

## LEARNING ALONE TOGETHER: A QUALITATIVE INVESTIGATION EXPLORING VIRTUAL CONNECTEDNESS

**Pauletta Irwin<sup>1\*</sup> & Rosanne Coutts<sup>2</sup>**

<sup>1</sup> School of Nursing and Midwifery, College of Health, Medicine and Wellbeing, University of Newcastle, Callaghan, NSW, Australia

<sup>2</sup> School of Health and Human Sciences, Southern Cross University, Lismore, NSW, Australia

\*Address all correspondence to: Pauletta Irwin, Faculty of Health and Medicine, University of Newcastle, Callaghan, NSW, Australia, E-mail: [pauletta.irwin@newcastle.edu.au](mailto:pauletta.irwin@newcastle.edu.au)

*A shift in pedagogy is required to accommodate the broad adoption of technology enhanced teaching strategies in higher education. Academics are increasingly being challenged to shift from a position of viewing online learning as providing access to course work with mostly asynchronous activities to the promotion of inclusive, connected learning opportunities. The aim of this research was to explore the learning relationships that were developed after interacting in the virtual world of Second Life. The research adopts a qualitative approach within the setting of a tri-campus higher education institute. The participants were undergraduate nurses, academics, and registered nurses. Their experiences and perspectives were captured through observation, interviews, and the collection of artefacts. Three themes emerged: Second Life can enhance preexisting real-world relationships and may augment new communities of learners; learning together can enhance motivation; and Second Life supports the establishment and development of peer relationships. Significant and unique findings clearly identify that learning connections can be established and maintained when interacting in Second Life. Furthermore, the learning connections forged through Second Life experiences suggest that the use of this platform can elicit, sustain, and enhance intrinsic motivation. A recommendation from this research is to encourage and support academics to adopt the use of technology enhanced teaching strategies such as Second Life. Further research to examine the transferability of the learning outcomes from the virtual world to the clinical environment is recommended.*

**KEY WORDS:** avatar, connectedness, connectivism, higher education, online learning, nursing education, presence, qualitative, simulation, virtual learning, virtual worlds

## 1. INTRODUCTION

Higher education is challenged to keep pace with the use of digital technology as a now predominant teaching modality. Facilitating learning in this way has necessitated ever changing shifts in pedagogy; the initial approach was limited to providing access to course work, while the current approach incorporates dimensional promotion of inclusion and connectedness through active learning experiences (Irwin et al., 2019). Despite the purported benefits, there are imposing assumptions implying that utilizing online platforms for teaching and learning may not be fundamentally valuable, such that the method is devoid of active learning (Morris, 2018).

Increased connectivity (Chau et al., 2013), altered learner profile and preferences (Yoder & Terhorst, 2012), and most recently a global pandemic (Johnson et al., 2020) have initiated a widespread transition to online education. Being initially a strategy to reduce costs, increase enrollment, and enhance student accessibility and flexibility (Janssen et al., 2016), digital technology is now widely adopted. This has become an enforced reliance, where courses are delivered using a modality that was once considered as emerging.

Additionally, the student experience is also prioritized, such that belongingness and engagement during learning activities are foundational (Murray et al., 2019). Deficits in authentic learning opportunities, particularly in practice-based learning, have seen a number of disciplines invest in developing virtual environments where students can learn anytime and anywhere (Dudding & Nottingham, 2018; Janssen et al., 2016; Wegerle et al., 2020). Therefore, it is timely to consider the nuances of digital technology usage in higher education and to continue to explore and validate practices and innovations. One such digital learning platform is Second Life ([www.secondlife.com](http://www.secondlife.com)).

## 2. SECOND LIFE

Second Life (SL) is a three-dimensional virtual world that can represent real-world and fantastical environments (Moscato & Altschuller, 2019). The learning opportunities afforded in SL have been proven to “promote dimensional collaboration and heighten student engagement” (Irwin & Coutts, 2015, p. 576). Users of the environment are represented “inworld” as an avatar, which is a self-created cartoon-like figure that is capable of synchronous speech and movements, including walking, flying, and some gestures (Minocha & Hardy, 2016).

Without real-world conventions of naming or appearance, avatars can provide anonymity for the user and can take on humanoid forms and other figures (Triberti et al., 2017). In essence, avatar creations can represent the actual self (albeit modified) or the ideal self (Mancini & Sibilla, 2017). Gaming literature supports that the creation of an ideal-self

avatar results in improved performance in terms of involvement and enjoyment (Hobart, 2012).

The added benefit of a digital platform such as SL is that it provides an opportunity to rehearse skills or simulate activities in a safe environment (Janssen et al., 2016; Kidd et al., 2012). Nursing research, in particular, has established that the relationship between the learner and avatar characteristics is relevant during learning experiences (Irwin et al., 2019). Capitalizing on the features of the virtual space for learning, previous research in nursing has established the benefits of using SL to develop experiential knowledge regarding the application of protective personal equipment (Chow, 2016). Importantly, there are dual safety benefits in the context of learning the skills of nursing: the student is in a supported learning environment and is aware that there is no physical risk to participants within a simulation (Savin-Baden et al., 2015).

### **3. CONNECTIVISM**

Along with an increase in the usage of digital technology, the learning theory of connectivism has also emerged to accommodate the concept of a network, multiple connections, and the learner engaging in self-directed learning (Vas et al., 2018). Siemens (2005, p. 5) asserted that, “technology has reorganised how we live, how we communicate and how we learn.” As such, the concept of connectivism derives from this resolve and addresses the engrained discrepancies in the application of dominant learning theories to contemporary, adult education (Bell, 2011; Siemens, 2005). While still valuable, the impact of technology upon the traditional relationship between learner and educator has exposed the limitations within established learning theories such as behaviorism, cognitivism, and constructivism (Clarà & Barberà, 2013; Siemens, 2005).

Connectivism advocates that learning occurs within a connected, learner-centric paradigm, such that educators need to transition from functioning as a broadcast medium to an interactive medium (O'Neil & Carr, 2008). This idea of interaction extends beyond “share, participate, collaborate” to incorporate “immersive co-creation” (Bulu, 2012, p. 154). SL, as an example, demonstrates the advances in learning technology that, as described by Boitshwarelo (2011), have created a considerable shift in the accessibility of knowledge from a one-to-many connection (the lecturer to many students) to multi-directional connections. The role of the educator in a connectivist learning environment is altered in line with the learner centeredness of the theory. Unlike the traditional chalk and talk approach, a facilitator working within a connectivist framework would guide from the side (King, 1993; Yoder & Terhorst, 2012). This altered educator presence has evolved because of the need for increased self-directed learning.

When working in a framework based on connectivism, Kop (2011) suggested that the movement between formal and informal learning is effortless when learners are intrinsically motivated. Engendering the user to feel a presence or sense of belonging will heighten learner engagement and intrinsic motivation. Put simply, a learner's presence is his or her sense of being in a virtual environment (Kop, 2011). The ability to focus on a virtual space irrespective of an actual physical environment will heighten the experience of presence (Tirado Morueta et al., 2016).

According to Tirado Morueta et al. (2016), social presence (i.e., being with) signifies a learner's ability to become part of a group where he or she has developed social and affective connections. Capitalizing on the relationship between intimacy and immediacy (Zhan & Mei, 2013), social presence can be enhanced in the education context by providing regular and timely feedback to the learner. Online learners, for example, have demonstrated high levels of social activity and cohesion when given structured tasks by educators (Tirado Morueta et al., 2016).

Presence is further defined as being there, or co-presence (Bulu, 2012). This represents the relationship that learners have with each other—otherwise expressed as their psychological connection (Nowak, 2001). Extending beyond the social potentials of interacting virtually, co-presence captures the acknowledged and mutual sharing of the environment beyond its sensory properties (Bulu, 2012).

According to Anderson (2016), it is the within unbounded, networked environments such as SL that learning is created and shared—where users can develop a presence as part of a community of practice. Connectivism can be employed when developing SL learning activities, given that within this approach virtual learners “engage in activities of accessing, processing, applying, creating and sharing information” (Jung, 2019, p. 51). Supported by a connectivist paradigm, and in the context of nursing education, this research sought to investigate the outcomes and reactions to a learning task conducted in the virtual world of Second Life.

#### **4. METHOD**

The research was completed in accordance with the ethical guidelines from an Australian university's Human Research and Ethics Committee and was conducted at a regional tri-campus higher education institute, where a Bachelor of Nursing (BN) program was delivered at each campus. Students enrolled in the BN program were required to utilize the SL virtual platform for the delivery of content and assessments.

It was determined, via purposeful sampling, that representatives from three participant groups would provide candid descriptions of experiences when learning and utilizing the virtual platform and relate these experiences to nursing practice. One participant group

was comprised of nursing academic staff, which delivered or designed content and assessments in SL for students enrolled in the BN program. All students enrolled in the second year of the BN program were required to utilize SL, and as such were also invited into the research as the second participant group. The third participant group was comprised of registered nurses (RNs), who were employed at local area hospitals.

All participants in this research were invited initially via email communication. Following the recruitment process, 24 recruited participants ( $n = 24$ ) were included in the research. The three groups were represented as follows: 11 undergraduate nursing students, eight educators, and five clinically practicing RNs.

#### **4.1 Virtual Curricula**

The staff and students requested support in order to learn how to navigate in the virtual world of SL when it was first introduced into the BN curriculum. The virtual simulation lead for the BN program developed resources for academics and students that accommodated all stages of digital literacy and included written instruction, videos, and large and small group training sessions. The outcomes for this education strategy were to assist those utilizing SL in developing basic skills that would enable learners to download SL; create, acquire, and change the appearance of an avatar; and find the “land” where the course would be conducted. Some of the synchronous training sessions were delivered at night and during weekends. The virtual simulation lead for the BN program provided the RNs with a tour of the virtual teaching environments in SL and gave detailed descriptions of the content and assessment delivered when utilizing the platform.

As part of their required course work, 240 enrolled nursing students were required (as avatars) to complete virtual consultations with two patients in SL. During these formative assessments, the patient avatars were operated by an educator. Each had a back story and the patient avatar's appearance was congruent with this. Patient characters were developed to portray a broad social representation, such as an aged football player, and as seen in Fig. 1, a young administrative assistant speaking with a biker group member. The virtual patient in the ensuing scenario had chronic pain following a motor bike accident and was presenting for assessment and treatment in the virtual clinic. Using synchronous speech, the nurse avatar (student) would complete a consultation with the patient avatar (educator).



**FIG. 1:** Academic-as-patient avatar (blue denim), who was depicted as a member of a biker gang, speaking with another academic (white/red) during a break between pain assessments

Each student was evaluated on his or her ability to complete a home risk assessment, communicate effectively with the patient, offer a nursing diagnosis, and develop an appropriate treatment plan. When the student completed the pain consultation with the patient, the academic would state “simulation end.” At this point, the academic provided immediate feedback to the student in SL. To complete this phase, the academic would change the appearance of his or her avatar to a customized avatar that more closely represented his or her real-world self.

Interviews were conducted with the three participant groups. Despite having very different experiences of interacting in SL, participants from the groups contributed thoughts and perceptions about connected learning which, when combined, enable a rich understanding of the experience of interacting in the online world. Interviews were recorded and transcribed verbatim. Transcripts were reviewed for responses in relation to the learning activities and were considered together with researcher observations and collected artefacts. Emerging themes were identified by employing techniques supported by Corbin and Strauss (1990): open, axial, and selective coding of concepts and triangulation

between group responses. To provide context, direct quotes from all participant groups were also collated.

## **5. RESULTS**

### **5.1 Second Life Can Enhance Preexisting Real-World Relationships and May Augment New Communities of Learners**

Students stated that interacting in SL actually provided an opportunity to share their learning experiences with friends and family, and in fact transcended any geographical separation and abated the inference of technology use and isolation. The shared virtual learning was spoken about with positive emotion and remembered joyfully.

Supporting the concept of enthusiasm for shared learning, one student spoke about learning with her daughter for shared role-play activities in SL in the following comment: “I actually used my daughter in my lounge room at home—she is a film student and thought this was fantastic. It was great that we could do this together” (Student D). Further to this point, other students spoke about the social aspect of SL, where “all you really did was walk into a room and just talk with your friend. It was so great” (Student G). Socializing was further extended to shared learning opportunities, where students spoke of working on assessments together inworld.

With a focus on shared learning, a number of the students who were interviewed clearly valued SL over other forms of social media because of the sense of connectedness they felt. Telecommunications and Facebook were deemed less superior because SL offered groups a live discussion and presence:

I think it was to keep us in contact because we were all from different places. It was during the assessment. I kept in contact with XX and YY from [another campus] because we've got Facebook but you can only write whereas in SL we can meet as a group and talk (Student F).

In this quote, it should be noted for context that “it” refers to the experience of using SL.

### **5.2 Learning Together Can Enhance Motivation**

Higher education academics voiced different experiences. Before reaching the point where they were able (or even wanted) to use SL, they received classroom training, where they were guided to download the program, create their own avatar, and learn basic inworld actions such as walking and talking. Aligned with experiential learning theory (Kolb & Kolb, 2009), all of the academics who participated in this training agreed that “having the support to learn how to use it was really important” (Academic C).

Another academic suggested this training increased self-assuredness inworld: “That’s how the confidence was built really it was being guided” (Academic A). It was also clear that the use of SL engendered a sense of comradery among these academics, and this not only proved a foundational motivating factor for engaging, but also a welcomed source of support when learning how to operate their avatars.

Given their own personal success in using SL, it was not surprising that the academics offered a guided approach to learning in SL with their students. What was encouraging was their commitment and willingness to interact with students socially inworld to achieve this. The example below demonstrates that this initiative was motivating for students. Field notes also reflected this enjoyment, where a particular academic was observed to be recalling an experience of working in SL, stating to a group of other academics who had not used the platform: “Oh my God. It was so funny! You should see me in there now, I have been rehearsing all these moves” (Researcher field notes). Also:

I think prior to that we actually did this task—you know some of the groups from my labs we would meet after dinner. I'd say at 8 o'clock tonight who is on. Let's meet in SL and go through it. So, it was basically like that. Something that I was so fearful about you know extra time, extra commitment was actually a really good motivational tool for students. It made it so much easier knowing what they were talking about... To actually get on and go through it together. That really made a big difference (Academic G).

This discourse is also an example of computer self-efficacy. This phenomenon is an extension of Bandura's work, where self-efficacy is considered instrumental in influencing motivation and behavior (Bandura, 1989). Furthermore, Compeau and Higgins (1995) found that heightened computer self-efficacy resulted in lowered computer anxiety levels, which can influence learner expectations.

Banfield and Wilkerson (2014) supported the idea that increased intrinsic motivation enhanced computer self-efficacy. Intrinsic motivation is about enjoyment and self-regulation (Ryan & Deci, 2000). The following comment represents the essence of the enhanced computer efficacy of an individual student, where positive virtual learning outcomes evolved during the social interactions inworld even prior to the formal learning assessments:

I think knowing SL—and being able to explain it to them, they felt more comfortable I think when we got in there together, they were so much more relaxed. They could concentrate on the pain assessment rather than concentrating on how to sit there moving your arm. It was a really positive experience (Academic G).



### **5.3 Second Life Supports the Establishment and Development of Peer Relationships**

The viewpoint of some academics also supported the use of SL as a means to enhance connectedness between students with peers and educators with students. This could be interpreted as recognizing that the traditional bonding in classrooms or in nurses' quarters could also be entirely possible in the virtual world, leading the academics to voice the opinion that SL could be a platform in which to learn, given that it also has the capability to facilitate the social needs of the learner:

I can see that it has huge value and the more we're trying to relate to the students of today with multiple commitments. The technology, we need to be using it and using it wisely. I think it's something we just can't avoid (Academic C).

Clinically practicing RNs lamented the lack of cohesion and camaraderie between higher education–based nursing students; however, they recognized that SL could assist contemporary students in forming these close relationships, developing somewhat of a virtual relational agency (Larsen, 2019). Students agreed that, across the multi-campus higher education institute, SL had facilitated and maintained close associations, and even friendships with peers. In particular, they found these connections to be extremely conducive to productive, convivial group work.

Academics were acutely aware of the multiple life commitments of students, expressing their view that this explained their poor attendance at face-to-face lectures on campus. An excerpt from minutes taken at a discipline meeting demonstrated that academics were aware of a decreasing student presence on campus. This was cause for embarrassment since expert external educators had recently presented lectures to meager student audiences. The minutes reflected the ensuing conversation that considered the possibility of moving the lectures to an online format to enable greater student engagement.

## **6. DISCUSSION**

A profound and unique finding of this research was that learning connections can be established and maintained in SL. In their most fundamental form, the connections involved the student and academic participants as avatars. They conversed with each other or relayed information in couples or groups. These interactions were shown to be dimensional and positive. Indeed, all of the participant groups were clear that interrelating in a virtual space was a significant component of the experience. These connections emulated real-world, casual, and peer-to-peer relationships that one might have previously seen on any higher education campus. Salmon et al. (2010) associated this with the second stage of a scaffolded model for online learning, where learners develop key relationships that support the building of virtual learning communities.

Parallel to this initial finding were examples of preexisting, real-world connections that were, somewhat surprisingly, enhanced by sharing virtual experiences through SL. For example, via SL, students were able to bring a portion of their nursing education into their lounge room and involve family and friends in their experience of learning. This additional, profound, and unique finding also suggests that learning the skills of nursing using SL may potentiate the development of whole communities of learners that can cross the boundaries of virtuality and reality. An ecological perspective acknowledges the importance of human resources, such as friends, peers, and family, in achieving learning as well as in the development of aspirations (Richardson, 2002). This revelation is consistent with the principles of connectivism, in which Boitshwarelo (2011) proposed that social and cultural connectedness between users does indeed augment the uptake of knowledge.

The learning connections forged through the SL experiences and presented in this research suggest that the use of this platform can elicit, sustain, and enhance intrinsic motivation. In other words, SL networks can satisfy the desire of learners for relatedness. As identified by Ryan and Deci (2000), this is a key component of motivation. In addition, the sense of relatedness can also facilitate the process of internalization, i.e., the movement from external to intrinsic motivation. Ryan and Deci (2000) described this as essential to the development of autonomous, lifelong learning. This shift was evident during the research, when, for example, some academics met with students in SL after hours in less formal, didactic interactions. In comparison to those who had engaged in the after-hours virtual meetings, these academics reported that there was increased engagement in the course content and heightened participation during real-life classes.

This research has provided an example of learning being achieved in a virtual mode. There was evidence that learning connections were being forged and also augmented due to real-time virtual avatar interactions that were ultimately motivating to the learners. The application of real-world content represented within virtual contexts has demonstrated experiential learning. Other disciplinary contexts—in particular, those reliant on practice-based learning models—could benefit from consideration of this approach to learning.

## 7. CONCLUSIONS

Digital technology is now consistently being utilized to support learning activities in higher education. The evolution of theory contributes to a changing landscape where there is an impetus to develop new understanding about approaches that are responsive to evolving and complex, contemporary conditions. Connectivism presents a foundational theoretical framework that supports the development of learning technologies. Virtual worlds, such as Second Life, can motivate students to learn together, develop connections, and potentiate

new communities. It is considered that this does have the potential to challenge the existing and longstanding pedagogical approaches that have served to endorse educational tradition. For higher education, it is now timely to encourage the embracing of the capacity of technology. Further research could explore the integration of SL in other disciplines.

## REFERENCES

- Anderson, T. (2016). Theories for learning with emerging technologies. In G. Veletsianos (Ed.), *Emergence and innovation in digital learning: Foundations and applications* (pp. 33–50). Athabasca University Press.
- Bandura, A. (1989). Social cognitive theory. In R. Vasta (Ed.), *Annals of child development. Six theories of child development* (vol. 6). JAI Press.
- Banfield, J., & Wilkerson, B. (2014). Increasing student intrinsic motivation and self-efficacy through gamification pedagogy. *Contemporary Issues in Education Research*, 7(4), 291–298. <https://doi.org/10.19030/cier.v7i4.8843>
- Bell, F. (2011). Connectivism: Its place in theory-informed research and innovation in technology-enabled learning. *International Review of Research in Open and Distance Learning*, 12(3), 98–118. <https://doi.org/10.19173/irrodl.v12i3.902>
- Boitshwarelo, B. (2011). Proposing an integrated research framework for connectivism: Utilising theoretical synergies. *International Review of Research in Open and Distance Learning*, 12(3), 161–179. <https://doi.org/10.19173/irrodl.v12i3.881>
- Bulu, S. T. (2012). Place presence, social presence, co-presence, and satisfaction in virtual worlds. *Computers & Education*, 58(1), 154–161. <https://doi.org/10.1016/j.compedu.2011.08.024>
- Chau, M., Wong, A., Wang, M., Lai, S., Chan, K. W. Y., Li, T. M. H., Chu, D., Chan, I. K. W., & Sung, W. (2013). Using 3D virtual environments to facilitate students in constructivist learning. *Decision Support Systems*, 56, 115–121. <https://doi.org/10.1016/j.dss.2013.05.009>
- Chow, M. (2016). Determinants of presence in 3D virtual worlds: A structural equation modelling analysis. *Australasian Journal of Educational Technology*, 32(1), 1–18. <https://doi.org/10.14742/ajet.1939>
- Clarà, M., & Barberà, E. (2013). Learning online: Massive open online courses (MOOCs), connectivism, and cultural psychology. *Distance Education*, 34(1), 129–136. <https://doi.org/10.1080/01587919.2013.770428>
- Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial tests. *MIS Quarterly*, 19(2), 189–211. <https://doi.org/10.2307/249688>

- Corbin, J. M., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology*, 13(1), 3–21. <https://doi.org/10.1007/BF00988593>
- Dudding, C. C., & Nottingham, E. E. (2018). A national survey of simulation use in university programs in communication sciences and disorders. *American Journal of Speech-Language Pathology*, 27(1), 71–81. [https://doi.org/10.1044/2017\\_AJSLP-17-0015](https://doi.org/10.1044/2017_AJSLP-17-0015)
- Hobart, M. (2012). Learning from myself. Avatars and educational video games. *Current Issues in Education*, 15(3), 1–15.
- Irwin, P., & Coutts, R. (2015). A systematic review of the experience of using Second Life in the education of undergraduate nurses. *Journal of Nursing Education*, 54(10), 572–577. <https://doi.org/10.3928/01484834-20150916-05>
- Irwin, P., Coutts, R., & Graham, I. (2019). Looking good sister! The use of a virtual world to develop nursing skills. In A. Naweed, L. Bowditch, & C. Sprick (Eds.), *Intersections in Simulation and Gaming: Disruption and Balance* (pp. 33–45). Springer.
- Janssen, D., Tummel, C., Richert, A., & Isenhardt, I. (2016). Virtual environments in higher education—Immersion as a key construct for learning 4.0. *International Journal of Advanced Corporate Learning*, 9(2), 20–26. <https://doi.org/10.3991/ijac.v9i2.6000>
- Johnson, N., Veletsianos, G., & Seaman, J. (2020). U.S. faculty and administrators' experiences and approaches in the early weeks of the COVID-19 pandemic. *Online Learning*, 24(2), 6–21. <https://doi.org/10.24059/olj.v24i2.2285>
- Jung, I. (2019). Connectivism and networked learning. In I. Jung (Ed.), *Open and distance education theory revisited. Implications for the digital era* (pp. 47–55). Springer. [https://doi.org/10.1007/978-981-13-7740-2\\_6](https://doi.org/10.1007/978-981-13-7740-2_6)
- Kidd, L. I., Knisley, S. J., & Morgan, K. I. (2012). Effectiveness of a Second Life® simulation as a teaching strategy for undergraduate mental health nursing students. *Journal of Psychosocial Nursing and Mental Health Services*, 50(7), 28–37. <https://doi.org/10.3928/02793695-20120605-04>
- King, A. (1993). From sage to the stage to guide on the side. *College Teaching*, 41(1), 30–35.
- Kolb, A. Y., & Kolb, D. A. (2009). The learning way: Meta-cognitive aspects of experiential learning. *Simulation & Gaming*, 40(3), 297–327. <https://doi.org/10.1177/1046878108325713>
- Kop, R. (2011). The challenges to connectivist learning on open online networks: Learning experiences during a massive open online course. *International Review of Research in Open and Distance Learning*, 12(3), 19–37. <https://doi.org/10.19173/irrodl.v12i3.882>
- Larsen, D. P. (2019). Expanding the definition of learning: From self to social to system. *Medical Education*, 53(6), 539–542. <https://doi.org/10.1111/medu.13893>

- Mancini, T., & Sibilla, F. (2017). Offline personality and avatar customisation. Discrepancy profiles and avatar identification in a sample of MMORPG players. *Computers in Human Behavior*, 69, 275–283. <https://doi.org/10.1016/j.chb.2016.12.031>
- Minocha, S., & Hardy, C. (2016). Navigation and wayfinding in learning spaces in 3D virtual worlds. In S. Gregory, M. J. W. Lee, B. Dalgarno, & B. Tynan (Eds.), *Learning in virtual worlds* (pp. 3–41). Athbasca University Press.
- Morris, S. M. (2018). Online learning shouldn't be 'less than.' Retrieved December 10, 2020, from <https://www.insidehighered.com/digital-learning/views/2018/04/04/are-we-giving-online-students-education-all-nuance-and-complexity>
- Moscato, D. R., & Altschuller, S. (2019). Realising the potential of virtual world-based simulations in higher education: A visual perspective. *International Journal of Technology, Policy and Management*, 19(2), 149–170. <https://doi.org/10.1504/IJTPM.2019.100606>
- Murray, G., Wilson, R., & Clarke, B. (2019). Engaging for belonging. In B. Tynan, T. McLaughlin, A. Chester, C. Hall-van den Elsen, & B. Kennedy (Eds.), *Transformations in tertiary education* (pp. 3–9). Springer.
- Nowak, K. (2001). *Defining and differentiating copresence, social presence and presence as transportation* [Conference presentation]. Fourth Annual International Workshop on Presence, Philadelphia, PA, United States.
- O'Neil, P., & Carr, J. (2008, September 29–October 2). *Connected learners: Implications for teaching in a connected world* [Conference presentation]. Australian Computers in Education Conference, Canberra, Australia.
- Richardson, A. (2002). An ecology of learning and the role of eLearning in the learning environment. In G. White (Ed.), *Connecting the Future: Global Summit of Online Knowledge Networks*. Education.au Limited.
- Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 25(1), 54–67. <https://doi.org/10.1006/ceps.1999.1020>
- Salmon, G., Nie, M., & Edirisingha, P. (2010). Developing a five-stage model of learning in Second Life. *Educational Research*, 52(2), 169–182. <https://doi.org/10.1080/00131881.2010.482744>
- Savin-Baden, M., Falconer, L., Wimpenny, K., & Callaghan, M. (2015). Virtual worlds for learning. In E. Duval, M. Sharples, & R. Sutherland (Eds.), *Technology enhanced learning: A compendium of research literature* (pp. 97–107). Springer.
- Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology & Distance Learning*, 2, 3–10.

- Tirado Morueta, R., Maraver López, P., Hernando Gómez, Á., & Harris, V. W. (2016). Exploring social and cognitive presences in communities of inquiry to perform higher cognitive tasks. *The Internet and Higher Education*, 31, 122–131. <https://doi.org/10.1016/j.iheduc.2016.07.004>
- Triberti, S., Durosini, I., Aschieri, F., Villani, D., & Riva, G. (2017). Changing avatars, changing selves? The influence of social and contextual expectations on digital rendition of identity. *CyberPsychology, Behavior, and Social Networking*, 20(8), 501–507. <https://doi.org/10.1089/cyber.2016.0424>
- Vas, R., Weber, C., & Gkoumas, D. (2018). Implementing connectivism by semantic technologies for self-directed learning. *International Journal of Manpower*, 39(8), 1032–1046. <https://doi.org/10.1108/IJM-10-2018-0330>
- Wegerle, D., Kerner, B. S., Schreckenber, M., & Klenov, S. L. (2020). Prediction of moving bottleneck through the use of probe vehicles: A simulation approach in the framework of three-phase traffic theory. *Journal of Intelligent Transportation Systems*, 24(6), 598–616. <https://doi.org/10.1080/15472450.2019.1652825>
- Yoder, S. L., & Terhorst, R. (2012). “Beam me up, Scotty”: Designing the future of nursing professional development. *The Journal of Continuing Education in Nursing*, 43(10), 456–462. <https://doi.org/10.3928/00220124-20120904-78>
- Zhan, Z., & Mei, H. (2013). Academic self-concept and social presence in face-to-face and online learning: Perceptions and effects on students' learning achievement and satisfaction across environments. *Computers & Education*, 69, 131–138. <https://doi.org/10.1016/j.compedu.2013.07.002>