In 2004, the first edition of the now widely disseminated Horizon Report, which was initially published through the New Media Consortium and is now a joint endeavor with Educause, published its predictions of what emerging technologies would most likely be adopted (on one to five year ‘horizons’), and what the likely impact to teaching, learning and creative expression might be (NMC: The New Media Consortium, 2004). While the first edition of the report cited technologies such as learning objects and scalable vector graphics, the current edition (see: http://cdn.nmc.org/media/2015-horizon-he-preview.pdf) articulates a much more complex and multi-faceted look at the trends, challenges and technological developments that impact educational organizations. Agile approaches to change, complex thinking and communication, and the advent of wearable technologies are all addressed within the report that seeks to articulate many of the technological innovations and integration challenges and complexities that face the teaching and learning enterprise (Johnson, Adams Becker, Estrada, & Freeman, 2015). The level of complexity, challenges and opportunities that are represented within a report that has, changed, developed and become more content-rich in the past decade is one of many examples that point to an ever-changing landscape that provides much potential and opportunities for the development of rich, engaging, personalized learning environments.

The ever-changing educational technology landscape that is articulated within the Horizon Report lends perspective to why educators often speak with disdain of the ‘industrial’ model of schooling. The days of producing the educational equivalent of widgets is over; the advent of digital technologies, and the rapid pace in which they have changed, and continue to evolve has opened myriad opportunities for more engaged and interactive formal learning opportunities as well as more informal learning endeavors, and has presented challenges and opportunities for the transformation of traditional educational structures. Not since the printing press has society seen such radical shift in the ways in which individuals are able to access, manipulate and use information.
It is within this changing societal landscape that the providers of educational opportunities find themselves: challenged to deal with those accustomed to different ways of learning, and forced to meet this market demand at an increasing pace. It has become increasingly evident that along with changes in the tools comes a need to rethink pedagogical models. The growing importance of online learning is without question – from the advent of virtual schools in K-12 to the emergence of Massive Online Open Courses (MOOCs) and completely online for-profit universities – there is discussion both in the popular press and research literature about trends and issues with teaching and learning using current technology tools. Emerging technologies and systems have provided both new opportunities and challenges for educational organizations. Organizations can work to meet increasing demand and marketplace needs for flexible delivery, but face a lack of information about and experience with pedagogical effectiveness within these systems. For example, facilitating a MOOC limits the instructor’s capabilities for personal levels of interaction, collaboration and/or community. This problem with pedagogy becomes evident when looking at factors leading to student dissatisfaction with online learning: lack of interaction among students or between the student and the instructor, inappropriateness of course content for online delivery, absence of a strong collaborative, supportive learning environment, and poor course design that involves the mere distribution or “dumping” of information (Milheim, 2012).

THE GAP BETWEEN EDUCATIONAL ORGANIZATIONS AND PERSONAL KNOWLEDGE-BUILDING

A disconnect between the growth of personal access to information and that of traditional education is apparent. Kennedy and Kennedy (2010) describe many of the assumptions of mainstream schooling: that knowledge is discrete and quantifiable, that learning proceeds by building upon unquestioned assumptions, that cooperation is necessary but a secondary dimension of classroom discourse, that the authority of the teacher is a sacred part of pedagogy, and that individual intelligence is the only relevant intelligence. They write:

All of these assumptions tend to support the social and historical maintenance of a closed or control system, and as such, may be characterized as undemocratic to the extent that they inhibit the ideal speech situation, and ignore the potential of the autopoietic process for optimal individual and group development. (p. 13)
This hierarchical construct – this shared remembrance of a teacher standing in the front of a classroom delivering a lecture – is less and less relevant. Not only do the students of today gather information independently, but they also seek control over when they learn. Distance from traditional institutions, family obligations, and other factors have led to the increased demand for online, virtual learning opportunities.

To meet growing demand for online offerings, schools have most often turned to instructional technologies designed for course management (CMSs) and learning management (LMSs). Online instruction delivered through these systems typically emulates traditional models of face-to-face instruction. Bronack, Riedl, and Tashner (2006) discuss the many similarities. Among the characteristics identified, they note that these courses and systems are frequently:

- Content delivery driven
- Driven by assumptions of need and usefulness
- Not conducive to interactions with peers or mentors
- Not characterized by the building of community.

Lane (2009) clearly explains why these types of systems are often not responsive to the needs of today’s learners:

Course management systems each contain their own inherent pedagogy, and for most systems these pedagogies are traditional in nature. As with all technologies, the design of the product is a result of its perceived use. Today’s enterprise-scale systems were created to manage traditional teaching tasks as if they were business processes. They were originally designed to focus on instructor efficiency for administrative functions such as grade posting, test creation, and enrollment management. Pedagogical considerations were thus either not considered, or were considered to be embodied in such managerial tasks.

Weller (2009) compares some traditional uses of Learning Management Systems (LMSs) to traditional schooling in this way:

In elearning terms, current LMSs can be seen as the embodiment in code of the physical structures of learning. In Lanier’s phrase they are further sedimentation as to how education should be conducted. This is acceptable if we believe that the existing educational model is the best there can be, but there are many issues in education which the current model struggles to address. (p. 182)
The author goes on to note the specific issues which seem to have not yet been remedied with many online learning systems: limited curricula, lack of personalization, changing demands and informal learning. Scardamalia and Bereiter (2006) additionally call for a ‘refashioning’ of education that would involve students “…not only developing knowledge-building competencies but also coming to see themselves and their work as part of the civilization-wide effort to advance knowledge frontiers” (pp. 97-98). The potential to facilitate such knowledge building endeavors, which can be achieved by appropriately integrating emerging technologies and pedagogical strategies, must therefore continue to be addressed, especially as online education continues to grow as a model. With growing numbers of students interested in online education, and with a tool kit that provides much potential for innovation, it is clear that solutions to these issues must be pursued. It is in hopes of contributing to this conversation that we present this volume.

PROSPECTIVE AUDIENCE

The primary audience for this publication is educators with an interest in leveraging digital technologies and virtual environments to enhance personalization in learning. These include educators and trainers in higher education, K-12, and corporate training environments. Furthermore, the most important potential use of this book is as reference and guide to those wishing to design virtual teaching and learning environments for individualized and constructivist experiences. Those most interested in this use may include professors and teachers, graduate students, instructional technology support personnel and corporate trainers.

SOLUTIONS

This volume provides addresses solutions from the broader perspective of virtual and personal learning environments, and more specifically through thematic investigations that bring into the conversation areas such as immersive technologies, new research methodologies, a variety of personalized learning strategies, and issues such a community, identity and citizenship. Combined, these areas bring a comprehensive view of optimal learning environments into play in the innovative teaching and learning arena.
Virtual Environments for Learning

The term ‘virtual’ is one which has come to have many meanings in educational contexts – in this book, the reader will see it used to describe everything from online manipulatives to immersive technologies such as virtual worlds and augmented reality. It is often used even in context of the LMS and CMS technologies discussed above. In the broadest sense, ‘virtual’ technologies for education are considered most anything in which learning is mediated through digital technology, particularly the Internet.

Dede (2014) identifies and provides a more current definition of the types of technologies which can most effectively help teachers and students meet the challenges of a changing world: collaboration tools, online and hybrid digital environments, tools that support students as makers and creators, immersive media, and games and simulations. He notes that one of the important strengths of these technologies is that, used well, they can address the learning strengths and preferences of students growing up in this digital age, including bridging formal instruction and informal learning.

The ideas of informal learning, self-efficacy, self-organization, and learning through community are themes that run throughout the chapters in this volume. All are important aspects of social constructivism – up to and including the idea of these new ways of situating learning within authentic contexts. In keeping with this idea, in their discussion of mobile learning (m-learning) (Kjærgaard & Sorensen, 2014) note that a Community of Practice involves a shift in paradigm from institutionalized teaching to personalized learning, and that pedagogical designs should take their point of departure in the student’s lived experience and participation with his/her peers, subjects, technology, etc.

As Wenger writes:

So, what if we adopt a different perspective, one that placed learning in the context of our lived experience of participation in the world? What if we assumed that learning is as much a part of our human nature as eating or sleeping that is both life-sustaining and inevitable, and that given a chance – we are quite good at it? And what if, in addition, we assumed that learning is, in its essence, a fundamentally social phenomenon, reflecting our own deeply social nature as human beings capable of knowing? What kind of understanding would such a perspective yield on how learning takes place and on what is required to support it? (2000, p. 3)
Immersive Learning/Technologies

A more specific genre of virtual technologies that is addressed within several chapters in this volume is that of immersive technologies. Although a relatively young and somewhat ill-defined field, immersive technologies are those that allow users a sensory experience; therefore, it is one that extends beyond the typical desktop interface. In their description of the Immersive Education Laboratory (iEL), Gardner and Elliott (2014) cite the definition of immersive education provided by the Immersive Education Initiative (http://immersiveeducation.org) as being one in which:

Participants [experience] a sense of ‘being there’ even when attending a class or training session in person isn’t possible, practical, or desirable, which in turn provides educators and students with the ability to connect and communicate in a way that greatly enhances the learning experience. (p. 2)

Common examples of tools that are known to provide a sense of immersion, or ‘being there’, are those that enable a sense of embodiment by use of avatars, such as virtual worlds and massively multi-player online role-playing games (MMORPGs). Other types of technologies that considered immersive in nature include augmented reality (AR) technologies, which include handheld and wearable devices, and virtual reality devices such as the Oculus Rift. Dalgarno and Lee (2010) note that immersion relies upon the technical capabilities of a technology to render sensory stimuli, and argue that the fidelity of the representation, along with the types of interactivity available within the environment, lead to a high degree of immersion.

With the advent and accessibility of these and other devices such as tangible and full-body interfaces, as well as the popularity of games and educational game design, the potential to design and develop highly personalized and sensory-rich learning environments is virtually limitless.

Personalized, Authentic Contexts for Learning with Technology

Despite the identification of hardware, software and Internet tools in earlier years, it was not until 2010 that Personalized Learning Environments (PLEs) were first identified in the Horizon Report as emerging technologies to watch, having a 4-5 year time to adoption in the K-12 arena. These were described as:

. . . systems for enabling self-directed and group-based learning, designed around each user’s goals, with great capacity for flexibility and customization. PLEs are conceived as drawing on a variety of discrete tools, chosen by the learner, which can be connected or used in concert in a transparent way. (Johnson, Adams, & Haywood, 2011, p. 30)
The authors of the report noted that, even then, the technologies needed to help students create these personalized learning environments were readily available, but that widespread adoption would require shifts in attitudes toward technology, teaching and learning. PLEs have been mentioned in subsequent reports, and in 2014 Integrating Personalized Learning is specifically mentioned as a challenge (Johnson, Adams Becker, Estrada, & Freeman, 2014).

The Higher Education edition of the Horizon Report refers first to the personalization of learning in 2015 – but at this level time initially identifying it as a challenge:

*Personalized learning refers to the range of educational programs, learning experiences, instructional approaches, and academic support strategies intended to address the specific learning needs, interests, aspirations, or cultural backgrounds of individual students. While there is a demand for personalized learning, it is not adequately supported by current technology or practices. The increasing focus on customizing instruction to meet students’ unique needs is driving the development of new technologies that provide more learner choice and allow for differentiated instruction. Advances such as online learning environments and adaptive learning technologies make it possible to support a learner’s individual learning path. The biggest barrier to personalized learning, however, is that scientific, data-driven approaches to effectively facilitate personalization have only recently begun to emerge . . . . (Johnson, Adams Becker, Estrada, & Freeman, 2015, p. 26)*

There is still much to learn about personalized learning, PLEs, and the ways in which digital technology tools can facilitate their integration into the learning process. As part of this exploration, it is also important to consider how these tools and changing pedagogy can facilitate the building of learning communities and enhance knowledge sharing and co-construction. The authors of this book continue a relatively new area of research in these areas, providing information about design, implementation, and research considerations surrounding virtual and personal environments for learning.

**ORGANIZATION OF THE BOOK**

*Utilizing Virtual and Personal Environments for Optimal Learning* is divided into four distinct sections. *Section One* is comprised of five chapters that deal with immersive technologies for learning. Immersive technologies, which are generally defined as being able to provide a heightened sensory experience for users, include technologies such as multi-user virtual worlds (MUVEs), augmented reality applications and massively multiplayer role playing games (MMORPGs). A variety of applications of these technologies are compiled within the chapters in this section.
The first section begins with Chapter 1, “Eight Years of Utilizing Virtual Worlds for Education: a View from the Trenches”, that brings to this volume a depth of experience with implementing MUVEs, and provides perspective on many issues related to implementing such innovative technologies within educational settings. By describing a series of four case studies, author Schutt and Linegar identify many operational issues related to the implementation of virtual worlds. The analysis is focused on the areas of working with teachers and students, working within institutional settings, working within the project team and working with the technology. As such, this chapter provides a comprehensive look at ‘lessons learned’ from different vantage points that can provide much perspective to those working within educational settings to implement innovative technologies.

Chapter 2, “Teacher Perceptions of the Practicality and Effectiveness of Immersive Ecological Simulation MUVEs”, describes issues and perceptions related to implementing an inquiry based science modules into the classroom. EcoMUVE, which is an immersive virtual world that uses a middle school science curriculum, was developed based on a research grant from the Institute of Education Sciences (IES). The Harvard University based project team, Metcalf et al., has investigated many areas related to the implementation of this project over the years, again providing a breadth of ‘in the trenches’ perspective. This study, however, focused on the goals of implementation feasibility, alignment with curricular objectives and standards, perceived value, and comparison with a non-MUVE curriculum, thus providing more perspective on a variety of aspects related to designing and implementing immersive learning environments.

Chapter 3, also taking the role of virtual worlds, or MUVEs, as its subject, considers the role of students as designers. In “Students as Designers of Virtual World Learning Environments”, a case study, Jacka and Booth chronicle a pre-service teacher and her mentor as they design math units in a K-6 school curriculum. The case study describes the level of creativity and engagement achieved by the student/pre-service teacher as she created experiences within the virtual environment that were aligned with math curricular units. Her reflections and perceptions of the experience highlight many benefits that immersive environments can bring to the teaching and learning experience.

Chapter 4, “Teacher-Created Augmented Reality Experiences: An International Perspective”, which is also a case study, takes as its subject the implementation of two augmented reality projects. The study from O’Shea and Curry-Corcoran describes and discusses a range of issues, from technology selection to teacher training to policy and operational concerns that had an impact on the project development and implementation in two different school systems – one in North America and one in Australia. A variety of technological, pedagogical and operational findings provide rich lessons learned for educators aiming to design or implement augmented reality in an educational setting.
The fifth and final chapter in this section, “Using Massively Multiplayer Role Playing Games (MMORPGs) to Support Second Language Learning: A Case Study of the Student Journey”, highlights the application of yet another immersive technology – massively multiplayer role playing games (MMORPGs). In this study from Strachan et al., the attributes of MMORPG technology are leveraged to engage two students in the process of learning a second language. As such, it investigates the role of this type of technology in supporting second language learning through formal and informal game playing contexts.

Section Two of the book is comprised of four chapters that focus on a range of technologies, from institutional learning management systems to e-portfolios, virtual manipulatives and personalized learning environments (PLEs). This section provides a breadth of information related to how best leverage the affordances of a variety of personal and virtual learning environments.

In Chapter 6, “A Whole-Network Analysis of Participation and Interaction in PLEs”, Casquero et al. problematize the institution centered model of the virtual learning environment (VLE and explore alternative options for engaging students with developing Web 2.0 based personal learning environments (PLEs). Institutional personal learning environments (iPLEs), which are a hybrid blend of institutional and Web 2.0 technologies, are proposed as a model to facilitate a participatory student network and are investigated as a means of leveraging institutional resources and support with tools that provide more flexibility and engagement for students.

Similarly, in Chapter 7, Salinas and Juarros focus on iPLEs, but specifically address the ePortfolio as a central component of the students’ personal learning environments. In “Trajectory of an Institutional PLE in higher education based on an ePortfolios System”, the implementation of this particular iPLE/ePortfolio project is the focus, and the chapter provides much information related to investigating technology use as it pertains to both academic and personal use. Also discussed is the application of such technologies to both formal and informal learning experiences.

Chapter 8, “Applying E-Portfolio Evaluation Criteria to the Blackboard LMS EPortfolio “, extends the conversation on ePortfolios by specifically describing the development of the Learning Management System Evaluation Criteria (LMSEC) Questionnaire. McKenna et al. describe utilization of a literature review to develop this instrument. The LMSEC Questionnaire, which provides a framework for educators wishing to evaluate ePortfolio systems, addresses many issues related to pedagogy and usability that have broad implications for the integration of ePortfolios into educational settings.

The last chapter in this section, “Revisiting the Effects and Affordances of Virtual Manipulatives for Mathematics Learning”, is a comprehensive meta-analysis in which Moyer-Packenham and Westenskow investigate various instructional implications related to the use of virtual manipulatives in the mathematics curriculum. This
comprehensive meta-analysis revealed moderate effects on student achievement as mediated by five different affordances. This study lends much to the use of dynamic, personalized learning environments in the mathematics curricular area.

Section Three takes a slightly different approach to investigating virtual environments by questioning the role and potential impact of these technologies on notions of identity, community and citizenship.

Chapter 10, “Identity, Citizenship and Moral Constructs from the Virtual Self”, in which Martin specifically investigates notions of identity, citizenship and moral constructs, describes the use of a virtual environment to engage participants in The Citizenship Project to study how citizenship education can adopt new approaches to explore relevant issues. The project has been widely utilized and findings that have been disseminated provide much perspective into how engagement with rich, immersive projects such as these can impact adult development and ultimately affect notions such as citizenship.

Terry et al., in Chapter 11, again utilizing a 3D virtual environment, investigate the notions of presence and community as it relates to engaging adult learners in hybrid and online graduate courses. “Facilitating Communities of Practice in Immersive Online Learning Environments” investigates and provides insight into how the affordances of these types of immersive, collaborative learning environments can lead to the development of highly interactive instructional environments and ultimately, engaging and effective communities of practice.

Section 4 of this volume addresses emerging concepts of research and scholarship based on the potential and affordances offered by the myriad technological possibilities that can be used to facilitate virtual and personal learning environments.

In Chapter 12, authors Warren and Gratch describe the Critical Cine-ethnographic method as a lens through which they investigate many aspects related to the integration and utilization of games for learning. In “A Research Lens for Studying Power in Learning Games: Critical Ciné- Ethnography”, the authors describe, in detail, the use of this methodology as a means by which questions related to the impact and utility of learning games can begin to be addressed.

In the final chapter of this volume, “Design Based Research with AGILE sprints to produce MUVES in Vocational Education”, Cochrane et al. describe an innovative approach to the design, development and testing of MUVEs. Legitimate peripheral participation and TPACK are utilized as cornerstones of the process. The authors discuss the ways in which design based research is utilized as a tool that informed the development and examine the impact of a MUVE designed to be utilized within a vocational educational environment.
CONCLUSION

As the Horizon Report continues to evolve and articulate the many trends, challenges and opportunities that emerging technologies provide, so too must educators and scholars continue to design and develop models that continue to add authenticity and rich contexts to the learning experience. Providing learners with access to tools that not only personalize, but also provide sensory rich, authentic experiences across broad domains and disciplines enhances the potential for efficient and effective learning.

There is growing interest in both the advantages and challenges of personalizing education using virtual environments, and an increasing literature base reflects this. We believe that this volume adds valuable voices to the discussion, and increases the knowledge base surrounding not only the ways in which technologies can help personalize the educational process, but can help develop communities of learners in effective and meaningful ways. We hope that this book contributes a much-needed perspective on the design of instruction, the development of virtual environments to enhance learning, and innovative methods for evaluating their effectiveness.

Collectively, these thirteen chapters provide an unprecedented perspective on how the intersection of virtual technologies and personalized learning join to guide the design of teaching and learning experiences. It is evident in reading the chapters described above that this intersection, regardless of specific platforms used, has significant potential to enhance learning experiences, and perhaps change our design of teaching in virtual environments.

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REFERENCES


