“EMERGING”: A Re-conceptualization of Contemporary Technology Design and Integration

Abstract
Within this chapter we argue that it is imperative for scholars and educators to recognize that the promise of emerging technologies is not the tool or technology itself. Instead, it is how emerging technologies are designed for and utilized in education that impacts online distance teaching and learning. As a model for our discussion, we present a theory of online learning, adventure learning as it exemplifies the power emerging technologies can have in transforming online education. Further, we detail how adventure learning as an emerging theory of online learning complements and illustrates Veletsianos’ (chapter 1) definition of emerging technologies. Finally, we argue that it is the synergy between emerging technology tools, theories of online teaching and learning, and their varying affordances that will ultimately transform distance education.

Introduction
Online teaching and learning is becoming more and more widespread and ubiquitous within K–12 and post-secondary schools and institutions across the U.S. (Cavanaugh, Gillan, Kromrey Hess, & Blomeyer, 2004). Currently, there are more than three million students enrolled in completely online courses within post-secondary education, with one-third of K–12 public school districts and 9 percent of public schools (Picciano & Seaman, 2007) existing completely online or offering online courses. Florida Virtual High School served more than 31,000 students during the 2005–2006 school year. In Michigan, all current high-school students
must take one online learning course before graduating. And the governor of Minnesota proposed that all Minnesota state college and university students take 25 percent of their courses online by 2015 (Bedard, 2008).

The exponential growth in online teaching and learning has fueled both the creation and use of new technologies. Additionally, “older” technologies are being built upon, and in some cases, improved with contemporary features, essentially a maturation of the original implementation ideas and design. These technologies range from courseware such as WebCT™ and Moodle™, social networking technologies such as Ning™, and Web 2.0 technologies such as wikis and blogs. Often in the numerous and diverse domains of K–12 and post-secondary education, it is inferred that if you use one of these technologies, you are “doing distance or online learning.” However, for decades, scholars and researchers in the field of educational technologies have argued vehemently, and we had hoped conclusively, that it is not the media or technology that impacts teaching and learning—it is the inherent design of the technologies, their affordances, and how they are used pedagogically that facilitates successful, effective, and “good” teaching and learning (chapters 1, 2, 6, and 7; Clark, 1983; Cuban, 2009; Doering, Miller, & Veletsianos, 2008).

Alone, technology tools are no more than simple media. Cuban (2009) notes, “the real promise of technology in education lies in its potential to facilitate fundamental, qualitative changes in the nature of teaching and learning” (p. 44). Within this chapter we argue that it is imperative for scholars and educators to recognize that the promise of emerging technologies is not the technology itself. Instead, it is how emerging technologies are designed for and utilized in education that impacts online teaching and learning. As a model for our discussion, we discuss a theory of online learning, “adventure learning,” as it exemplifies the power emerging technologies can have in transforming online education. Further, we detail how adventure learning as an emerging theory of online learning illustrates and complements Veletsianos’ (chapter 1) definition of emerging technologies. Finally, we argue that it is the synergy between emerging technologies, their varying affordances, and theories of online teaching and learning that will ultimately transform distance education.
Rethinking Online Learning through Design, Curriculum, and Pedagogy

Since 2004, the adventure learning (AL) model of online learning has evolved to educate millions of students throughout the world. AL is a hybrid online learning framework that provides students and teachers with the opportunity to learn about real-world content while interacting with adventurers, students, and content experts at various locations throughout the world within an online learning environment (Doering, 2006). AL is grounded in two major theoretical approaches to learning: experiential and inquiry-based. Like experiential learning (Kolb, 1984), where learners develop understanding and meaning from their intimate experiences and reflections, within AL, students develop their understanding of subject-matter content and the world through real-time virtual experiences with teachers, adventurers, fellow students, and experts. This real-world intimate experience is the guiding goal of AL. Moreover, inquiry-based learning also guides AL, where learners are investigating the answers to their questions with little emphasis on isolated and irrelevant facts. AL uses the union of inquiry- and experiential-based learning to guide the design of its model and implementation.

Based on these theoretical foundations, the design of the adventure learning experiences follows seven interdependent principles (Doering, 2006) that further operationalize AL (see Figure 5.1):

- a researched curriculum grounded in inquiry;
- collaboration and interaction opportunities between students, experts, peers, and content;
- utilization of the Internet for curriculum and learning environment delivery;
- enhancement of curriculum with media and text from the field, delivered in a timely manner;
- synched learning opportunities with the AL curriculum;
- pedagogical guidelines of the curriculum and the online learning environment; and
- adventure-based education.
Current adventure learning projects

Reaching more than three million learners annually (across all fifty states and around the globe), previous K–12 AL programs, including the GoNorth! Series and Arctic Transect 2004 — An Educational Exploration of Nunavut, provide the grounding proof-of-concept (see http://www.polarhusky.com for current and past programs). In these programs, students across the world completed research-based lesson plans while interacting with an Arctic dogsledding expedition team, scientists, and other students and teachers. This adventure learning approach, tying existing curriculum into what is happening in society today, provides authentic and meaningful learning opportunities.

Adventure learning affordances

We believe there is a tension in the educational technology field between what we understand about learners and how we design technology-based environments that afford learning (Gaver, 1991; Kirschner et al., 2004). In other words, our understanding of learners’ needs and abilities seldom reflects our awareness of the capabilities and limitations that technologies offer for instructional design. Our field tends to develop, implement, and research online and hybrid learning environments
with a focus on the surface-level characteristics of the pedagogical and technological foundations of the environment (e.g., identifying optimal group sizes, performing comparative media studies, etc.), often resulting in disappointed students and instructors, diminished motivation, wasted efforts and resources, and ultimately an absence of meaningful learning (Kirschner et al., 2004). Therefore, we must re-focus our efforts not only on the technological prerequisites for meaningful learning, but also on the educational and social conditions that fuel the nature of this interaction and experience.

When designing an online learning environment, the selection and implementation of an appropriate pedagogy supportive of the instructional aims of the project, taking into account the characteristics of the selected media, is the primary concern (Kirschner et al., 2004). The social characteristics of the design must enrich the chosen pedagogy by providing engaging opportunities that encourage the social dynamics and interactions that exist habitually in traditional face-to-face learning (e.g., group formation, learner-learner and learner-instructor communication, generative problem-solving, etc.). Likewise, the technological foundation and design of the environment must not only allow for these social interactions to emerge, but ultimately thrive by providing an effective and efficient structure that satisfies users as they accomplish tasks and collaborate with peers in the environment. In this design scenario, technology is an affordance for learning and education, essentially a guide for the educational and social contexts of the online learning environment.

Crucial to the effective implementation of the AL model is an understanding of the educational, social, and technological affordances for delivering a successful AL project (Doering, Miller, & Veletsianos, 2008). Educational affordances are those characteristics that determine if and how effective learning takes place (Gibson, 1979; Kirschner et al., 2004; Norman, 1988), and within AL, these affordances are vital to the success of learners’ experiences becoming transformational (Doering, 2006). The researched curriculum/lesson plans that accompany the online learning environment, the adventure-based approach to the AL model, and the cohesiveness of all learning activities represent
the educational affordances for AL. AL social affordances are those characteristics that are instrumental in determining if and how social collaboration and interaction within the project take place. These come in the form of collaboration and interaction opportunities within the online learning environment. The technological affordances of an AL environment are (1) designed to ensure a highly usable experience for children and adult users alike, (2) scalable to an influx of both media (e.g., trail reports, photos, videos, collaboration activities, etc.) and users over the course of AL project, and (3) technology use to enhance and guide user interactions within the environment, avoiding the use of technology for technology's sake (Kirschner et al., 2004; Norman, 2004). All three of these affordances work in unison to provide opportunities for transformative learning experiences (Figure 5.2).

Figure 5.2 Affordances for AL (Doering, Miller, & Veletsianos, 2008)

**Adventured Learning Affordances**

<table>
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<tr>
<th>Educational affordances</th>
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<tr>
<td>Curriculum</td>
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<td>Adventure-based</td>
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<td>Synched learning opp.</td>
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<th>Social affordances (devices)</th>
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<td>Collaboration zones</td>
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<td>Expert chat zones</td>
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<td>Q &amp; A zones</td>
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<td>Ask-the-team zones</td>
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<td>Send-a-note zones</td>
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<tr>
<th>Technological affordances</th>
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<tr>
<td>Highly usable experience</td>
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<tr>
<td>Sealable to an influx of media and users</td>
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<tr>
<td>Technology guides and enhances user interactions</td>
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K–16 students, teachers, educators, experts, parents, public audience

**Developing and delivering an adventure learning project**

When designing and delivering the AL projects at the University of Minnesota, a region of investigation is identified (e.g., Nuanvut, Fennoscandia, Chukotka, etc.) and an inquiry-based curriculum and online learning environment is designed, developed, and delivered
accordingly. For example, in preparing for GoNorth! Chukota 2007, the development of the curriculum and online learning environment focused on the region of travel — the most eastern region of Russia, Chukotka — and the four Native communities that the AL team would interact with during the expedition. The curriculum consisted of four modules that were written based on three levels of curricular activities: experience, explore, and expand (Doering, 2006).

The AL online learning environment (OLE) is developed parallel to the curriculum so the online spaces support the curricular goals and objectives. These spaces afford collaboration among learners, interaction with real-time authentic media from the field (i.e., the location of travel), delivery of authentic media that supports the curricular learning, and an overview of pedagogical principles and support for the successful teaching of AL (Doering, 2006). An example of the close connection between the OLE and the curriculum is the weekly trail reports that become available for classrooms within the OLE on Monday mornings. During the live delivery of an AL program, an “education day” is taken every Friday so the educators in the field can download the various media that was collected during the week and that support the curriculum, write and edit the text and media for the trail report, and send it to the education basecamp using satellite technologies. Once the basecamp manager receives the trail report, s/he makes sure the report and all of the activities that support the curricular goals for that week are uploaded accordingly. For example, if a curricular unit is focusing on culture, all photos, movies, QuickTime virtual reality (QTVR) files, interviews, and trail reports reinforce the culture lessons. At the same time, the education basecamp manager is updating the OLE content, scheduling the expert speaker for the week, moderating the collaboration zones where students from around the world are posting project files, and answering all questions from students and teachers to support learning and integration respectively — with all actions scaffolding the relevant curricular unit. In essence, the curricular units, media, and interactions between the actors engaged in learning (i.e., learners, teachers, explorers, and experts) support the curricular goals of the AL environment (Doering, 2006).
Adventure learning technologies

Although the goal of this chapter is not to discuss specific technologies used when designing and developing an AL program, it would be nonsensical to avoid noting the many technologies that are used to make an AL project such as GoNorth! a success. A number of diverse technologies are employed in the design and delivery of AL — some cutting-edge, some complex, others rather simple. However, it is the unison and harmony of these technologies, working both independently and together, which create opportunities for transformational teaching and learning.

To design past AL OLEs we have used diverse development technologies, including Adobe Flash or HTML/CSS for the front-end learner environment; PHP, ASP, or ColdFusion for data middleware; and MySQL or MSSQL for data storage. We have consistently challenged ourselves to think about how our design can improve the learner experience. For example, within the collaboration zones, we wanted learners to easily upload and download their project files, while at the same time being able to see other AL students from around the world with whom they were collaborating. Thus, we added an interactive map that updated in real-time with the addition of new learner-generated content (i.e., a placemark is noted on the map, along with the name of the school, student, and project file).

We also strive to ensure the OLE can be easily updated with real-time, authentic content from the field. For example, as we are travelling on the expedition route, we ensure that the curricular goals for the week guide the collection of all field data, notes, imagery, and video. We then use digital video cameras, digital cameras, microphones, handheld computers, laptops, and Iridium and Globalstar satellite technologies to make sure the weekly trail reports are available to the learner and teacher on time!

In the following sections, we situate AL within the context of emerging technologies. By discussing how AL as a practical theory of online learning is “coming into being,” as well as exploring the “hype cycle” behind AL and how as a “disruptive technology” AL is not yet fully understood, we hope to illustrate AL as an emerging form/approach to online distance learning and teaching.
Adventure Learning: Conceptualizing Emerging Technologies

It is not the technology that makes AL successful; rather, it is the orchestration of numerous technologies, innovations, advancements, curricula, pedagogy, and design that makes it a success. Based on decades of discussion and debate, we have seen that it is not the AL technologies alone that make it emerging; it is the use of the AL model within the learning context that sets it apart and provides foundations for success.

Adventure learning is not a new technology, it is simply “coming into being”

As noted earlier in this chapter, the development technologies behind current and past AL projects (e.g., Flash, HTML, MySQL, etc.) do not represent anything new or emerging in the field; rather, the coordination and cohesive alignment of these technologies to support and make possible AL is what we consider emerging. Moreover, the initial AL model itself has evolved more than the technologies themselves.

With millions of students and thousands of teachers using AL on six continents, the critical question often asked at conferences, in online K–12 education discussion forums, and at speaking engagements is: “How can I create my own adventure learning program?” This is the primary inquiry we have addressed with the AL 2.0 framework, positioned at the intersection of principles, practice, and community; the often-disregarded juncture of grounded pedagogical models, practical design inquiry, and authentic context for which the framework will be implemented.

The AL 2.0 framework promises a bright future of online learning with emerging technologies, where teachers and students are delivering AL projects based on their local region of exploration and sharing their lesson goals and adventures online to collaborate with learners around the world. AL does not have to exist as an elitist form of developing learning opportunities where the region of travel is as remote as the Arctic. Rather, AL can be a class investigation of an issue or problem within the context of the learners’ own locale, using the principles, practice, and community models of the AL 2.0 framework.
Through implementation of the AL 2.0 framework, we believe AL has the potential to change the existing architecture of traditional online learning by providing access to and the opportunity to collaborate and interact with authentic data, content, people, cultures, environments, and real-world contexts.

The AL 2.0 model (Figure 5.3) adds and identifies two key principles to the existing AL model: (1) the identification of an issue and respective location of exploration at the forefront of the AL project, and (2) the exploration of the issue, environment, local population, culture, and additional relevant factors that provide an authentic narrative for students and teachers to follow. These additional principles provide further support to the practical design and implementation of an AL project.

One of the caveats of the original AL framework was the belief that AL represents an elitist model of online education made possible only through sizeable funding and considerable development timelines. While this may be the case in large-scale AL projects such as the GoNorth! AL Series, successful and engaging AL programs can take
place in any local community over the span of a few days, even in a learner’s own backyard where he or she is collecting data and media artifacts about the Mississippi River while sharing it with fellow students and teachers around the world. Therefore, by rearticulating the original framework into a practical model for integration, we encourage teachers and students to embark on their own unique AL experiences (Figure 5.4).

Figure 5.4 Practical design and implementation of an AL 2.0 project

Finally, the AL 2.0 Community model (Figure 5.5) outlines the various connections and social affordances that are instrumental in determining if and how social collaboration and interaction within an AL project take place. If the synthesis of issue, place, and curriculum serves as the heart of an AL program, then collaboration and interaction would serve as the arteries and veins necessary for prolonged sustainability and vivacity. AL cannot be successful at a transformational level unless there is successful interaction and collaboration at
multiple levels (chapter 2) — between students and teachers; between students and subject matter experts; between teachers and subject matter experts; between students, teachers, subject matter experts, and the AL explorers and content; and lastly, between students themselves, teachers themselves, and between the subject matter experts. The layers of interaction and collaboration occur within the social affordance devices within the project. These devices include “Collaboration Zones,” “Expert Chat” zones, “Question and Answer” (Q&A) zones, “Ask the Team” zones, and “Send-a-Note” zones (see Doering, 2006; Doering, Miller, & Veletsianos, 2008).

Figure 5.5 Community collaboration in AL 2.0 (adapted from Doering, 2006)
Adventure learning and the “hype cycle”

Gartner (2006) noted that technologies go through a hype cycle, and Veletsianos (see chapter 1) identifies this cycle as an indicator of an emerging technology; education theories and models also go through such cycles. For example, although not perfectly aligned, when applying this concept to the AL model, one could argue that it has gone through inflated expectations and is moving to the plateau of productivity as others implement the model for online learning. There has been much hype around AL as many individuals wish to bring attention to their favourite cause while hiking, trekking, and so on. Within six months after the completion of Arctic Transect 2004 (http://www.polarhusky.com/2004/), the University of Minnesota received dozens of calls from individuals wishing to apply the AL model to their cause for humanity—be it global climate change or how to live longer. Fortunately, because of the need and desire to do research, the need for funding to support projects, and the implementation of the model within the degree programs, AL bypassed the “trough of disillusionment” and has moved into a plateau of productivity.

Adventure learning is “not yet” fully understood

Veletsianos (chapter 1) notes that an emerging technology is not fully understood and is yet to be fully researched in a mature way. To date, many have viewed AL as being an elite, expensive approach to delivering online learning. However, this view is problematic because the AL model is not yet fully understood. The AL 2.0 evolution of the model intends to clarify this misunderstanding, as AL does not need to be an expensive undertaking. Doering (2006) noted that the AL model could be used in numerous situations if an educator wishes to give learners an authentic and real-time experience. For example, within a junior-high math class, students learn geometry through the adventure of building a home with a non-profit organization. Through connections with this “real” organization, the teacher gives students an authentic opportunity to see what using math in the real-world looks like. At a building site, students spend a day taking photos and videos, interviewing carpenters, and documenting how math is
applicable outside of their classroom walls. These media artifacts are uploaded to an AL site. Parallel to the student activities, the teacher develops a lesson plan, invites an expert to answer questions related to the project, and sets up the adventure space by choosing the interactive and collaborative features that best enhance the experience. During the experience, students from around the world also share their authentic math experiences through collective artifacts online in the collaboration zones and discuss their experiences, making math real for learners. The second point is that emerging technologies are not yet fully researched or researched in a mature way. Although AL has been researched for over five years, it has by no means reached the tipping point of the masses implementing and researching the model; yet, with each new cycle of research we come to know more and more about AL and its possibilities. For example, a recent review of the adventure learning literature (Veletsianos & Kleanthous, 2009) laid the groundwork for further research in the area.

**Adventure learning is “potentially disruptive”**

The final characteristic of an emerging technology, or learning theory in our case, is that it is “potentially disruptive, but [its] potential is mostly unfulfilled” (chapter 1, p. 16). Projects grounded in AL can and do disrupt traditional K–12 face-to-face schooling and online teaching and learning. For example, at the completion of the first AL project, instead of attending school, hundreds of students visited the local airport to welcome the AL team back to the United States. Students have also asked their teachers why they are not using GoNorth! when other classrooms in their schools are able to participate. So, AL can pragmatically and philosophically disrupt the status quo of K–12 schooling. AL projects have also faced problems in their drive to be disruptive; although not to the extent that they could, for many reasons. First, the pedagogy inherent within adventure learning projects does lend itself more seamlessly towards constructivism. Research conducted with K–12 teachers using the adventure learning program Arctic Transect 2004 found that most participating teachers utilized constructivist learning principles in their classrooms (Doering &
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Veletsianos, 2008). In addition, many teachers noted that two of the biggest hurdles to using AL programs were conflicts with standardized testing schedules and district-mandated curricula. Due to schools’ ties to politics, adventure learning does not fit in the already overscheduled school calendar. Additionally, despite their hybrid nature and flexible curricula that have both on- and offline components, AL programs such as GoNorth! have yet to find their way into virtual K–12 schooling. Finally, AL seeks to disrupt barriers of digital equity and social class that often overshadow educational opportunities and experiences. Both Arctic Transect 2004 and GoNorth! were, and will continue to be, available free of charge to teachers and students: these programs require only a computer and Internet connection to access and use. Although AL has the power to disrupt and thereby transform traditional teaching, learning practices, and curricula around the world, it has yet to create a disturbance.

Designing Forward with Emerging Technologies

Imperative to the future success of our field is the investment of our collective efforts in designing and implementing “emerging” instructional solutions with technology. As designers, practitioners, and researchers of emerging technologies, we must challenge ourselves as a community to pose difficult design and research initiatives that bridge far-reaching gaps in technology and learning. One challenge we advocate is to place the learner experience first, with pedagogical orientation and technological selection supporting the guiding nature of the experience (see chapter 6). For example, foremost in the development and integration of an AL project, designers and teachers must strive to maintain the learner experience of excitement about learning with truly authentic content. This experience, in turn, may be achieved through designing and integrating affordances for pedagogical foundations of collaboration, inquiry-based learning, and experiential learning within the online environment. If the experience comes first, the pedagogy should fall into place.

Finally, as Reeves (2004) questioned, “Will today’s passive classroom students easily transform themselves into tomorrow’s active
online learners?” We must explore how emerging technologies fit into this complex transformation and what roles they might play in future iterations of the learning and technology dynamic. Moreover, is it the emerging uses of technology, or the emerging technologies themselves, that will ultimately lead to more meaningful, transformative, and engaged online learning? Through the collaborative investigations, shared case narratives, and emerging technology research initiatives illustrated throughout this book, we believe these theoretical questions are evolving quite nicely into practical design challenges: a wonderful and welcomed progression for our field.

REFERENCES


Emerging Technologies in Distance Education


