Multimedia: Is it Worth the Effort?

Introduction

It appears that as our rapidly developing society enters the 21st century that we have almost unwittingly stumbled on a journey of social innovation that is likely to have major impact on our world. Is multimedia one of the keys that will open our somewhat stagnant apprenticeship-based educational system, thus providing a link to the future of a networked world in cyberspace, or is multimedia yet another flash in the technological pan that will fizzle as quickly as many of the past 'answers' that have failed to develop into the revolutionary answers that they were purported to be. I suggest that the former is most likely and that multimedia is here to stay, in any number of rapidly developing formats. Thus, future thinkers seem at the forefront of this question as we collectively stand on this precipice of change. Visionaries such as Toffler (1970) and Boyer (1987) have previously urged us to prepare for this necessary and impending change in our increasingly rapid-developing world. As Brandt (1995) suggests, we have already arrived in Toffler's future world and therefore we can now see a glimpse of the future that includes multimedia as we also move on, rather uncertainly, towards a newer future whose main requirements, according to Day, Crump, & Rickly (1996), are conceptual agility and a spirit of adventure. I believe multimedia is our first stop on this new virtual journey!

Multimedia-Effective or Not?

As with a wealth of other educational issues, determining the effectiveness of a particular strategy or methodology is often fraught with conflicting studies or reports that leave one unclear as to the conclusions to be made. However, studies relative to multimedia seem relatively clear to me, although never as conclusive and far-reaching as one might hope for. Although early reports by Van den Berg and Watt (1991) suggested that there was no difference in academic performance for those using multimedia, following reports suggest otherwise. The report by Kulik and Kulik (1991) showed that while 150 of 248 research studies showed no significant effects from computer-supported learning, others showed benefits in terms of fewer error rates and decreased study times and thus produced a „small effect" (Hasebrook 1998). The Software Publishers Association (1995) found in a study of 133 school's instructional technologies that

there were improved test results, greater self-reliance, and closer interactions between teachers and students. Similarly, Boettcher (1993) reports on 101 success stories in higher education and thus supports the summary made by Hasebrook (1998) that multimedia enhances communication, motivation, and self-efficiency.

Meanwhile, the sheer movement to multimedia in schools and on the Internet seems to be unsubstantiated support of its success and usefulness in the worldwide 'classroom'. As Dwyer (1996) states, „Technology, whether we like it or not, is changing the face of the planet. It is changing our notion of who we are as citizens of that planet". Also, Howard Mehlinger (1996) suggests that schools are currently involved in a „quiet revolution" towards technology. A 1997 NCES report indicates that while one third of US two to four-year colleges already provide distance (multimedia) education, another quarter plan to provide such courses within a few years. As Willis (1992) suggests, multimedia also holds great potential relative to the integration of technology as has also been reported by Knowledge Society's success in bringing students and worldwide multimedia resources together. Finally, Wolcott (1997) suggests that there is a greater need for online and virtual (multimedia) universities. Therefore, multimedia appears to be having a major impact worldwide and seems destined to bring us, willingly or otherwise, into a new world envisioned by visionaries such as Toffler and Boyer.

Advantages of Multimedia Learning

Multimedia learning promises a great number of learning advantages while also being fraught with many of Noble's „mad rush" (1996) issues, such as poor planning and lack of proper implementation strategies, that have hampered past efforts aimed at progress in education in general and more specifically within technology education. From the user's constructivist involvement in learning, multimedia fosters more engaging and memorable (Lewis 1993) and motivating learning as compared to past apprenticeship models. As Comenius suggested back in 1658 (Bank Academy) students can benefit from multiple sensory channels. Those who are not predominantly text-based learners can benefit from the multiple forms present, which ultimately can increase learning and retention, when they are appropriately conceived. This may have numerous benefits for students with disabilities or those who are simply not as adept in their ability to utilize one learning style or modality. According to Graziadei (1996), multimedia learning provides users with the opportunity to study at their own pace, to gather information as they wish and in the sequence that they prefer to. Immediate feedback can also be provided to

encourage further study or a new focus for the learner. Therefore, a more engaging and individualized learning environment can be envisioned which would support more meaningful learning. Schools around the world, such as Woolley's (1998) efforts in Thailand are experiencing success with the use of multimedia as it supports the notion Dewey raised that the greatest educational resource is our „natural impulse to explore and inquire" (Bruce and Levin 1997).

In terms of sheer learning potential, multimedia works provide opportunities to access a wealth of various media forms and information. Links within hypermedia and hypertext components can supply users with immediate access to related and supporting learning opportunities, whether on site or via the Internet. No longer does one need to simply view a list of references and then tediously look through a library for books that may or may not be available there. As a result, students can be more active in their personal searches for the answers and learning that is suited to them. As Lemke (1993) suggests, this „ease of operation" and access is most revolutionary in that it potentially can make profoundly positive changes to learning for many.

From a more global standpoint, multimedia projects involving the Internet provide a wealth of learning opportunities that are only beginning to be tapped (NCES 1997). As December (1996) details, Internet-based multimedia learning provides tremendous global learning opportunities in terms of communication and idea exchange, collaborative efforts across cultures and national boundaries, immediate and extensive information sharing, forums supporting the greater development of particular fields of study, and immediate connections to events, learning and insights from around the globe. Thus, global multimedia learning, such as this current course OMDE 605, provides extensive opportunities to benefit learners beyond that which is typically available in a traditional setting.

Disadvantages of Multimedia Learning

Of course, I would be inaccurate if I were only to highlight the benefits of multimedia learning without also focusing on the negative issues at hand. From my view as an educator, perhaps the most distressing problem limiting the successful pedagogical implementation of multimedia is the simple fact that traditional structures have long had a history of putting up barriers to such innovations (Graziadei 1996). My limited experiences suggest that the prominent method of teaching is currently based on the old delivery model of education, one that is not in

line with Dewey's investigative model of learning. In many, if not most cases, teacher's have learned, trained and worked in this model and thus a major paradigm shift is required to move educators to more of a multimedia-rich, constructivist model of learning. Additionally, our typical curricular education (Lemke 1996) serves to preset the learning required and often encourage teachers to deliver the „fill-them-up" model of learning where students enter and are filled with information or ''learning" by the teacher. Thus, while quality materials may be available, teachers may still choose to remain with their traditional methods and reject the new opportunities or at least only pay them unsatisfactory service. Other aspects of education are so print orientated (Day et. al. 1996) that the movement to multimedia is seen as threatening by some. Harrison and Stephen (1996) also note this tension between old and new. Additionally, Cherry (1985) suggests that many of us are not well suited to developing a vision of technology and thus multimedia's ultimate uses. As a result many of us are seemingly fumbling around looking for clear directions or at times we are being led by commercial enterprises that may necessarily not have our best interests at heart. However, the veil of change may be lifting and as technology continues to move ahead in greater society, regardless of the dragging feet of education, the metaversities referred to by Roush (1993) are apparently already appearing.

Additional issues facing the implementation and effective use of multimedia resources and learning revolve around issues of technology. As Lemke (1996) notes, the „lack of standardization still stands in the way" of multimedia truly becoming an effective and integral component within learning. Additionally, the proliferation of computers and technological companies over the past years, in even just one country never mind the entire world, has resulted in a diverse range of protocols and technological challenges that face global multimedia sharing and use. Costs are another major factor which limit some institutions and various groups in the world, as this is really a rich-persons' world of technology at the moment. While there are potential cost savings, such as from the decreased need for print, shipping and inventory of texts in the world of texts, the fact remains that one must first have a reasonable computer budget to begin enjoying such benefits. Clearly, not all in the world are on equal footing here. In addition, one must be conscious of each potential user's computing power or at least a base minimum when designing a project. Obviously, it would not be useful to develop a state of the art project that none of the users could adequately access. As with many new developments, much of the initial work and products in multimedia learning have been of poor quality to date, as has been witnessed with the initial CD-ROM attempts that first appeared quite revolutionary and later were

deemed failures to various degrees. Finally, while there is a wealth of information on the Internet, not all fields of study are equally represented and we are years away from even most of the media being digitized for multimedia uses. Even if we optimistically consider that much of our future media will be published in some digitized form, considerable time, effort, and resources would be needed to convert all past media into that form.

Specific pedagogical issues affecting the effectiveness of multimedia also exist. According to the Bank Academy web site *(2001)*, due to the speed at which current screens refresh and display text, it is reported that there is a 10-20% slower reading rate of text on computer screens. Additionally, this site suggests that there are 10-20% greater errors in the reading of text from the digital page. Clearly there are some current issues with multimedia learning here. It is also suggested that much of what we see and hear is forgotten and thus multimedia must improve on the individual senses and evoke multiple senses to gain greater learning. However, one can not assume that more media will mean better learning. Subsequently, we must at least be cautious and purposeful in our future endeavors to improve learning via multiple media formats. We must also look for and seek out clear proof from future multimedia studies which carefully document evidence of greater learning and therefore not accept all that is initially proposed as fact.

Basic Guidelines for the Use of Multimedia in Distance Education

As we consider guidelines relative to the use and the effective use of multimedia in distance education, we must reflect on the purpose and goal of education and how multimedia will support or improve this effort. We must not move ahead with new technologies at the expense of becoming technopolists, as Postman (1993) suggested, rather we must seek ways that these new tools can enhance our learning goals. The purpose of multimedia should be to bring greater learning to the user in their distance situation. One way to achieve this is to ensure that the project is designed appropriately. Thus, I refer to the design principals laid out by the International Engineering Consortium (2001).

A quality multimedia project must pay particular attention to the design interface and the suitability of the various media included. In designing a quality human-machine interface system, The International Engineering Consortium (2001) suggests five main categories to focus on, characteristics that also seem suitable in terms of the usability of multimedia projects. They suggest that the project have a high degree of learnability such that users be able to easily master

and use a site. Secondly, they recommend that the media be highly efficient and productive for the user. Thirdly, they propose that the product and screens be memorable such that the system's controls be easily reused as the learner revisits a site or area. Fourthly, they recommend a low error rate, whether these are system errors or user input errors. Finally, they counsel that the site be satisfying to use and that this be achieved through a combination of the four points above as well as through appropriate colors and motivational aspects. In addition, the Bank Academy (2001) web site recommends careful attention to the connected use of media in order to ensure that the components are not conflicting or competing with each other for the user's attention and memory. Appropriate decisions must also be made about the suitability of pictures, schematics, animations, and video as each has unique qualities, such as their ability to accurately represent particular concepts, which make them more or less suited to various learning needs. The goal is for the various media to support one another, to aid memory retention or possibly to least free memory for other learning, and ultimately to promote greater learning than would have been achieved individually. Without these factors of usability and supportive media formats properly accounted for, the product will be inferior and the user will quickly becoming frustrated or disinterested with the material. The result of such oversights will be that suitable levels of learning will not be achieved.

In addition to specific features that will aid the usability of the project, the International Engineering Consortium (2001) goes on further to highlight three aspects of design which must be followed to be successful in designing human-machine interface systems. The three design principles are to „know your users, involve users early and continuously, and rapid and frequent iteration towards measurable usability targets. A user-centered approach assumes that although people vary widely, they all have particular needs that must be met". The multimedia distance learning component must meet users' needs and must work with the user to achieve their goals, rather than simply providing media to the learner. As the component is being designed, developers must ensure that it is examined to determine areas of strength and need so that future modifications can be made to ensure final success. Additionally, the media must be suitable to a wide range of students rather than only meet the needs of a few. Without this careful attention to detail, during the development of a multimedia project, it is highly likely that the project will result in one more of the number of poorly developed projects already on the market.

In terms of pedagogy, there are a number of additional factors that must be considered when developing multimedia educational programs. These factors provide what I feel are the real

links between the technology, the interface needed to run the program, and the users' needs. While the items above may ensure a quality product, the following items are critical for ensuring a truly interactive and engaging multimedia environment. In conjunction with the above-mentioned points, a truly effective project must be engaging to the user. It must provide them with learning pathways to select and options that Lemke (1996) suggests should vary. These should allow users to interact individually while not being so complex that users are lost in the programming architecture. Ultimately, these future programs will be guides to the users and intimately aware of their abilities and needs so that they can actively support Boyer's (1987) notion of active, critical, independent, problem solvers who experience new learning experiences in an engaging manner. This concept is further supported by Cronbach and Snow's theory of aptitude-treatment interaction (1977) in that user's abilities and aptitudes must match the teaching methodologies selected or made available. Additionally, attention must be paid to communication possibilities that a user may be able to access. This might include other students or instructors such that a greater sharing and discussion of ideas occurs, leading to greater learning, across cultures and various boundaries. A final component of a quality multimedia learning project would be quality instruction, including guidance from the multimedia resource aimed at assisting the user to understand the use of the program components, as well as supportive feedback and guidance from the instructor aimed at encouraging the user to delve deeper into their personal questions and the construction of knowledge (Romeis 2001).

General Conclusion

Multimedia: Is it worth the effort? To me it appears that we are already living in Toffler's future and that both multimedia and technology have rapidly arrived here with us. To me it seems akin to asking if the cellular phone is a useful part of our lives or not. However true this premise may be, it is clear that there are many questions yet unanswered. We are not certain of all that will come and we are not clear on how effectively the paradigm shift in education will occur, or even if it will. Will education merely pay lip service to multimedia education or will it really be utilized to reach students of all ages, so that education truly becomes as active and engaging as Boyer (1977) envisioned? The road to the future is unclear and thus we must move ahead with a clear vision of what learners need for quality education while being flexible enough to change our vision as the future passes beneath our feet. Thus, let us move to what we do know now, such as, what is multimedia?

Multimedia generally refers to a computer-based method of presenting different types of sensory media, such as text, sound, video, computer graphics, and animation. Interactive multimedia integrate computer, memory storage, digital (binary) data, telephone, television, and other information technologies. Their most common applications include training programs, video games, electronic encyclopedias, and travel guides. Interactive multimedia shift the user's role from observer to participant (Auer, Benger, Coll, & Hillier, 2001). In addition, I appreciate Kozma's (1994) inclusion of the concept that the sensory information can also be „actively influenced by the user,“ thus providing a two-way interaction of information rather than the common one-way media streams that we have already shown fail to teach effectively.

We must take advantage of the benefits of multimedia while being active participants in the construction of our collective new vision of education. Multimedia holds the promise of providing multiple-sensory learning that can be adapted to meet the needs of individual students, including those with various disabilities. The future of multimedia may include the promise of VR in which we will be able to enter educational worlds and learn from a 360-degree learning environment as discussed by Lemke (1996). In order to achieve this vision, we must be active participants in the construct of the paradigm shift in education that will move us away from our current, traditional models and towards these new visions. Meanwhile, we must be active in the development of suitable multimedia projects that users need and want rather than simply accepting those that are sold to us as new technologies. Additionally, we must educate our students and ourselves in order to be capable in utilizing existing and future multimedia to its fullest potential.

While working to maximize our gains from the benefits from multimedia we must also be cognizant of the pitfalls of these same packages. We must prepare our organizations and ourselves for change and the subsequent tensions that this will create for many, particularly those that are more adverse to technology. Our educational system has long been focused on a particular model and we must all recognize that change is not equally easy for everyone. However, we can be proactive in our development of programs to foster greater understanding and learning for all interested parties. We should also educate ourselves relative to the new technologies so that we can make informed decisions that will benefit our schools and ourselves personally, while being cautious not to jump onto another misguided educational bandwagon. Finally, educators must encourage developers to not create glitzy, multimedia versions of old

material by collectively making informed purchases that will hopefully encourage further growth in appropriate fields of multimedia development.

Multimedia learning of the future holds a promise for a broad spectrum of educational settings in my mind. At this early stage, however, it appears that multimedia projects are best suited to older learners and subject areas that predominantly deal with more concrete fields of study such as the sciences and some of the humanities. More abstract areas of study that would not benefit from the inclusion of multiple media forms, as these are likely to be conflicting rather than supportive in nature, should be left for future endeavors following our effective use of multimedia in areas most conducive to these learning methods. More abstract topics, such as discrete mathematics and the arts, seem less suited to multimedia although as a math teacher I can see benefit from multimedia representations of at least some of the concepts currently being covered. My sense is that we are somewhat limited by our weak visions that are based on current realities and thus we can not properly envision the full impact that multimedia might have. This brings to mind the story of some of the early computer developers and how some envisioned the perfect home computer as one that would be considered a terribly inadequate. Thus, even some of our visionaries can not envision effectively in this world of exponential development and where does that leave the rest of us? Additionally, ATI research (Snow 1989) suggests that well defined or structured learning is best suited for low achieving students while low structure environments support high ability students. This suggests that there are a wide rang of learning possibilities assuming one carefully follows appropriate design and pedagogical issues, including those previously raised in this paper.

I look forward to the future and the unfolding of the multimedia puzzle that many have tried to envision. I foresee engaged students working interactively and constructively on a variety of subject areas with support from their guiding teacher. In my limited vision, the teacher's purpose will not be to merely provide information but they will facilitate the learning and thinking skills that the learner must develop in order to be lifelong learner in this rapidly expanding and specializing world of ours. I imagine students from around the world sharing and learning from each other, along with teachers who specialize and share their expertise to other worldwide sites. As Cairney (1997) suggests, our youth are already growing up in a multimedia world and thus it is all very natural and an accepted part of their daily play or learning. It is likely that they will determine the future of multimedia for us, based on their greater integration with it as youth. We must begin the process for them, however badly we might fail in the attempt. So, is

multimedia worth it? Most certainly! I think it is already being successfully utilized and that it will only become of greater use and importance in the near future!

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