This important book provides both a synthesis of current research on virtual worlds as media for engagement and learning as well as an implicit research agenda for the future. As the authors note, at this point in the evolution of immersive interfaces, those making claims about their value should support them with both theoretical and evidence-based justifications. We know that learning technologies are not innovations that intrinsically generate learning; rather they are catalysts that, when used well, can enable high engagement, active learning, authentic assessment, and links between schooling and life (Dawley & Dede, 2014). Virtual worlds have many affordances that provide potential for these dimensions of effective learning, and this book describes to what extent these capabilities are currently realized and where improvements in design, implementation, and research are needed.

As the authors discuss, part of the difficulty lies in designing an interface that scaffolds the motivational and learning goals of a specific virtual world. Simplistic authoring shells have the virtue of easy usage, but this comes at the cost of having features beyond basic chat and graphics. To develop richly detailed simulated real-world situations with challenges that can be resolved through applying academic knowledge and skills, more sophisticated features are necessary, such as simulating data collection or enabling shared representations among team members (Kafai & Dede, 2014). Our work with immersive digital ecosystems demonstrates that such authenticity sometimes requires custom programming beyond what even a high-end gaming shell like Unity provides (Metcalf, Kamarainen, Tutwiler, Grotzer, & Dede, 2011). These advanced affordances also enable individual learners to customize (Dede, 2012a; Warschauer & Matuchniak, 2010). This anthology notes how important this personalization is in providing access to the broadest possible range of learners.
Virtual worlds have many capabilities (e.g., navigation, communication, embodiment) that not only aid motivation and learning when used well but also provide rich data for diagnostic, formative assessment. The unobtrusive, real-time assessments used to provide formative feedback include (Dede, 2012b, pp. 3–4):

- **Capturing exploratory paths.** The paths that a student takes in exploring a virtual world to determine the contextual situation, identify anomalies, and collect data related to a hypothesis are an important predictor of the student’s understandings about scientific inquiry.

- **Analyzing usage of guidance systems.** Gathering data on when students first choose to use an interwoven individualized guidance system, which messages they viewed, where they were in the immersive simulation when they viewed them, and what actions they took subsequent to viewing a given guidance message provides diagnostic insights that can aid instruction.

- **Interacting with animated pedagogical agents (APAs).** APAs are “lifelike autonomous characters [that] co-habit learning environments with students to create rich, face-to-face learning interactions” (Johnson, Rickel, & Lester, 2000, p. 47). The trajectory over time of questions students ask of an APA is diagnostic—typically learners will ask for information they do not know but see as valuable. This can help us comprehend a student’s thought processes and methods of knowledge acquisition. Also, APAs scattered through an immersive authentic simulation can collect diagnostic information in various ways, such as the APA requesting a student to summarize what he or she has found so far.

- **Documenting progress and transfer in similar settings.** Shifting a student to a similar, but not identical environment in which he or she must identify a problem (earlier in the curriculum) or resolve a problem (later in the curriculum) can provide insights into a student’s progress and aid transfer. Further, centring these assessments on learners’ common misconceptions and then immediately conveying the results to them can prompt “aha” moments that help synthesize new levels of understanding.

- **Attaining “powers” through accomplishments.** Like levelling up in games, students can attain new powers by reaching a threshold of experiences and accomplishments. These new capabilities document team achievements, promote engagement, facilitate learning, and offer additional opportunities for interwoven assessment.
Several chapters describe the potentially valuable contributions APAs can make to engagement, learning, and assessment in virtual worlds.

The material in this book about implementation of virtual worlds for learning and assessment of their strengths and limitations adds an important real-life dimension to this emphasis on effective design. Research and development on immersive interfaces must necessarily take into account the many challenges of real-world contexts, including professional development, cross-cultural understanding, and legal issues. Overall, this book is a very important, timely contribution to the ongoing dialogue about reaching the full potential of educational virtual worlds.

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REFERENCES


