

**Digital Media Development:  
Creating Active Learning Environments & Significant Learning Experiences  
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Throughout my career, I have been fortunate to work with and study under many innovative and influential leaders in Instructional Design. These mentors have guided my understanding and approach to instructional design and how it is applied in the development of innovative, dynamic, interactive curriculum design and delivery for classroom and eLearning. Throughout my years of experience in designing and developing digital media, I have gained extensive understanding of instructional technology and the importance of implementing clear goals, objectives, and assessments for determining the effectiveness of a project. Developing, refining, and producing a complete product requires the integration and collaboration of many entities. All of these elements together compose the instructional design plan or model. By following such a plan, the design process is ensured to be both comprehensive and systematic, thus leading to a quality product and, most critically, a significant learning experience.

eLearning standards represent a paradigm shift not only for a diverse group of learners, but also for instructors, administrators, and technicians. Instructors cannot come into an eLearning environment and teach the traditional way. Course content must engage students. It is important for instructors to create an environment where learners can become engaged in authentic projects, problem solving, and learning activities. Interaction in the service of teaching and learning should be viewed in context and in relationship with teaching methods and delivery systems available to the person(s) designing the instruction. For successful learning to occur, there must be an alignment of three elements: learning goals and objectives, learning activities, and assessment.

It has been my experience that with any collaboration between multiple departments or organizations, there must be clear goals and learning outcomes, with measurable and observable objectives, for everyone involved on the project to ensure all entities are on the same page. For example, I developed an online Biology course that had only been taught in a live lab classroom setting. This course development required the collaboration of the Biology and Science Departments to repurpose the current traditional classroom lab to an online course. Development began with a meeting between the Biology/Science Departments and myself. These departments could never visualize how their content that consisted of a lab manual with 11 hands-on lessons could be repurposed for online. At the conclusion of this initial meeting, I had them all onboard (even the old-school skeptics) with my conceptualization of an online virtual lab experience. The development team I organized consisted of myself; subject matter experts; graphic designers (including Flash technology); Multimedia Department; and the online director and curriculum team to ensure academic accreditation standards. I provided assessment to ensure learning outcomes were being met. The goals and objectives for the online course were to create a virtual learning experience that simulates a biology lab. For example, I created a virtual microscope for the student to use online. The learning outcome was for a student to enter a real-world lab environment and be able to work with a real microscope from the knowledge they gained from the online course.

I have a love for technology and a passion for pushing the limits of research and development to stay on the cutting edge. My instructional design background has given me interactive design and production experience that began in the late 80s with researching and creating interactive laserdiscs to teach math and science concepts on a project funded by the National Science Foundation. Teachers were not skilled at using this new technology in their classrooms. Therefore, a printed curriculum resource manual was developed to train instructors on the effective use of the laserdisc to meet the learning objectives of the project. The objective of the resource manual was to teach the concept of the principle of "Direct Instruction," where the laserdisc controlled the pace and interaction of the instruction. The interactive laserdisc was very effective in teaching math and science concepts when used properly by the teacher. This experience has always stayed with me in regards to utilizing new technology in classroom or online instruction. Students today are technologically savvy with access to an infinite variety of information technology. However, instructors should select digital media not just because it is readily available, but to support their students' internal processing needs. Technology must be used with purpose to meet the learning objectives.

In the early 90s, my research and development switched to DVD technology at its beginning stages, and its uses in education and training. I was one of the first to use the interactive features of DVD, such as multi-angles, multi-audio tracks, ROM, and captioning, as an educational tool. My programs are still being used today in many school districts and other educational organizations. DVD technology provided the ability to control the pace, interaction, and guide the learning objectives. I was developing curriculum for distance education projects in the early days of very slow Internet speeds. As a solution to the low bandwidth, I created DVD-ROMs that contained the video, graphics, and animation. The DVD-ROM would then be given to the student to load onto their computer. They were instructed to log onto the Web-based course, which would link to the DVD-ROM. Knowing the limits of technology is a big part of developing effective curriculum. The online courses that I created using the technology available at the time were very effective, and student feedback was very positive.

I am now focusing on Flash and Web-based technologies to create innovative curriculum products to support classroom and eLearning. The instructional design theories that I use in Flash and Web development are virtually the same as what I used in the 80s with laserdisc development: Clear, concise goals and objectives that guide the design and development of learning activities and self-paced instruction.

I have always enjoyed teaching and feel it a privilege to have had the opportunity of being an Adjunct Professor for the Instructional Technology and Communications Departments at Utah State University. I take a student-centered approach when developing online courses or designing educational products to ensure learner engagement. As an instructor, when mentoring student(s) projects, creating digital media projects, developing online courses, or designing educational products, I always begin with an instructional strategy that describes the external teaching events that I plan to use to support the learning processes in achieving the instructional goals. A well-designed instructional strategy should focus on four key elements of the student-centered learning process: (1) information, (2) engagement, (3) practice, and (4) assessment.

**Information.** The information to describe in an instructional strategy includes the specific content that students need to think about: definitions, explanations, examples, non-examples, illustrations, demonstrations, etc. This is the content that students need to process to acquire the target capability. Because the ultimate goal is for students to process this information, my teaching strategy involves ways of expressing information that holds meaning to the student. By “expressing information,” I am not suggesting that as an instructor I need to always verbalize information for my students. Expressing information simply means that I need to be clear about the declarative statement of a proposition, rule, principle, concept definition, cognitive strategy, or motor skill that I want my student(s) to represent in their own memories.

**Engagement.** Digital technology and new media continue to revolutionize the instructional environment. Students are living in a digital world and are “switched on” today when it comes to technology. Therefore, it is important to keep up with new, emerging technologies to ensure learner engagement. If designed effectively, technology has the ability to engage the learner and as a result creates effective learning through interactive activities and exercises—in other words, “*active learning*.” The more engaged students are with learning, the more likely they will retain what they have learned. For significant learning to occur, there has to be some kind of lasting change in the learner that is important in terms of the student’s life. Students that are engaged learn how to apply the content, can see how it connects with other knowledge, and come to understand and care about the subject and the human implications of what they have learned. When this occurs, it is much likelier that they will retain what they have learned and continue their knowledge after the course is over.

Communicating information by means of some form of digital medium is not usually enough to produce learning. All of us have received a numerous array of visual and auditory messages over the years that we cannot remember 5 minutes later. That students see or hear information does not necessarily mean they will learn anything from it. Students will learn from information they receive only to the extent that they actively construct meaning from it. That is, they have to *do* something to the information to internalize it as their own. When I develop curriculum, I am reminded of the old Chinese proverb: I hear, and I forget; I see, and I remember; I do, and I understand. This is why in my eLearning course development, I build in ways for the learner to experience information in a manner that will influence their internal learning processes, such as developing interactive games to engage students for the purpose of review, testing, and instant feedback.

I create a variety of learning activities, such as Flash games, podcasts, interactive learning modules, and 3D virtual learning spaces to enhance student engagement and create an active learning environment that is a vital feature of self-paced learning. For example, for a neuro-psychology online course, I created “Jeopardy” games to assist students in learning complex medical terms related to mental processes, which are generally hard to spell, phrase, and understand. For students who want a career in this field, it is crucial that they know how to pronounce and spell these terms. While playing the game, the student types their response (spelling), is given feedback with an audio track pronouncing the word (phrasing), and is given the definition of the term (understanding). If answered correctly, they are given points to add a reward or motivation to the game. Students need motivation. Succinctly stated, motivation is the reason we do what we do.

Two teaching philosophies similar to my own are Benjamin Bloom’s (1956) taxonomy of cognitive objectives and John Keller’s (1987) ARCS Model. Bloom uses categorized and ordered thinking skills and objectives. His taxonomy follows the thinking process. You cannot understand a concept if you do not first remember it; similarly, you cannot apply knowledge and concepts if you do not understand them. It is a continuum from lower-order thinking skills (LOTS) to higher-order thinking skills (HOTS). Well-designed interaction can move learning from the lower levels of cognitive processing, such as recognition and comprehension, to the higher levels of analysis, synthesis, and evaluation.

**Higher-Order Thinking Skills (HOTS)**

Evaluation  
 Synthesis  
 Analysis  
 Application  
 Comprehension  
 Knowledge

**Lower-Order Thinking Skills (LOTS)**

Keller synthesized existing research on psychological motivation and created the ARCS Model: Attention, Relevance, Confidence, and Satisfaction.

- **Attention:** First and single most important aspect of the ARCS model is gaining and keeping the learner's attention. Keller's strategies for attention include sensory stimuli (active learning), inquiry arousal (thought-provoking questions), and variability (variance in exercises and use of media).
- **Relevance:** Attention and motivation will not be maintained unless the learner believes the training is relevant. Simply put, the training program should answer the critical question, "What's in it for me?" Benefits should be clearly stated. Students must see the value of what you are teaching in their lives after the course is over by enhancing their individual lives, preparing them to participate in multiple communities, or preparing them for the world of work.
- **Confidence:** The confidence aspect of the ARCS model is required, so that students feel they should put a good faith effort into the program. If they think they are incapable of achieving the objectives or that it will take too much time or effort, their motivation will decrease. In other words, for learning to occur, there has to be some kind of change in the learner—no change, no learning. And significant learning requires that there be some kind of lasting change and confidence in terms of the learner's life.
- **Satisfaction:** Finally, learners must obtain some type of satisfaction or reward from the learning experience. This can be in the form of entertainment or a sense of achievement. A self-assessment game, for example, might end with an animation sequence acknowledging the player's high score. A passing grade on a post-test might be rewarded with a completion certificate. All of these examples promote the fundamental need—for students to have a significant learning experience.

Although motivation in itself does not guarantee learning, students generally learn best when they have some motivation for doing so. In my curriculum development, I create learning activities to give them hands-on experience. This not only motivates them, but it encourages student participation, which creates a learning environment that is both exciting and fun. I receive positive results in using interactive media in course development that has created a surge of excitement among instructors across all disciplines. The feedback includes statements such as, "There is excitement, especially if students are working in groups. You can see on their faces or read in their discussions that they're engaged, they're reflecting, they're having a good time, and they're excited about learning."

**Practice.** The third critical component of an instructional strategy is practice: The opportunity for learners to perform the capability described by an instructional goal prior to performing it for summative assessment purposes. Practice is a significant, essential part of the learning process for three reasons:

1. The outward actions that students perform when practicing have the potential to help them become more active participants in the learning process, thus strengthening the quality of their learning.
2. Through practice, students have the opportunity to receive informative, corrective feedback on the quality of their learning.
3. Student practice can be used to collect assessment data for the purpose of making formative evaluation decisions. Whenever students practice, I have the opportunity to observe their performance, evaluate their progress, and make appropriate adjustments.

In developing a lesson plan, I add a practice activity. For example, I created a lesson on brain functions. Students learn the different parts of the brain, and after completing the lesson, they are given the opportunity to test their knowledge by typing their answers in spaces provided. If their response is correct, they are given extra credit points for successfully completing the exercise. The extra credit motivates the students to complete the exercise, and typing in the answers in the corresponding spaces allows the instructor to assess if they are actually learning the material.

Along with practice, I would like to add a concept called *reflection*, which can be accomplished alone or with others. Once students have learned a concept and have a chance to practice using the new knowledge, they need time reflecting alone to absorb the information. However, most learners find that making meaning entirely by themselves is not the most effective way of accomplishing this task. When we engage in dialogue with others, the possibility of finding new and richer meanings increases dramatically. In addition, when people collaboratively search for the meaning of experiences, information, and ideas, they also create the foundation for community. In my course development, I create discussion groups, wikis, and utilize social networking, such as blogs, Facebook, and Twitter, to create environments where students can use and share what they have learned. Creating a sense of community is a concept that can greatly enhance the quality of a learning experience. For example, for an online Biology course, I created Flash-based virtual labs to support online course content. I used new pedagogy, such as creating a lab portfolio, eLab book, and discussions, to provide students the opportunity for reflective dialogue. Students are required to reflect on the course and its specific activities by writing a lab report. They are also required to share their individual reflections with other members of the class. Reflection helps students to better understand content by actively using the content after learning about it.

**Assessment.** Significant learning experiences represent a recent pedagogical paradigm that is rooted in the realization that new generations are much more comfortable with and excited about new digital media. Today's ever-changing technological environment has created the need for effective instructional design more than ever. In the instructional design process, it is essential to align goals and objectives and assessment to determine the effectiveness of a lesson. At the end of a learning activity, for example, students can be given a quiz, exercise, or engage in a discussion to provide an evaluation tool to assess if they are actually learning the new material.

Formative evaluation may suggest course corrections to improve the quality of the course or level of student learning as the learning experience proceeds. Summative evaluation usually differs from formative evaluation in that the results are reported to the program, department, or institutional administration in order to make decisions about the course continuation, termination, or revision and the academic standing of the student regarding credit or certification.

Another concept of assessment I use in my instruction is providing students the opportunity to engage in *self-assessment* of their performance. At some point, to be powerful performers in life as well as self-directed learners, students must learn how to assess the quality of their own work.

In conclusion, classroom or online environments must provide rich, authentic, contextualized, problem-solving activities that learners can experience individually or collaboratively. There must be careful planning, delivery, and assessment regarding learning goals, activities, interactivity, practice, and reflection—combined with feedback and assessment—for eLearning to be successful. This ensures educational quality and optimal learning environments.