Chapter IV

CONCEPTUAL FRAMEWORK AND DEVELOPMENT OF MULTIMEDIA COURSEWARE

This chapter outlines how constructivism from both the science and education technology fields informed the conceptual framework and development of the computer program used in this study. This discussion will facilitate a full understanding of methodology issues in Chapter III and provide a more transparent insight into the study’s findings and conclusion presented in Chapter V and VI. The program was created by the author over a six month period. The first part of this chapter described the conceptual framework behind the multimedia courseware and second part of the study is discussed about the development procedure of multimedia courseware.

Part I

Designing and Creating Educational Software

The term ‘Courseware’ is taken to encompass the whole range of educational materials associated with computer assisted learning, including the software itself. Two things at least, are worth mentioning; the use of authoring systems, and the idea of a ‘top-down approach’ in producing courseware. The idea of a top-
down approach in developing software is far from new, but its use could be valuably carried across into lesson planning, producing educational materials.

The approach essentially involves forming an overall view of plan of the material being prepared, with clear aims and goals in mind, then gradually breaking the task down into a structured series of sub-tasks, before embarking on tasks of them. For example, in writing a set of pupil’s work sheets the first job would be one of deciding the overall plan, structure and aim of the sheets. The structure and plan of each individual sheet could then be decided, and the final job would be actually to write the sentences to be read. This could be called bones before flash approach. If teachers are involved in producing courseware including program of their own, the top-down approach will surely result in clear, more readable and well structured material. Such an approach to creating courseware of all kinds, however, should be widely encouraged in teaching and teacher training. It may be implicitly used now but making its principles explicit will surely improve computer assisted learning programs and courseware in general.

The value and influence in education could be endless, yet they need not pose a threat to teachers. For example, there is already more knowledge in even the most highly specialized areas
of the sciences than any one person could either acquire, remember or keep up with. The development and use of expert systems in schools and colleges could change the whole nature of education and the learning process. Emphasis on the acquisition and storage of facts could be removed from the curriculum and laid firmly upon the development of skills, the use of general principles, and the ability of learner to learn for himself. Thus the use of expert systems in multimedia based computer assisted learning could have much more profound and far-teaching effects than any other type of computer assisted learning.

**Multimedia**

Multimedia systems, which are computer based tools for generating and displaying textual, graphic and pictorial material have diverse potential roles within education.

In the 1960s, the term ‘multimedia’ was used to mean a “collection of media emanating from desperate presentation devices”, such as learning packages, consisting of printed materials, slides, audio tapes, and so on. In the 1990s, the term to “a class of computer driven interactive communication systems which create, store, transmit and retrieve, textual, graphic and auditory networks of information”.

Multimedia and Its Significance

Multimedia a sub-field of computer science has progressed to the point that some of the innovative methods are of practical use for information retrieval system. To say, multimedia is any combination of text, graphic art, sound, animation and video delivered to users by computer or other electronic means. It is a richly presented sensation.

The arrival of multimedia combining sound, audio, text, still and motion video, animation, moving images and interactivity made users possible to interact. The interaction of multimedia with the computer has made the user interface much easier than before. At the simplest level, multimedia can enhance the Graphic User Interface (GUI) concept by transforming icons into motion icons. On the whole, multimedia excites eyes, ears, fingertips and most importantly, the head.

Multimedia is in continuous transformation. The technical definition of multimedia is the user of digital data in more than one format such as the combination of text, audio, video and graphics in a computer/document. Multimedia delivers information in a variety of ways, but achieves its greatest effectiveness through interaction. In the first case, packing, music, information knowledge combine to convey the message. In the second case,
technology provides a more effective presentation for less expense; information, images and sounds are technically and aesthetically, then focused on a single specific purpose.

**Multimedia Presentations**

Multimedia systems do much more than conventional database systems, which are oriented toward numeric processing, (or number crunching). The goal of multimedia is to increase the utility of all information through the processing and distribution of new forms, such as images, audio and video. Multimedia goes far beyond traditional. Forms of numeric, text and graphics presentation give end-users information in a variety of media, including text and graphics, displays, voice and other digitized audio, photographs and video clip, however, many multimedia systems go beyond one way information presentation. They allow end users to select the form and content of the information presented and browse through the information in a random way, instead of being tied to the sequential access of information.

Multimedia elements are typically seen together into a project using authoring tools. These software tools are designed to manage individual multimedia elements and provide user interaction. In addition to providing a method for users to interact with the project, most authoring tools also offer facilities for creating and
editing text and images, and they have extensions to drive videodisc players, video tape players and other hardware relevant peripherals. Sound and movie are usually created with editing tools dedicated these media, and then the elements are imported into the authoring system for play back. The sum of what gets played back and how it is presented to the viewer is the human interface. The hardware and software are that govern the limit of what can happen in the multimedia with the computer has made the user interface much easier than before.

**Elements of Multimedia System**

A multimedia system combines elements that are familiar from the worlds of film, video, broadcast television, music and telecommunications as well as computing.

- A processor, typically a personal computer or workstation that has been enhanced to handle audio and video

- A variety of methods by which the user can interact with the system, such as keyboard, mouse, joystick or touch screen
- A screen that can display high-quality still images and moving video as well as computer-generated text, graphics and animations

- Speakers to allow speech and music to be output

- A microphone

- A way to playback pre-recorded source material, usually from some form of optical disk, such as a compact disk

**Components of Multimedia Systems**

**Audio Application**

Audio is the ‘front end’ of a multimedia system. It comprises an audio adopter, an audio input device such as microphone software to digitize the analogue sound, amplifiers and speakers. The audio side of multimedia has attracted relatively little attention in the computer industry. Audio clearly has an important role in multimedia applications. Special effects such as music and voice can be added to applications, especially training and point-of-sale or point-of-information systems. A voice commentary can be used to narrate what is happening on screen or to highlight and reinforce key concepts combined with still pictures or animations;
it can be used to explain an idea or a process to the user in a more effective way than text or graphics alone; music can be used to attract customer attention to create a particular mood.

**Video Applications**

Video is the other major “front-end” Rapid advances in video digitization technology have enabled video to be harnessed and deployed on the desktop. The launch of audiovisual application on personal computers has attracted much attention. One can think of video applications in two groups: play back of stored audiovisual material and real-time audiovisual communications. Real-time video communication may be one-to-many. In this case, only person has a video camera: everyone else receives the video on the computers, as in a live broadcast.

**Text and Image Database**

Text databases are a natural growth of the use of computers to create and store documents electronically. The text database management systems software helps to create, store search remove most and other information stored as text data in such databases.

Image databases or multimedia databases can also store a wide variety of images electronically. For example, electronic encyclopedias on CD-ROM disks store thousands of photographs
and many animated video sequences and digitized images, along
with thousands of pages of text.

**Hypertext and Hypermedia**

Hypertexts or hypermedia provide a way of representing and
managing information in a flexible and non-linear way that is
appropriate for many multimedia applications. They are
foundation technologies for multimedia presentations. Hypertext is
a methodology for the construction and interactive used of text
databases. By definition, hypertext contains only text and a limited
amount of graphics. Hypermedia is electronic documents that
contain multiple forms of media, including text, graphics, video,
and so on. A hypertext of hypermedia document is a body of text of
any size in electronic form that is indexed so that the reader can
quickly search it. Instead of passively watching a program on
mammals, for example, the user can chose his own route through
the material provided. The user does this by following a series of
links that lead to related pieces of text or other types of data.

**Computer Graphics**

Micro computer and graphics software packages give end
users a variety of computer graphics capabilities, ranging from
computer aided design to computer art to presentation graphics.
Graphics can be presented as video displays, printed materials, transferences and colour slides. Computer graphics have been used for many years in design applications called computer aided design (CAD). Engineers use CAD to design complex mechanical and electronic products and physical structures. Computer graphics also assist researchers in analyzing volumes of data and help technicians in monitoring industrial process. The presentation graphics include the use of line and bar graphs, pie charts and pictorial charts using a variety of symbols.

**Image applications**

Multimedia is now required to handle many types of image in a wide variety of applications. These images typically are scanned and stored in electronic file folders for use in applications such as insurance claims and mortgage processing’s. Optical scanning and storage technology are also replacing microform is record management systems where documents such as patents, medical records, taxation forms and back records need to be archived. The second type of image, known as line art includes engineering drawings in Computer Aided Design (CAD) application, diagrams in technical manuals for the aerospace and defense sector charts, flow diagrams, circuit diagrams, maps and cartoons.
**Animation**

Animation is yet another feature of multimedia capabilities. Two dimensional (2-D) animation is the most common type today, such as cartoon. However, 3-D animation has mostly been confined to the engineering field like in computer aided designing. As 3-D animation technology matures and becomes more competitive, this feature will also get into applications like on-line tutorials, simulations and virtual reality.

**Role of Multimedia in Education**

Multimedia enhances the standard of education technology. Multimedia components such as graphics, animation and sound increase the learning process through visualization. In fact multimedia is changing the nature of reading itself. Instead of limiting to the linear presentation of text as printed in books, multimedia makes reading dynamic by giving words and important new dimension. Many studies have found that students learn as much or more from multimedia as from traditional methods, generally with approximately a 30 percent reduction in instructional time. Research projects have also generally found that students enjoy learning through multimedia. The ability for students to work independently and receive instruction suited to their needs and learning styles in inherently attractive.
Role of Multimedia CD-ROMs

In schools and colleges, multimedia will provoke radical changes in the teaching process in the coming decades particularly as smart students discover they can go beyond the limit of traditional teaching methods. Indeed, in some instances, teachers may become guides and mentors along a learning path instead of being only the teachers become the core of the teaching and learning process. This is a sensitive subject among education, so educational software is often positioned as enriching the learning process, not as a potential substitute for traditional teacher-based method. Multimedia may be applied in teaching different subjects—foreign language, science subjects, humanities and arts.

Role of Multimedia Based Computer Courseware

Most multimedia software have been designed to try and remedy the difficulties, which the teachers and pupils have in teaching and learning especially the scientific concepts can be investigated easily with the help of computer animation courseware. The school and college students have lot more to access and learn from animated software based on science. Just imagine a biology teacher explaining the respiratory system or just a body part like larynx to the class. While there may not be anything wrong with teachers dedication or tolerances, the system
may pose difficulties to a teacher to go on and on with the same topic. In contrast, the teacher can get them to watch an animation sequence, where the learners, can see all that activity happening in the respiratory system and the role of various body parts – all for deeper understanding and better recall abilities. Similarly, the physical education students can easily come terms with origin, insertion, function and exercise besides so many other concepts. Students of chemistry can complete their experiment on a computer without worrying about it going away.

**Educational Paradigms and Multimedia Courseware**

All computer assisted instructional courseware are developed on the basis of both instructional and revolutionary paradigm in order to meet the individualized way of learning. In the instructional form, the multimedia courseware is used as a patient tutor and in the revolutionary form; it is used to mediate between the bringing out the hidden model or simulation of a real world situation. In developing the multimedia based computer animation courseware, both instructional and revolutionary forms of computer-assisted learning were considered to provide a realistic learning environment to the learners.
Summary of Conceptual Framework

Education for the 21st century definitely needs a lot of rethinking on modernization, more so, the wake of increasing globalization, setting up of e-communities, readiness for e-commerce and implied demand for a global citizen. The content and methodology of the present system of education must undergo a metamorphosis.

The development of electronic devices, specially the computers, has given added impetus to this activity. Computer is certainly one of the most versatile and ingenious developments of the modern technological age. Computer specialists promote the wide spread use of computers in instruction because they are convinced that computer would provide the means for the tailoring of educational process to individualized students. It makes the ideal for individualized instruction into reality. Educators are using computer for instruction as computer assisted learning and computer-managed learning.

Education and training are probably the most common applications of multimedia computer technology at present. Researchers believe that multimedia offers an effective and efficient means of improving the quality, delivery and presentation of educational and informational materials. Numerous studies have
shown that interactive multimedia technology is effective means of achieving instructional objectives. The story and retrieval systems of multimedia can contain more information than any human training agent can possibly embrace, and can have many terminals through which student can have access to the information. The graphical arts and animation can go long way facilitating quick understanding. The main educational benefits of multimedia are critical thinking, individualized learning and the students will learn at their own time and pace. Apart from those advantages, the multimedia based computer animation technology has a wider scope in the instructional process bringing the real situation and characters. The learners are able to understand the concepts very easily. Computer animation technology reduces the monotony, because it brings forth real life situations.

The above lay out in terms of conceptual frame work of the study helps the investigator proceed in his goal of developing multimedia based courseware for teaching kinesiology for physical education learners.
Part II

Developing Multimedia Courseware

The part II discussed the following such as the courseware, computer, basic systems of a computer, hardware and software, tools used, minimum system requirements and how to run the program. The program can be used in different ways. In the linear mode, the reader selects via action words different levels of the program. The user can read either only on the level of the summaries or on detailed information (text, pictures, simulations and videos). In the non-linear mode the user jumps via menu items or buttons to selected pictures, simulations or a searched term. In this study non-linear modes were used in this courseware.

In general multimedia is the combination of visual and audio representations. These representations could include elements of texts, graphic arts, sound, animation, and video. However, multimedia is restricted in such systems where information is digitalized and is processed by a computer. Interactive multimedia and hypermedia consist of multimedia applications that the user has more active role. Education is perhaps the most useful destination for multimedia and the place where multimedia has the most effective applications, as it enriches the learning process.
For developing multimedia projects we need hardware and software, talent and skill. The software requirements for multimedia development consist of one or more authoring systems and various editing applications for text, images, sounds and video.

**Courseware**

Courseware is an electronic collection of multimedia-rich learning materials combined with varying levels of tutorial interactivity, which can be independently accessed by learners at any time and used at their own pace. Courseware can be made available on CD-ROM, over an intranet or through the Internet. Most courseware contains a mixture of: interactive tutorials designed to develop student knowledge and understanding, a database of resources and hypertext links to other sections of the courseware or to external websites and self testing exercises which provide formative feedback.

In developing the courseware the consortium had the following goals: to create a pedagogical foundation based on high academic standards, to make the material accessible and flexible, and to provide the necessary support for coach and players using the courseware.
We are living in an information age dependent upon digital information. Digital information is electronic information, the result of computer processing. Every type of job relies upon getting information, using it, managing it, and relaying information to others. Computers enable the efficient processing and storage of information.

Do not think of a computer merely as the machine with the keyboard and the mouse, although that might be true for some types of computers. Embedded computers may be inside your household appliances, the VCR, the automobile, planes, trains, power plants, water purification plants, calculators, and even inside a few toys. These embedded computers are very small. They affect our lives each day. Why, even modern traffic lights operate with computers. They are all around us. Think of additional ways in which computers affect our lives each day.

A Basic Computer "System"

A computer system refers to the computer and all of its equipment. Equipment like speakers, printer, mouse, monitor, keyboard, scanner, etc. is called peripheral equipment, sometimes shortened to "peripherals". The central processing unit (CPU) is
considered to be "the computer". Without peripheral equipment (such as monitor, printer, speakers, etc.) for input and output the microcomputer (home computer) will not be able to do anything you find useful.

**Hardware and Software**

Usually, things you can see and touch on a computer or inside a computer are called "hardware" whereas programs for the computer (digital instructions) are called software. Software is created by a computer programmer who writes lines of code for the computer. An interpreter or compiler is a smaller program which changes the programmer's code into machine instructions for the central processing unit. After much testing and debugging, the programmer's code is finally "packaged" into executable files which make up the final "software" which can be purchased later, or might be "bundled" with the computer when you buy it.

Hardware is a comprehensive term for all of the physical parts of a computer, as distinguished from the data it contains or operates on, and the software that provides instructions for the hardware to accomplish tasks. The boundary between hardware and software is slightly blurry - firmware is software that is "built-in" to the hardware, but such firmware is usually the province of
computer programmers and computer engineers in any case and not an issue that computer users need to concern themselves with.

A typical computer (Personal Computer, PC) contains in a desktop or tower case the following parts:

1. Motherboard which holds the CPU, main memory and other parts, and has slots for expansion cards

2. Power supply - a case that holds a transformer, voltage control and fan

3. Storage controllers, of IDE, SCSI or other type, that control hard disk, floppy disk, CD-ROM and other drives; the controllers sit directly on the motherboard (on-board) or on expansion cards

4. Graphics controller that produces the output for the monitor

5. The hard disk, floppy disk and other drives for mass storage

6. Interface controllers (parallel, serial, USB, Firewire) to connect the computer to external peripheral devices such as printers or scanners
Courseware Development

The courseware was developed by the investigator with the help of a system analyst who has been working in the related field of study and also in consultation with educational technologists, language experts in English and computer specialists on selected units of kinesiology for physical education major.

Software Used

For the development of the courseware, the researcher used the following software for various purposes. Such as Swish 2.0, movie player, Adobe Photoshop, Adobe Image ready, MS Word 2000, Macromedia flash player and Pagemaker 6.5.

Swish 2.0 is a powerful tool to create professional looking presentations and movie shows. It allows you to construct presentations from scratch or by using the easy to use wizard. It is used to develop slide show, seminar presentation, poster presentation and preparing frame with hyper link.

The main software used for this study is Swish 2.0. The courseware is developed on Swish 2.0 with help of additional software to assist in typing text, drawing, animation and designing diagrams.
The researcher integrates much technology in his courseware for the compatibility of the user. Placed many buttons like Next, Previous, and Home on every frame to guide the user for easy roaming and to consume less time. To attract the user, the background and text are given different colours and pictures.

**Steps in Designing Courseware**

The following are steps followed while preparing the multimedia based courseware.

1. Typing the text into MS Word

2. Proof reading of the Text

3. Drawing, scanning and designing pictures relevant to the topic by using the software namely Adobe Photoshop and Adobe Image ready.

4. Recording video pictures related to the exercises.

5. Integrating text, movies and pictures in to a single frame by using Swish 2.0 software

6. Placing coloured background, sounds, animation, movies and graphics on each frame in the movie.
7. The procedure was done on each unit namely muscles and joints in upper extremities separately.

8. Now each unit was combined in a single movie in a sequential order.

9. The developed courseware was given to the experts to construct face and content validity of the courseware.

10. After the consultation of the experts, the courseware was finalized.

11. Then the Swish Movie file was converted into flash player and then it was transferred to .EXE file.

12. The CD-ROM was prepared and it set to run automatically when inserted into the computer system.

13. Now the courseware made available for teaching to the students.

**Minimum System Requirement**

The following are the minimum system configuration of hardware and software to run the developed multimedia courseware in teaching selected units in kinesiology.
**Software**

Windows 98/ Windows 2000/ Windows XP

Swish 2.0

Macromedia flash player

Multimedia software

**Hardware**

Computer with the following configuration is needed.

Pentium III/ IV

Multimedia Kit

High Colour Cord

128/ 256 RAM

20 GB/40GB Hard Disk

**Method of Using Courseware**

The multimedia courseware CD-ROM may be inserted into the CD drive. When inserted into the computer system, the CD-ROM runs automatically. First the information about the title, researcher and guide will appear on the screen then the home page for multimedia courseware on kinesiology. Now the user may go through the content and browse according to their wishes.
otherwise use the buttons in each slide for the logical sequence of the content in order throughout the courseware.

Home page contains link pages like muscles and joints in upper extremities, so the subjects would click any one of the link and go through the content in details for further information of the topic. Each frame contains the following such as text, picture, audio, movie and animation.