“I felt like I was missing out on something”: An evaluation of using remote technology in the classroom

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As technology develops in Higher Education (HE), distance learning has adopted many different guises and supports many different needs (Keane, 2013). The purpose of this study was to evaluate the use of Double Robotics on a Doctoral (level 8) postgraduate course at a HE institution. The aim of this project was to generate an understanding of student and tutor experiences more generally, while examining the feasibility and impact of Double Robotics within a doctoral programme more specifically. Data were collected through a series of focus group interviews with the student and tutors over the course of a single semester (10-weeks). The data were subject to an inductive thematic analysis (Braun and Clarke, 2006, 2013). The findings of the study shed light on the interactive pitfalls of the technology and contribute to understanding the experiences of distance learners’ engagement. Four key themes were identified: quality of technology, classroom familiarity, tutor facilitation and user isolation. The significance of this study lies not only in assessing the feasibility of Double Robotics but, specifically, shedding light on the nuanced understanding tutors require to enrol and engage distance learners remotely. Most notable, the ‘isolation’ of the learner points to a heightened awareness of context that can help tutors develop robust and durable environments, which embrace both traditional classroom settings and facilitate the addition of distance learners. Building upon Tucker (2013), technological advancements in the classroom must be carefully designed to appreciate the context of the learning environment, the teacher, and the pedagogic experiences of the learners.

Key words: *Distance learning, remote learners, Double Robotics, focus group interviews, pedagogic isolation*

Introduction

In recent years, technology assisted classrooms have become a routine feature of everyday practice, particularly in Higher Education (HE). Alongside the upsurge in technological development, teacher education has been infiltrated by technological 'innovations' (Robinson and Latcham, 2004). In this respect, shifting learning to online platforms can take many forms, which, for Hunter (2015), can help to connect learners to the classroom and actual practice. For example, online learning platforms hold the potential to overcome spatial and temporal restrictions (Bates, 2005). Such crucial features of distance learning include facilitating freedom of space, medium, access, and potentially content (Paulsen, 1993). Yet, while Larreamendy-Joerns and Leinhardt (2006) recognised that technological advancements have contributed to considerable change to distance learning, the rationale for technological integration ranges from the promotion of learning (i.e., learner experiences) to the facilitation of educational programmes (i.e., increasing access).

A review by Kartensi's (2013) suggested online open courses share the advantages traditionally associated with distance learning; that is, increased accessibility, asynchronous access, and self-paced/initiated learning. The danger, however, lies in an overly superficial use and assessment of available tools and resources among teachers and learners. Despite the ostensible advantages of distance learning, the format for delivering such education holds some significant barriers. Warning against the position of open online courses, Steffens (2015, p.52) stated that it is difficult to discern if they "constitute a revolution in higher education of just a fad". For Almarashdel (2016), the quality of distance learning remains bound to the quality of the technology, individual competence, technological access and/or issues, expectation, motivation and time management. In turn, the subsequent evidence supporting the value of open online courses and distance learning remains unconvincing (Steffens, 2015; Flavin, 2016; Almarashdel, 2016).

Often referred to as 'remote' learning, one potential remedy to the constraints of distance learning is allowing students to access 'traditional' classrooms remotely. Double Robotics is one example of a specific technology designed to allow the user to dial into a classroom from a remote location. The technology has been adopted by Michigan State University to allow students to join face-to-face classes (Button, 2015). For Michigan State University's Educational Psychology Doctorate programme, the technology remained rooted by a constructivist approach to learning; that is, learning was assumed to be situation specific

and bound by context, which emphasises the importance of language and interaction among participants (McInerney and McInerney, 2002; Woolfolk, 2001; Lui and Mathews, 2005). Thus, the telepresence robot (featured in the article's methodology) is assumed to allow students to feel a part of the classroom, which includes the ability to move and rotate (Button, 2015). Yet, despite the ostensible merits of the telepresence robot, a lack of understanding remains concerning student and tutor experiences engaging with such technology. Consequently, building upon the recent upsurge of research examining online teaching (e.g., Mclawhon and Cutright, 2012; Almarashdeh, 2016), the principal purpose of this project was to evaluate the use of Double Robotics as a means to engage distance learners on a taught doctoral programme in a HE institution. The aim of this project was to generate an understanding of student and tutor experiences more generally, while examining the feasibility and impact of Double Robotics within a doctoral programme more specifically.

Relatedly, a growing body of literature (e.g., Hall, Corman, Drab, Meyer and Smith, 2009; Swartz, Cole and Shelley, 2010) have identified user satisfaction, technical skill and user friendliness as essential components to support distance learners. Huner (2015) added that that online technology often requires the support of specialist staff. Thus, the significance of this study lies in further investigating the appropriateness of Double Robotics in the classroom. In doing so, the value of the intervention evaluates not only the quality and feasibility of using Double Robotics, but the consequences on the pedagogy of a taught doctoral programme; that is, the impact Double Robotics has a digital on distance learners, traditional learners and tutor experiences. For, as Hatnett, George and Dron (2011) identified, the motivation of the learner (and tutor) is always situational and must be assessed accordingly.

There has been much academic research devoted to understanding online and distance learning. In the next section, we briefly discuss some of this existing literature. Following this, we describe the Double Robotic technology used and provide a more specific insight to the research design for this evaluative work. The remainder of the article is dedicated to presenting the experiences of both tutors and students on the module in question. Four key themes are presented: (1) quality of technology; (2) classroom familiarity; (3) tutor facilitation; and (4) user isolation. We conclude with a critical discussion of the experiences presented in this paper.

Online and distance learning

Distance learning has seen a huge uptake in recent years and has developed to be an integral feature of HE provision (Rogers and Cordell, 2011). Consequently, Learning Management Systems (e.g., Blackboard, Moodle) have become an omnipresent technological advancement and resource to support student learning. However, Parsad and Lewis (2008) differentiated between the common types of distance learning available in HE, which included the variation in the proportion of online instruction required for a courses to be deemed 'online' by institutions. For instance, some described web-based courses as offering strictly online material with no face-to-face interactions with a tutor, meanwhile other institutions described a hybrid of face-to-face delivery, tutor interactions and online material, also known as blended learning. Blended learning typically involved specified meetings between student and tutor throughout the duration of the course, but cut-off points varied between 80-50% online instruction.

The increase in research concerning online learning compared to classroom (traditional) learning is unsurprising given the development and expansion of distance learning (Rogers and Cordell, 2011). Subsequently, the effectiveness of face-to-face education compared to online study has received considerable attention (e.g., Chen, Shang and Harris, 2006; Ng and Cheung, 2007). Indeed, Ng and Cheung (2007) compared the experiences of pre-service school teachers' ability to recall concepts when engaging in online discussion boards compared to more traditional tutor-led discussions. The findings suggested there was no statistical difference in the recall scores demonstrated online compared to face-to-face in the classroom. Such findings are congruent with several studies asserting that there is no statistical difference between online compared to face-to-face classroom (e.g., Summers, Waidgandt and Whittaker, 2005; Kirtman, 2009). From this perspective, it is proposed that online discussions have several potential benefits when compared to traditional face-to-face environments; including, a more refined focus on content, increased emphasis on individual reflection, reflection on posts, knowledge building, and high levels of motivation. Tabor's (2007) examination of a blended learning course concurred with such findings, adding that students enjoyed the flexibility and space to engage with online discussions. In fact, Althaus (1996) suggested that students in an online class achieved a higher average grade than their traditional classroom counterparts due to their increased opportunity to read and reflect on their responses.

Furthermore, a sport pedagogy study by Papastergiou and Gerodimos (2013) adopted a blended learning approach to a web-based multimedia course to improve PE teachers' delivery of basketball. The findings suggested that a combination of web-based course and face-to-face instruction was significantly developed from 'traditional' face-to-face interaction alone. Similarly, Russel, Wadsworth, Hastie and Rudisill's (2014) blended learning physical activity and wellness course also reported positive effects associated with distance learning, increased accessibility, and continuous access to material. However, while the findings alluded that teachers can have confidence in online platforms, accepting that learning is constructed through negotiation and interaction, Ng and Cheung (2007) identified 'depth of experience' gained remained dependent on the context of the discussions. In addition, the authors noted that students reported online discussions and tasks as time consuming, voluminous, and hard to synthesise. In this regard, Szarbo and Schwartz (2011) asserted that online tasks must be purposeful, connected, and facilitated by an instructor / tutor to allow students to reach higher-order thinking.

Relatedly, Summers et al. (2005) assessed the student satisfaction of online courses compared to traditional classroom through Likert-based questionnaire. Through comparing the two groups, whilst no statistical differences regarding grades were reported, Summers et al. (2005) indicated that online students were generally less satisfied than traditional classroom students. Specifically, the students expressed dissatisfaction with the tutor's enthusiasm and engagement. The findings suggested that communication from emails and discussion boards did not offer students sufficient opportunity to engage with the tutor. Despite the students of Tabor (2007) appreciating the flexibility of online discussion, the participants reported the face-to-face classes were better suited for engagement in hands-on content. Placing an emphasis on face-to-face discussion, Chen, Shang and Harris (2006) indicated that real time interactions allowed tutors and students to grasp physical expression and verbal cues that were fundamental to scaffolding learning and experiences. The point made here emphasises the role of the pedagogue facilitating learning, irrespective of the communication platform.

In this regard, facilitating learning in all its guises (e.g., online, distance, remote, blended/hybrid and traditional) remains a complicated practice that requires the careful planning of content, delivery, assessment and context (Cushion and Townsend, 2018). Here, the authors advocated that, despite the potential merits held by technology enhanced learning environments, the evidence base supporting the integration of technology remains fragmented

(Cushion and Townsend, 2018). The subsequent call was for careful consideration of roles, functions and impact in the design of learning environments.

Teacher involvement

The varied findings concerning technology in learning environments illustrates the contextual and contingent nature of learning. For, as Milman (2014) recognised, despite online learning becoming ever more attractive to increase enrolment, HE institutions need to carefully assess whether their courses are appropriate via 'distance'. Consequently, distance learning, remote learning and blended learning have adopted many different guises within educational settings. According to Keane (2013), blended learning requires careful negotiation to ensure there is not an overemphasis on 24hour classrooms. Rather, student and teacher should benefit from the accessibility and flexibility provided by technological platforms. In this regard, blended learning has been an increasing feature to merge face-to-face instruction within online tasks and activities. The essence, Cooper (2013, p.111) tells us, remains that technology enhanced learning "should enable students to achieve their educational goals by delivering academically sound courses and educational support services that are flexible, responsive and innovative".

However, a preoccupation with technology, according to Conrad (2004), has resulted in tutors' experiences moving teaching online as precarious. Building upon this line of investigation, Almarashdeh (2016) explored the tutor experiences of a distance learning technology. Through implementing questionnaires, the study's findings highlighted that service quality, perceived usefulness and information quality had a significant effect on the user satisfaction. Therefore, the findings suggested that increased instructor satisfaction allowed for an increased user satisfaction (Almarashdeh, 2016). Hall et al. (2009) would concur with such a finding, reporting that high levels of user satisfaction, from both instructor and learner, support engagement with the respective course. The significance of Hall et al.'s (2009) study moves beyond creating a face-to-face and online dichotomy by suggesting that universities must ensure instructor satisfaction contributes to the overall experience of the distance learner. Similarly, drawing upon Self-Determination Theory (SDT), Hartnett, George and Dron (2011) examined the experiences of pre-services teachers' motivation to learn via online platforms. Rather than concentrating on the learner as intrinsically motivated, or emphasising the importance of course design, the findings presented the experiences of distance learners as complex, multifaceted and situational. Such a position, in keeping with

Jones and Thomas (2013), depicts learning as a collaborative effort, rather than a linear process of knowledge accessibility and transfer.

This albeit brief review has examined literature relevant to the study helping to place its significance. Having discussed some of the key literature exploring technology within distance learning, including quality of technology, blended learning and participant satisfaction, the study contributes to a very specific location within the existing literature. According to McGee and Reis (2012), integrating the best of face-to-face and online learning can allow for students to be fully engaged, sustained and supported. Thus, the integration of Double Robotics in a traditional classroom combines a unique form of distance learning that caters for learners engaging from remote locations. Having discussed some key features of distance learning in relation to Double Robotics, the next section outlines to the research design used to address the aim of the study.

Methodology: The research setting and context

The utility of case study in educational research as a means to understand the complexities of educational practice has a vast history (see Simons, 2009). The following study adopts Stake (1995, 2005) and Merriam's (2009) emphasis that case study is an inductive, exploratory, and holistic approach to describing the phenomena. In this respect, the project employed an evaluative case study design (Simons, 2009), which formed one of three HE research-led teaching interventions. Driven by the research questions and phenomena under study, Simons (2009) suggested that an evaluative case study must discern the 'value' of the chosen programme. In this case, the evaluation was an empirical investigation of users' experiences of Double Robotics as a means to better harness the pre-existing remote learners in context. More specifically, the programme under study echoed current trends in HE institutions to provide better synergies between 'on' and 'off' campus provisions, while maintaining academic standards and integrity. Thus, the integration of Double Robotics was offered to develop the accessibility and sustainability of the course both nationally and internationally.

The particular teaching context under investigation included two separate modules, which formed a part of a postgraduate taught Doctoral course (level 8). The modules studied comprised four 'traditional' students, two 'remote' students (only one in each module at any one time) and two members of teaching staff. Each module included three hour sessions over

a 10 week period. One of the remote students, Joe, had previously been in the classroom and opted to complete the module remotely to suit his Geographical needs. Meanwhile, the other remote student, Dave, was an international student and had not previously 'physically' attended the classroom.

The course delivery was underpinned by a constructivist approach to learning inspired by the work of Lev Vygotksy; that is, learning was assumed to be actively constructed by learners and, as a result, learners are enculturated into their learning contexts (McInerney and McInerney, 2002; Woolfolk, 2001; Lui and Mathews, 2005). The course operated with reduced participant numbers to facilitate small working groups, which emphasised high-quality discussion. In this respect, interaction and critical discussion were fundamental to the delivery of the course. Despite the ostensible merits of the technology to move beyond traditional video platforms (e.g., Skype, FaceTime), the selection of Double Robotics was based on the technology available at the institution and, more importantly, to promote discussion and enrich student experience. In doing so, the learning context did not change, but rather, Joe and Dave were able to join the environment remotely, which would have previously been inaccessible.

Single-method case study

Acknowledging that case studies can be designed and viewed in various ways (Harrison, Birk, Franklin & Mills, 2017), this study adopted focus-group interviews as the primary research method. Developed from Stake (2005), the fundamental goal was to describe the participants' experiences in relation to Double Robotics. Prior to data collection an initial pilot study was conducted beforehand to introduce staff and students to the remote learning technology; doing so promoted familiarity with the technology and developed user-interface competence. The purpose was to familiarise the staff and existing cohort to the technology. In doing so, the pilot allowed for an initial assessment of the feasibility of Double Robotics. This pilot study was conducted by the primary researcher joining the context via the 'new' technology. The pilot study provided an initial orientation to the teaching team and students regarding 'how' to use the technology. In addition, the pilot sessions provided reassurance to the teaching team and students that the equipment was suitable for further engagement and exploration.

The primary data assessing the teaching intervention were taken from semi-structured focus group interviews. Given the intimate nature of the postgraduate cohort, Tracy (2013) would suggest that focus group interviews are well poised for exploring the experiences and

issues of the shared group. Thus, in keeping with Tracy, a loose interview guide was developed to facilitate the semi-structured interviews. Here, the themes were informed by the aims and objectives of the intervention and discussion designed to elicit how the participants experienced, supported and engaged with the remote learner via Double Robotics. The interview technique, according to Lindolf and Taylor (2011), is known as 'chaining'; that is, the cascading effect where participants make their own links and connections to improve the expressions that came before allowed for open discussion regarding the addition of Double Robotics into the learning environment. In doing so, the focus groups encouraged participants to articulate their experiences based upon the session.

Focus group interviews were conducted immediately following the session to include the participants' experiences of Double Robotics in the learning environment. Each focus group comprised the teacher, 'traditional' students, and 'remote' students who had participated within the taught element. Interviews were recorded via Dictaphone and transcribed verbatim immediately following the session. In total, the data collection occurred over the course of 10-weeks, which included 10 sessions. The taught sessions typically ran for three hours each. The additional focus groups varied in duration from 15-minutes to 45-minutes. The class size did fluctuate throughout the data collection depending upon attendance and tutor availability. Nevertheless, all those who participated in the taught element were invited to the focus group. Known as a 'purposive sample', the participants were deliberate and non-random to enable the researcher to evaluate the feasibility of Double Robotics on the programme (Bryman, 2012).

Double Robotics: From product to classroom

Double Robotics has been used in various ways, including in HE institutions, library services and nursing (see http://www.doublerobotics.com/). As previously mentioned by Button (2015), Double Robotics is a telepresence robot that is intended to provide an online user the opportunity to engage in a face-to-face format. The technology involves a mounted iPad on a base which develops from existing platforms (e.g., Skype) by allowing the user the autonomy to physically join tasks, interactions by moving and scanning the room (see Figure one). This is done via a keypad of arrows to navigate the telepresence robot.

INSERT FIGURE 1 ABOUT HERE

Figure 1: Double Robotics front view

The Double Robotics is designed to allow for real-time engagement from both the student and teacher. The display picture to the remote learner in class can be edited to control the movement of the 'robot'

Data analysis

Following transcription, the focus group interviews were subject to thematic analysis inspired by Braun and Clarke (2006, 2013). In keeping with the interpretive approach espoused by Stake (2005), the authors recognised that thematic analysis processes are "organic, exploratory and inherently subjective" (Braun and Clarke, 2015, p.741). The process began with all focus groups being transcribed verbatim and then re-read to gain a sense of the whole (i.e., familiarity). Following this, data were subject to an inductive analysis which combined Charmaz's (2004) line-by-line coding with a constant comparative technique to develop larger loose themes. Such a technique aligns with Tracy's (2013) primary coding. The initial codes

were constructed of words, meanings and impressions and were used to further explore and develop understanding in the ensuing sessions and focus group interviews (Hsieh and Shannon, 2005). Following this, in keeping with Tracy (2013), the larger themes were then organised into tables for a more refined secondary coding. The gathering, organising and reviewing of the themes occurred concurrently to allow for depth and quality of data.

Ethics

Approval for the research was acquired from the host University's ethics committee. Following an explanation of the aims and purpose of the project, voluntary informed consent was obtained from the participants within the study (McFee, 2014). Here, participants were briefed on their involvement in the project, protection of anonymity using pseudonyms and provided clarity on the dissemination of results. However, the specificity of the course meant guarantees of confidentiality and anonymity could not be made to participants. All interviewees were made aware their participation was voluntary and the process could be stopped at any time.

Results

The results begins with a brief overview of the participants' experiences using Double Robotics within the taught classroom setting. The intention is to demonstrate and highlight some of the pragmatics and practicalities of adding such technology to the learning context. Following this, four key themes are presented. The themes include: quality of technology, classroom familiarity, tutor facilitation and user isolation.

Quality of Technology: Double Robotics

The ability of the user and the quality of the technology as essential ingredients to distance/remote learning (Lee and Choi, 2010). In the following context, Double Robotics was deemed to support the needs of the student within the classroom. When asked to describe their experiences using the technology, Joe and Dave (all names used are pseudonyms) indicated the following:

> Joe: "I usually Skype my parents and there is always a lag on the conversation. I always blame my connection to the Wi-Fi, but this seems to have no lag at all. I can have a conversation with you real-time and that is huge for discussion"

Dave: “Urmm, initially it [the navigation pad] took a bit to get used to, but I definitely felt a part of the room… In terms of interaction, I could clearly hear everyone, which was good.”

The following quotation illustrate the importance of ‘real-time’ conversation. The Double Robotics allowed for a ‘physical presence’ within the room; that is, the movement and ability to pan members of the classroom provided a sense of control and autonomy to the learner. In turn, the remote learners reported that the autonomy added to their experience:

Joe: “I really like the fact I can move with the screen. It gives me some power as a learner and makes me feel like I am in the room. That is important when compared to just being on a screen, like you are on Skype. However, the movement can be awkward and difficult to see where you are going. I got it wrong a few times.”

Dave: “I really liked that the technology allowed me to be in the class without actually being there. It took me a while to comprehend that I was actually involved in this class and I wasn’t just watching, it wasn’t a webcast for example, I was actually a part of the room and I was contributing.”

Initial consensus existed that the technology was adequate to engage with as both a remote learner and a traditional student. However, the participants identified several unfolding issues with Double Robotics. Firstly, the participants reported the screen as “small” and “slightly awkward” to see features in the background of the classroom. This included both interaction from and with the remote learner. For example, Joe reported the following when engaging as a remote learner:

Joe: “The screen on my side is OK, but the PowerPoint in class is hard to see. Actually, I couldn’t see it at all for the most part. I got them (PowerPoint slides) on my laptop beforehand. It meant I was jumping between the screen and the slides next to me... There is no way I could have it all on one screen.”

Secondly, within the classroom participants also reported technical issues regarding the presence of the robot. For instance, Calvin, one of the lead tutors, reported a glare coming off the screen, which made the remote learner “hard to see”. In this regard, the two-way screen, which was deemed important for engaging and fulfilling the ‘physical presence’ of the learner, was not clearly visible within the classroom. Following this, the participants recognised the importance of personal and tutor preparation to support the remote learner. For example, Calvin arranged the slides to be provided before the session which reduced the need to read from his

remote device. In addition, the 'traditional' students also reported difficulty hearing the speaker from the robot, stating "you had to really concentrate".

Classroom Familiarity

Building upon the previous theme, the participants alluded to a sense of familiarity concerning the 'robot' in the classroom. Over the course of the module (12 weeks), the students reported feeling more comfortable with the additional technology. However, despite identifying that Double Robotics allowed for 'real-time' conversation, the following quotations suggested the presence of the robot did not replicate the full capacity of 'being there'. For instance, Dave suggested the following:

> Dave: "It took the initial point of contact to make me realise, 'right I am in the room now and everyone can hear me and everyone can see me'. It wasn't until after that point I felt like I was a part of the class… There was an incidence when I had something I wanted to say but it was in the middle of a conversation and I would have had to jump in over the top. I was waving my hand, but it went missing on the screen and I wasn't sure on the clarity of the speaker. So, I missed the chance."

> Joe: "It was quite apparent that I only had one stimulus when I was on the robot. Whereas when I have been in classrooms I can look at other people; see how they react, the confusion and so on. It was more difficult on the screen, you can't really make eye contact and so the feel is different with just the one screen. I had to time my interjections, or maybe make everyone go back because I couldn't keep up with the pace. When in person I can read and make gestures but on the robot it is much more difficult. I lose some of those moments to speak. IT took some getting used to."

In a similar vein, the 'traditional' classroom learners cited the importance of 'seeing' the robot screen to support interaction. Here, Ryan identified the importance of conscious interaction with the learner on the robot:

> Ryan: "I think it helped I could see the robot. After 15 minutes I didn't find it difficult at all. It was quite easy to engage, I just had to remember to bring him into the conversation. I suppose, Joe was almost were privileged being on the robot."

As identified by Ryan, the remote learner's engagement grew as the sessions developed. This development allowed for further engagement from both tutor and participants. However, such

a development was focused on interactions, rather than the physical presence and autonomy to move provided by Double Robotics. The following extract by Dave illustrated this perspective:

> Dave: "I felt like I didn't want to interrupt the class by moving the robot. It might be distracting. You don't want someone to be speaking and then a robot turns to their face. Calvin (a tutor) was very specific to direct questions towards me. That actually helped because Graham started to do that as well. So, Callum started explaining something then it went to Graham and he actually started quizzing me on something. It meant I could engage, but I was reliant on Calvin and Graham to initiate that discussion."

The subsequent findings illustrated the importance of negotiating the remote learner's integration into the classroom. Emphasising the importance of collaboration, the tutor and traditional students played a vital role to include the remote learner.

Tutor Facilitation

As alluded to above, the individual and classroom set-up of the 'robot' was imperative to ensure engagement on behalf of the remote learner. In this regard, the remote learner was always placed at the end of the table to capture as much of the room as possible. However, the picture could not fully capture the whole room and, therefore, required the remote learner to manoeuvre and pan the room when individuals began speaking. Whilst this initially appeared an advantage to the Double Robotics, placing the quality of interactions at the heart of each session, Dave reported difficulties keeping 'tuned into' the discussions:

> Dave: "Sometimes I struggled to concentrate on a single voice, especially when a couple people start talking, it can become a bit disruptive. This was particularly difficult when debates broke out regarding certain topics."

Building upon the previous section, the remote learner was often found 'tracking' conversations, as opposed to actively contributing. Despite the absence of a time-lag, the limited eye-contact and lack of visual and verbal cues meant tutor (and student) facilitation was essential; that is, actively seeking to bring the remote learner into the discussion. Here, the quotes recognised the 'connection' between 'being there' and 'being a screen' within the environment:

> Kyle: "I think it was very important to recognise that the Joe (remote learner) required facilitation. I think there were a few occasions for him that he found it difficult

to input. That is certainly lost on the robot, something as simple as moving forward so I can see someone has something to say."

Callum: "I found myself bringing him (remote learner) into conversations. I was making a conscious effort and I was somewhat catering to him. I think this eased off as the session went by, but I was certainly working hard to engage the Joe"

In keeping with the tutor facilitation, the Double Robotics required the tutor to prepare (e.g., charge the battery) prior to the scheduled teaching session. Failure to upkeep the device would cause a lack of function and result in the remote learner not being able to engage. In turn, the equipment must be accommodated into the class preparations. The following quote by Kyle, a tutor on the programme, illustrated the increased burden:

Kyle: "I think remembering to set the robot up, charge it and support it is important. It would be disastrous to engage for half an hour and then the battery go flat. In terms of the set-up and planning, it was fairly straight forward, but I did need to accommodate that. I tend to prepare and up-load my slides before the session anyway."

User isolation

The findings thus far have focused on the functionality of Double Robotics for remote learners. Shifting attention from operationalising the robot, the motivation and integration of the remote learner was a prominent theme within the on-going data collection. Here, the following quotes illustrated some of the tensions experienced by the participants, irrespective of the 'quality' of the technology:

David: "I really enjoyed my time in the classroom, however, the break in-session meant I was not able to go for coffee with the other students or tutors. Whilst I was able to relax, I felt like I was missing out on something. A little chance to catch up and network. You know... the informal bit."

Joe: "I guess it felt a bit lonely because I was actually on my own. It was not that I was put a side, but I felt that… I needed to move the angle and move the camera, so I could see someone and get myself into the conversation. I suppose sometimes, when everyone was not actually speaking to me, but were speaking to those in the room it felt more alone."

The isolation referred to above can be attributed to two aspects. Firstly, the remote learner, whilst being able to scan the room and engage in conversation, was not able to engage in any informal rapport built during breaks. The resulting experience is one of 'joining' the class,

rather than ‘being’ in the class. Secondly, as Joe identified, the remote learner is in a solitary room, creating a reliance on ‘others’. In this regard, the experience of traditional students is not replicated. For, as Joe identified:

> Joe: “It was really important for me to remember this is not the same as being there. This is not what I have experienced before. After a couple of weeks, I realised I had to seek interactions in other ways than being able to catch Calvin (a tutor) for a coffee or bumping into a student to discuss ideas. That was an important realisation.”

Subsequently, the demands and requirements of the remote learning engaging with Double Robotics needs to be carefully considered and negotiated to ensure the appropriate experience is provided.

Discussion: Experience, Double Robotics and practical implications

There has been a growing misconception among ‘technology-enhanced’ teaching practice that the internet and associated platforms hold the capacity to provide equality across all locations (Rennie, 2003; Cushion and Townsend, 2018). The following study was not an attempt to create an online course. Rather, adopting focus-group interviews over the duration of a complete semester, the aim of this project was to evaluate the student and tutor experiences on a postgraduate doctoral programme using Double Robotics to engage remote learners. In doing so, the technology allowed students, who previously might not have been able to consider the course, access as remote learners. In keeping with Tucker (2013), the following evaluative case study was ‘teacher-designed’ and supported the integration of remote students accessing the class. The findings presented covered functionality of Double Robotics, classroom familiarity, tutor facilitation and the user isolation of remote participants.

More specifically, assessing the experiences of the tutor, traditional learners and distance learners indicated that the technology had the potential to facilitate the integration of ‘remote’ learners into the classroom; that is, learners nationally and internationally can join the classroom, which would previously have been inaccessible, via the robot. In keeping with Hunter (2015), Double Robotics added to the increasing number of technological advancements that allow students to penetrate curriculum. However, the investigation highlighted some technical issues, including sound, screen size and visibility of presentations. Consequently, despite the ostensible autonomy available with Double Robotics, the ‘remote’ learner cannot expect the same level of integration as face-to-face interaction (Conrad, 2004).

Rather, a more intricate combination of tutor experience, user experience and perception of the learner were instrumental to shaping the experiences of the participants.

Concurring with Kori, Pedaste, Leijen, and Mäeots' (2014) review, the findings from this study showed that tutor guidance and tutor interaction helped to integrate the Double Robotics technology into the classroom. In this way, while the technology fulfilled its initial function to connect the learner and tutors, the addition of Double Robotics added to the complexity of the learning environment. For, as Lu and Churchill (2014) remind us, good practice requires pedagogues to prescribe and support potential 'lurking' students. For example, Callum identified the need to 'bring in' remote students to the discussions. Consequently, Double Robotics cannot be positioned as a gimmick or proxy for high quality, stimulating delivery. Nor can the technology be positioned as a replication of existing practice. Rather, the findings highlight the wider pedagogical function of the tutor negotiating the demands of 'traditional' and 'remote' learners. Indeed, Cushion and Townsend (2018) identified that the interaction between the learner, the learning environment and intended learning outcomes should remain at the heart of the course design. The point made here is that, to incorporate Double Robotics into the pedagogical context in a meaningful way, the technology should be regarded as a supportive mechanism to the function of the course, as opposed to enlightened pedagogic practices (Bayne, 2015; Flavin, 2016); the technology must be made to 'fit' within existing practice (Flavin, 2016). A guiding distinction offered by Kirkwood and Price (2014) is described as technology supporting 'doing things better' rather than 'doing better things'. In this way, the latter description of technological variety cannot be 'black-boxed' from social context (Bayne, 2015; Cushion & Townsend, 2018)

In addition, asserting that technology-based interventions should be 'teacher-designed', Tucker (2013) recognised the important combination of tutor and student experience. Whilst the Double Robotics increased accessibility to the classroom, like Summers et al. (2005), the experience of the learner is often an overlooked feature of distance/remote learning. Distance learning should not be regarded as providing equality to all learners, but rather, Macintyre and Macdonald (2011) recognised that considerations of the individual's location and rurality should be essential. Clay (2009) asserted that a central concern, then, is students withdrawing from online courses due to misconceptions regarding the demands and limitations of online/remote study. Here, various scholars have suggested that maintaining a range of contacts is central to the student feeling connected and a sense of belonging to their associated academic

community (e.g., Haythornthwaite, 2005; Fuller and Paton, 2008; Macintyre and Macdonald, 2011). This assertion was supported through the experiences of David and Joe.

Echoing previous studies that have suggested online platforms do not place the learner at a disadvantage (e.g., Summers et al., 2005), the experiences presented of the remote learner plays a pivotal role in their continued engagement. The temporal nature of this study meant the initial 'novelty effect' on the participants was later replaced with participants expressing loneliness and isolation. As a result, the findings from this study call for sensitive consideration of the social context, perceptions of the learning, and connection to the learning environment, rather than immediately assess the perceived 'improvement' of technologically-enhanced learning environments (Casey, Goodyear and Armour, 2016). This is a particularly prominent finding considering the current search for growth among post-graduate and undergraduate provision.

Finally, logistical and operational dilemmas of Double Robotics should not be overlooked. Casey, Goodyear and Armour (2016) argued that maintenance, administration and technical support are crucial aspects to successful integration of technology in the classroom. As a consequence, the evidence provided in this paper alluded to the pitfalls associated with remote learners and the active role pedagogues must take to support the learning environment (Cushion and Townsend, 2018). Thus, in developing remote learner's accessibility to the course, the following project advocates that clear expectations between teacher, students, remote learner and environment must be clarified to achieve learning outcomes. Here, whilst the technology-enhanced environment can provide the possibility for remote learners to engage, they are not the scaffold in themselves. Therefore, personal and individual reflection among tutors (and students) is crucial to ensure student learning is facilitated (Szarbo and Schwartz, 2011).

Concluding thoughts and recommendations

The experiences presented in this paper using Double Robotics to engage remote learners have evidenced the possibility of expanding the accessibility taught (postgraduate) provisions. The findings reported that, with consideration of the classroom, preparation, and the role of the tutor, Double Robotics is a viable option to expand discussion-based pedagogies. However, the technology has some evident limitation, including the need for a more panoramic view, an increased speaker volume and developments to reduce glare on-screen. With that in mind, Double Robotics should not simply be added to the classroom. The findings presented

that learners are susceptible to experience isolation when joining classes 'remotely'. In this way, viewing the learner as an active contributor to the learning environment, Macintyre and Macdonald (2011) recognised the importance of 'who' the individual is and their associated barriers. In turn, adapted from Macintyre and Macdonald, the following suggestions can be deemed as good practice concerning Double Robotics: (1) Provide an orientation and induction to 'remote' learners. This could be included among course induction activities; (2) Promote the maintenance of a community of fellow students to engage the distance learner in alternative and various ways. For example, Keane' (2013) flipped-classroom can take many different forms, which may provide an opportunity for tutors to reduce delivery, promote discussion, and share the pedagogic responsibilities among the class; (3) And finally, the recognition of tutor work-load to facilitate and maintain the upkeep of Double Robotics.

In terms of specific developments for teaching practice engaging with Double Robotics, future research should look to address the effect of multiple 'robots' (i.e., distance/remote learners) in the same classroom. Further investigation is needed to assess the appropriateness of other devices when more than one remote learner is engaging in the classroom (i.e., two robots). Here, the quality and functionality of the device with another device needs clarification. Finally, accepting the assertion that remote learners experience 'isolation' more generally, further recourse should be paid to alternative platforms to engage and sustain learners (e.g., Microsoft Surface Hub). This research would build upon the existing project by providing an understanding of the longevity when engaging as a remote learner. In this regard, the notion of 'learner isolation' should continue to be at the forefront of pedagogical practices that places students at the heart of design.

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