications/teacher-recruitment-and-retention-strategy>
- Department for Education. (2021, June 8). *School workforce in England: Reporting year 2021*. <https://explore-education->

statistics.service.gov.uk/find-statistics/school-workforce-in-england

De Souza, D. E. (2013). Elaborating the Context-Mechanism-Outcome configuration (CMOC) in realist evaluation: A critical realist perspective. *Evaluation*, 19(2), 141-154. <https://doi.org/10.1177/1356389013485194>

Dholakia, N., & Detlev Z. (2004) Cultural contradictions of the anytime, anywhere economy: Reframing communication technology. *Telematics and Informatics*, 21(2), 123-141. <https://ssrn.com/abstract=689801>

Dror, I., Schmidt, P., & O'Connor, L. (2011) A cognitive perspective on technology enhanced learning in medical training: Great opportunities, pitfalls and challenges. *Medical Teacher*, 33(4), 291-96. <https://doi.org/10.3109/0142159X.2011.550970>

Englund, C., Olofsson, A. D., & Price, L. (2017) Teaching with technology in higher education: Understanding conceptual change and development in practice. *Higher Education Research and Development*, 36(1), 73-87. <https://doi.org/10.1080/07294360.2016.1171300>

Federičová, M. (2021). Teacher turnover: What can we learn from Europe? *European Journal of Education*, 56(1), 102-116. <https://doi.org/10.1111/ejed.12429>

Fischetti, J., Ledger, S., Lynch, D., & Donnelly, D. (2021). Practice before practicum: Simulation in initial teacher education. *The Teacher Educator*, 57, 155-174. <https://doi.org/10.1080/08878730.2021.1973167>

Frei-Landau, R., & Levin, O. (2022). The virtual Sim (HU) lation model: Conceptualization and implementation in the context of distant learning in teacher education. *Teaching and Teacher Education*, 117, 103798. <https://doi.org/10.1016/j.tate.2022.103798>

Frei-Landau, R., & Levin, O. (2023). Simulation-based learning in teacher education: Using Maslow's hierarchy of needs to conceptualize instructors' needs. *Frontiers in Psychology*, 14, 1149576. <https://doi.org/10.3389/fpsyg.2023.1149576>

Goodchild, T., & Speed, E. (2019). Technology enhanced learning as transformative innovation: A note on the enduring myth of TEL. *Teaching in Higher Education*, 24(8), 948-963. <https://doi.org/10.1080/13562517.2018.1518900>

Graham, A. C., & McAleer, S. (2018). An overview of realist evaluation for simulation-based education. *Advances in Simulation*, 3(1), 1-8. <https://doi.org/10.1186/s41077-018-0073-6>

Haidt, J., & Allen, N. (2020). Scrutinizing the effects of digital technology on mental health. *Nature (London)*, 578(7794), 226-227. <https://doi.org/10.1038/d41586-020-00296-x>

Hamilton, D., McKechnie, J., Edgerton, E., & Wilson, C. (2021). Immersive virtual reality as a pedagogical tool in education: A systematic literature review of quantitative learning outcomes and experimental design. *Journal of Computers in*

Education, 8(1), 1-32. <https://doi.org/10.1007/s40692-020-00169-2>

Heitzmann, N., Seidel, T., Opitz, A., Hetmanek, A., Wecker, C., Fischer, M. R., Ufer, S., Schmidmaier, R., Neuhaus, B., Siebeck, M., Stürmer, K., Obersteiner, A., Reiss, K., Girwidz, R., & Fischer, F. (2019). Facilitating diagnostic competences in simulations in higher education: A framework and a research agenda. *Frontline Learning Research*, 7(4), 1-24. <https://doi.org/10.14786/flr.v7i4.384>

Ingleby, E., Wilford, B., & Hedges, C. (2019) Teaching with technology and higher education: A brave new world? *Practice: Contemporary Issues in Practitioner Education*. 1(1), 73-87. <https://doi.org/10.1080/25783858.2019.1589985>

Judge, S., Bobzien, J., Maydosz, A., Gear, S., & Katsioloudis, P. (2013). The use of visual-based simulated environments in teacher preparation. *Journal of Educational and Training Studies*, 1, 88-97. <https://doi.org/10.11114/jets.v1i1.41>

Kaufman, D., & Ireland, A. (2019). *Simulation as a strategy in teacher education*. Oxford Research Encyclopedia of Education. Oxford University Press. <https://doi.org/10.1093/acrefore/9780190264093.013.478>

Kelly, N., Cespedes, M., Clarà, M., & Danaher, P. A. (2019). Early career teachers' intentions to leave the profession: The complex relationships among preservice education, early career support, and job satisfaction. *Australian Journal of Teacher Education*, 44(3). <https://doi.org/10.14221/ajte.2018v44n3.6>

Kim, J., Park, J. H., & Shin, S. (2016). Effectiveness of simulation-based nursing education depending on fidelity: A meta-analysis. *BMC Medical Education*, 16, 152. <https://doi.org/10.1186/s12909-016-0672-7>

Ledger, S., Ersozlu, Z., & Fischetti, J. (2019). Preservice teachers' confidence and preferred teaching strategies using TeachLivE™ virtual learning environment: A two-step cluster analysis. *EURASIA Journal of Mathematics, Science and Technology Education*, 15(3), 1- 17. <https://doi.org/10.29333/ejmste/102621>

Long, R., & Danechi, S. (2022, December 8). *Teacher recruitment and retention in England*. <https://researchbriefings.files.parliament.uk/documents/CBP-7222/CBP-7222.pdf>

Luke, C., Counihan, C., Nichol, D., Meller, S., Mulholland, K., Gray, W., Anderson, A., Herridge, D., Karikis, D., Sanderson, R., Collard, E., & Hill, R. (2023). Welcome matviy: Working in staff-student partnerships to develop simulation-based learning to support teachers' understanding of EAL. *Impact: Journal of the Chartered College of Teaching*, 19, 40-42. https://my.chartered.college/impact_article/welcome-matviy-working-in-staff-student-partnerships-to-develop-simulation-based-learning-to-support-teachers-understanding-of-eal/

Mayer, D., Allard, A., Bates, R., Dixon, M., Doecke, B., Kline, J., Kostogriz, A., Moss, J., Rowan, L., Walker-Gibb, B., White, S., & Hodder, P. (2015, November). *Studying the effectiveness*

of teacher education: Final report. <http://dro.deakin.edu.au/eserv/DU:30080802/walkergibbs-studyingthe-2015.pdf>

McGarr, O. (2021). 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>

Meredith, C., Heslop, P., & Dodds, C. (2022) Simulation: Social work education in a place. *Social Work Education*, 1-18. <https://doi.org/10.1080/02615479.2021.1991908>

Miller, J. M., & Youngs, P. (2021). Person-organization fit and first-year teacher retention in the United States. *Teaching and Teacher Education*, 97, 103226. <https://doi.org/10.1016/j.tate.2020.103226>

Mulholland, K., Luke, C., Meller, S., Nichol, D., Anderson, A., Herridge, D., & Gray, W. (2022). Exploring the use of simulation in a primary ITE context. *Impact: Journal of the Chartered College of Teaching*, 16, 60-62. https://my.chartered.college/impact_article/exploring-the-use-of-simulation-in-a-primary-ite-context/

Nelson, J., Lynch, S., & Sharp, C. (2021, September). *Recovery during a pandemic: The ongoing impacts of Covid-19 on schools serving deprived communities*. NFER. https://www.nuffieldfoundation.org/wpcontent/uploads/2021/09/recovery_during_a_pandemic.pdf

Official Journal of the European Union. (2016). *Regulation (EU) of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and Repealing Directive 95/46/EC. (General Data Protection Regulation)*. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679&from=EN>

Pawson, R. (2006). Realist evaluation and realist synthesis. In *QMSS seminar, networks and behaviour: Statistical models and advances in the theory of action* (Vol. 18, No. 2007, pp. 42-60). University of Groningen, The Netherlands.

Pawson, R., & Tilley, N. (1997). An introduction to scientific realist evaluation. In E. Chelimsky & W. R. Shadish (Eds.), *Evaluation for the 21st century: A handbook* (pp. 405-418). Sage Publications, Inc. <https://doi.org/10.4135/9781483348896.n29>

Pelly, F. E., Wiesmayr-Freeman, T., & Tweedie, J. (2020). Student placement adaptability during COVID-19: Lessons learnt in 2020. *Nutrition & Dietetics*, 77(4), 481-483. <https://doi.org/10.1111%2F1747-0080.12625>

Pfitzner-Eden, F. (2016). I feel less confident so I quit? Do true changes in teacher self-efficacy predict changes in preservice teachers' intention to quit their teaching degree? *Teaching and Teacher Education*, 55, 240-254. <https://doi.org/10.1016/j.tate.2016.01.018>

Platt, A., McMeekin, P., & Prescott-Clements, L. (2021). Effects of the simulation using team deliberate practice (Sim-TDP) model on the performance of undergraduate nursing students. *BMJ Simulation and Technology Enhanced Learning*, 7(2), 66-74. <https://doi.org/10.1136%2Fbmjstel-2019-000520>

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

Siddiqui, Z. S., O'Halloran, M., & Hamdorf, J. (2021). Using simulation to learn surgical skills in oral surgery: What do students think? *Academia Letters*, Article 3677. <https://doi.org/10.20935/AL3677>

Steuer, J. (1992). Defining virtual reality: Dimensions determining telepresence. *Journal of Communication*, 42, 73-93. <https://doi.org/10.1111/j.1460-2466.1992.tb00812x>

Theelen, H., van den Beemt, A., & Brok, P. D. (2019). Classroom simulations in teacher education to support preservice teachers' interpersonal competence: A systematic literature review. *Computers and Education*, 129, 14-26. <https://doi.org/10.1016/j.compedu.2018.10.015>

US Bureau of Labor Statistics. (2022). *Employment, hours, and earnings from the current employment statistics survey (National)*. <https://data.bls.gov/timeseries/CES9093161101>

Walsh, C. M., Garg, A., Ng, S. L., Goyal, F., & Grover, S. C. (2017). Residents' perceptions of simulation as a clinical learning approach. *Canadian Medical Education Journal*, 8(1), 76-87. PMID: <https://pubmed.ncbi.nlm.nih.gov/28344719>

Yu, M., Yang, M., Ku, B., & Mann, J. S. (2021). Effects of virtual reality simulation program regarding high-risk neonatal infection control on nursing students. *Asian Nursing Research*, 15(3), 189-196. <https://doi.org/10.1016/j.anr.2021.03.002>

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