

The Trends of Technology-assisted Learning

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Abstract: Higher education is facing a broad range of challenges upon entering the new millennium with shifts in technology, paradigms and resources for learning. In response to these challenges, teachers are broadening their range of instructional methods. One area that is seeing increased attention is the provision of instructional support for 'self-accessed' learning. This paper mainly examines the issues and trends of multimedia instructional support. Examples associated with the development of CD-ROMs and interactive web sites are presented to illustrate important considerations for such development. It is hoped that these considerations will result in greater educational support for individualized learning.

Keywords: multimedia technology, self-accessed, student-directed, individualized learning, cooperative learning

1. INTRODUCTION

Over the last 20 years higher educational content has changed so rapidly that content knowledge sometimes becomes outdated before students even graduate. Given this, education needs to respond by shifting focus away from content-based learning to a more pro-active approach that embraces process-based learning. Focusing rather on providing students with creative problem-solving skills, education in the new century will teach students how to adapt to changing situations and to the speed at which these changes occur. Because students are now surrounded with excessive amounts of information, it becomes increasingly important for them to identify the most relevant content and that which most appropriately serves their needs. Further, students at all levels must learn to recognize outdated assumptions and think critically about how to replace them. This transformation of ideology can only occur when students are sensitive to process, adaptable to change and aware of the benefits of information technology.

The need for changing teaching methods has come about partly due to the demands of the workplace and partly because of a general re-assessment of teaching methodologies. Graduates are now expected to be versatile in a world of communications that includes email, Intranet, Internet, conferencing systems and the world-wide web. These same graduates are also expected to apply higher cognitive skills, such as analyzing, summarizing and synthesizing information, as well as engaging in creative and critical thinking. Teaching methods that

assume a single language and shared homogeneity of proficiencies, learning styles, and motivational systems are increasingly inadequate and inappropriate. Teachers who are willing to re-evaluate traditional instructional methods have begun to discover that by broadening their range of teaching to include the use of new technologies, they will produce more effective learners. This re-evaluation has brought about a shift toward 'self-accessed' and 'student-directed' learning. This shift has occurred because of the interactive nature of some of these new technologies. Rather than simply making technology available to students, new learning and teaching is characterized by the introduction of flexible and innovative teaching/learning technology into teaching. What this means is that there is an integration of computer-based interactive multimedia which may include CD-ROMs and the World-wide web as part of the delivery of content. For many, the introduction of new technology suggests a removal of the teacher from the process. With the rise in usage of technology, the role of faculty members is not eliminated; rather, the role simply changes. Teachers will never be replaced by technology. What they will find, however, is that their resource base gets larger and more varied as technology extends itself in a plurality of new directions. As a result of this direction, there are various interactive learning environment elements presently being created and evaluated that extend beyond the bounds of traditional classrooms.

This paper examines the trends of multimedia instructional support. Examples and experiences drawn from personal experience are included to demonstrate the current standing of this new learning approach. The paper begins with a brief overview of trends in multimedia development, including individualized learning, cooperative learning, and assessment. It then focuses on the development of two multimedia formats: CD-ROMs and interactive web sites. Conclusions about the future of technology in education and the creation of increasingly robust learning environments are drawn.

2. TEACHING WITH TECHNOLOGY

Interactive multimedia learning environments have a variety of characteristics that facilitate a shift away from lecture-driven towards self-accessed and student-directed learning. In these environments, students are no longer treated as passive receptors of information; rather, they begin to actively construct, transform and extend their knowledge. The role of faculty alters similarly; instead of making sure students have precisely defined knowledge, teachers now expend their efforts to developing students' competencies and talents. This is accomplished, in part, through recognizing that students possess a wide variety of leaning styles and abilities. In this way, education is a personal transaction among students as well as between faculty and students. Effectively, education becomes defined as working together.

Teaching in this new environment becomes a complex application of theory and research in enhancing student learning through process innovation. Technology, with its multimedia capability, becomes a crucial enabling factor. Perhaps most importantly, it aids in the removal of historical time and space constraints. Learning need no longer occur in only one space and at

one time; learning becomes barrier free. For the first time, students are being challenged with the responsibility and accountability for controlling their own educational discovery process. This, in turn, leads to greater motivation and interest as students determine the pace, direction and content of their learning and are able to match it with their real world needs, desires and expectations.

Multimedia technology provides learners with a rich base, offering students the choice of pathways of learning rather than being restricted to a single mode of delivery. It not only makes content-specific instruction more compelling, but also allows learners to experience realistic simulations for more effective decision-making training (Brookfield, 1990; Fripp, 1994). While interactive teaching is only now gaining popularity and wide implementation, research from as early as the 1970s shows the effectiveness of multisensory stimulation (Strang, 1973; Nasser & McEwen, 1976). The strength of multisensory stimulation lies in its ability to adapt to students' individual differences. Quality interactive multimedia materials respect the learners' capabilities of controlling the learning path by facilitating a plurality of learning styles within one package. Inherent in this mode of learning is the necessity of creating material that is flexible enough to allow the students to determine the pace of learning, the level of difficulty and the style of learning.

Teaching with technology: positive effects

There are many studies demonstrating that when using interactive materials, students not only learn more - more quickly and more enjoyably they learn the much needed life skill of learning how to learn; that is, they begin to take responsibility for their own learning (Lamb, 1992; Sponder & Hilgenfeld, 1993; Jonassen *et al.*, 1999). Davis shows that skills such as effective communication and working well in teams can also be learned with the use of technology-and these are skills that employers are looking for (Davis, 1997).

There are several other positive effects that have been discovered from the use of technology. A study by Morrison & Vogel (1998) demonstrated that the effective use of presentation visuals significantly increases student comprehension and retention, especially those that use color and some degree of animation. The use of technology has also been found to have a positive impact on students' perceptions of teachers. Instructors who use presentation visuals are judged to be better prepared, more concise, more professional, clearer, more credible, and more interesting. Technology can also enable teachers to work together to share material and complement each other's expertise in adding value to education (Alavi *et al.*, 1997). Additionally, technology can enable teachers to link students and classes together as well as actively encourage participation with government and business experts.

By integrating innovative learning technology with lectures, the role of faculty shifts from that of a delivery medium to that of a mentor or facilitator of learning. As such, faculty is responsible for creating a learning environment that accentuates the impact of content and accelerates student learning. There will always be, of course, the need for content expertise for the delineation of material, but these same content experts can find additional employ in the development of instructional interactive multimedia packages. Faculty now finds itself with

the additional responsibility of developing a host of other skills associated with teaching with technology. The range of new skills that can be developed includes those that are technological in nature to some that are more artistic. It would be beneficial for faculty to devote time to the incorporation of a plurality of materials, combining advantages of various media into a unified content. To some, technology accentuates the faster and more efficient involvement of more people to tackle bigger problems with a greater degree of freedom, higher interest level and, ultimately, higher levels of 'buy in'.

3. EDUCATIONAL TRENDS

The educational environment is undergoing rapid change — it is possible that educators will see more change in the next five years than in the past 50. Virtual universities are cropping up around the world and challenging traditional university geographic dominance. Within this rapidly changing environment, a number of trends are emerging.

4. INDIVIDUALIZED LEARNING

Individualized learning is a perspective on education that focuses attention on the ability of students to select the mode of delivery and timing of course material. As such, students can elect to attend class sessions and participate in a face-to-face mode in a traditional fashion, or they can be connected remotely to the class (participating at the same time but at a different location). Another option is to access class session material and recorded video of class lectures and interactions after the class has actually occurred in an on-demand mode. In this fashion, students select the type of learning environment characteristics that best fit their needs and constraints. This flexibility in availability serves a variety of student needs, particularly for those who are at work making it difficult for them to attend class regularly. In addition, individualized learning is ideal for addressing different learning styles and aptitudes of students. Those who require multiple exposures to material, for example, have the option of saving a lecture onto disc and reviewing it off-line without absorbing class time.

5. COOPERATIVE LEARNING

Cooperative learning represents a paradigm shift in thinking that encourages students to learn from each other, not only from the teacher. Cooperative learning tenets include simultaneous interaction, equal participation, positive interdependence, individual accountability, group skills, and reflection (e.g. Johnson & Johnson, 1975). Cooperative learning teaches group and communication skills and is felt to increase job retention, academic achievement, critical thinking and problem-solving skills. It crosses traditional disciplinary and age boundaries in providing an opportunity to add technology in a synergistic fashion, building on an established foundation. A variety of structures can be used within classrooms (or increasingly when

students are distributed at multiple sites) to enhance team building, information exchange, communication skills, mastery and thinking skills (e.g. Kagan, 1994).

6. PARTNERING

Partnering is emerging as institutions recognize that they cannot do everything, realizing the value inherent in sharing resources and complementing distinctive competencies. These partnerships can involve external stakeholders from the business community who may provide resources such as broadband Internet access to homes. The partners may also be other institutions who see value in sharing faculty and material as well as physical resources to offer special programmes. The extent to which partnering is balanced by individual institutional desire to operate autonomously remains to be seen. Numerous examples exist of individual faculty linking students together and sharing content and teaching responsibilities (e.g. Alavi *et al.*, 1997). These partnerships can enable the creation of a rich learning space from which students can develop multicultural appreciation of a broad range of topics.

7. TECHNOLOGY

Technology continues to change dramatically both in capability and availability. For example, students are being offered programmes to enable them to buy laptops and procure software at attractive prices. Software companies are able to create high quality student applications in a short time, thus enabling students and faculty to explore a wide range of interface and application issues. Broadband Internet is becoming increasingly available to provide a platform for sophisticated multimedia interactive applications previously available only on CD-ROM. Software designed for use on the Internet is enabling collaborative learning using groupware and providing access to servers and locations running programs that would be cost prohibitive to most institutions. Internet-based audio and videoconferencing is widely available to complement high quality and high speed multimedia transmission. It is now possible and increasingly achievable to hold panel discussions where panel members are located on different continents. Teams of students from multiple countries can work together across many time zones and experience the reality of multicultural global team interaction.

8. CONCLUSION

Educational environments are changing rapidly as a result of a combination of lack of effectiveness of traditional approaches and the increasingly cost-effective availability of technology to enable alternatives to the traditional approach. Technology is enabling education to become more effective and capable of supporting a wider variety of needs. Individualized and on-demand education programmes are becoming available to meet the needs and desires of an ever-broadening student population no longer bound by time and space. Overall, there is a heightened appreciation of the interaction between technology and educational pursuits.

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