Int. J. Engng Ed. Vol. 8, No. 2, pp. 89–91, 1992
Printed in Great Britain.

0742-0269/91 $3.00+0.00

Is a Revolution in the Classroom Coming?

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INTRODUCTION

COMPUTER-AIDED learning has been around for some time. In the 1960s attempts to introduce computers for classroom teaching evaporated when limited 8-bit technology, insufficient authoring capabilities, lack of graphics, and absence of effective interaction with the computer became apparent. Computers have come back into the classroom in the 1980s, exemplified in electrical engineering education by the SPICE circuit simulation program. The advent of computergraphics, spreadsheets, expanded memories and faster responses generated a host of simulation software useful in higher education [1]. Yet the use of the computer had not penetrated into the classroom to any large extent, and initial disappointment with the cost effectiveness of the delivery of education via the computer had quieted the enthusiasm to go any further with systems such as the PLATO derivative TENCORE as an applications authoring system for education. There are however some signs that the situation may be rapidly changing. The increased power of personal computers, and the advent of multimedia and of hypertext are responsible for this transformation.

WHY IS THE ADVENT OF THESE TOOLS AND MEDIA GOING TO MAKE A DIFFERENCE?

The proliferation of television as a factor, especially a time factor in the development of every child, has influenced our capabilities to digest information transmitted to us. We are used to fast-moving information clips via images. Students are impatient with long abstract discourses without tangible visual or kinetic presentations. We have become used to being entertained, much of the time passively. Books have been around for 500 years, while the change from paper to total image immersion has happened in the past 30 years. We are now facing the danger of entertaining ourselves to death, according to Neil Postman [3]. The classroom with the traditional chalk and blackboard presentation fails in the face of the emerging presentation prospects. CAD is replacing drafting. Complex mapping graphics replace endless tables. The possibility of text, graphics, images, animations, and audio now make the computer an efficient complementary tool situated between text and video. The key value added here is that these so-called multimedia are interactive. This implies that it is not just like a movie or a presentation, but you may have to involve yourself in order to continue the show. More than that, with the combination of multimedia and hypertext you may also test yourself; you may jump to any other section; or you may have another language on screen by the touch of a button. You may also add a database, a simulation, or a graphical presentation of your calculation on the screen. The classroom can come alive by delving into a database with multimedia materials for a lecture. Away from the classroom, the students may acquire expertise and knowledge at their own pace.

BUT WHY HAS ALL THIS NOT BEEN POSSIBLE BEFORE AND WHAT WILL BE POSSIBLE?

Hindrances to the involvement of interactive multimedia in education were the small storage capacities, the slowness, the lack of graphic capabilities and the absence of video on computers. The large storage capacities are essential for the inclusion of audio and moving colour images. This storage capacity needs to be further enhanced to include digital video. The advent of image compression makes it possible to compress image storage by a factor of 100. Consequently there may be 70 minutes of video on 600 Megabytes of storage. This storage capacity is that of a 5.25″ compact disc. It is quite likely that this size of disc is destined to become the standard 'letter size' for the physical delivery or transportation of multimedia materials. But in addition to this letter novelty, carrier innovations are also emerging. Telecommunications are also evolving into data delivery systems that will revolutionize communications. Current slow transmission speeds of 2400 Bauds are soon to be superseded and we are moving

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towards many thousands of millions of bauds. This communications development leads us to the transmission of large strings of data images [4]. Therefore immense storage vaults of instructional data can be transmitted from a remote host computer to a classroom. The teacher will need to employ new tools to keep up. Efficiency of delivery, and testing in education, will determine who will retain or gain technological mastery. A further great advance has been made in recent developments of authoring tools. With the advent of hypertext tools, initially for the Macintosh but also increasingly for the IBM line, authoring of multimedia interactive materials is fast becoming an easy task for everyone. We are moving towards the time when writing a multimedia textbook will be relegated to the subject matter expert just as writing a paper textbook has been up to now. Furthermore, authoring the book practically includes setting it directly for publication. So as the tools come down in price it will be cheaper to publish a multimedia electronics text than it ever has been to write and publish a paper-based text. We are in fact on the verge of an explosive new publishing industry. The trend is exemplified by the recent commercial agreements to launch large-scale electronic publishing on CD-I, the Philips interactive compact disc which will be available for consumer use. The delivery platforms are destined to come down to prices of ordinary home entertainment, and the days of loaded shelves of multimedia discs in every home may not be too far away.

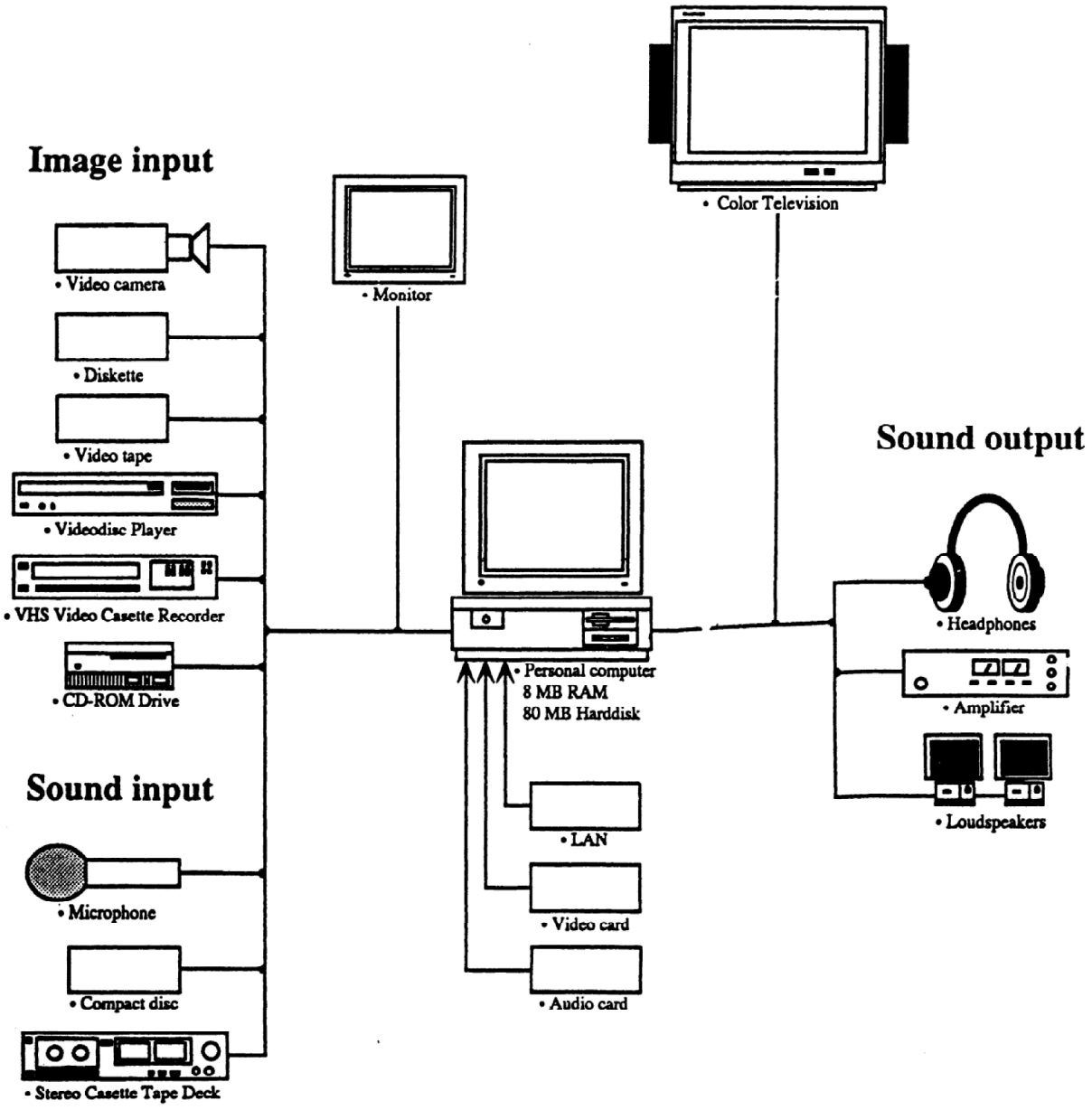

Fig. 1

CURRENT TOOLS IN OUR MULTIMEDIA LABORATORY

Currently available tools are hypertext-based software for both Macintosh and IBM compatibles. These authoring environments include relatively affordable audio digitizers and video grabbers that can incorporate images from a VCR player or a videodisc. The current renaissance of videodiscs and players is an interim to digital video. It is now probably unwise to make large investments in these delivery tools before they are superseded by digital video. Multimedia authoring software such as Hypercard, Supercard and Macromind Director for Macintosh are fast being complemented by Windows with other tools such as Toolbook for the IBM compatibles. These are supplemented by intelligence software such as Macsmarts for the Macintosh and Knowledge-Pro for the PC. Before long both the intelligent tutoring avenue and external commands and macros will improve the capabilities of authoring tools so that very little tuition will be required for a subject matter author to be able to produce an electronic text. At present programming knowledge is still required for simulations and for animations for interactive problems and graphics. Our production and delivery network is shown in Fig. 1.

The laboratory features networked IBM compatibles with Macintoshes (Fig. 1). The facility to transport material from one operating system to another though the server is useful for animations, which are easier to produce on the Macintosh. Large capacity optical discs are used to store many Gigabytes of multimedia materials. After preparation of materials the data is structured for CD-ROM production.

WHERE DO WE GO FROM HERE?

New delivery systems for the classroom are coming. The high-tech classroom will include facilities such as the high resolution screen, downlinking capabilities, and instant interaction with the professor via a computer keyboard for every student. Interactive graphics are a further development exemplified by VPL research of Redwood City, California. These interactive graphics facilitate virtual reality letting the user or student actively engage in manipulations on the screen without physically touching it. The doctor will be able to simulate a difficult operation on a patient whose X-ray and quantitative data have been fed to the computer. Similarly the manipulation of complicated equipment can be simulated at relatively low cost, in contrast to expensive simulators which are already available. All these classroom changes will definitely not replace the good teacher. However, as it will relieve the teacher from going through the motions of difficult or redundant presentations in front of a captive classroom, he will be a facilitator in an interactive classroom, and will be able to advance much further into discussions of details and difficult learning materials. All this does amount to a revolution in the classroom, provided one thing can be resolved—the costs.

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