Conclusion

INTRODUCTION

The case studies in this volume have presented details of teacher-researchers experimenting with assessment in virtual learning spaces. Each case study is a work-in-progress, as might be expected in this area of higher education research, and, in the conclusion to each case study, the researchers reflect on their experiences to look into the future. In their reflections and predictions, they are not just planning how the learning spaces might change, but also how the students’ experience of assessment might be improved.

In using the conclusions of these case studies to scope the future of assessment in higher education, we are aware of the slippery nature of “emerging technologies,” of which virtual worlds in higher education are a prime example (see, for example, Huber and Blount’s positioning of virtual worlds on the Gartner hype cycle, Chapter 2). We are aware, too, of how small initiatives within an institution, like the work depicted in these case studies, can shift its direction markedly. Veletsianos (2010, p. 19) describes this interaction and adaption clearly:

*On the one hand, technologies developed for purposes other than education find their way into educational institutions and processes (e.g., wikis), while, on the other, once such technologies are integrated into educational practice, they both mould and are moulded by micro-educational practices, such as teaching and learning activities and communities of practice.*

Assessment methodology and practice in higher education, because it is such a significant activity for all stakeholders, can appear resistant or slow to change (Clarke-Midura & Dede, 2010, p. 309). Where the pressures of innovation and experimentation, the “moulding” of Veletsianos’ formulation, do affect assessment activities, we can reckon them to be particularly powerful: any changes in assessment indicate some shift in education and society. These shifts, as expressed by the researchers in these case studies and the commentary chapters, and supported by cases drawn from recent literature, can be examined under three headings:
1. “Real world” assessment.
2. Assessing skills and attributes.

In gathering the researchers’ observations under each of these aspects, we can look at how virtual world and game technologies support the experience of assessment, and also at how prevailing pedagogies and institutional processes support or hinder the success of assessment for and of learning.

“REAL WORLD” ASSESSMENT

The first case studies in this volume exploit one of the key affordances of virtual worlds, expressed by Dalgarno and Lee (2010, p. 19) as the potential to “facilitate experiential learning tasks that would be impractical or impossible to undertake in the real world.” The virtual world allows participants to be assessed as if they were in the real world: in the virtual birthing center described in Chapter 1, for example, the student midwife’s decisions are assessed not just by their lecturers, but by “service users,” peers, and by self-assessment. Students can practice skills without risk in an ideal environment, exploring the “physical space, tools, and structure of their future workplace prior to assuming their duties in the physical world” (Dawley & Dede, 2014) and researchers can probe their learning strategies further. “Representational fidelity” (discussed by Dalgarno & Lee, 2010, p. 12) is one characteristic of virtual worlds that suggests their suitability for any assessment that prepares students for real life practice, and a number of other case study assessments reported in the literature depend on the virtual world providing complex contextual cues: for clinical training for emergency departments (LeRoy Heinrichs, Youngblood, Harter, & Dev, 2008), for example.

Motivating students by siting their learning in an authentic context is a key reason for using virtual worlds in education (Kennedy-Clark, Chapter 7, this volume). Similarly, “authentic assessment,” an offshoot of situated cognition (Brown, Collins & Duguid, 1989; Wood, Critical Response 2, this volume), is now a well-used criterion for assessment design in vocational programs in higher education, for example in clinical and preclinical training contexts, for research tasks, and for complex professional roles (as for the case study described by Huber and Blount, Chapter 2, this volume). Indications from the literature are that authentic assessment tasks are increasingly likely to be chosen for implementation in future programs. Student motivation is heightened when the link between learning task and learning outcomes are evident, as in an authentic assessment activity, and feedback on an authentic task also seems well appreciated. In Tuten’s marketing plan project in
Second Life (2009), for example, students in her study reported satisfaction with the experience because “I was given training that many students don’t receive until their first job” and “I graduated never having to fake it because I have all the tools.”

The challenges for the higher education institution in maintaining and supporting authentic assessment tasks include allowing rapid curriculum revision, resourcing curriculum design, and negotiating with accrediting bodies and workplaces and placements. The student and staff relationships depend the success of these institutional procedures, and particularly on how authentically the curriculum can be framed.

Where representational fidelity is felt as lacking, for example in a student response recorded in Chapter 2, that the Second Life technology was “dated,” or where it contributes ambiance rather than generating entities that are essential to assessment, the experience of assessment as a real world learning activity is diminished. The important difference in terms of student experience in an effective representation of a real-world situation is that virtual worlds can allow more than one view of an activity. Mikropoulos and Natsis (2011, p. 777) claim that almost all of the educational virtual environments that they reviewed provided multiple representations of reality.

Where there is a need to represent in detail a real world setting in a virtual world, the resources and processes of the higher education institution may be put to the test. The complexity of designing and constructing interactive assessment objects means that educators might prefer to use existing frameworks in an existing platform, such as Second Life; this choice also offers the chance to dissolve the institutional walls and participate in global partnerships for assessment. Some educators have sidestepped institutional barriers to locate their practice in a virtual world, bolstered by enthusiasm and innovation, and thus open up alternative realities for teaching and for practice in their disciplinary areas. Even where higher education institutions have made a commitment to a strong corporate presence in a virtual world, users perceive that the context reduces their institutional power, according to Wimpenny et al. (2012), and students claim their own space; or, as Wood mentions in Critical Response 2, they are forced to experience an unmediated population in the learning space, “gate-crashing” their class and activities. More positively, sharing a complex learning space makes a greater range of activities available for assessment, even stretching to cross-institutional collaborations. Language learning and cultural exchange is an obvious area for cross-institutional work, as for example in the case documented by Wang, Calandra and Yi (2010), where first year students in an eastern Chinese university studying English as a Foreign Language used the audio capabilities of Second Life to practise speaking activities and complete language assessment tasks with teacher assistants from an American university.

In her concluding comments on Chapter 1, Gregory (Critical Response 1, this volume) notes how the detailed work on the virtual birth center might have had a much wider usage, had other institutions known of its existence. One emerging feature
of higher education is a readiness to collaborate on large-scale research projects and on high-tech educational resource packages, a collaboration encouraged by tight institutional budgets and government reward systems. MOOCs are an example of a resource-intensive, technologically complex educational offering, often jointly developed and resourced. Open educational resources are shared cross-institution, and these are finding greater acceptance, albeit often offered in a customised institutional frame. Assessment as a credentialing process, however, is usually still tightly administered by individual institutions.

The real experiences of the practitioner are at one end of the virtuality continuum, with virtual models of real-life worlds situated towards the other. Assessment itself, according to Clarke-Midura and Dede (2010, p. 310) has something of a virtual status anyway:

*Assessment involves indirect reasoning from evidence—developing a model of cognition reflecting the knowledge a learner is to master, collecting observations of a student’s statements and behaviors, and interpreting the extent to which those statements and behaviors match the expert model.*

For models of learning that have taken a less cognitive tack, such as connectivism, authentic assessment means seeking the closest match between the learning objective and its verified achievement. Institutional accreditation in higher education, at least in Australia, is currently focused on the achievement of standards, which assume a close connection between curriculum and achievement. Badges are perhaps the simplest expression of what is currently a strong trend in higher education innovation, gamification, a strategy that is given a mid-term adoption horizon in the 2013 NMC Horizon Report Higher Education Edition (Johnson, Adams Becker, Cummins, Freeman, et al., 2013).

Virtual worlds can be shaped to enable assessment tasks that cannot be done in the real world, or at scales that cannot be experienced, such as the virtual world views created by *Real Time Relativity* software (Wegener, McIntyre, & McGrath, 2012), where assessments include the students solving problems with special relativity, and their teachers observing and timing the student’s problem-solving process. Technology can also support activities in worlds that are invisible or impossible, such as the alternative cosmology of the Australian National University’s first MOOC, which is on astrophysics (edX, 2013), and where the assessment tasks will center on decoding the physics of this different universe.

Among all the other learning technologies and tools that aim to represent a real world in real time, such as case studies, scenarios (in all formats – text, multimedia, narrative), role plays, and immersive worlds, augmented reality is at a hyper-real point on the virtuality continuum. Higher education programs that make use of
augmented reality technology currently are taking advantage of its ubiquity – there are mobile devices in the hands of many people on campus – and the possibilities of visualisation, whether providing extra feedback in a medical or military simulation, or telling the history and function of the physical buildings on campus to the brand new student. Assessment using augmented reality is still some years off (Crisp, 2011), but the mixed-reality model of student engagement with learning objects that it offers seems irresistibly promising. Munnerley et al. (2012) put a persuasive case for research into uses of augmented reality that would lend themselves to assessment in higher education, where “the student connects, integrates, constructs and deconstructs his or her own meanings from his or her own experiences” (Munnerley et al., 2012, p. 46).

ASSESSING SKILLS AND ATTRIBUTES

While Second Life and its less well-known rivals dominate the virtual world applications discussed in the wider literature, by no means all educators use off-the-shelf solutions for assessment or for virtual worlds. Teacher-researchers, especially in those discipline areas where programming and design expertise is at a very high level, may well create virtual worlds from a software ecosystem that is precisely tuned to their assessment needs. In-house virtual worlds or modular extensions to existing worlds are described by, for example, Okutsu, Delaurentis, Brophy, and Lambert (2012, for aeronautical engineering design) and Callaghan, McCusker, Lopez Losada, Harkin, and Wilson (2009, engineering), while the customised use of game engines combined with supporting applications is central to the virtual worlds described by, for example, Cram, Lowe and Lumkin (Chapter 3, this volume) and Loh (2012).

Case studies and commentary which focus on assessment by design (Chapter 3 on architectural design learning, and Chapter 5 on virtual environments in general) show how virtual worlds can offer students strong new possibilities for design, and offer staff greater insights into students’ learning processes. The conclusions of these case studies, and the accompanying commentary chapters, are strongly positive, looking to expand the functions of the virtual environments, forecasting significant developments and new possibilities for design and creativity.

The “creative” activity is noted as a special case in the Horizon Reports on “significant developments in technologies supporting teaching, learning, and creative inquiry in tertiary education” (Johnson, Adams Becker, Cummins, Estrada, et al., 2013, p. 1 and passim). Design thinking and testing design are currently strong and expanding strands in educational practice and assessment, approaches that make it possible for students to contribute to the solving of real-world problems through collaborative and participatory work: the “maker” movements and hackfests are
examples of community initiatives that provide a wider social context to higher education activities. Using external assessors from the community is a related trend which is seen in professional practice assessment in higher education; Kennedy-Clark, in Chapter 7 of this volume, discusses the expert panel as model assessors of creative achievement, such as design with virtual worlds.

Another strongly emerging trend which is influencing educational design is design for experience. Griffiths alludes to this in his call (Critical Response 5 of this volume) for student designers to enable virtual world participants to engage “viscerally” in their design. The question of “fun” in assessment in higher education virtual worlds is touched on by Ip, Capey, Baker, and Carroll (2009) and Schiller (2009), and examined in detail by Bell, Smith-Robbins and Withnall (2010), who couch assessment in terms of “using the system to succeed” (p. 188). Bell et al. look to the potential for the participating student (or staff) to play with their own identity, to learn about themselves and their roles in a “third space,” free from constraints and consequences, and consider it as the key hedonic experience of virtual worlds.

“REAL-TIME” ASSESSMENT AND FEEDBACK

The “assessables” that can be recorded and observed in a virtual world can be realistically complex, and therefore the ranking and marking tasks can equally demanding of technological assistance and innovation. The complexity of marking and providing feedback is apparent in a number of this volume’s case studies. Chapter 4 in this volume (Ambler, Breyer, and Young) emphasizes in conclusion the importance of providing appropriate professional development and technical support for electronic assignment marking, especially given that “assessment is such a high stakes area.” Similar levels of technological assistance may need to be brought to bear on many new forms of assessments, especially where they involve authentic or performance elements, or where they test “twenty-first century skills,” as discussed by Thompson and Markauskaite in Chapter 6. Twenty-first century skills (also the focus of Hussain, Critical Response 6) include cooperation, negotiation, decision-making, and problem-solving: the “crux of twenty-first century skills is the need to integrate, synthesize, and creatively apply content knowledge in novel situations” (Binkley et al., 2012, p. 25). Virtual worlds facilitate the capture of multiple data streams, so it is possible to retrospectively observe a student’s complex interactions and use this record of their actions to assess knowledge and understanding. Thompson and Markauskaite (Chapter 6, this volume) also scope techniques for obtaining real-time feedback on student actions in virtual settings, both from physiological signals and from neural imaging.
Another key characteristic of virtual worlds in education is their support for computer-based social communication, the affordance highlighted in Dalgarno and Lee (2010) alongside representational fidelity as “learner interaction.” Chapter 7 provides an example of how the virtual world makes a detailed observation of learner behavior possible, and allows a fine discrimination in learner performance. “Stealth” assessment, where data gathered simply from the participant’s activity in a virtual world or other complex digitally mediated task is tracked and used for formative or summative purposes, is another emerging form (Crisp, 2011, p. 213).

Many of the case studies in this volume emphasize formative assessment, but the formative–summative distinction in an e-learning environment can become blurred (Thompson & Markauskaite, Chapter 6, this volume). As well as envisaging greater individual feedback and more extensive use of formative assessment in her conclusion to Critical Response 4 (this volume), McLoughlin looks to future higher education assessments that are focused on a formal explication of the achievement of soft skills. The real-time, authentic, and aggregated assessment that e-learning environments and particularly virtual worlds encourage is highly suited to what Ranilla et al. (2011) and others call “generic skills” or “transversal skills,” also termed “graduate attributes” or “graduate learning outcomes.” The recent review on assuring graduate learning outcomes (AAGLO project team, 2012) re-asserts the performance of the student as the key focus of soft skills assessment, but looks too at the kinds of answers that virtual environments make possible: “simulations and sophisticated digital tools allow students to construct multistructural and relational responses to questions.” The need to assess learner interactions (Thompson & Markauskaite, Chapter 6) in a super-complex and diverse student population (Hussain, Critical Response 6) requires educators to greatly widen the kinds of evidence that can feed into an assessment judgment. Students are increasingly playing an important role in organizing this evidence into e-portfolios and in other ways sculpting their professional identity in the “third space” (Bell, Smith-Robbins & Withnall, 2010) that e-learning environments provide. The demand for assured graduate capabilities from employers seems likely to continue to direct this trend for more complex, holistic, and collaborative assessment types in higher education.

**IN SUMMARY**

The case studies in this volume are useful to educators not just for learning what assessment methods have worked in virtual worlds in the past, but also for imagining what might work in the future, and gaining another set of perspectives on the pressures and emerging opportunities within the higher education sector. Other
technologies may subsume or outcompete the virtual worlds described here, but key drivers for change will continue: the demand for more authentic, more complex, data-driven, multi-modal, and interactive assessments.

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REFERENCES


KEY TERMS AND DEFINITIONS

**Augmented Reality Technology:** Provides a digitally enhanced view of the real world by adding layers of digital information, such as photos, videos, texts or sounds, on top of the user’s view of physical items. This may use personal devices, such as a smartphone or tablet.

**Emerging Technologies:** Technical innovations which represent progressive developments within a field; in this context, within the field of education.

**Real World Assessment:** Assessments that provide students with opportunities to use skills and knowledge in authentic contexts (such as may be experienced in the workplace).