

E-Learning: A Coming Of Age Story

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Search the web for the term “e-learning”, and you’ll find it everywhere. In its simplest definition, it is “electronic learning,” or instruction that occurs not in a classroom, but remotely with the use of electronic media. Given that definition, educational programming on television is a form of e-learning: but most people, when asked about e-learning, would not include television in their answer. They would talk about computers, the Internet, [Khan Academy](#), and [EdX](#). They might even mention that compliance course they were required to take at work.

Distance education programs of the past - including television - have paved the way for the advent of modern e-learning. Today, the field comprises not only the transfer of knowledge or information using electronics, but also the instructional design theories and principles that can be applied to produce better learning outcomes. In this paper we will review important developments in e-learning through history, outline the concepts and models that can be applied to develop more effective courses, and discuss what is required for e-learning to have a meaningful impact moving forward.

History

The first form of distance learning was transmitted by print, rather than by electronics. Correspondence instruction enabled the “common man,” as President Andrew once declared, to have access to higher education opportunities (a similar sentiment was echoed in the 21st century with the advent of Open Education Resources, or OER). The University of Chicago was the first institution to offer correspondence courses (Pittman; 1990, 2003). The courses, however, did not garner the same respect as the traditional forms of on-campus instruction. Complicating matters was the inconsistent quality of commercial, or “proprietary,” correspondence education, which damaged the credibility of distance education in the eyes of the federal government by the mid-20th century.

In the 1920s, radio became the first electronic-based tool utilized by educators for distance education. The first education broadcasting licenses were granted to universities in Utah, Wisconsin, Minnesota and Kansas. Much like correspondence distance learning, radio offered an opportunity for the “common man” to learn agricultural knowledge via an extension education established by the U.S. Department of Agriculture. By the 1930s, the Department of Education sponsored radio programs discussing topics such as science, history and even civil rights. Emerging commercial networks, such as NBC and CBS, even offered programs covering music education. Some critics questioned the effectiveness of radio as an educational tool. Willey and Young (1948) summarized, among other things, that:

- Radio only offered a one-way means of communication.
- Educational programming was not produced or edited by educators.
- Educational programming was not based on school curriculums.

By the time critics were debating the merits of educational radio, educational television was beaming both audio and video into living rooms across the country. As with radio, universities, such as Iowa State University in 1950, were the first to broadcast educational programming. The credibility of television as an education tool grew, especially in the 1960s. In 1962, Wilbur Schramm, a researcher from Stanford University, analyzed the results of more than 400 studies comparing educational television with traditional classroom teaching and found that:

- There was “no significant difference between learning from television and from classroom teaching” (p. 66).
- Students learn “fast and efficiently” from educational television.

In 1967, the Corporation for Public Broadcasting (CPB) was established as part of the Public Broadcasting Act signed into law by President Lyndon Johnson, to create a national education channel (PBS in 1970). One of CPB’s first successes was “Sesame Street,” which addressed an educational need in the country’s marginalized populations. By the 1970s, telecommunications satellites widened the reach of distance learners beyond the range of television transmission towers. The National Technological University (NTU) enabled universities to beam their educational courses to corporate employees. Throughout the 1980s, businesses such as auto manufacturers, insurance companies and banks used satellites to transmit training programs to remote offices locations across the globe.

As distance learning was altering education and training via a television monitor, it was the information coming through a computer monitor that would result in the e-learning environment of today. By the mid 1990s, the National Science Foundation (NSF) enabled universities’ access to the Internet. At first, the exchange of information was confined to emails, chat rooms and virtual bulletin boards. By the 21st century, learning dynamics changed significantly with the rise of Web 2.0 platforms. Blogs, social networks and document sharing now enable learners to be more active participants in the education process. Stronger broadband connections permit the downloading and streaming of educational video content via platforms such as YouTube. In addition, broadband growth and mobile computing devices have given rise to the next phase in distance learning: the virtual school.

As of academic year 2002-2003, Florida Virtual School offered classes from grades 7 through 12 and General Education Diploma (GED) options to over 10,000 students. Universities have experimented with distance education but there have been mixed results. An educational collaboration called Fathom.com, established by a number of institutions like University of Chicago and Columbia University, had as many as 65,000 students registered in 2000, but it folded less than 4 years later. Other higher educational initiatives, such as Massive Open Online Courses (MOOCs) have garnered mixed results.

One sector where distance education seems to be flourishing is in corporate training. Much like NTU, corporate universities emerged in the 1980s to train and re-train workers in satellite offices. With the emergence of the “Knowledge Economy” and the World Wide Web, businesses were able to eliminate redundancies and inefficient processes. Because of the instructional platforms available on the Internet, many companies decided to eliminate their in-house trainers. This new type of trainer-less instruction was referred to as “e-learning” which became the model of web-based learning as we know it today. Where e-learning is heading, be it with or without an instructor, depends on what educational models institutions value now and what the educational goals for learners must be in the future.

Key Terms, Concepts, and Models

E-learning is synonymous with several other names: multimedia learning, technology-enhanced learning, computer based instruction/training, internet/web based training, online education, and mobile/virtual learning. The world of e-learning is a massively complex one, not only with several aliases, but also with its own sort of language and vocabulary. To begin to understand e-learning as it is today, it’s best to start with an introduction to a few key terms, concepts, and models.

Blended Learning

Blended learning refers to any time a student learns, at least in part, at a brick-and-mortar facility and through online delivery with student control over time, place, path, or pace. For an education framework to be considered blended, the student would need to be taking courses inside an actual educational facility as well as taking some online courses. Blended learning can be grouped into six distinct models that vary by teacher roles, physical space, delivery methods, and scheduling ([Blended Learning Infographic](#)).

Blended Learning Models

<p>Face-to-Face Driver Face-to-face teachers deliver most of the curriculum. A physical teacher employs online learning in a technology lab or the back of the classroom to supplement.</p>	<p>Online Lab An online platform delivers the entire course, but in a brick-and-mortar location. Often, students who participate in an online lab program also take traditional courses.</p>
<p>Rotation Within a given course, students rotate on a fixed schedule between self-paced online learning and sitting in a classroom with a face-to-face teacher.</p>	<p>Self-Blend Students choose to take remote online courses to supplement their school’s traditional curriculum.</p>
<p>Flex An online platform delivers most of the curriculum. Teachers provide on-site,</p>	<p>Online Driver An online platform and teacher deliver all the curriculum. Students work remotely, and</p>

as-needed support through in-person tutoring or small group sessions.	face-to-face check-ins are either available or mandatory.
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Distance Learning

Distance learning is a mode of delivering education and instruction, often on an individual basis, to students who are not physically present in a traditional setting such as a classroom. Distance learning provides "access to learning when the source of information and the learners are separated by time and distance, or both" (Honeyman). Distance learning can occur synchronously, in real-time with all participants interacting at the same time, or asynchronously, in a self-paced environment that allows participants to engage in the exchange of ideas or information without the dependency of other participants' involvement at the same time ([Wikipedia](#)).

MOOCs

Within the realm of distance learning, there are Massive Open Online Courses (MOOCs). These courses are like any typical university style class but they are usually completely free and available to anyone, anywhere in the world, so long as there is an internet connection. Since MOOCs are a free educational resource, a huge barrier is removed for people unable to afford a traditional university or college. MOOCs are also much more flexible in the sense that they start on nontraditional dates and times as compared to more traditional schools (Spinner, 2013). Because a MOOC is an event in which people who care about a topic can get together and work and talk about it in a structured way, people engage with the material and with each other. Connections are made between ideas and between other people. One of the outcomes people get from the course, are the network connections they built up through engaging with each other (Cormier, 2010).

Connectivism

Within the realm of networked learning, there is connectivism, a theory that presumes that learning occurs as part of a social network of many diverse connections and ties (Davis, 2012). This network is made possible through various tools of technology. Connectivism teachers empower their students to take control of their learning and make connections with others who will strengthen the learning process. Connectivism teachers help students build their learning network and teach them how to take advantage of learning opportunities. Because there are no books or lectures, in Connectivism, the teacher plays the role of learning architect, modeler, learning concierge, connected learning incubator, and/or change agent (Drexler, 2008).

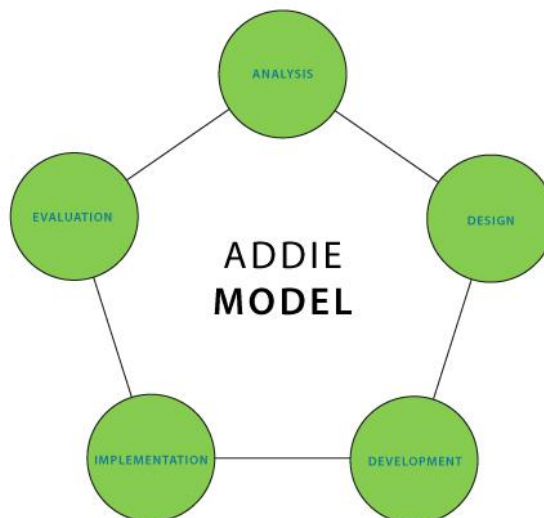
Traditional Learning Standards

The table below compares today's four most popular learning standards, Behaviorism, Cognitivism, Constructivism, and Connectivism (Ireland, 2007).

Questions	Behaviorism	Cognitivism	Constructivism	Connectivism
How does learning occur?	Black box - observable behavior main focus	Structured, computational	Social, meaning created by each learner (personal)	Distributed within a network, social, technologically enhanced, recognizing and interpreting patterns
What factors influence learning?	Nature of reward, punishment, stimuli	Existing schema, previous experiences	Engagement, participation, social, cultural	Diversity of network
What is the role of memory?	Memory is hardwiring of repeated experiences - where reward and punishment are most influential	Encoding, storage, retrieval	Prior knowledge remixed to current context	Adaptive patterns, representative of current state, existing in networks
How does transfer occur?	Stimulus, response	Duplicating knowledge constructs of "knower"	Socialization	Connecting to (adding nodes)
What types of learning are best explained by this theory?	Task-based learning	Reasoning, clear objectives, problem solving	Social, vague ("ill defined")	Complex learning, rapid changing core, diverse knowledge sources

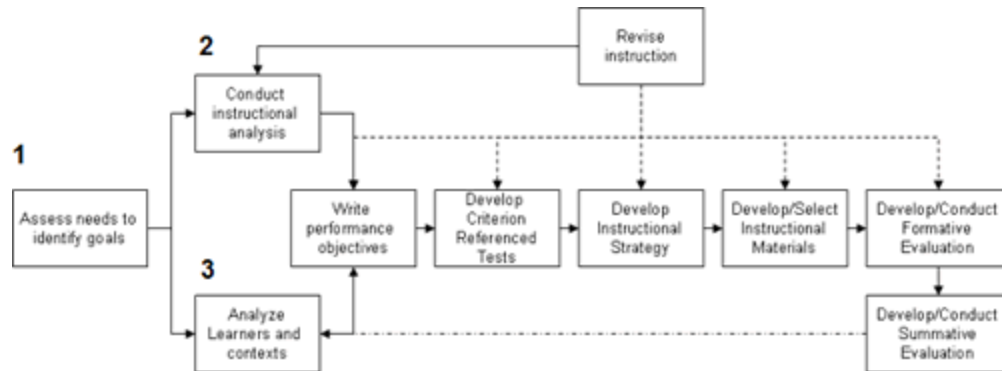
ADDIE Model

ADDIE stands for Analysis, Design, Development, Implementation, and Evaluation; the five stages or phases in the model. The ADDIE model is at the very core of instructional design and is the basis of Instructional Systems Design (ISD). This model represents a dynamic, flexible guideline for building effective training and performance support tools ([Instructional Design Central](#)).



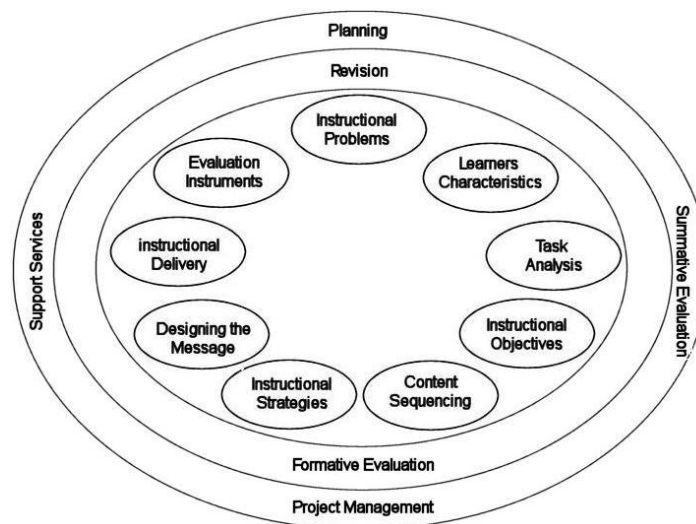
Dick and Carey Model

The Dick and Carey model addresses instruction as an entire system, focusing on the interrelationship between context, content, learning and instruction. According to Dick and Carey, "Components such as the instructor, learners, materials, instructional activities, delivery system, and learning and performance environments interact with each other and work together to bring about the desired student learning outcomes" ([Instructional Design Central](#)).



Kemp's Instructional Design Model

The Jerold Kemp instructional design method and model adopts a wide view. The oval shape of the model conveys that the design and development process is a continuous cycle that requires constant planning, design, development and assessment to insure effective instruction. The model is systemic and nonlinear and seems to encourage designers to work in all areas as appropriate. The model is particularly useful for developing instructional programs that blend technology, pedagogy and content to deliver effective, inclusive (reliable) and efficient learning ([Edutech Wiki](#)).



Gagne's 9 Events of Instruction

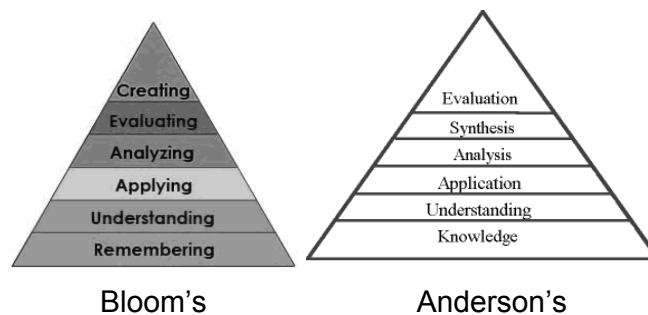
Robert Gagné is considered to be the foremost contributor to the systematic approach to instructional design and training. His book, *The Conditions of Learning*, identified the mental conditions for learning. He created a nine-step process called the events of instruction, which correlate to and address the conditions of learning ([Instructional Design Central](#)).

Nine Events of Instruction

1. Gain attention	4. Present stimulus material	7. Provide feedback
2. Inform learner of objectives	5. Provide learner guidance	8. Assess performance
3. Stimulate recall of prior learning	6. Elicit performance	9. Enhance retention transfer

Bloom's Learning Taxonomy

Benjamin Bloom headed a group of educational psychologists who developed a classification of levels of intellectual behavior important in learning. Bloom found that over 95% of the test questions students encounter require them to think only at the lowest possible level: the recall of information. Bloom identified six levels within the cognitive domain, from the simple recall or recognition of facts as the lowest level, through increasingly more complex and abstract mental levels, to the highest order which is classified as evaluation. During the 1990's a new group of cognitive psychologists, lead by Lorin Anderson (a former student of Bloom), updated the taxonomy to reflect relevance to 21st century work. The new taxonomy includes a higher level cognitive performance titled "Create" ([Instructional Design Central](#)).



Kirkpatrick's 4 Levels of Training Evaluation

Donald Kirkpatrick's 1994 book, *Evaluating Training Programs*, defined his originally published ideas of 1959, thereby further increasing awareness of them, so that his theory has now become arguably the most widely used and popular model for the evaluation of training and learning. Kirkpatrick's four-level model is now considered an industry standard across the HR and training communities. From information adapted from [Instructional Design Central](#), the four levels of Kirkpatrick's evaluation model essentially measure:

- **Reactions** - What they thought and felt about the training
- **Learning** - The resulting increase in knowledge or capability
- **Transfer** - Extent of behavior and capability improvement and implementation/application
- **Results** - The effects on the business or environment resulting from the trainee's performance

Cathy Moore's Action Mapping

Action mapping is a streamlined process to design training in the business world. Its goal is to help designers:

- Commit to measurably improving the performance of the business
- Identify the best solution to the performance problem
- When training is necessary, create challenging simulations, not information presentations (Moore, 2008)



Combining Technology and Technique

The web essentially combines the strengths of the instructional media that preceded it (teacher, textbook, audio, and video). Although an instructor is not physically present, e-learning can provide synchronous or asynchronous access to one. Web 2.0 also adds a layer of experiential learning and interactivity not seen with previous technologies. The medium is rich and varied, seemingly limited only by the imagination of the developer. Now we can see the possibility of inexpensive, on-demand access to engaging educational materials.

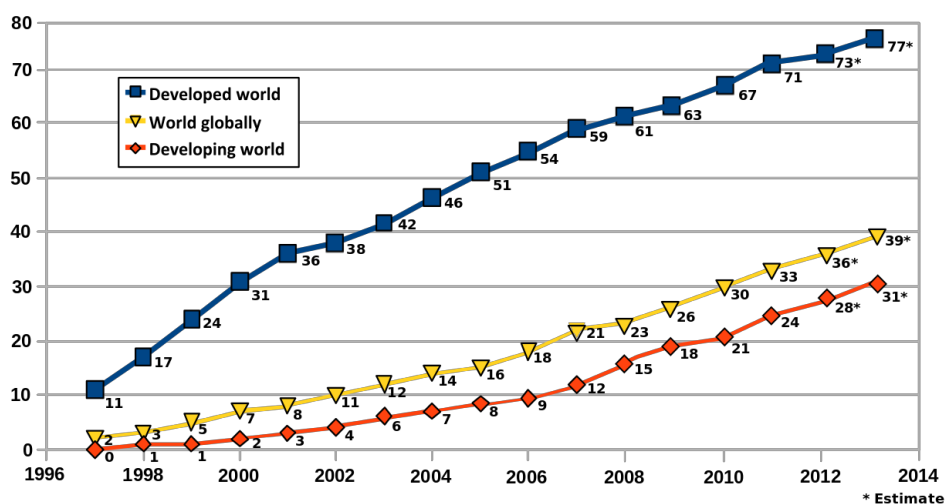
Previous innovative technologies have failed to have the disruptive impact that many predicted. What conditions are required to realize the full potential of e-learning with the tools now at our disposal? Two aspects are particularly critical for the web to have a meaningful positive impact on education:

- The technology must be readily available and adopted by learners;
- The application of the technology must be engaging and, most importantly, *effective*.

Availability and Adoption

Several websites (including [Wikipedia](#) and [Internet Live Stats](#)) provide information on the number of internet users worldwide. According to these sources, less than 1% of the world's population had an internet connection in 1995. Today, the number is greater than 40% - and in the United States it is well over 80%.

The following graph from [Wikipedia](#) (2014) illustrates the growth in the number of internet users per 100 inhabitants, from 1996 through 2014:



The website [Internetlivestats.com](#) presents a compelling visual representation of how quickly this is growing (made possible by the very technology it is tracking).

Rogers' (1995) Innovation-Decision Process Model describes five categories of adopters, from the innovators through to the "laggards." While there are challenges to overcome regarding availability (particularly in the developing world), adoption of the technology when it is available does not appear to be a problem. Worldwide we have reached the early majority, and the United States is already bringing the laggards on board. Sugata Mitra's (2010) research has shown that the technology can be mastered by children, even when left on their own to figure it out ([Sugata Mitra: The child-driven education](#)).

Content

Adoption and availability were not a significant limiting factor for earlier technologies, either: radio and television have long been staples in virtually every home. So it appears that the problem lies more in what we are doing (or rather, not doing) to create compelling and effective educational content. The role of research and the instructional designer is critical to the success of e-learning. A few simple examples illustrate just how great a difference a well-designed course can make.

Presented below are two web-based tutorials: one for *Python*, and one for *Markdown*.

- [Python tutorial](#)
- [Markdown tutorial](#)

Both were designed to teach a programming language to learners who potentially have no previous experience. Both contain information the learner needs, and both use the web as the medium. But the similarities end there. The Python tutorial overwhelms the learner by immediately presenting them with a large amount of text, without much context on how they are supposed to work their way through the material. The Markdown tutorial, on the other hand, starts with a manageable amount of information in the introduction, presented in a way that makes it clear how the learner should proceed.

Let's take a look at how the Markdown tutorial incorporates some of the concepts from Gagne's (1992) Nine Events of Instruction:

- **Gain attention of the students.** The starting page presents enough information to get the learner started, makes it clear how to proceed, and also makes the learner curious so they want to continue. It succeeds in gaining attention and engaging the learner right from the start.
- **Stimulate recall of prior learning.** The tutorial guides the user through learning by combining and building on previously learned concepts. It starts out simply, then gradually introduces more complicated content, and combines concepts.
- **Provide learning guidance.** The exercises are structured so that learners can experience immediately how what they type affects the output.
- **Elicit performance.** The learner must successfully complete an exercise before advancing to the next section. This introduces some aspects of gamification, which adds interest for the learner.

- **Provide feedback.** The tutorial “rewards” the learner with the next section when they correctly complete an exercise, as well as providing positive feedback.
- **Assess performance.** Performance is assessed throughout the tutorial: in fact, the learner cannot advance until they show mastery of the current concept.

Conclusion

This is an exciting time for instructional design and e-learning. Current technologies allow for the development of a wide range of rich multi-media experiences and authoring tools make it possible for anyone to create complex content without the need to become a programmer. The Internet continues to be adopted at an incredible rate and wireless Internet makes it possible for people to learn from just about anywhere. There literally is a wealth of information at our fingertips: we now have the means to bring education to everyone.

But giving everyone access to massive amounts of information will not provide them with an education. We need to apply what we know about learning and develop educational content that is compelling, engaging, and effective.

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