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To investigate the use of technology-enhanced simulation as an integrative authentic assessment approach on a blended learning professional programme

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Abstract

This Quality and Qualifications Ireland (QQI) funded research project[1] conducted by Hibernia College, set out to develop and test an integrated, authentic virtual scenario-based learning (VSBL) environment designed to support student mentoring and formative and authentic assessment. The project was conceived as a response to the perceived need in higher education for purposeful, supportive and sustainable formative assessment. The initiative aligns with the broader QQI Re-Thinking Assessment call, which sought to foster innovation in assessment scholarship and professional development, particularly within the context of the National Framework of Qualifications (NFQ). More broadly, the research aimed to explore the potential for VSBLs to promote and support the self-efficacy of student teachers (STs) through the provision of virtual mastery experiences, mirroring professional scenarios. As a highly prized aspect of many professional learning qualifications, Work- integrated learning (WIL), is a form of authentic assessment which can help foster good professional attributes and dispositions. However, the assessment of WIL can be a cause of significant anxiety to many students. Faced with all the challenges of a real workplace, under assessment conditions, students can quickly become overwhelmed and overwrought. This project is therefore a response to the need for opportunities for aspiring professionals and students to experiment in replicas of 'real life' professional experiences without the pressures of summative assessment. The project seeks to use technological solutions to formatively evaluate the learning outcomes of students on a professional programme of education.

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Introduction

The landscape of higher education is increasingly shifting towards the integration of technology to enhance learning experiences and assessment methodologies. The widespread use of digital platforms and educational apps in higher education has supported the democratisation of education by enabling learners to engage with learning and assessment through a variety of accessible means. Although advances in technology, particularly in generative artificial intelligence (GenAI), have created new challenges and exasperated existing ones for educators around assessment security and academic misconduct, they also hold the potential for transformative power in education. The opportunities for technology to support and enhance the experience, implementation and transparency of assessment processes are considerable. In response to the evolving demands of the educational sector, this research project, funded by QQI and conducted by Hibernia College, aims to address the critical need for authentic assessment approaches within teacher education. The primary focus of this research is to examine the potential of VSBL environments in promoting self-efficacy among STs by simulating real-world professional scenarios. Self-efficacy, a concept rooted in Bandura's social cognitive theory (Bandura, 1977), plays a crucial role in shaping students' academic success, resilience, instructional quality, and overall job satisfaction. Given the significant impact of school placements (SP) on ST's academic performance, the project aims to mitigate the pressures associated with these placements by offering a low-stakes, formative assessment platform that mirrors the complexities of real-life teaching situations.

The VSBL environment developed in this project is intended to provide STs with a controlled, yet authentic, space where they can engage in pedagogical decision-making and classroom management, without the high stakes associated with summative assessments. Through virtual mastery experiences, vicarious learning opportunities, and real-time feedback, the VSBL platform seeks to enhance STs' confidence and preparedness for actual placements. This approach addresses a key challenge identified in the education field: the need to balance the authenticity of assessments with the supportive, formative experiences that promote deep learning and professional growth. A benefit of this project is the potential to replicate these scenarios within a variety of different WIL contexts.

By employing a Design-Based Research (DBR) methodology, this project not only explores the theoretical underpinnings of authentic assessment but also applies these concepts in a practical, technology-enhanced environment. The research is guided by a multi-ontological STAR framework, which emphasises scenario-based learning, technology-enhanced engagement, authentic assessment of learning outcomes, and reflective practice. This integrative approach ensures that the VSBL environment is both pedagogically sound and practically applicable across various professional education programmes.

The Research Questions

Programmes of study designed for inclusion in the National Framework of Qualifications (nfq) are expressed in terms of learning outcomes and credits, mapped to the appropriate NFQ award-type descriptors. A focus on learning outcomes, rather than primarily on teaching content, reflects a wider move in education towards emphasising the student's ability to demonstrate achievement. Furthermore, an emphasis on student-centred approaches to assessment has brought educators towards a renewed appreciation for the benefits of high-quality authentic assessment. The purpose of the school-based, VSBL environment proposed in this project is twofold, (1) to enhance pre-service teachers' sense of self-efficacy (Bandura, 1977) by providing virtual mastery, vicarious teaching experiences, and verbal persuasion, and (2) to assess programme learning outcomes on a Professional Master of Education (PME) programme. To achieve these aims, the following primary research question was developed by the research team:

'What are the characteristics of a VSBL authentic assessment environment to improve pre-service teachers' self-efficacy and assess programme learning outcomes which will best support pre-service teachers before their first school-based experience on a Professional Master of Education (PME) programme?'

Two ancillary questions followed:

'Does the VSBL authentic assessment environment affect pre-service teachers' self-efficacy and assess programme learning outcomes?'

'What are the design informants and resources needed to consider to create an effective VSBL authentic assessment environment for use across other professional programmes?'

The Research Context

This research sits within the context of a grant aid application made to QQI under the Assessment and Confidence in HE Qualifications included in the NFQ: Call for QQI Anniversary Funded Proposal. QQI published a Green Paper on Assessment of Learners and Learning (2018) which set the focus going forward on linking assessment with intended or expected learning outcomes and the NFQ. The grant aid acted as a platform for enhancing assessment with outputs linked to scholarly publications as well as toolkits, strategies models, literature and CPD. Additionally, the purpose of the grant was to help build momentum in assessment scholarship and/or professional development relating to assessment in the context of the NFQ. This projects to investigate the use of technology-enhanced simulation as an integrative authentic assessment approach on a blended learning professional programme has specific relevance to Topic 1 under the grant aid as it seeks to provide an innovative and authentic assessment approach which can be adapted and replicated by HE providers with a professional aspect to their programmes. It acts as a means of effectively determining the reliability and effectiveness of assessment at sites of practice by providing consistent formative assessment in VSoPs prior to learners engaging directly with sites of practice. Graduate attributes are assessed via branching decision-making activities and scenarios linked to specific Minimum Intended Programme Learning Outcomes (MIPLOs), which mirror key challenges learners are likely to encounter in their chosen profession. The decisions made by learners can be tracked and used to support the development of teaching and learning strategies to directly address areas identified as common weaknesses. Sites of practice, and the learning attained there, can lack consistency and it is challenging for providers to ensure the validity of assessments which are by their very nature unique and context specific in some respects. This project seeks to maintain coherence by providing all learners with a consistent space to make decisions within, whilst also providing for the uniqueness of the learner by responding to and adapting, based on the decisions they make.

The Research Paradigm

This research is informed by an interpretative paradigm. Interpretivists hold the view that reality is subjective, fluid, multiple and socially constructed (Lincoln et al., 2011). Researchers act as social participants and need to understand the differences that exist between participants and their perspectives (Collins, 2010). The reality under exploration in this research is that of the learners on a professional programme and their interpretation of, interaction with and learning from virtual sites of practice. From an interpretivist perspective, experience is specific to context and involves the construction of knowledge (Yanow, 2014). In this research, the context is a professional programme of education with compulsory and assessed WIL modules in the form of School Placement. Interpretivists also emphasise the dialogue and relationship between the roles of the researcher, the research itself and the subject matter being researched. As academics and staff teaching, assessing and supporting students on the professional programme, the researchers acknowledge our relationship with the research context and participants. The potential for bias has been mitigated against using the multi-ontological framework, the ethics application process and the systematic approach to data analysis.

The National Context

The NFQ is a significant part of Ireland's response to the Bologna Process, a series of ministerial meetings between European countries to ensure comparability in standards and quality of education. It describes how high-level outcomes are expected to be achieved by students completing an award at a particular level. Institutions in Ireland are tasked with carefully mapping learning outcomes at module level to learning outcomes at programme level and towards the overall award. This is a complex task requiring a highly skilled and knowledgeable approach to assessment and module content design and development. This research sits within the context of the NFQ and assessment of WIL. Work is currently underway within QQI on the development of Statutory QA Guidelines on Working Integrated Learning however authenticity is already widely recognised as a key principle for effective assessment design in WIL within the NFQ.

The Initial Teacher Education Context

School Placement is the mode of WIL in Initial Teacher Education (ITE) in the Republic of Ireland (henceforth referred to as Ireland). It addresses the basic need for STs to experience professional practice within the classroom context prior to graduating. It also provides STs with opportunities to put the pedagogical knowledge and theoretical underpinnings gained during their period of study into practice. It functions as a strategy to bridge the gap between transitioning from the role of a student to that of a practicing teacher. However, it is also fundamentally a mode of assessment, providing assurances that graduates have met the required professional standards to teach in Ireland.

The Institutional Context

Hibernia College is a private institution of higher education in Ireland, providing a suite of QQI validated programmes at level 8 and 9 on the NFQ. The College is the largest single provider of primary school teachers into the system. This research has been conducted within the context of the PME Primary programme.

Rationale

The need to prepare STs for the challenges of complex modern classrooms prior to the assessed and high-pressure environment of School Placement (SP) was a motivating factor in this project. Focus groups conducted with PME STs revealed that assessment pressure hampers risk-taking and innovative performance on SP. Formative assessment helps to guide students in the learning process and can improve learning outcomes (Bennett, 2011). Timely feedback is integral to formative assessment (Hattie & Timperley, 2007). Although an authentic form of assessment, the fact that performance on SP significantly impacts academic achievement impedes its ability to function as a formative experience. While Shulman (1986) speaks to the challenges of developing knowledge for teaching and learning, the authors question the use of SP for this purpose. The authors propose VSBL as a facility for enabling authenticity by mirroring the classroom experience and the types of scenarios and decisions teachers are faced with, prior to sending students into a real school environment, thus promoting self-efficacy.

A strong sense of self-efficacy is noted in research as integral to students' academic achievement (Klassen & Tze,2014; Clarke & Newbury, 2019), resilience (Beltman et al., 2011), instructional quality (Holzberger et al.,2013), teaching commitment (Klassen &Chiu, 2011), and job satisfaction (Klassen & Chiu, 2010). Bandura's conception of self-efficacy underpins much of this area of research (Bandura, 1977, 2012).

Aim and Objectives

The aim of this research is to design and develop a virtual integrative authentic scenario-based learning environment to enhance the sense of self-efficacy experienced by STs in their own mastery of learning outcomes assessed during SP, through low-risk, reflective but authentic experiences. The study investigates the use of VSBLs as an integrative authentic assessment approach on a blended learning programme. The simulation acts as a bridge between assessed experiences in reals sites of practice and academic and professional studies.

1. Design an integrative authentic scenario-based VSoP assessment tool to support the assessment of Programme Learning Outcomes
2. Explore students' experiences of using an integrative authentic scenario-based VSoP assessment tool to develop professional competencies
3. Evaluate the coherence, validity, reliability and efficiency of a technology enhanced simulation assessment tool in providing authentic assessment experiences
4. Specifically and transparently address the assessment of MIPLOs often confined to sites of practice

Literature Review

The research began in February 2023 with the completion of a structured literature review into three key areas of relevance: authentic assessment, scenario-based learning and virtual scenario-based learning. Literature review findings demonstrated that VSBL is a promising and exciting technological innovation that is underutilised in professional programmes (Raja Lala et al., 2017), especially in

teacher education (Dieker et al., 2014). VSBL offers students the opportunity to experience real-life situations in a controlled and managed way, allowing them to practice skills authentically (Kaufman and Ireland, 2016). While there are benefits to using VSBL, such as increased motivation, creativity, collaboration, and social interaction, as well as flexibility, there are also concerns about potential limitations in critical reflection and the need for empirical evidence of efficacy (McGarr, 2020). Virtual simulations have been successfully used in various sectors, such as healthcare, aviation, genetics, and engineering, to develop critical skills in realistic and immersive environments (Bosse & Provost, 2015; Claudio et al., 2015; Dymora et al., 2021; Guo et al., 2012). VSBL offers a low-cost, low-risk alternative to accessing and assessing real-life work-based environments, and it can be integrated into professional programmes or offered as standalone professional development activities (Baddie & Kaufman, 2015). Bespoke virtual environments can also ensure that programme learning outcomes are met in line with accrediting bodies and programmatic design.

Research Approach and Design

Upon receipt of ethical approval from the host institution (Hibernia College) in March 2023, an Educational Design Research (EDR) methodology (McKenny & Reeves, 2019) was utilised for its suitability and applicability to this research project. In the last quarter century, there has been a growing recognition of the significance of Design-Based Research (DBR) and related practitioner-focused research methods, such as Educational Design Research (EDR) (Hall, 2020). These approaches have increasingly gained recognition as effective means for investigating how we can enhance the beneficial effects of digital technologies in the field of education. This EDR approach was used as it entails a collaboration between stakeholders (e.g., researchers, pre-service students, co-operating teachers, school placement tutors, and learning designers) to simultaneously develop both new theoretical insights and practical solutions to serious teaching and learning challenges (McKenney & Reeves, 2018). The research project comprised of one iteration of the EDR process; analysis and exploration, design and construction, and evaluation and reflection. For data collection and analysis, an exploratory sequential mixed methods approach (Creswell & Creswell, 2018)

was utilised, where the collection and analysis of qualitative data was then followed by a development phase of translating the qualitative findings into a tool that was tested quantitatively. This meant that the tool was grounded in the views of participants and emphasised exploration before the design and construction phase.

Non-probability convenience self-selection sampling was employed for selecting participants (n=22) with the onus on the PMEP Spring 2023 cohort. Participants were selected based on availability and willingness to take part. The data generation comprised of a series of Focus Groups with ST (n=17) and Semi-Structured Interviews with School Placement Tutors (n=5).

As a further facilitator of validity, a STAR framework was utilised to frame the research process. This ensured a consistent but flexible approach to the research and consisted of:

- Scenario-based to improve professional sense of self-efficacy.
- Technology-enhanced to improve engagement, authenticity/lifelikeness, and making it easy to access, use and scale.
- Authentic assessment of programme learning outcomes.
- Reflective practice to support teacher/professional identity.

Analysis and Exploration Process

The first task in the analysis and exploration process was to draft a problem statement with input from the key stakeholders. These key stakeholders were identified by the research team as comprising of STs on the PME programme and School Placement Tutors (SPTs) involved in the assessment of students on placement. Initial Focus Groups were conducted with STs and Semi Structured Interviews with SPTs to identify more precisely what elements of WIL would be assessed within the VSBL structure. The pressures of classroom management and the impact this has on self-efficacy and a sense of preparedness were identified as key emergent themes from an initial wider list of possible themes including teaching, learning and assessment and Universal Design for Learning approaches. The 3 focus groups conducted with PME STs revealed that STs believe that assessment pressure hampers their ability to take risks and engage with

innovative teaching and learning. STs and SPTs expressed concerns that the fact that performance on SP significantly impacts academic achievement impedes its ability to function as a formative experience. A range of challenges were identified by STs including lesson planning, delivery and classroom management issues. STs shared how new learning gained on SP could be used to improve their future practices but reported feeling a range of both positive and negative emotions around SP. Emotional responses related to perceptions of success or failure in teaching and learning and an overall sense of lack of self-efficacy. Instances where students received verbal feedback, mentoring support.

Design and Construction

In designing an effective VSBL simulation for STs, a key factor was to create opportunities for active participation in teaching activities, such as delivering aspects of a lesson, leading discussions with pupils, or facilitating group activities that simulate SP settings (Bandura, 1997). However, other considerations included providing STs with realistic challenges which would require them to make complex decisions about classroom management and teaching and learning, mirroring those experienced on SP. Therefore, simulations were designed to be set within an overall school and class environment, where the ST was tasked with making a series of pedagogical, classroom management and UDL- informed decisions, with a particular emphasis on classroom management.

Creation of the scenarios commenced in July 23 with a series of workshops between the research team and the Digital Learning and Design team to establish the content of the lessons and the overall visual presentation style. It was agreed at an early stage that the simulations should include opportunities for the ST to gain feedback as they made decisions. Therefore, the decision was made to divide lessons into 3 sections; Introduction, Development and Conclusion, with a requirement for the ST to make a pedagogical decision based on a series of possible scenarios presented to them. Furthermore, the options presented to the STs were of a high calibre, ensuring that the decisions being made required deep engagement with the lesson content. The design of the VSBL proceeded with the creation of early design representations. These were brought to a focus group of STs for feedback and adjusted based on that feedback. Adjustments included the

introduction of more realistic elements such as sound effects to mirror a busy classroom. Maths was chosen as the subject to focus the pilot lesson around. The rationale for this was that it is a core subject, it can include a lot of active elements and diverse range of abilities and interest levels which impact of classroom management and it is a curricular area where many students express some anxiety around their own abilities. The pilot lesson was built using Articular Storyline and Vyond for video content, both of which facilitated interactive design. The development of the content included ensuring that the teacher avatars represented diversity in gender and ethnicity, that the pupils in the classroom also reflected diversity and that the classroom environment was representative of a modern primary classroom in use of colour, space, displays and seating arrangements.

Evaluation and Reflection

The pilot VSBL Math lesson was shared with STs through a Focus Group and with Academic Faculty for reflection, evaluation and review. It was also disseminated with the wider academic community through presentations at international conferences (Eden in Graz and BERA in Manchester). Journal articles will follow as a final stage in the dissemination. As a response to the growing demands for authentic and formative assessment in education, the VSBL project was recognised as reflecting a forward-thinking approach that integrates virtual technology to simulate real-world professional scenarios. The use of a low-stakes environment where STs could develop crucial skills before their first school-based experience was considered of significant benefit. The potential for this type of VSBL to counteract some of the overwhelming pressure of summative assessment in a real-world setting, which often impedes risk-taking and innovative teaching, was recognised as another benefit of the project.

The project's methodology, a Design-Based Research approach, was experienced as highly suitable for this type of exploratory work. The integration of the multi-ontological STAR framework—Scenario-based, Technology-enhanced, Authentic assessment, and Reflective practice—provided a solid pedagogical and theoretical foundation for the research. This framework ensured that the simulations were

designed with pedagogical integrity while also being adaptable to various professional contexts.

One of the significant strengths of the project was the use of feedback from key stakeholders, including STs and SPTs. By involving these groups in the design and evaluation of the VSBL tool, the research team was able to refine the scenarios and simulations to better meet the needs of pre-service teachers. For example, the inclusion of sound effects to mirror a busy classroom and the focus on classroom management issues were informed by feedback from focus groups. These adjustments enhanced the realism and relevance of the simulation, thereby improving its effectiveness as a formative assessment tool.

By simulating classroom environments where STs are required to make pedagogical and classroom management decisions, the VSBL tool directly addressed the areas where STs often struggle during SP. This simulation offered a low-cost, scalable solution that can be adapted for use in other professional education programmes.

However, there are challenges inherent in the implementation of VSBLs, particularly in ensuring critical reflection and overcoming the limitations of virtual environments. In conclusion, the project successfully demonstrates the potential of technology-enhanced simulations in providing authentic assessment experiences that are both formative and supportive. The use of VSBL has the potential to transform professional education by fostering self-efficacy, promoting deep learning, and ensuring consistency in the assessment of work-integrated learning experiences.

Findings

The project yielded several key findings:

1. Enhanced Self-Efficacy: Feedback from STs indicated that the tool significantly improved their sense of self-efficacy in handling classroom situations. The ability to practice in a low-stakes environment helped them feel more prepared for the pressures of school placement.
2. Authentic Assessment: The VSBL tool provided an innovative approach to authentic assessment by simulating real-world teaching environments. It allowed for formative feedback, which is often lacking in high-stakes summative assessments like SP. This aligns with the broader QQI Re-Thinking Assessment initiative, offering a scalable solution for professional programmes that require WIL.
3. VSBL Simulation Tool: The development of an interactive VSBL tool that allows STs to practice classroom management and pedagogical decision-making in a virtual environment. The tool includes branching scenarios that mirror real-life teaching challenges and offers feedback to guide student learning.
4. Scalability and Adaptability: The project demonstrated that VSBL tools can be adapted for use across different professional programmes. The branching decision-making structure allows for the assessment of programme learning outcomes (MIPLOs) in a consistent manner, addressing common challenges in WIL settings.
5. Stakeholder Involvement: The involvement of STs and SPTs in the design and evaluation process was a key strength of the project. Their feedback ensured that the tool was both realistic and pedagogically sound, enhancing its relevance and effectiveness.
6. Publications and Conferences: The project's findings were disseminated through international conferences (EDEN, BERA and EADTU) and will be further shared through journal publications, facilitating knowledge sharing within the higher education community.

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