For Effective Use of Multimedia in Education, Teachers Must Develop their Own Educational Multimedia Applications

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ABSTRACT
This paper makes the strong claim that for multimedia to have any significant effect on education, the educational multimedia applications must be designed by the teachers of those classes. The arguments supporting this claim are presented in the headlines: curriculum, software, hardware and evaluation. The paper begins with an introduction discusses what is a multimedia and a multimedia authoring tools and describes some typical areas of multimedia application development. Finally the paper ends with the action plan and concludes that we must and need as educator to create our own multimedia applications if we really want to make use of the multimedia applications as an effective tool in education.
Keywords: Education, Learning, Multimedia applications, Software, authoring tools

INTRODUCTION
Since educators first began to use computers in the classroom, researchers have tried to evaluate whether the use of educational technology has a significant and reliable impact on student achievement (Clark, 1994; Kozma, 1994; Tennyson, 1994). Searching for an answer, researchers have realized that technology cannot be treated as a single independent variable, and that student achievement is gauged not only by how well students perform on standardized tests but also by students' ability to use higher-order thinking skills such as: thinking critically, analyzing, making inferences, and solving problems (Means, Blando, Olson, Middleton, Morocco, Remz, & Zorfass, 1993). Judging the impact of any particular technology requires an understanding of how it is used in the classroom and what learning goals are held by the educators involved, knowledge about the type of assessments that are used to evaluate improvements in student achievement, and an awareness of the complex nature of change in the school environment. Whether technology should be used in schools is no longer the issue in education. Instead, the current emphasis is ensuring that technology is used effectively to create new opportunities for learning and to promote student achievement. Educational technology is not, and never will be, transformative on its own, however. It requires the assistance of educators who integrate technology into the curriculum, align it with student learning goals, and use it for engaged learning projects (Carlson 2002). Darling-Hammond and Berry (2005) suggest that "For widespread change to occur, teachers need to incorporate the opportunities of the emerging technological infrastructure into their overall curricular thinking"(P.199). The role of the classroom teacher is the crucial factor in the full development and use of technology in the schools (Trotter, 1999).

When educators use the accumulating knowledge regarding the circumstances under which technology supports the broad definition of student achievement, they will be able to make informed choices about what technologies will best meet the particular needs of specific schools or districts. They also will be able to ensure that teachers, parents, students, and community members understand what role technology is playing in a school or district and how its impact is being evaluated. Finally, they will be able to justify the investments being made in technology.

MULTIMEDIA
According to (Sethi, 2005); (Mayer, 2001) Multimedia refers to the integration of two or more different information media within a computer system. These media can include text, images, audio, video, and animation. Vaughan (2011) defined multimedia as a combination of digitally manipulated text, photographs, graphic art, sound, animation, and video elements.

In this context multimedia can be thought of as a combination of text, graphics, sound, animation and video delivered by some form of computer. When the user has some control of what is presented it becomes interactive multimedia. Multimedia does not have to be interactive, for example a tutorial may just involve the student pressing enter to go on to the next screen in a linear fashion. The tutorial would become interactive if the student affects the tutorial, for example if their answer to a question determined which screen came up next (Vaughan 2011).

Before producing any application you should be very clear about why you wish to produce it and what you expect to gain from it. Spend time finding out what other courseware is already available in your subject area. There may be suitable courseware already available or similar courseware may be available that you can modify. Modifying an existing program or using a tutorial shell will greatly reduce the programming effort required, and may provide you with a good quality user interface that has already been through a testing and evaluation cycle with students.

MULTIMEDIA AUTHORING TOOLS

Any software, or collection of software components, that authors can use to create or modify multimedia content for use by other people, is a multimedia authoring tools (Sethi, 2005). Vaughan (2011) defines authoring tools as "These software tools are designed to manage individual multimedia elements and provide user interaction" (Vaughan 2011, p.2). In the development of educational software, an authoring system is a program that allows a non-programmer to easily create software with programming features. The programming features are built in but hidden behind buttons and other tools, so the author does not need to know how to program. Generally authoring systems provide lots of graphics, interaction, and other tools educational software needs. Sethi (2005) classified in three categories based on the metaphor used for sequencing or organizing multimedia elements and events.

1. Card or page based tools
2. Icon base, event driven tools
3. Time base and presentation tools

Depending on the educational multimedia application which is to be developed, what information is to be conveyed, who the audience will be, and how much interaction there will be between the application and the user, an appropriate tool can be chosen. Educational multimedia applications can be subdivided into four typical educational multimedia application areas:

- Text-Based applications
- Interactive applications
- Web applications
- Mobile (Smart) phones applications

Text-Based Applications
Many multimedia applications provide efficient navigation through a large resource of primarily text-based information. These applications need to be searchable so that relevant information can be found easily and quickly. Development tools, which cater to this type of application generally, provide hypertext capabilities. Hypertext is similar to regular text, except that it contains information pointing to another point in an application. Microsoft Windows Help is an example of a hypertext, searching program. Some form of an overview, table of contents, or map of the information available in such an application helps the user to navigate efficiently. These applications can also often handle embedded images, sounds, and movies, which make them true educational multimedia applications.

There are specific tools which provide good development environments for text-intensive applications. Microsoft's Multimedia Viewer is a sophisticated information viewer with multimedia, hypertext, and sophisticated search capabilities. Adobe Acrobat is another text-based package which is hypertext-capable, but has limited search capabilities. Both of these packages provide an overview of the content, to guide the reader through the maze of information, and allow importing existing word processor documents. All multimedia applications are capable of storing text and moving through quantities of it, but some tools are specifically designed to work more efficiently with large volumes of it.

Interactive Applications
The majority of educational multimedia applications fall into the category of interactive, graphical applications. These applications are fully capable multimedia tools which can handle all media formats, as well as providing interactivity with the user. It is also offer a very high level language or interpreted scripting environment for navigation control and for enabling user inputs This is often desirable in an education setting as it provides the ability to allow specific feedback to a user, keep track of results, and customize the application to a specific user as a function of responses. Although most applications provide these capabilities, some are better suited to complicated, interactive applications than others.

Authoring tools, which cater to this type of application generally, included programing future, commands and functions provided in the scripting language. IconAuthor from AimTech Corporation, Macromedia Director, Macromedia Flash from Macromedia, the Apple Media Tool Programming Environment from Apple, and

Course Builder from Discovery Systems are professional-quality, sophisticated multimedia packages, but are also quite expensive. Development packages like SumTotal Systems Multimedia ToolBook, and Claris Corp's Hypercard are very capable development tools which cost significantly less. The goals of the multimedia project must provide the specific criteria for choosing between several development tool alternatives. This often requires first-hand experience with the development environment to assess the tool's capabilities and example applications

Web Applications

A new area of educational multimedia applications is emerging with the purpose of providing information to an audience over a wide geographical area. This is in part being made possible via the Internet in conjunction with new content management system (CMS). These systems compose an information distribution system providing services to 10-20 million people from commercial and academic organizations. Browsers are capable of retrieving information from all over the world via the Internet in the form of text, graphics, sounds, and movies.

One of the important capabilities of the CMS is its support of hypertext, which allows users to maneuver quickly from one page to another with the click of a button. There is an enormous wealth of information available on the Internet, and contributing to this body of information is, in essence, providing multimedia access to information. One of the serious drawbacks of this web technology is its lack of organization. There is a tremendous amount of information available, but finding information you are interested in can be difficult. If a multimedia application is to be implemented with a geographically diverse, academic audience as its recipients, this technology is very suitable.

Information is made accessible on the World Wide Web using a mark-up language called HTML (Hyper Text Markup Language). This language provides the common protocol for providing rich-formatted text, embedded graphics, sounds, movies, and hypertext. More recently there has been the development of image map, and forms fill-out technology. Image mapping allows selected regions on an image to contain link which, when clicked, take the user to another document. The fill-out forms function allows user feedback through fields, buttons, and drop-down menus. This information is relayed to the originating server where it is subsequently processed. To provide documents on the Internet with these capabilities requires setting up a World Wide Web server, and composing documents in HTML. One of the tremendous benefits of this system is that a user can gather information free of charge, as long as Internet access exists. The cost to the information provider is the hardware cost of the server itself, and the time devoted to creating and updating HTML documents. This is quickly becoming the standard method for providing many types of information to a wide-area audience.

Mobile (Smart) phones Applications

Gale research group define mobile phone as an electronic telecommunications device that can make and receive telephone calls. It connects to a wireless communications network through radio wave or satellite transmissions (Gale Research, 2008, p. 658). Nowadays, in addition to telephony, mobile phones support a wide variety of other services, such as text messaging, MMS, email, Internet access, short-range wireless communications (infrared, Bluetooth), multimedia applications, gaming and photography. Mobile phones are also used to play all types of multimedia, e.g. play sounds, view images and watch videos. Mobile phones that offer these and more general computing capabilities are called smart phones. Mobile Applications are the software that runs on a mobile device and performs certain tasks for the user of the mobile phone. Applications may include Games, Web Browser, Camera, Media Player, Social Networks, Calendar, Calculator, Image Viewer, etc.

There are many Mobile multimedia authoring tool enables non-programmers to build and to create educational multimedia presentations for the different handset devices: Nokia, Samsung, LG, RIM and Apple devices (iPhone/iPad).

Emantras, a company that develops online and mobile educational tools, has officially launched Mobl21, a platform for creating, managing and distributing educational content to the web and mobile devices. Mobl21 is an educational application created to facilitate mobile learning by complementing current learning methods. Available as a mobile app, desktop widget or web application, Mobl21 provides users with access to customizable learning material, which can be accessed anywhere. Mobl21 targets individual students and teachers, as well as institutions like colleges and universities. Each account allows users to create educational content like study guides, flash cards or quizzes, then manage the content to specific groups and, finally, publish it to mobile devices or social networks. Another example of a Mobile multimedia authoring tool is Wapple Canvas. It is a design and publishing platform, enabling the development of highly functional, creative and scalable educational mobile websites.

WHY DO WE NEED TO CREATE OUR OWN MULTIMEDIA APPLICATIONS?

For most of us working at small educational institutions (Schools, colleges, educational centers) where resources are few, money is scarce, time is limited, and professional multimedia developer team is virtually an impossible feat. "The development of educational multimedia inevitably requires the commitment of substantial amounts of time and money. Both are typically in short supply in educational institutions." Albion (1999, p.9).

In the absence of a limited number of skilled team members, we have to make a decision: should we dismiss designing multimedia applications altogether, or should we undertake the difficult challenge of acquiring some of the basic multimedia skills. Research has shown that Different students learn better in different ways; there are visual learners, tactile learners, and auditory learners. Also, different subjects and topics are often more understandable when taught in different ways. The use of several media of instruction facilitates the movement of information from short-term memory into long-term memory (Pashler, McDaniel, Rohrer, Bjork, 2008). Some students do well with the tried and true method of direct instruction, but the majority of students do not. To reach the majority of students, the teacher needs to create a variety of learning experiences. Thomas B. Corcoran (1995) puts it this way "To meet these new expectations, teachers need to deepen their content knowledge and learn new methods of teaching. They need more time to work with colleagues, to critically examine the new standards being proposed, and to revise curriculum. They need opportunities to develop, master and reflect on new approaches to working with children "(p.2).

The first and most simplistic way is to use technology and multimedia applications to supplement classroom instruction. Technology and multimedia applications will help meet these demands is by allowing students to interact with information within a different medium. An educator involved in multimedia applications development faces two significant problems. The first is why we need to use and create multimedia applications? And the second involves how can we design multimedia applications? I should say right away that I will not be discussing this second problem here. The strong claim of this paper is that for multimedia to have any significant effect on education, the material taught must be designed by the teachers teaching these classes. The arguments supporting this claim are presented below.

Curriculum

The first and most obvious issue for creative work in multimedia is how to integrate such work into the present structure of the national curriculum.

According to Bloom's Taxonomy, as children move through the hierarchy of learning, their studies should progressively move towards developing higher level thinking skills (Anderson, Krathwohl, David, 2001).

According to Andresen & Brink (2013) Multimedia applications can facilitate this process when integrated within the existing curriculum. The days of spending hours mulling through over a dozen hard-copy books looking for information for a research project are left behind our day. With Multimedia applications, students can shift their focus from acquiring information to the task of hand - synthesis, analysis and presentation of information. Both roles of the teacher and student have changed dramatically over the last 25 years. In the traditional model of education, the teacher was responsible for disseminating information to students. The students' primary responsibility was to consume and retain as many of the facts and figures as they could. "Teachers get new competencies and new roles in a multimedia-learning environment. Besides having a broad knowledge base, teachers have to offer pedagogical guidance and supervision by inspiring, motivating and guiding students in their search for knowledge "(Andresen & Brink , 2013, p.13).

The most successful students were those who could memorize and regurgitate information in a variety of format writing papers, oral reports and tests. However, we have recently discovered that these types of skills do not always prepare our students for their professional lives. For a student to be successful in today's job market, they must be able to assess and analyze information, not merely memorize. Businesses are looking for independent thinkers, not mindless robots. Educational Multimedia applications are not, and will never be, transformative on their own. It requires the assistance of educators who integrate Multimedia applications into the curriculum, align it with student learning goals, and use it for engaged learning projects. As instructors, we must realize this fact and adjust our curriculum accordingly.

Software

One barrier to multimedia integration is the difficulty many teachers face in finding and using appropriate software for instruction (Glenn, 1997). Teachers at novice or apprenticeship stages of technology integration may need guidance in locating multimedia software and Internet sites to support the school's learning goals, either because they are unfamiliar with these media or because they feel overwhelmed by the profusion of

software on the market and sites on the Internet. Teachers may lack some personal skills and time to make good decisions about what particular applications or sites have the potential of reinforcement the learning goals. (Glenn, 1997). This can make multimedia integration a frightening prospect.

According to (Glenn, 1997) Finding and using the right software or courseware for instruction is a difficult task. The number of high-quality multimedia applications has increased, and there is a wider variety; however, it requires an understanding of how it is used in the classroom and what learning goals are held by the educators involved. Whether educational multimedia should be used in schools is no longer the issue in education. Instead, the current emphasis is ensuring that multimedia is used effectively to create new opportunities for learning and to promote student achievement. There are numerous multimedia applications designed to meet the special needs of diverse learners, but most of the commercial educational multimedia applications until now don't easily lend themselves to a constructivist approach. The layered design frameworks proposed by Taylor (1997) argue that:

> Most user, multimedia designer, and educators would agree that all the multimedia applications in the market represent very difficult types of applications. However, most people would probably have a difficult time cogently explaining why they are different and, more importantly, the implications of these differences both for effective use and for future design practice." (Taylor, 1997, p. 215).

How can we decide which applications are appropriate for a specific group of learners?

Another problem is that commercially available software is owned by PC manufacturers or its distributors and is protected by Countries copyright laws and international treaty provisions. Most software licenses specify that the original purchaser of a software program may make one archival copy solely for back-up purposes. It is illegal to make extra copies of a program for use by students or other teachers within a school or district, unless specific written permission from the publisher or copyright holder is obtained. Most of the education institutions have limited fun to purchase such software In order to promote ethical use of educational software; educational institutions need to develop there owns educational software.

Evaluation
In the interests of ensuring that resources are used to best effect it is important to ensure that both the processes and products of multimedia development are evaluated (Albion 1999). Researchers (Draper 1996, M. Kennedy & McNaught 1997) have indicated that a formative, iterative design process, which involves students, produces more useable and effective IMM. Draper (1996) argued that, one important use of evaluation is while it is being developed: testing it on learners while there is a still resource for modifying it. He points out that "The most realistic, and so most helpful, formative evaluation would use real students in their normal learning situation" (p. 61). It is in general best to base evaluation on actual learning by representative students who really want to learn". He also points out that formative evaluation increase the time for the whole cycle of production, testing, and modification. Most of the commercial multimedia applications depend on the summative evaluation, and that evaluation is not expected to have any direct effect on the applications itself by telling the authors how to improve it. This is not the case with multimedia developed by a teacher.

Hardware
There are several educational multimedia applications for all the computing platforms (Windows - PC, Macintosh, and UNIX.) Generally it is best if the application is created on the same platform it will be used on. This eliminates problems, which tend to arise during the conversion of applications from one platform to another. Some multimedia developers provide software for several different platforms. The ability for multimedia applications to be transferred to a different platform varies. With some tools this function can be performed automatically, while with others, an additional piece of conversion software is required. Of course a more costly and capable machine is required. From this perspective the key IMM investment is not in equipment, but in the knowledge and skills of staff to make use of what is available. (Vaughan 2011)

Several financial decisions need to be made concerning the computer system, and extra hardware needed to produce a multimedia project. The hardware requirements of the computer system being used for development will be determined by the sophistication of the application being developed. If the full range of multimedia types (images, sounds, animations, and movies) are to be included, a more costly and capable machine is required. On the other hand, projects which provide exclusively text-based information can be implemented on a system requiring fewer extras, and therefore will be less expensive. I absolutely agree with Fred Riley (1995) when he stated that:

This is particularly the case in the academic sector where the provision of microcomputers for staff and students is a significant item of expenditure and one, which the institution is not likely to want to repeat every 2 or 3 years. For this reason courseware developers should think very carefully about which multimedia elements to incorporate into applications and only include those which have significant value. (Riley, 1995, p. 6).

ACTION PLAN

The educational institutions staff, administrators, teachers, and parents and community members can take the following steps to promote developing educational multimedia applications within the academic community at educational institutions:

- Professional development for technology use should be an integral part of the school technology plan.
- Initial inclusion in the technology plan ensures that professional development is considered an essential factor in using technology to improve teaching and learning.
- The multimedia development effort on educational institutions should be consolidated and organized to increase the efficiency with which applications can be developed, and to share technical and artistic knowledge among staff members and students.
- Staff members should be made aware of the capabilities of multimedia tools within the learning environment and should be encouraged to use them, and guided in their use.
- Staff members should be educated on the importance of selecting an appropriate multimedia development tool, the challenge of incorporating various media into a production, and the balance, which is necessary between the content, presentation, and programming of an application.
- Communication between academic institutions should be improved to facilitate the sharing of multimedia applications, which have been and are being developed, to avoid repetition of application creation, and to distribute computer-based learning knowledge more widely.
- Educational institutions should find additional financial resources.

CONCLUSION

Educational institutions must recognize that the world has changed. Educators and students have needs that our current delivery system is not meeting. We face financial constraints that will not quickly disappear, as well as both global and private competition. Doing more of what we are currently doing will not solve these problems. To survive these challenges, we must find new ways to deliver education to our students. Developing our own multimedia applications can contribute to solving some of these problems, if we really want to make use of multimedia applications as an effective tool to enhance learning.

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