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Exploring the Effect of a Collaborative Problem-Based Learning Simulation Within a Technology-Enhanced Learning Environment on Tutor Perceptions and Student Learning Outcomes

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Abstract

Alternative learning experiences and environments are being increasingly investigated, in response partly to technological developments but also following the emergence of the COVID-19 pandemic. Educators have found that pedagogic strategies and learning environments profoundly influence behaviour of students, approach to learning, learning outcomes and overall level of satisfaction. There is nascent literature on how specific pedagogical approaches (in this case, collaborative problem-based learning) and environments (technology-enhanced learning environment: TELE) can positively impact student learning. In this article, the authors explore the value of a technology-enhanced problem-based simulation exercise for achieving learning objectives and engagement. This approach is novel in combining research on active learning, collaboration and simulation within a specific context. This was a mixed-method study, and staff and student participants were engaged, gathering data through several methods, including questionnaires and interviews. The data was analyzed through different methods, including thematic analysis. The results suggested that the pedagogic approach and learning environment explored in this study positively enhanced student understanding of subject content and learners' ability to apply abstract theories and concepts. Moreover, evidence shows that these interventions increased learner motivation and knowledge retention.

Keywords: collaborative problem-based learning, learning environments, technology-enhanced learning, simulation

1. Introduction

This study sought to use a collaborative technology-enabled simulation to explore whether this approach would enhance student engagement. In higher education (HE), learning environments have traditionally been designed with the teacher positioned at the front, 'transmitting' knowledge (Beichner, 2014) to students who listen in a generally passive and non-participatory manner. Despite running counter to research on learner-centred pedagogies (Laal & Ghodsi, 2012; Krause et al., 2008), it remains the most common arrangement (Van Note Chism, 2006). To promote and achieve higher-quality student learning outcomes, HE institutions increasingly incorporate more active learning into the curriculum and design more flexible, technologically enabled spaces (Beichner, 2014; Mei & May, 2018). By active learning, we use Freeman et al. definition (2014) of "engaging a student in 'the process of learning through activities and/or discussion in class, as opposed to passively listening to an expert".

Research suggests that both the form of learning and environment influence how students behave during learning and how they experience learning (Brophy, 1998; Pintrich & Schunk, 1996). Additionally, this influences how we conceptualise pedagogical practice (Beichner, 2014; Verdonck et al., 2019). This article explores using a simulation based on active learning principles, where students interact in teams to apply previous knowledge and practical skills to real-world problems. By simulation, we mean a realistic role play, as suggested by Andersson et al. (2010). This potentially enables deeper and more experiential learning while allowing teachers to assess learning objectives of students (García-Carbonell & Watts, 2012; Angelini, 2016). When paired with a technology-enhanced learning environment, detailed below (TELE), it offers students the opportunity to engage with technological applications in a cooperative and participatory way, promoting information access, the sharing of ideas, knowledge exchange, and content production (McLoughlin & Lee, 2008).

1.1 Problem-based Learning

Problem-Based Learning (PBL) is an approach which was first taxonomised by Barrows, H (1986), who argued it could have a range of benefits, including enhanced learning motivation. Wood, D. (2003) has described it further in relation to medical teaching, particularly pointing out the self-directed nature of PBL. Yew et al. (2016) provided a comprehensive overview of PBL, found evidence of solid efficacy for 'longer-term knowledge retention', and argued for the 'application of knowledge'. This study uses a series of problems with which the students must grapple and ensures that students are self-directed; in this sense, it is problem-based. We should be mindful of the literature around PBL when considering the approach used, in particular, the fact that the approach was student-centred learning. However, it does not fit Woods's (2003) description in that students were asked to act out the role of specific actors within a conflict, and thus, is more akin to a simulation.

1.2 Review of Collaborative Based Learning

Laal, M., Ghodsi, S. M. (2012) define collaborative learning as an educational approach to teaching and learning that involves groups of learners working together to solve a problem, complete a task, or create a product. Having looked at the benefits of collaboration for educational purposes, they identified a range of benefits, including those related to social, psychological, academic, and assessment areas. This case study draws on classroom-based pedagogies of engagement, particularly learning engagement and its challenges, and problem-based learning incorporating technology, as expanded upon below. One mechanism to enhance learner engagement is to consider a more collaborative, active learning environment. The benefits of active learning are well evidenced (Freedman, S et al (2014)).

1.3 Engagement and Interaction in Learning Environments

When interacting in learning environments, students tend to assign more importance to and gain greater satisfaction from problem-based activities (Tan et al., 2009; Erickson *et al*., 2020). Engagement in technology-enhanced classroom experiences is increased when these activities promote genuine interaction and deeper learning. The perception of relevance is crucial (Baepler *et al*., 2014; Verdonck *et al*., 2019). Therefore, We argue it is important to evaluate users' perceptions of the role and value of collaborative problem-based learning and the use of technologies in learning environments. This is particularly relevant because research suggests that perceptions of the value of both differ between staff and students, with staff being more critical and students often being more enthusiastic and open to innovation (Freedman *et al*., 2014).

This study seeks to add to the body of evidence with respect to the benefits of collaborative problem-based exercises in a technologically enhanced environment to facilitate learning and improve student satisfaction. We argue that such exercises open alternative learning paths to participants who only sometimes respond well to conventional lectures (Newmann & Twigg, 2000). Using a technology-enhanced learning environment where, depending on class size (between 30-50 students), theory is put into practice in a real-world scenario.

Although there are some critics of 'student-centred' learning (e.g. Rochester, 2003; Raines, 2003), this paper builds on the larger body of research in support of student-centred pedagogy and student ownership of learning that has emerged in the last few decades (Craig & Hale, 2008; Hale, 2005; Kaunert, 2009). Recognising the value of more diverse teaching methods alongside more orthodox lecture and seminar-style delivery also reflects, at least in part, the increasing emphasis in Western HE on the need to develop vocational skills for students (Hale, 2006). We suggest that, as individuals learn and process information differently, lectures – while remaining an essential technique to convey key information – are insufficient to teach a cohort of students with varied learning preferences, backgrounds and experiences (Shellman & Turan, 2003).

Active learning simulations can potentially facilitate better acquisition and integration of knowledge for students (Good & Brophy, 1990). Requiring students to complete meaningful learning activities while considering the task at hand enhances students' memory (Cherney, 2008) and is valued by students (Machemer & Crawford, 2007). There is broad consensus in the pedagogic literature regarding the value of simulations to develop cognitive skills, e.g. critical thinking (Halpern *et al.*, 2012; Ahmad, 2013), action-directed learning (Lu *et al.*, 2014), decision-making (Tiwari, 2014), knowledge acquisition and content understanding (Sitzmann, 2011; Elias, 2014; Fu e*t al*., 2016), problem-solving (Lancaster, 2014) and the key skills students develop simply from participating (Hazleton & Jacob, 1983; Phillips & Muldoon, 1996). However, simulations can have a negative impact on learning if they are stress-inducing (Fraser *et al*., 2014), and responsiveness to simulations is greatly influenced by individual differences (Anderson, 2005; Sitzmann, 2011).

We intended with work to engage in a simulation using an active learning approach. This simulation can now be detailed.

1.4 The Simulation

We conducted a simulation as part of a strategic communications class. The simulation, 'Syrian Crisis Scenario', was a four-hour session. It involved small teams playing the parts of states and militant groups in a specially written gaming scenario set in the Syrian theatre of conflict. It confronted the contemporary events and demands shaping successive strategic communications responses as the story changes from geopolitical to local level. The scenario challenged the idea of strategy in strategic communications when events are changing so dynamically and unpredictably.

The simulation was distinctive for several reasons as it had been conceived and delivered. This is because the simulation forms a core component of postgraduate degree-level assessment. Related assessment of students contributes to their overall degree classification. Also, while the War Studies Department has war gaming experience, this was done virtually rather than face-to-face. It is a compulsory component for strategic communications students. This indicates the seriousness with which the teaching staff regard the simulation as a vehicle for active learning, problem-solving and research-engaged teaching. Approaching the simulation in this way – as a central part of assessed student work rather than as an extra-curricular and non-assessed activity – has necessitated balancing the teaching, assessment and validation requirements with the successful simulation of geopolitical, diplomatic, strategic communications practice. To date, the simulation has been run three times. It was piloted when strategic communication was a module rather than a full Master's, and it was rerun in the following year. The simulation was adapted for this year to incorporate a number of different technologies into the classroom with the aim of (i) improving the student experience, (ii) delivering the learning objectives, and (iii) better reflecting the reality of the contemporary communications environment.

1.5 Main Objective of the Study

There is a clear literature gap because despite the potential benefits of active learning strategies (Freedman et al., 2014), there still needs to be an evidence base to fully demonstrate effectiveness or otherwise when combined with simulation and technology-enabled learning environments. We contribute to addressing that gap by assessing the impact of a collaborative simulation on student learning.

The simulation aimed to immerse students in real-world situations, providing a practical context for learning in a way that traditional seminars and lectures simply cannot replicate (Caruson, 2005). The article focuses on the main objective of the study: evaluating the effectiveness of this approach for encouraging and developing student knowledge and understanding. We focus on a specific exercise, its design, use of technology and learning environment. Through students and staff reflections on this exercise, we explore the claims that both the approach to learning and environment positively impact how students behave, learn, and experience learning and contribute to better grades and levels of student satisfaction.

2. Method

2.1 Overall Design of the Study

A collaborative problem-based learning simulation was delivered. To evaluate this activity, we used multiple lenses (Brookfield, 1998; 2017) to triangulate data from staff, students and pedagogic literature. Data was collected from students using a questionnaire and focus groups. Data were collected from staff using an interview - the rationale for using interviews was that among sources of teaching data, facilitator interviews do not disturb classes, consume instructional time, or burden students. The contribution of this approach is that while an interview might introduce bias, it directly taps into the facilitator's experience and judgement.

In contrast, the flexibility of an interview provides the opportunity to amass detailed information (Cresswell, 2007). The research methodology was primarily qualitative, with some mixed methods. This was informed by Doyle et al. (2009)'s approach as it relates to education.

Student focus groups can be seen as an adjunct to more formal types of evaluation, such as questionnaires. Student forums can be used to understand student opinions, perspectives and perceptions better. Defined as a collective activity 'exploring a specific set of issues', the main goal of a focus group is the 'active encouragement of group interaction among participants' (Kitzinger and Barbour in Webb and Kevern, 2001), while the flexibility of forum discussions allows the facilitator 'to probe and clarify implied or unclear meaning'. The contribution of the focus groups is that it allows participants to raise important issues and nuances which the researchers often do not foresee' (Balch & Mertens, 1999, p.267).

2.2 Collaborative Problem-based Learning Simulation

Participants in the simulation were thirty-nine postgraduate students. The collaborative problem-based real-world simulation took place on campus over four hours. The activity was compulsory and linked to an assessment. The participants worked in small teams. There were a number of reasons why they worked in this way: First, to teach specific content in a real-world context; second, to embed core disciplinary and vocational skills; and third, to encourage student

engagement and develop a cohort identity. Lowry (1999: 123) identified three key areas of student participation and involvement in exercise-based learning: effort, preparation and participation. The authors benefited from this framework in designing assessment tasks. The assessment of such exercises remains largely anecdotal, with current research finding little to no statistically significant improvements in quantitative measures of academic performance among students who participated (Krain & Lantis, 2006; Powner & Allendoerfer, 2008).

This included a PowerPoint presentation, used as a reference throughout; an interactive map, which was created and shared, locating the exercise and changing situation; and a collaborative digital 'wall' (Padlet) was set up for the student teams to share information. We also included a 'breaking news' film clip to be used at a critical moment to capture the students' attention. Teams were asked to use live pieces to camera to be posted on the Twitter social media platform to raise broader public awareness and shape public opinion. In addition, Twitter was used by all the teams to engage with a wider public and shape public opinion. The technology used was chosen for its perceived familiarity among the student cohort, ease of set-up and use, and to overcome concerns previously raised. Devices used included display screens, a classroom podium, a class laptop displaying Twitter accounts, and later Padlets and PowerPoint presentations. Dedicated Twitter accounts were used, with posts only visible to other participants in the simulation. Feeds were displayed across multiple screens in the exercise space.

2.3 Participants in the Study

There were different sets of participants included in different parts of the study. The questionnaire was designed for students, and we later had focus groups and interviews and participants that included both students and an interview with the external facilitator.

2.4 Questionnaire and Participants

Respondents to the questionnaire were sixteen students who took part in the simulation. Participants were provided with the study information and gave written consent. Questionnaire data was gathered at the end of the seminar, with a completion time estimated at five minutes; some of the questions required answers on a Likert scale from strongly agree to strongly disagree about whether it was an enjoyable learning experience or beneficial to their learning. Additional questions were asked about their agreement with specific learning objectives. This gave clear information about the student perspective, and the open-ended qualitative answers provided opportunities to discuss the potential benefits or challenges of simulations using technology-enhanced learning tools.

2.5 Focus Groups and Interviews and Participants

Participants in the focus groups were students invited to participate in a small focus group at the end of the course, as Fife (2007) and Grover and Nangle (2003) advocated. This was hosted by an independent facilitator unconnected with the exercise and course, as the authors concur with the view that it is helpful to have a third party to conduct such forums (Macquarie University, 2006). Participants were the students taking part, and they lasted around an hour each, with semi-structured questions probing the key research questions. Additionally, an interview of the external facilitator interviews was conducted, observed and organised by an author. We also gathered information from the reflections of a researcher on notable observations noted by research team members during the interviews.

3. Findings

Analysis was formed through thematic analysis along with that outlined by Pope et al. (2000). Student interaction produces rich, deep data (Fife, 2007). Student comments complemented the themes highlighted in the other assessment methods used and provided useful critical feedback to improve the exercise. The analysis procedure builds on that of Kiger and Varpio (2020), following the same steps of familiarisation, generation, searching, reviewing, naming and producing. Once all the data was analysed and themes emerged, multiple sources were grouped by relevant theme.

3.1 Theme 1: Benefits of Applying Theoretical Concepts to Real-World Problems and Practical Situations

Several themes emerged from the data. The first theme was about the benefits of applying theoretical concepts to real-world problems and practical situations:

- 'I really liked the idea of the game scenario and experiencing strategic communications in practice.'
- 'Confirming my understanding of principles of StratCom, and applying them.'
- 'Seeing the importance of understanding different countries interests and objectives.'
- 'I learned broader ideas of geopolitics, such that it is chaotic and largely susceptible to unforeseen events.'
- 'Understanding the way geopolitics works.'

This was echoed in feedback from the facilitator, who emphasised the importance of authentic contexts by using a 'real world' simulation rather than a game (Juan et al., 2017). The conflict, rules, and predetermined game goals make them less authentic. In contrast, simulations are dynamic tools which more accurately represent reality and provide an open-ended sandbox environment. Thus, they are more suitable for presenting real-world challenges where theoretical knowledge can be applied.

3.2 Theme 2: Potential for the Approach to Help Learners Develop Transferable Work Skills

A second theme was the potential for the approach to help learners develop transferable work skills:

- 'Learning how to manage a team and operate, and think critically, under pressure.'

In the focus groups and questionnaire data, students noted the beneficial impact of collaboration, networking and problem-solving on their conceptual understanding and enjoyment of the learning process.

- 'I also liked the idea of working together in mixed teams. In this way, we were able to work together with people from our class that we haven't been working with before'.
- Students commented on how the approach not only modelled innovation but also encouraged important work skills such as experimentation, independent decision-making and taking on responsibilities within a team. 'It was 'a novel approach to teaching. 'The environment created allowed students to experiment with different strategies, adopt different roles, and take charge of their own decisions by assuming responsibility.'

3.3 Theme 3: Impact of Learning Technologies on the Learning Process

A third theme was the impact of learning technologies on the learning process. A number of benefits were identified, such as how the tools used helped teams prepare for the exercise, both in-person and remotely, and helped the community produce a repository of knowledge (tweets and Padlet pages) to draw upon for the assignment. A range of tweets were generated during the session, all with the students in character as their respective country or non-state actors. A review of the tweets during the exercise and post-exercise confirmed that the student content aligned clearly with the principles taught: that coherence and continuity are required for credibility and legitimacy. The user-generated content demonstrated sound knowledge and understanding of the learned theories, concepts and processes.

Students also commented on how necessary technologies were for the nature and context of the exercise and that its benefits were only sometimes apparent to them later in the process.

3.4 Theme 4: The Role of the Tutor, Feedback and Peer Interaction

A fourth theme centred on the role of the tutor, feedback and peer interaction. The data suggested that real-time feedback and sustained tutor contact during the exercise enabled students to clearly define expectations in the interactive environment, reducing anxiety and uncertainty and thus encouraging better performance outcomes. Most importantly, the social interactive nature of the exercise helped students develop stronger peer friendships and created a sense of collective cohort identity.

In addition to the benefits identified, several themes emerged around suggestions for developing this approach. One theme for development was how the task instructions were presented to students. The feedback stated:

- 'In my opinion … there should have been clearer instructions.'
- 'I think we should have been given the rules beforehand (for example, we should know beforehand that our approach should be similar to what that actor would do in real life).'

3.5 Theme 5: Clarifying or Revising the Structure of the Session

Another theme in the student comments suggested clarifying or revising the structure of the session:

- 'The session was not very structured, hard to focus on the task at hand. There was not a centered discussion, so it became too unclear to follow.
- 'Although the intent was to simulate the chaos in the information environment, future simulations may be better organised in 'rounds' like Model United Nations. [Model United Nations simulations are simulation and debating exercises for students interested in learning about the UN.] This is to give participants space for their speeches, because from the second half of the last simulation, people stopped noticing when someone tried to make an announcement.'

3.6 Theme 6: Limitations of the Technology and How It Was Applied

A final theme focused on the limitations of the technology and how it was applied. Students mentioned:

- 'The delay on Twitter.'
- 'Would be beneficial to see the Twitter feed on [their] laptops not just on the screens and use a platform that would automatically update as we tweeted.'
- 'Technology was distracting when delays or problems arose.'

This theme was echoed by feedback from the facilitator, which highlighted that the use of technology must add to the experience and student imagination rather than simply adding more and more layers. There is a need for caution because more complicated technologies result in more potential for distraction, more demands on tutor time, and flexible planning needed to deal with unexpected difficulties. Feedback from tutors also corroborated this point: technologies used in the workshop added preparation time and anxiety about technical failures during the exercise and required a Plan B to be prepared. Prioritising time and resources, as well as adding value, must be considered for selecting the technology used.

4. Discussion

The results suggest numerous strengths to using a collaborative problem-based simulation, combined with a technology-enhanced environment, in an HE teaching context. The evidence underscores how these pedagogic strategies affect student approaches to learning and levels of satisfaction. Overall, findings suggested that students engaged well, worked collaboratively, and enjoyed the discursive aspects of the session. Specifically, a key insight is that the simulation provided an opportunity for students to gather work-related skills. This indicates that the unique approach here of combining simulation and the technology-enhanced active learning environment can benefit the student learning experience.

Most students responded positively regarding collaborative learning that occurred before and during the session; learning after the session received a more neutral response. The focus group held after assignments were submitted, which did not cover questions about the before/during/after periods, found that students were in the main positive. Students reported the benefits of revisiting the simulation – through individual reflection, group discussions and knowledge shared on Padlet pages – to complete their creative assignments.

Students reported being confident in their understanding and having achieved the learning objectives. These findings were also supported by the quality of the output they produced. Regarding how enjoyable and beneficial the learning experience was, positive responses outnumbered negative by a considerable margin (3:1 to 2:1). However, the students were most optimistic about their knowledge and understanding of specific learning objectives. Khan et al. (2007) supported the idea that there is a benefit to complementary educational simulations, and the general results from students in this study echoed this. This was also reflected in the richness and diversity of assignments, with submission formats ranging from songs to artwork, interviews, documentaries, and interactive maps. We should take a particularly critical eye on student perceptions of active learning. Deslauriers et al. (2019) highlight that feedback of the students when taught using active learning strategies, while generally positive, is less positive than feedback from those taught using passive methods. This suggests that attempts to evaluate instruction based solely on students' perceptions of learning could inadvertently undervalue active learning and create a bias in favour of didactic pedagogies.

We must remind ourselves that perception of learning is not the same as learning attainment – at least as judged by exam performance. Indeed, there have been examples where student perceptions of their learning are at odds with the reality of their grades (Deslauriers et al., 2019). This research found that, with a very active learning process, students felt they learned less despite their grades showing the opposite. However, a study by Sedaghat et al. (2011) found that perceived ability can somewhat predict attainment, and the correlation was strongest between perception and achievement rather than any other two pairs of variables. As such, while we agree that caution is required lest we over-extrapolate from self-reported data, we equally should not discount the perception of ability as a proxy for achievement. We should also note the context of the study, which is that of a simulation with specific postgrad students with much heterogeneity in a London-based university. We would suggest the approach described here would work best in university subjects for which vocational simulations would work well, e.g., communications business studies, whilst being cautious about the possibility of over-extrapolating.

Our assumptions also warrant examination. For example, there may be an assumption that students are enthusiastic about using learning technologies, but this was only sometimes the case in this study. A more precise understanding of student and staff views about learning technologies in the classroom would enable better-informed decisions and more appropriate applications of digital tools in the design of learning environments (Henderson et al., 2017; Waycott et al., 2010).

In terms of data use, observations highlighted the need for proper metrics to construct key performance indicators for tutors to quantify the effectiveness of the teaching methods during (and after) the exercise. This research will form a baseline for ongoing work in this area. Examining metrics also uncovered a misconception identified in the study on the

difference between 'running a successful simulation' and 'interpretation of the output data'. The study identified a group of metrics that were used to construct several composite indicators for goal assessment and measurement of learning outcomes. The effectiveness of simulation-based education is related to a variety of factors that may be student or faculty-driven, tools and technology-driven, and/or curriculum-driven (i.e., related to the time of offering or mode of application), or a hybrid of all factors. Taken as one lens among a multitude of critical perspectives (Brookfield, 1998; 2017), these findings – while potentially susceptible to subjective bias – contribute to a positively emerging picture of the validity of the assessment approach taken.

Overall, however, the research helped fill a gap in the literature, with evidence from focus groups and other data sources on the value of simulation and collaborative learning. Further, it enhanced the evidence base on the combination of simulation and technology-enhanced active learning environment.

There is evidence that, on the whole, the technology benefitted learning, although this is reliant on it being appropriately managed. The research of Venkatesh et al. (2000) is evident in that perceived ease of use (PEU) is correlated with acceptance; here, the general ease of use did help with adoption. There were also a number of technical challenges; for example, getting the Twitter feed to synchronise live only sometimes worked as expected. A simple workaround in future would be to have this displayed on students' own devices. In the future, if adopting this approach, we would recommend further time building and creating the resources and testing the technology to ensure a smoother process. Helsper, E and Eynon, R. (2009) have shown that there is little evidence of the 'digital native' generation and that young people can be just as unsure and challenged by technology as any other group. This research backs up that notion.

With the benefit of hindsight, a number of limitations in the methodology were identified, as, rather than only pre-testing the students once, we would have devoted more resources to a thorough prior assessment of their understanding of the subject. This would have given us a more solid 'in-cohort' baseline. In subsequent years, we would look to track results longitudinally. In addition, we would aim to replicate this study with more participants, as the current sample size limits the generalisability of results. This could be further strengthened by carrying out comparative studies with other simulations run across the department or beyond within other higher education institutions, extending the research over a longer timeframe, and reviewing the data longitudinally.

5. Implication of Study and Limitations and Future Direction

The findings here strengthen the evidence base on the efficacy of active, collaborative learning for simulations in HE. Whilst being mindful of the context the research was conducted in, the policy implication is that practitioners should consider adding some version of these approaches to their pedagogic toolkit. For implementing simulations in teaching practice, we recommend greater emphasis on digital resource design to scaffold learning, rigorous technology testing, and increased student training in participating effectively.

In terms of future direction, future research is needed on using problem-based learning simulations in different teaching contexts. In particular, it would be good to see more research which evaluates how different combinations of pedagogy and learning technology affect learner motivation and impact the achievement of learning outcomes for students. It would also be beneficial to see studies exploring how this type of activity could be adapted for online distance learning.

6. Conclusion

To conclude, in line with Stice (1987) and Boyer et al.'s (2000) conclusions that students learn more by 'doing' and 'saying' things than by reading and listening. We developed a blend of collaborative, technology-enhanced learning and a simulation exercise that incorporates more 'doing' and 'saying' to enhance student learning in response. This method is useful for educators because it can help students apply their knowledge to real-world situations and garner a deeper understanding of the concepts, theories, and processes discussed in our readings, seminars, and weekly lectures. Furthermore, we aimed to design an exercise relevant to all students, regardless of their background and experience – an experience that would be enjoyable but would also facilitate the development of critical and analytical thinking skills.

While learning technologies, collaborative tasks and simulation activities are often used in isolation, there needs to be more research on how specific combinations of these impact student engagement and learning outcomes.

In conclusion, this research provides evidence for a useful combination of teaching tools and strategies for practitioners to add to their constantly evolving toolkit. As an HE teacher, incorporating the fusion of approaches described in this paper and making them an assessed element of your module may require you to take risks and adapt to traditional practice. Therefore, we recommend that others continue to research and experiment with versions of this approach in their classroom pedagogy and assessment, further exploring and adding to our understanding of its potential to bring appreciable pedagogic, disciplinary, and vocational value.

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Authors contributions

MD and FG were responsible for study design, revision, and data collection. MD and FG drafted the manuscript and revised it. TB suggested some ideas for the literature review.

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Data sharing statement

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References

Ahmad, S. M. S., Fauzi, N. F. M., Hashim, A. A., & Zainon, W. M. N. W. (2013). A study on the effectiveness of computer games in teaching and learning. *International Journal of Advanced Studies in Computers, Science and Engineering*, *2*(1), p.1.

Anderson, J. R. (2005). The relationship between student perceptions of team dynamics and simulation game outcomes: An individual-level analysis. *Journal of Education for Business, 81*(2), 85-90. https://doi.org/10.3200/JOEB.81.2.85-90

Andersson, N., & Andersson, P. H. (2010). Teaching Professional Engineering Skills: Industry Participation in Realistic Role Play Simulation. In *Making Change Last: Sustaining and Globalizing Engineering Educational Reform* (Vol. Proceedings of the 6th International CDIO Conference.). Montréal, Canada: École Polytechnique

Angelini, M. L. (2016). Integration of the Pedagogical Models "Simulation" and "Flipped Classroom" in Teacher Instruction. *SAGE Open, 6*(1). https://doi.org/10.1177/2158244016636430

Baepler, P., Walker, J. D., & Driessen, M. (2014). It's not about seat time: blending, flipping, and efficiency in active learning classrooms. *Computers and Education, 78*, 227-236. https://doi.org/10.1016/j.compedu.2014.06.006

Balch, G. I., & Mertens, D. M. (1999). Focus group design and group dynamics: lessons from deaf and hard of hearing participants. *American Journal of Evaluation, 20*(2), 265-277. https://doi.org/10.1177/109821409902000208

Beichner, R. J. (2014). History and evolution of active learning spaces. *New Directions for Teaching and Learning*, *214*(137), (pp.9-16). John Wiley & Sons. https://doi.org/10.1002/tl.20081

Brookfield, S. (1998). Critically reflective practice. *Journal of Continuing Education in the Health Professions*, *18*(4), 197-205. https://doi.org/10.1002/chp.1340180402

Brookfield, S. (2017*). Becoming a critically reflective teacher* (2nd ed.). San Francisco, CA: John Wiley & Sons.

Brophy, J. (1998). *Motivating students to learn* (1st ed.). Boston, MA: McGraw Hill.

Caruson, K. (2005). So, You Want to Run for Elected Office? How to Engage Students in the Campaign Process Without Leaving the Classroom. *PS: Political Science and Politics*, *38*(2) (April), 305-310. https://doi.org/10.1017/S1049096505056532

Craig, J., & Hale, S. (2008). Implementing problem-based learning in politics, *European Political Science*, *7*(2), 165-174. https://doi.org/10.1057/eps.2008.6

Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approache*s (2nd ed.). Thousand Oaks, CA: Sage.

Crocco, F., Offenholley, K., & Hernandez, C. (2016). A proof-of-concept study of game-based learning in higher education. *Simulation & Gaming*, *47*(4), 403-422. https://doi.org/10.1177/1046878116632484

Deslauriers, L., McCarty, L., Miller, K., Callaghan, K., & Kestin, G. (2019). Measuring actual learning versus feeling of learning in response to being actively engaged in the classroom, *PNAS*, *116*(39), 19251-19257. https://doi.org/10.1073/pnas.1821936116

DeWalt, Kathleen M., & DeWalt, Billie, R. (2002). *Participant observation: a guide for fieldworkers*(1st ed.). Walnut Creek, CA: AltaMira Press.

Doyle, L., Brady, A. M., & Byrne, G. (2009). An overview of mixed methods research. *Journal of Research in Nursing*, *14*(2), 175-185. https://doi.org/10.1177/1744987108093962

Elias, A. (2014). Simulating the European Union: Reflections on module design. *International Studies Perspectives*, *15*(4), 407-422. https://doi.org/10.1111/insp.12009

Erickson, M., Marks, D., & Karcher, E. (2020). Characterizing student engagement with hands-on, problem-based, and lecture activities in an introductory college course. *Teaching & Learning Inquiry*, *8*(1), 138-153. https://doi.org/10.20343/teachlearninqu.8.1.10

Fife, E. (2007). Using focus groups for student evaluation of teaching. *MountainRise: the International Journal of the Scholarship of Teaching and Learning*, *4*(1).

Fraser, K., Huffman, J., Ma, I., Sobczak, M., McIlwrick, J., Wright, B., & McLaughlin, K. (2014). The emotional and cognitive impact of unexpected simulated patient death: a randomized controlled trial. *Chest*, *145*(5), 958-963. https://doi.org/10.1378/chest.13-0987

Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences of the United States of America*, *111*(23), 8410-8415. https://doi.org/10.1073/pnas.1319030111

Fu, K., Hainey, T., & Baxter, G. (2016). A systematic literature review to identify empirical evidence on the use of computer games in business education and training. In *10th European Conference on Games Based Learning ECGBL, pp.232-239.Academic Conferences International Limited.*

Good, T. L., & Brophy, J. E. (1990). *Educational psychology A realistic approach* (4th ed.). White Plains, NY: Longman Publishing Company.

Grover, R. L., & Nangle, D. W. (2003). Adolescent perceptions of problematic heterosocial situations: a focus group study. *Journal of Youth and Adolescence*, *3*(2), 129-139. https://doi.org/10.1023/A:1021809918392

Hale, S. (2005). Case based learning: a review of good practice. *FDTL Case Based Learning in Politics*: http://www.c-sap.bham.ac.uk/hottopic/FDTL/practice_review.pdf

Hale, S. (2006). Politics and the real world: a case study in developing case-based learning., *European Political Science*, *5*(1), 84-96. https://doi.org/10.1057/palgrave.eps.2210060

Halpern, D. F., Millis, K., Graesser, A. C., Butler, H., Forsyth, C., & Cai, Z. (2012). Operation ARA: A computerized learning game that teaches critical thinking and scientific reasoning. *Thinking Skills and Creativity*, *7*(2), 93-100. https://doi.org/10.1016/j.tsc.2012.03.006

Hazleton, W. A., & Jacob, J. E. (1983). Simulating international diplomacy: the national model united nations experience, *Teaching Political Science:A Journal of Political Science,10*(2), 89-99. https://doi.org/10.1080/00922013.1983.9942346

Helsper, E., & Eynon, R. (2010). Digital natives: where is the evidence*? British Educational Research Journal, 36*(3), 503-520. https://doi.org/10.1080/01411920902989227

Herz, B., & Merz, W. (1998). Experiential Learning and the Effectiveness of Economic Simulation Games. *Simulation & Gaming*, *29*(2), 238-250. https://doi.org/10.1177/1046878198292007

Juan, A., Loch, B., Daradoumis, T., & Ventura, S. (2017). Games and simulation in higher education. *International Journal of Educational Technology in Higher Education*, *14*(1), p.37. https://doi.org/10.1186/s41239-017-0075-9

Kaunert, C. (2009). The European Union simulation: from problem-based learning (PBL) to student interest. *European Political Science*, *8*(2), 254-265. https://doi.org/10.1057/eps.2009.8

Kiger, M., & Varpio, L. (2020). Thematic analysis of qualitative data: AMEE Guide No. 131, *Medical Teacher,42*(1), 1-9. https://doi.org/10.1080/0142159X.2020.1755030

Kolb, A. Y., & Kolb, D. A. (2009). Experiential learning theory: A dynamic, holistic approach to management learning, education and development. *In The SAGE handbook of management learning, education and development*, 42-68. https://doi.org/10.4135/9780857021038.n3

Kolb, D. (1984). *Learning Style Inventory.* Boston: McBer and Co.

Kolb, D. A. (1988). Learning Styles and Disciplinary Differences. In *The Modern American College,* (ed). A.W. Chickering and Associates. San Francisco, CA: Jossey-Bass.

Kolb, D. A., Boyatzis, R. E., & Mainemelis, C. (2001). Experiential learning theory: Previous research and new directions. *Perspectives on thinking, learning, and cognitive styles*, *1*(8), 227-247. Routledge. https://doi.org/10.4324/9781410605986-9

Krain, M., & Jeffrey, S. L. (2006). Building Knowledge? Evaluating the Effectiveness of the Global Problems Summit Simulation. *International Studies Perspectives*, *7*(4), 395-407. https://doi.org/10.1111/j.1528-3585.2006.00261.x

Krause, K., & Coates, H. (2008). Students' Engagement in First-Year University. *Assessment and Evaluation in Higher Education*, *33*(5), 493-505. https://doi.org/10.1080/02602930701698892

Laal, M., & Ghodsi, S. M. (2012). Benefits of collaborative learning. *Procedia: Social and Behavioral Sciences*, *31*, 486-490. https://doi.org/10.1016/j.sbspro.2011.12.091

Lancaster, R. J. (2014). Serious game simulation as a teaching strategy in pharmacology. *Clinical Simulation in Nursing*, *10*(3), e129-e137. https://doi.org/10.1016/j.ecns.2013.10.005

Lechner, S. K. (2001). Evaluation of teaching and learning strategies. *Medical Education Online*, *6*(1). https://doi.org/10.3402/meo.v6i.4529

Lowry, P. E. (1999). Model GATT: a role-playing simulation course, *Journal of Economic Education*, *30*(2), 119-126. https://doi.org/10.1080/00220489909595948

Lu, J., Hallinger, P., & Showanasai, P. (2014). Simulation-based learning in management education: A longitudinal quasi-experimental evaluation of instructional effectiveness. *Journal of Management Development*, *33*(3), 218-244. https://doi.org/10.1108/JMD-11-2011-0115

Machemer, Patricia L., & Crawford, P. (2007). Active learning in higher education. *The Journal of the Institute for Learning and Teaching*, *8*(1), 9-30. https://doi.org/10.1177/1469787407074008

Macquarie University. (2006). *Other Ways to Evaluate*. Centre for Professional Development, Macquarie University.

McLoughlin, C., & Lee, M. J. W. (2008). The Three P's of Pedagogy for the Networked Society: personalization, participation, and productivity. *International Journal of Teaching and Learning in Higher Education*, *20*(1), 10-27.

Mei, B., & May, L. (2018). Reflective renovation: insights from a collaborative and active learning space project evaluation. *Australasian Journal of Educational Technology*, *34*(6), 12-18. https://doi.org/10.14742/ajet.4476

Muller, R., Collins, C., & Knight, S. (2013). Focus Groups as a Form of Student Evaluation of Teaching. https://www.researchgate.net/publication/243972382_Focus_Groups_as_a_Form_of_Student_Evaluation_of_Teaching

Newman, W. W., & Twigg, J. L. (2000). Active engagement of the intro IR student: a simulation approach, *Political Science and Politics*, *33*(4), 835-842. https://doi.org/10.2307/420926

Phillips, M. J., & Muldoon, J. P. (1996). The Model United Nations: a strategy for enhancing global business education, *Journal of Education for Business*, *71*(3), 142-146. https://doi.org/10.1080/08832323.1996.10116774

Pintrich, P. R., & Schunk, D. H. (1996). *Motivation in education: Theory, research, and applications*. Englewood Cliffs, NJ: Prentice Hall.

Pope, C., Ziebland, S., & Mays, N. (2000). Analysing Qualitative Data. *BMJ*. *320*, 114. https://doi.org/10.1136/bmj.320.7227.114

Powner, Leanne C., & Michelle, G. A. (2008). Evaluating hypotheses about active learning. *International Studies Perspectives*, *9*(1), 75-89. https://doi.org/10.1111/j.1528-3585.2007.00317.x

Raines, S. S. (2003). The Potential Perils of Slack (not Pack) Pedagogy: A Response to J. Martin Rochester's Remarks about Active Learning Strategies. *International Studies Perspectives*, *4*(4), 432-435. https://doi.org/10.1111/1528-3577.404007

Rochester, J. M. (2003). Pieces on Our Craft: The Potential Perils of Pack Pedagogy, or Why International Studies Educators Should be Gun-Shy of Adopting Active and Cooperative Learning Strategies. *International Studies Perspectives* 4: inside back cover.

Rofe, J. S. (2010). The 'IR model': a schema for pedagogic design and development in international relations distance learning programmes, *European Political Science*, *10*(1), 103-117. https://doi.org/10.1057/eps.2010.25

Sedaghat, M., Abedin, A., Hejazi, E., & Hassanabadi, H. (2011). Motivation, cognitive engagement, and academic achievement, *Procedia-Social and Behavioral Sciences*, *15*, 2406-2410. https://doi.org/10.1016/j.sbspro.2011.04.117

Shellman, Stephen M., & Turan, K. (2003). Acute Crisis in Cyprus: A Multilateral Bargaining Simulation. *Simulation & Gaming*, *34*(2), 281-291. https://doi.org/10.1177/1046878103034002007

Sitzmann, T. (2011). A meta-analytic examination of the instructional effectiveness of computer-based simulation games. *Personnel psychology*, *64*(2), 489-528. https://doi.org/10.1111/j.1744-6570.2011.01190.x

Stice, James E. (1987) Using Kolb's Learning Model to Improve Student Learning. *Engineering Education*, *77*(5), 291-296.

Tan, O. S., Chye, S., & Teo, C. T. (2009). Problem-based learning and creativity: A review of the literature. *Problem-based learning and creativity*, pp.15-38. Cengage Learning.

Tiwari, S. R., Nafees, L., & Krishnan, O. (2014). Simulation as a pedagogical tool: Measurement of impact on perceived effective learning. *The International Journal of Management Education*, *12*(3), 260-270. https://doi.org/10.1016/j.ijme.2014.06.006

Van Note Chism, N. (2006). Challenging traditional assumptions and rethinking learning spaces. In D. G. Oblinger (Ed.), *Learning spaces*. Washington DC: Educause.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies, *Management Science*, *46*(2), 186-204. https://doi.org/10.1287/mnsc.46.2.186.11926

Verdonck, M., Greenaway, R., Kennedy-Behr, A., & Askew, E. (2019). Student experiences of learning in a technology-enabled learning space. *Innovations in Education and Teaching International*, *56*(3), 270-281. https://doi.org/10.1080/14703297.2018.1515645

Webb, C., & Kevern, J. (2001). Focus groups as a research method: a critique of some aspects of their use in nursing research. *Journal of Advanced Nursing*, *33*(6), 798-805. https://doi.org/10.1046/j.1365-2648.2001.01720.x

Young, M. F., Slota, S., Cutter, A. B., Jalette, G., Mullin, G., Lai, B., … & Yukhymenko, M. (2012). Our princess is in another castle a review of trends in serious gaming for education. *Review of Educational Research*, *82*(1), 61-89. https://doi.org/10.3102/0034654312436980