A Definition of Emerging Technologies for Education

George Veletsianos

Surprisingly enough, the education, e-learning, educational technology, instructional design, and so on literatures do not include a definition of emerging technologies for education. Below is my attempt at defining the term. This definition will be part of a book chapter to be published in 2009. The complete chapter will be posted here by the end of January 2009. Enjoy, and if you have any comments, or if you happen to stumble upon a definition of emerging technologies, please feel free to comment!

Emerging Technologies are tools, innovations, and advancements utilized in diverse educational settings (including distance, face-to-face, and hybrid forms of education) to serve varied education-related purposes (e.g., instructional, social, and organizational goals). Emerging Technologies (ET) can be defined and understood in the context of the following five characteristics:

1. ET can be, but are not necessarily, new technologies

It is important to note that in this context the words emerging and new are usually treated as synonymous, but they may not necessarily be so. While a definition of new might be perilous and contentious, ET may represent newer developments (e.g., utilizing the motion sensing capabilities of the Wii Remote to practice surgical techniques) as well as older ones (e.g., employing open source learning management systems at higher education institutions). Even though it may be true that most emerging technologies are newer technologies, the mere fact that they are new, does not necessarily categorize them as emerging. This idea of new technologies being emerging technologies also begs the following two questions: When do technologies cease to be new? When technologies cease to be new, do they also cease to be emerging? For example, synthetic (or virtual) worlds were described as an emerging technology more than ten years ago (Dede, 1996). Today, virtual worlds are still described as emerging technologies (e.g. de Freitas, 2008). Newness, by itself, is a problematic indicator of what emerging technologies, as older technologies can also be emerging– the reasons for this will become clearer after we examine the characteristics that follow.

2. ET are evolving organisms that exist in a state of "coming into being"

The word evolving describes a dynamic state of change and continuous refinement and development. Twitter, the popular social networking and micro-blogging platform, represents an illustrative example of an ET that is "coming into being." Twitter's early success and popularity would often cause frequent outages. Such issues were most noticeable during popular technology events (e.g., during the MacWorld keynote address). After a while, Twitter's outage issues were both lambasted and anticipated by the industry. When a new company moved into Twitter's old offices, an image was posted on the office door (Figure 1) as a tongue-in-cheek statement regarding Twitter's downtime and office relocation. Early attempts to satisfy sudden surges in demand included using more servers and implementing on/off switches to various Twitter features (e.g., during the 2008 WorldWide Developers Conference), while later efforts included Re-designing the application's architecture and withdrawing services (e.g., free SMS and instant messaging support). Existing in a state of evolution, Twitter continuously develops and refines its service, while maintaining its core purpose, and still being an emerging rather than an established technology.

3. ET go through hype cycles

Today's emerging technology might be tomorrow's fad, and today's simple idea might be tomorrow's key to boosting productivity. While it is easy to fall into the trap of believing that today's innovations will completely restructure and revolutionize the way we learn and teach, it is important to remain critical to hype. Even though technology has had a major impact on how distance education is delivered, managed, negotiated, and practiced, it is also important to recognize that due to organizational, cultural, and historical factors, education, as a field of study and practice, is resistant to change (c.f. Cuban, 1993; Lortie, 1975). Technologies and ideas go through cycles of euphoria, adoption, activity and use, maturity, impact, enthusiasm, and even infatuation. In the end, some of today's emerging technologies (and ideas) will become stable (and staple), while others will fade in the background.

One way to describe the hype that surrounds emerging technologies and ideas for education is to observe the Hype Cycle model (Fenn & Raskino, 2008) developed by Gartner Inc. This model evaluates the relative maturity and impact of technologies and ideas and follows five stages that have been successfully applied to diverse topics (table 1). Most specific to the topic of this book are the hype cycle models developed for Higher Education (Gartner, 2008a) e-learning (Gartner, 2006), and emerging technologies (Gartner, 2008b).

4. ET satisfy the "not yet" criteria

The "not yet" criteria refer to two interrelated issues:

a. *ET are not yet fully understood*. One factor distinguishing ET from other forms of technology is the fact that we are not yet able to understand what such technologies are, what they offer for education, and what they mean for learners, instructors, and institutions. For example, what exactly is mobile learning? How does it differ from other forms of learning? What does it mean to have access to data regardless of geographic location? What are the social and pedagogical affordances of mobile learning in relation to alternative forms of learning? As a result of ET not being fully understood, a second issue arises:

b. *ET are not yet fully researched or researched in a mature way*. Initial investigations of ET are often evangelical and describe superficial issues of the technology (e.g., benefits and drawbacks) without focusing on underdtanding the affordances of the technology and how those affordances can provide different (and hopefully better) ways to learn and teach at a distance. Additionally, due to the evolutionary nature of these technologies, the research that characterizes it falls under the case study and formative evaluation approaches (Dede, 1996), which, by itself, is not necessarily a negative facet of research, but it does pinpoint to our initial attempts to understand the technology and its possibilities. Nevertheless, because ET are not yet fully researched, initial deployments of emerging technology applications merely replicate familiar processes, leading critics to argue that

technologies are new iterations of the media debate (e.g., Choi and Clark, 2006; c.f. Clark, 1994; Kozma, 1994; Tracey & Hasting, 2005). Unfortunately, to a large extend, they are right – newer technologies are often used in old ways: Linear PowerPoint slides replace slideshow projectors; blogs – despite the opportunities they offer for collaboration – replace personal reflection diaries; and pedagogical agent lectures replace non-agent lectures (e.g., Choi and Clark, 2006).

5. ET are potentially disruptive but their potential is mostly unfulfilled

Individuals and corporations recognize that a potential exists, but such potential hasn't yet been realized. The potential to transform practices, processes, and institutions, is both welcomed and opposed. For example, open access journals have the potential to transform the ways research and knowledge are disseminated and evaluated. While this advancement has the potential to disrupt scholarship, to date, the majority of research is still published at closed access journals and periodicals.

As I have said before, i developed the above "definition/description" because i couldn't find one in the literature. If you have one that for one reason or another i couldn't find, please feel free to add the citation/reference to the comments or send me an email. If you have any critiques, i also wouldn't mind hearing those either :)