This article examines the difference between technical- verses pedagogy-based training in preparing faculty to create and use technology-based educational products for the classroom. A discussion of the influence of learning theory on instruction and how this affects one's choice of instructional technology is also exemplified.

1. Introduction

The use of technology is an immanent concern at many educational institutions. More and more colleges are interested in providing training for their faculty that will enable them to create technology-based educational products and use them to aid the teaching/learning process. The technological field is a prime example of an area in which increasingly rapid external environmental changes will require more rapid responses than traditional training approaches can provide. Educators are in great danger of losing a competitive advantage in serving their students/clients if they are not able to respond quickly to the changing technological landscape. Further, unless the deficiencies of traditional training programs are successfully addressed, many institutions will find their faculty resistant to implementing instructional technologies.

Using technology to enhance the educational process involves more than just learning how to use specific pieces of hardware and software. It requires an understanding of pedagogical principles that are specific to the use of technology in an instructional setting. A model for training and development that emphasizes pedagogy-based training, and promotes team-based product development, is illustrated in Figure 1.

2. Technical- verses Pedagogy-based Training

Traditional technical-based training focuses on familiarizing the trainee with the mechanics of how a particular piece of hardware or software works. This type of training is hardware/software dependent and attempts to transfer specific technical skills to the trainee. For example, a technical-based training approach to learning about e-mail would focus on the specific mechanical aspects and features (e.g., creating and editing mail rules, or attaching files) of a particular e-mail application (e.g., Outlook, Eudora, etc.).
In contrast, pedagogy-based training focuses on preparing the trainee to implement technology skills and acquired knowledge in an instructional setting. It is hardware/software independent and attempts to educate the trainee on how to use newly gained technical skills in the teaching/learning setting. Pedagogy-based training would approach the e-mail scenario by focusing on how e-mail might enhance and/or support instruction, and how e-mail technologies can match differing student learning preferences.

The preceding should not be misconstrued as advocating pedagogy-based training over technical-based training; both types of training are necessary to promote comprehensive and effective technology-mediated instruction. However, to ensure good instructional practice, as well as student success, instructional goals should drive technology-training needs. Thus, pedagogy-based training should be addressed prior to, and separate from, traditional technical-based training.

3. Product Development Teams, a Realistic Approach

Traditional training/development approaches have placed the burden of educational product development on the shoulders of faculty. Most colleges offer technology workshops designed to help faculty acquire various technology skills. The purpose of these traditional classes is to teach faculty to develop their own technology products (e.g., web sites, multimedia presentations, etc.).
Unfortunately for most teachers, the creation of these products requires multiple skills, more skills than can be practically mastered given the typical faculty workload. To create a multimedia presentation, for example, faculty would need to learn to use multimedia presentation software, digitizing hardware and software, have a knowledge of principles of graphic design, and even be acquainted with the unique pedagogy skills for using multimedia to enhance the learning environment. Product development teams are a way to bring innovative, high-quality products to the market (i.e., classroom) in a time-efficient, cost-effective manner. By using a team approach, institutions can distribute the workload of product development across individuals and departments. This is not only more time and energy efficient, but it also serves as an integrated training mechanism that helps team members to learn from each other.

These teams could be comprised of a faculty person, who would provide the product concept, and other specialists including digitizing technician, software specialist, graphic design specialist and technology pedagogy specialist. In a team approach, faculty would share their instructional concept with the rest of the team, who would then work together to bring the project to fruition.

4. The Influence of Learning Theory on Instruction

Pedagogy-based training begins by helping teachers understand the role of learning theory in the design and function of class activities, and in the selection and use of instructional technologies. The following brief summary will explain the prominent features of two main educational theories: "instructivism" and "constructivism," and discuss the implications for technology training. Though obviously an oversimplification of learning theory, the following discussion is meant to provide a simple and applicable "working theory" of learning. For a fuller treatment of learning theories, the reader is advised to look elsewhere [1-3].

The traditional, teacher-centered, "instructivist," learning theory reinforces a view that knowledge is attained passively by information transfer from a knowledgeable "authority" figure (teacher) to the learner. Knowledge (reality) exists independent of, and external to, the learner. Thus, an instructivist teacher assumes the responsibility for obtaining this knowledge and controlling the learning process through the "distribution" of knowledge. This approach clearly places the emphasis for learning on the dispenser of knowledge (i.e., teacher), and on the method of dispensing information. Instructivism leads quite naturally to a lecture format, a dualistic (i.e., "black and white") view of knowledge, and a passive learning perspective.

Though it has been shown that actively involving students in discussion fosters retention of information, application of knowledge, and development of critical thinking skills, between 70% and 90% of professors still use the traditional lecture as their instructional strategy of choice [4]. Why is this? In many cases, teachers teach as they have been taught. Since an instructivist
learning theory has prevailed for quite some time, it is understandable why so many instructors have used a teacher-centered approach in the classroom, and also why most traditional students tend to exhibit dependent (passive) learning styles [5]. Perhaps many educators are simply replicating their own traditional instructivist training.

An instructivist view of teaching/learning promotes three predominate types of communication (figure 2). According to instructivist principles, learning flows in a mostly unidirectional path, proceeding from the knowledgeable authority (teacher), or from instructional content, to the passive learner. Though many teachers employ methods that attempt to engage students, they often apply them in ways consistent with a predominately instructivist worldview. For example, an instructor may employ a "Socratic" or question/answer style in the classroom, however if the teacher is "leading" students toward pre-planned learning objectives, then this application of the Socratic method is still instructivist-based.

Figure 2. Facilitating Communication: Basic View

Educational theory has been changing throughout the 20th century [6]. Dewey, in the early 1900's noticed that students who were interested in their subjects applied more effort to their studies. This idea shaped the concept of "student learning preferences." So did the curriculum experiments of the 1930's, which promoted a curriculum designed to meet the future work needs of post-Depression-era students. In following suit, Thorndike encouraged "transfer training" that is, training that could be transferred to real-world workplace environments.

These developments led to the current "constructivist" theory: that "learners are able to construct their own knowledge" with guidance from their teachers. Instead of being passive recipients of information and knowledge, students become more active in the learning process and are placed closer to the center of the instructional experience. The constructivist learning perspective asserts that the learner constructs new knowledge through a process of relating
new information to prior knowledge and experience [7]. According to the constructivist approach, teachers become guides rather than dispensers of knowledge, and instructional practice places more importance on the role of the student in constructing knowledge. Thus, the adult learning theory paradigm has shifted from a teacher-centered towards a learner-centered environment [8, 9].

Constructivist learning theory paves the way to a multi-dimensional view of communication (figure 3). Constructivist practice facilitates reciprocal communication and a more balanced participation between educational participants. Using this approach, teachers can employ collaborative learning techniques that allow students to combine efforts at solving a problem, or in task management. Further, teachers interact with other teachers, as well as with content, to facilitate professional and personal growth (i.e., staff development, conferences, etc.). Finally, "smart" technologies allow one application to interact with other applications (e.g., search engines) to cull data based on specific queries. This content-to-content interaction will become more commonplace and specialized as information management struggles to keep pace with the information explosion.

![Figure 3. Facilitating communication: 3-D View](image)

5. The Influence of Learning Theory on Technology Selection

For practical purposes, we view learning theory as a continuum between instructivism on the one hand, and constructivism on the other. The extent to which teachers see themselves as instructivist versus constructivist, implicitly determines the extent to which classroom activities are based on teacher or student preferences, and guides the selection of instructional technologies. Instructional technology selection is based on the type of communication desired, which in turn is based on one’s predominate learning theory (figure 4).
Figure 4. Selecting Instructional Technologies

An example of an instructivist implementation would be the posting of lecture notes on a course web site for students to read and/or study. Posting lecture notes would facilitate a passive, unidirectional information exchange from teacher to student. On the other hand, a constructivist approach might be to create a threaded discussion site or establish a listserv to facilitate communication and discussions on lecture topics covered in class. This approach is more active and expands communication in a multi-directional manner. Thus, a constructivist approach employs technology to engage the student, facilitate reciprocal communication, and foster an interactive learning environment.

6. Conclusion

In preparing faculty to create and use technology-based educational products for the classroom, a new approach to training is necessary. Technology training for faculty should at the very least include a discussion of learning theory. Instructors should be made aware of the two predominant learning theories (instructivism/constructivism), and should determine to what extent they ascribe to each theory. This process is essential for helping faculty understand the factors that determine the design of instructional activities and the choice of instructional technologies. In conjunction with a discussion of learning theory, instructors should also be aware of student learning styles and how instructional activities relate to and encourage these styles. And finally, an integrated approach to technology training should incorporate both pedagogy and technical skills, and should promote team-based educational product development. This comprehensive approach to technology training and product development will help ensure that faculty are favorably positioned to meet the demands of a changing technological landscape, as well as meet the unique needs and expectations of students in the 21st century.
References


