Definition of Development

The development domain of instructional technology is where theory is combined with technology to produce a product. Using the plan established during the design domain (analysis and design), the development domain uses technology to put the plan into practice.

The domain of development encompasses the design, development, and delivery of a product (Seels & Richey, 1994). One technology can be used to design the product (word processor), a second to produce the product (video camera), and a third to deliver the product (the internet).

The instructional designer takes the design and uses storyboards and flowcharts to express this vision to their team. Along with their team the instructional designer "develops" using a number of formats including: print, audio-visual, computer-based, and integrated technologies. When the product has been completed a delivery method is chosen.

As soon as development is completed formative evaluation begins. Formative evaluation is a way to measure the success of a product before the process is completed. For example, if the instructional design team was designing a computer-based instruction, a prototype would be developed and evaluated using one-to-one, small group, and large group strategies. The idea behind a formative evaluation is that any mistakes can be discovered in the early stages before substantial resources have been allocated.

There are a number of theories that instructional designers may use when developing a product. Examples of such theories are: Richard Mayer's SOI Model for Constructivist Learning, Richard Mayer's Cognitive Theory of Multimedia Learning, as well as John Sweller's Cognitive Load Theory, and David Jonassen's Constructivist Learning Environments.

The SOI Model for Constructivist Learning is an ideal framework for developing multimedia products. This model encourages instructional designers to design instruction in a way that allows the learner to "select relevant information" to "organize information," and "integrate information" with prior knowledge (Reigeluth, 1999, p. 142). These objectives are often met by designing instructional materials that include a clear graphic and text hierarchy, transparent relationships between objects and concepts, graphic representations, animations with narration, advance organizers, and elaborative questions.

Mayer's Cognitive Theory of Multimedia combined with Cognitive Load Theory are valuable in this context as they place parameters and make assumptions as to how humans learn. Mayer's Cognitive Theory of Multimedia has three underlying assumptions: dual channels, limited capacity, and active processing (Mayer, 1999). The dual channel assumption is that humans have two separate channels for processing information: one for visual information and one for auditory information. This means that

pictures, moving images, and text are processed in one channel and music and other types of audio are processed in a second channel.

The assumption of limited capacity is where Cognitive Theory of Multimedia and Cognitive Load Theory intercept. Limited capacity is the belief that human's brains have a finite amount of information which can be processed at any one time. Information is processed in the working memory. Cognitive Load Theory suggests that there are instructional techniques which if designed into the instruction can facilitate learning and conversely if not utilized can hinder learning (Sweller, 1994).

Proponents of Constructivist Learning Environments, in the constructivist tradition, believe that humans construct their own knowledge and truth and that these elements do not exist outside of the learner's mind (Duffy & Jonassen, 1992). This model first suggests selecting an authentic problem which is engaging and fosters learning ownership. Providing case studies and work samples of past similar projects enables the learner to flexibly apply their newly constructed skills (Reigeluth, 1999). Just-in-time support is also an important component of this theory in addition to providing conversational and collaborative support. In any constructivist learning environment coaching and scaffolding at the right time and location are paramount.

Print Technologies

Print technologies represent a number of ways to present information in a traditional two-dimensional context. The most common types of print development include textbooks, manuals, diagrams, photographs, and workbooks. These technologies are learner-centered because the user has the ability to restructure and reorganize the content to best fit their needs.

Audiovisual Technologies

Audiovisual technologies use both auditory and visual information to present instruction. Film projectors, TVs, VCRs, slides, and DVD players are common audiovisual presentation tools. These technologies often present content which is linear in nature, teacher-centered, and involves little or no learner interactivity.

Computer-Based Technologies

Computer-based technologies deliver instruction using microprocessor-based resources (Seels & Richey, 1994). Instead of using a printed page or film projected onto a screen to present content, these technologies often use computer screens. Computer-based instruction (CBI) is the most commonly used type of computer-based technology. This technology allows for student-centered learning with a large amount of interactivity.

Integrated Technologies

Integrated technologies represent a combination of a number of technologies all controlled by a computer. These technologies offer the most flexibility allowing a developer to choose the most attractive parts of the other delivery methods and integrate them. Common examples of this type of technology are modules developed using Macromedia's Authorware and Click2Learn's Toolbook. Integrated technology allows the content to be accessed in a linear, or non-sequential order, allows for a high level of interactivity, and for the incorporation of words and images from various sources (Seels & Richey, 1994).

The development domain is where theory meets practice. Instructional technologists use a number of different theories combined with various technologies to produce a high quality product.