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Using a digital escape room to engage first year pre-registration nursing students in evidence-based practice learning: a case study

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Abstract

Students on courses leading to professional registration are required to develop an understanding of how to find, appraise and integrate research to inform practice.

An escape room activity was designed as part of the learning experience for a first-year academic module titled ‘Introduction to evidence-based practice’. The learning module was designed to develop nursing students’ skills in the first three stages of EBP: Developing a question, searching and appraising the literature. This case study will describe the staff and student experience of a virtual escape room from design to delivery for evidence-based practice learning.

Keywords: virtual escape room, evidence based practice, healthcare students, curriculum innovation, curriculum design

Introduction

Developing confidence in academic literacy is considered an essential skill for all undergraduate study, as it is the basis for assessment. However, student ability is often assumed even though these skills have not necessarily been developed in tertiary education (Erickson et al., 2006). Baker et al. (2019) argue that developing academic

literacy is essential if students are to meaningfully engage in higher education, and this is increasingly important in the context of widening participation. Programmes that require the student to develop a professional identity through research-based knowledge, add an additional level of complexity to the design of learning aimed at increasing academic literacy (Afdal et al., 2022).

This is the case for programmes leading to professional registration in nursing or allied health, as integrating the best available evidence in the clinical decision-making process, is considered essential for the safe and effective delivery of high-quality care (Titler, 2008). This requires educators to incorporate Evidence Based Practice (EBP) in the curriculum, so students develop the necessary competence to find, appraise and integrate research to inform clinical practice (Newhouse, 2007). However, many health professionals remain reluctant to engage with published research and struggle to communicate on best practice, with potential consequences for patient care (National Health Service Improvement and National Health Service England, 2020).

The World Health Organisation (WHO) European Region identifies ‘promoting evidence-based practice and innovation’ as a priority action area (2015, p.10) and states ‘evidence-based practice is every nurse's and midwife's concern. It should be enabled by means of education, research, leadership and access to evidence sources’ (p.14). Despite the importance of the subject, difficulties remain in engaging learners with EBP and in achieving competency (Lehane et al., 2019).

Hitch and Nicola-Richmond (2017) recommend that the effective teaching of EBP requires students to first develop basic academic skills through collaborative learning. Reading professional sources requires students to understand scientific language, a ‘jargon’ which can be considered to undermine efforts to inform and persuade (Bullock et al., 2019). Students’ knowledge, skills and attitude have been identified as a barrier to teaching EBP (Fiset et al., 2017). Numerous strategies have been devised to increase student engagement, with varied results, including participation in clinical research projects and various methods of interactive learning to enhance library skills (Horntvedt et al., 2018). Literature pertaining to the use of gamification to engage students in EBP learning is scarce.

A Digital Escape Room (DER) was devised to promote familiarity with the ways of 'being, thinking and writing' necessary to develop a deep approach to reading, as described by Hermida (2009, p.2), for a first-year undergraduate module. When designing the interactive activities for the escape room inspiration was drawn from techniques used in foreign language teaching (ESOL) for 'acquiring target knowledge in an interactive manner that is also motivating' (Xu et al., 2020, p.878).

Background

Recreational escape rooms have grown rapidly in popularity across the globe (Institute of Entrepreneurship Development, 2020) offering groups of participants a fun and immersive experience. In recent years, research into the use of escape rooms for educational purposes has developed; these gamified, pedagogically driven activities are designed with specific target groups in mind and with clear learning objectives at the core (Makri et al., 2021).

Within the current research literature, educational escape rooms have been identified as providing a range of benefits. They embrace social constructivist and active learning approaches, with teamwork identified as a valuable non-technical skill that is developed through their use (Styling et al., 2018; Reinkemeyer et al, 2022). They have also been found to be motivational and engaging experiences for participants (Nadelson and Nadelson, 2020; Saltz and Heckman, 2020; Ferrer-Sargues et al., 2021; Lundholm et al, 2021; Molina-Torres et al, 2022) aiding interprofessional collaboration and socialisation (Fusco et al., 2022). Alongside opportunities for collaboration and competition, escape rooms have also been found to offer the scope to develop technological, communication, time management and problem-solving skills (Stollhans, 2020). They also have the potential to increase student awareness of subject matter (Styling et al., 2018), help bridge the theory-knowledge gap (Powers et al., 2022) and improve learning performance (Makri et al., 2021), knowledge recall (Ferrer-Sargues et al., 2021; Fusco et al., 2022), confidence and satisfaction (Reinkemeyer et al., 2022).

Drawbacks to physical educational escape rooms include the cost of resources, classroom availability and the lack of time to prepare classes (Fotaris and Mastoras, 2019; Reinkemeyer et al., 2022). Reinkemeyer et al. (2022) also identified participant stress as a

drawback especially when allied with simulation and clinical skills. As a counter to some of these drawbacks, Ang et al (2020) converted a physical escape room into a digital experience but found that students preferred the physical escape room due to the presence of a more immersive environment. It was noted that recreating teamwork and an immersive environment is more difficult in a DER (Ang et al., 2020). Saltz and Heckman (2020) also highlight the difficulty of monitoring, at a higher level, multiple digital rooms compared to one face-to-face classroom. Hickner et al., (2021) on the other hand, who also transitioned from a physical to DER found that marginally more students reported the DER as more fun but that the competitive elements caused a loss in immersion. Hickner et al. (2021) maintained the teamwork aspect online by using Zoom breakout rooms, whilst Ang et al (2020) reverted to individual work. Studies solely on the use of DERs are far less prevalent than those on physical escape rooms, however such studies have found digital only rooms to be effective at encouraging teamwork, communication and critical thinking (Anton-Solanas et al., 2022) and reported the experience as engaging and fun for students (Foulds and Forbes, 2021).

The aim of this study is to share the experience from design to delivery, of staff and students involved in a DER for EBP learning. This should provide the 'if, how, why, and when' of the use of escape rooms in education, which was identified as a gap in the literature by Taraldsen et al. (2022).

The design process was a collaborative effort between nurse educators and the faculty Technology Enhanced Learning (TEL) team.

Rationale for using an escape room for EBP learning

The skills needed to develop confidence in using research for academic writing and critical thinking is considered problematic (Borglin & Fagerström, 2012). The DER activity was designed as part of the learning activities for a first-year academic module 'Introduction to evidence-based nursing'. The learning outcomes for the module (Table 1) require nursing students to develop skills in the first three stages of EBP. The objective of the DER was to develop a spirit of enquiry, as described by Melnyk et al. (2009) and embed key vocabulary and concepts relating to the module learning objectives, to inspire confidence in academic reading.

Table 1. Learning outcomes for Introduction to evidence-based Nursing Level 4

1.	Understand the characteristics of effective evidence associated with core concepts and practices in nursing
2.	Identify the role of evidence in shaping the development of nursing skills
3.	Reflect on the academic and personal skills associated with nursing practice

Activities were designed (Table 2) to encourage evidence-based digital collaborative learning, which has been shown to improve student's knowledge, competence, satisfaction and problem-solving skills (Männistö et al., 2020).

Table 2. Mapping activity design to EBP model

	EBP model (Straus *et al.*, 2019)	**Skills**	**Activity**
0.	Spirit of enquiry	Critical thinking	Each activity required students to critically analyse the question and search for a solution.
1.	Asking the question	Narrowing down	
2.	Searching the evidence	Formulating search terms	All: Searching for authors and definition of terms. Enigma: using key words to develop search strategy.
3.	Appraising the evidence	Abstract reading	Word search
		Identifying authors	Drag and drop
		Understanding the vocabulary	Drag and drop

The technical design of the DER

The DER was hosted on the University's Virtual Learning Environment (VLE) to provide an intuitive user experience for students and nurse educators. A Sharable Content Object Reference Model (SCORM) provided additional scope to embed more complex and gamified functions into the VLE. An E-Learning authoring package called Articulate Storyline™ was used to build and design the DER content, allowing customisation and heightening user engagement. Articulate Storyline™ proved useful when locking down each activity with a passcode and was also used to create 'drag and drop' interactions, word searches, crosswords, and other interactive tools such as hotspots, states, triggers, data-entry fields, and buttons. Some of the more engaging DER activities were only possible due to the use of this additional software package. The DER consisted of ten group-based activities for the students to complete, each containing a password granting access to the next room or activity. The first activity, a Word search acted as an 'icebreaker' for the group, with activities increasing in complexity, with the final activity being an 'Enigma code' which developed the idea of key words.

The DER was framed by a narrative explaining the rationale for each activity in the session (Nicholson, 2018). For example, we specifically used the example of travelling to a foreign country and needing to understand basic expressions to get by. This was used to present the activity which required students to match a word to a definition. This was accompanied by instructions for students on how to work together in groups to search for answers. The DER was managed using Zoom with randomly allocated breakout rooms. Facilitators regularly checked in on each group to monitor progress and observe engagement. All facilitators were provided with the passcodes to support students, if necessary, but critical thinking was encouraged with subtle hints or prompts. The facilitators documented their observations and shared them with the research team (Hoyle et al., 2002).

Evaluation of the activity

The staff and students were informed of the voluntary nature of their engagement in the evaluation of the learning activity. Implicit consent was requested before students and staff completed the online anonymous survey. Participants were not required to answer all questions. No personal details were collected in the survey and the results were stored

securely on a password-protected University web service. Minimal risk university ethics approval was obtained.

A student survey was conducted post DER activity that contained a four-point Likert scale (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree) and seven open-ended questions. The Likert questions explored student enjoyment, motivation, ease of use and technical barriers, all of which were common areas of investigation in prior DER studies (Taraldsen et al., 2022). Open-ended free text questions gave students an opportunity to share aspects they thought went well, found challenging, what they would change if they were to undertake the DER again, how they might use the DER experience in their future professional practice and suggestions on how the DER could be improved for others.

A second survey was used to capture staff experience. The survey questions were adapted based on the Unified Theory of Acceptance and Use of Technology (UTAUT) with four key constructs of acceptance (intention to use and actual use): performance expectancy, effort expectancy, social influence and facilitating conditions (Venkatesh et al, 2003).

The Likert responses were summarised as percentages to quantify student satisfaction and engagement. The responses to the open survey questions for staff and students, were coded individually by two of the research team to ensure reliability (Fereday & Muir-Cochrane, 2006). Outliers were discussed and an agreement was reached on the identified themes (Hoyle et al., 2002).

Student survey results

The evaluation of the DER is based on the feedback from three consecutive first year undergraduate cohorts. An anonymous survey was used to capture student feedback, the results of which are presented in Table 3. Approximately 40% of the first-year nursing students who participated responded to the survey (n= 83). The DER was offered after the module assessment had been submitted to avoid creating time pressures due to other assessments and to embed learning for progression. Despite the timing, attendance was in the region of 15%-20%, which reflects the general difficulties for online engagement (ONS, 2022).

99% of students found the activity fun, with over 90% declaring that it was more engaging and motivating than other group learning activities. 90% of students were looking forward to completing another DER type activity.

Table 3. Summary of survey responses for agree and strongly agree.

	(n=83)	%
It was fun completing the DER	82	99
It was easy to navigate the DER	80	96
I had no technical issues completing the DER	67	81
I felt more engaged completing the DER compared to other 'group' learning activities	77	93
I felt more motivated completing the DER compared to other 'group' learning activities	74	90
I am looking forward to completing another DER type activity	75	60

Four broad themes were identified from the student responses to open-ended questions (Table 4): teamwork, group engagement, enjoyment of the activity and identification of learning. Difficult activities, searching for answers, working with new people, and remembering content were identified as the greatest challenges to completing the DER. A few students requested hint or clues for teams struggling, in order to complete the activities.

Table 4. Thematic analysis of student experience for 3 cohorts

Theme	Result n=83	%
Team	59	70
Group Engagement	48	57

Fun/enjoyment	22	26
Identification of learning	40	47

One student related the learning to their future professional practice: ‘we all worked together which is needed when we become nurses’. In terms of how the group engaged and why the activity went well one student reported: ‘normally in breakout rooms, people feel anxious about talking but because the focus was clear everyone was engaging well’. Whilst linked to this another commented that they were ‘almost forced to chat’.
In relation to their learning, students identified critical thinking, problem solving, and research as the key challenges. Students realised how much they had learnt, with comments such as ‘we have learnt a lot in this module’, and recognised that they were using that knowledge to complete the activity: ‘we escaped the rooms :) and were able to consolidate our learning’. Two students specifically identified the competitive aspect of the activity as a reason for it going well.

Staff feedback

Staff (n=7) who participated showed a clear interest in gamification and all had experience of an escape room (physical or digital). The main issue in the design of the DER activities was aligning expectation as many of the ideas proposed initially had to be simplified to make them technically achievable. All agreed that the relationship between the TEL team and nurse educators was a significant factor in the success of the initiative.

After the initial investment in the design and development, staff felt the delivery required minimal guidance from staff as students navigated the DER with ease. Staff felt there were fewer issues than they had envisaged and found the DER encouraged peer to peer engagement. All agreed they would use a DER again as a learning experience, as they were impressed by the student experience and interested in how it had successfully translated to an educational learning platform.

During the session, facilitators reported that when entering the breakout rooms they responded to queries and checked progression and engagement. Initial student reaction included some level of awkwardness, with some students asking: ‘what are we supposed

to do?' before a leader would naturally emerge to motivate the group. It was notable that the groups appeared to relax with laughter and joking as they worked through the first task. Facilitators entering breakout rooms after teams had completed the first task, found students at ease and engaged in the task.

Staff stated that students needed reminding that they could search for answers online, despite this being stated in the introduction. When teams realised they could search for answers, rarely would the group assign search tasks. When students were struggling there was a notable loss of motivation, but by giving direction without giving answers, facilitators improved group dynamic. All groups completed the DER without recourse to the answer sheet, which had been provided to facilitators in the event of a group failing to progress. Students reacted positively to a known facilitator entering the room, particularly when the group was struggling to find an answer. Teams would sometimes ask facilitators 'has anybody finished yet' or 'how are we doing compared to the others', clearly illustrating the competitive element of the session.

The final 'enigma puzzle' was identified as the most perplexing task, with one observer suggesting it was like a 'boss level' in a video game. This puzzle encouraged creativity and critical thinking, generating the most conversation and excitement from the teams, especially once they worked it out.

Discussion

Educators believed that converting physical activities to digital activities would be straightforward, but it became clear that developing a DER requires a mix of creative and pedagogical vision, technical skills, and time. Makri et al. (2021), mirrored by Saltz and Heckman (2020), note the crucial role the educator has in designing effective online collaborative learning which align with teaching objectives.

From an organisational perspective an embedded TEL team made the creation of this DER possible. Venkatesh et al. (2003) describe digital engagement as limited by 'the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system'. Nursing educators were confident from the start they had the technical support available to be creative with their teaching practice. Through this

support, the best resources to make the DER possible were identified early-on. This included the access code facility of the Quiz tool on the institutional VLE, and Canvas and Articulate Storyline™ for the more diverse and complicated puzzles such as word searches and drag-and-drop interactions.

From an educator perspective the attraction of the DER is the perceived appeal of gamification to the students. The student feedback from three different cohorts suggests that this approach is fun and enjoyable, echoing the responses found in the literature (Taraldsen et al., 2022). Students agreeing or strongly agreeing that they were looking forward to another DER activity, confirmed educators' expectations that such an approach would appeal to students.

The DER was identified by students as an effective approach for facilitating and encouraging teamwork, with students agreeing or strongly agreeing it was more engaging and motivating than other 'group' learning activities they had encountered. Furthermore, the facilitators reported that the competitive aspect of the DER encouraged a sense of urgency and immediacy of collaboration (Nicholson, 2018).

The design and tools chosen appear to have facilitated user experience as students agreed or strongly agreed that it was easy to navigate the rooms. Whilst access codes added an additional step to navigation, they were perceived by the facilitators as an important part of the fun.

Facilitators noted that the scripted activities of the DER might have acted as an icebreaker, as well as helping to provide a focus, encouraging the groups to work together (Saltz & Heckman, 2020). The survey results show that the DER encouraged collaboration and co-generation, which has been identified as a key factor for undergraduate nursing students to engage in digital learning (Langegård et al., 2021). Hitch and Nicola-Richmond (2017) also identified these as key aspects of learning for students to develop the skills required for EBP. Albarqouni et al. (2018) suggest there is a 'disproportionate focus on acquiring critical appraisal skills compared to question formulation, searching, applying, and self-assessment'. Compared to other teaching methods the DER activity concentrates on the importance of the 'apply' step of EBP through the process of shared decision making. The

students in our sample recognised that they were using critical thinking, searching and were applying their learning.

Most published studies involve small numbers of student participants and fail to explore teacher and students experience in any depth (Taraldsen et al., 2022). Digital mediation of escape rooms could present opportunities and advantages for larger cohort engagement and interaction.

In view of the staff time required to develop this complex learning resource, developers should consider investing in DER templates and content which crosses faculty boundaries. Our current development template for the EBP DER would allow, with minor changes, this design to be adapted for other scientific or social science courses.

Limits

Certain limits must be acknowledged. This was an optional activity so there is a degree of participation bias in that the students who attended were motivated and ready to engage (Fowler, 2009). The attractiveness of the activity and the students' enjoyment may have been the result of this being a novel approach to learning. Whilst students self-reported an improvement in their understanding of key knowledge and skills as a result of the activity, without a pre and post-test it is difficult to evaluate objectively if the learning outcomes were met. Darby (2006) questions whether all teaching evaluations are not just an exercise in social desirability; high student engagement during the activity and the timing of the activity and survey after the module evaluation, would make it unlikely that students' responses were influenced by a desire to please educators.

Recommendation

Drawing inspiration from digital collaborative learning and ESOL techniques, the use of gamification allows students to gain confidence in the academic skills necessary for EBP in a way that encourages students to apply key knowledge in a fun approach to team learning. However, this approach requires academics and TEL staff to work together to develop a clear understanding of the limits of the technology. In view of the investment in

developing this type of learning experience there is clear value in developing DER templates and frameworks for 21st century skills development such as EBP, which can cross discipline boundaries.

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