Developing Technology-Enhanced Learning Material

Introduction

The diversity inherent in adult learners puts a different pressure on the instructor /teacher educator to make the classroom experience relevant to each student's professional goals and personal life. Unfortunately, there is no "one-size-fits-all" solution. The success of the teaching-learning process in this kind of situation will depend on the instructor's/lecturer's creative thinking, an ability to present a broad view of practical, real world experiences that link to the class subject/lesson, and willingness to share personal insights and experiences with students. The outcome of this kind of a teaching learning situation merely should not be just passing the final test. They should have gained knowledge in the subject, and they should see how that subject fits into the bigger picture that includes personal professional goals and relationships. Creative instruction is needed to help the students to see these links.

Integration of technology into any teaching-learning environment would address most of the above issues related with providing meaningful learning experiences. The reason for this is incorporation of technology to teaching- learning environment or technology-enhanced teaching -learning procedures will provide opportunities to include a variety of learning experiences which would be able to address the different learning styles of a diverse learner group.

When developing a technology-enhanced learning package you would use more than one media that was discussed in Essential Reading 2. With the availability of sophisticated computers with multimedia capabilities and user-friendly multimedia authoring software, the tendency to develop computer-based interactive multimedia learning packages is increasingly observed.

In this Reading, we shall focus our attention on what technology-enhanced learning is, factors to consider when developing technology-enhanced learning material, different stages in developing an interactive multimedia learning package, multimedia authoring software and modes of delivering multimedia.

What is Technology-Enhanced Learning?

The new maxim in the world of technology-enhanced learning is that teachers must let curriculum drive technology, and should beware of letting technology drive curriculum. (Gynn, 1997) The goal in designing technology-enhanced curriculum is to use tools that are appropriate to the needs of the learning experience. A sound pedagogy involves sound use of technology.

The inclusion of technology into any learning environment should be undertaken for a reason. Technology can be the connection that enhances learning: the connection between student and knowledge, between student and student, between student and teacher, between student and society, and so forth (Gynn, 1997).

Technology-enhanced learning packages may range from simple print-based learning materials enhanced with media integrations such as audio or video at certain points, to more sophisticated, computer-based interactive multimedia learning packages. At whichever level, it is important to identify the purpose of developing a technology-enhanced learning material and the processes associated with it.

Factors to consider when developing technology-enhanced learning material

Planning the learning process

Whether in a technology-enhanced learning situation or any other situation, planning of the learning process should be done in a well organized manner in order to create a successful teaching-learning situation. Therefore before considering developing a technology -enhanced learning package, it is essential to have some knowledge on planning a learning process.

Planning learning process is a four- phase process which consists of **identification of learning outcomes**, **planning** effective ways to achieve them, **implementing** them with a group of learners and **evaluating** them for the purpose of feedback and improvement.

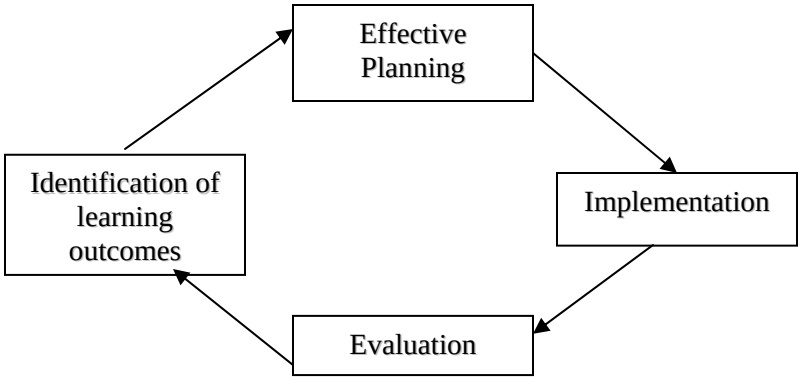


Figure 1: Four phase process of instructional system design

(Adapted from: ES-316 Curriculum Development of Distance Education, 2001)

These four phases can be presented as four questions as follows.

- What are we trying to accomplish with the desired teaching learning process? (Identification of learning outcomes)
- What activities the teacher/ learners should engage in to accomplish teaching-learning process satisfactory? (Effective planning)
- How to organize and deliver the lesson content? (Implementing)
- How to evaluate the impacts of the teaching-learning process?

Apart from the above tasks the other most important task is the improvement of the teaching –learning process by modifying the above stages in the light of the results of evaluation/feedback.

Major aspects to be considered in planning the teaching-learning process are:

- Nature of the learners
- Objectives of the lesson (learning outcomes)
- Lesson content
- Sequencing of the lesson content
- Appropriate methods and media to be used
- Assessment procedure
- Feedback (for further improvement)

(Rowntree, 1997)

(The above aspects were discussed in detail in Essential Reading 1 of ESP 2242- **Designing Learning Experiences)**

Instructional Design for multimedia

Before developing multimedia leaning packages we have to concentrate on the design of the desired multimedia package. We must hence, consider the various components that constitute the instructional design for multimedia learning system such as learning outcomes, content, media options and evaluation options.

Learning outcomes

- Specify the learning outcomes of the multimedia learning materials. These should be stated in observable terms. They can range

from, Simple ⟶ Complex

Lower ⟶ Higher

- and also may belong to domains of cognitive, psychomotor and affective behaviors.

Content

- Content of any design is informed by its learning outcomes According to the these outcomes, the content will also range from simple to complex.
- The content should be adequate to achieve the stated objectives.

Media Options

- It is important to match the learning outcomes and decide the media to synchronize the design and learning from it.
- Each media can offer either the whole or part of the content with or without referring to one another.

Evaluation Options

- This is the primary goal of instructional design. Without evaluation, one would rarely understand the achievement of learning outcomes.

- Evaluation options must include both summative and formative evaluation. In both cases you can choose from online, offline, paper and pencil versus performance tests, etc.

(Adapted from: Reddi & Mishra, 2003)

Other factors to be considered when developing an interactive multimedia learning package

- ***Review the entire course***

  Before deciding on creating an interactive multimedia package for a specific topic, it is essential to critically review the entire unit or course. This is because there are a number of other innovative techniques which can be used. (e.g.: use of presentations, journal writing, case study approach…etc.). Finally you could decide whether the multimedia package is the best instructional approach for the topic you have selected.

- ***Keep it small and focused***

  Each project gets bigger once you start designing. In a lecture, you can limit the scope of information you give, and students requiring more can approach you personally. In CBL you don't know who will be using it in which circumstances, so there is a tendency to add more details. This is usually justified, but it increases the size of the project. It is therefore important to keep your initial idea tightly focused on the required topic from the very beginning of the project.

- ***Appeal***

  Simply presenting information in a clear and logical way is not enough. In order for a project to be a success, you must present the information in an attractive way. That is, the project should stimulate the user's curiosity and attract them in to the content. Even a very dull program can be revitalized by sensible use of examples, interactivity and graphic design.

- ***Flexibility and portability***

  As most computer programs are written to use on a particular machine, people are continuously 'reinventing the wheel- writing a program which has already been written. Multimedia projects are no different. If a Physics lecturer produces a project on Fluid Dynamics, it may be possible that an engineer could adapt the same project for their teaching.

  Currently it is often not practical to 'mix and mach' parts of courseware, because of the lack of standards and multitude of authoring environments. It is none the less useful to consider a wider audience while developing your own product. While it is unlikely that many educational developments will be profitable, they may have other uses. Additional flexibility usually involves a trade-off. If you design a project to have a wide audience, it might not be quite as useful for your own particular use.

- ***Modularity***

  It will be easy to develop a program if it is split into a set of independent parts prior to developing. When you have this type of modular project once you have finished one part of it you may need not go back to it, but concentrate on other sections. Modularity also means that if you have a multimedia resource, such as a sound file, which is used in a number of different places, it can be stored centrally. Thus, when you update the project you only need to update the central resource, and not all the 'instances' of the resource.

(Phillips & Jenkins, 1997)

Things to avoid when developing multimedia learning packages

There are certain things that you should remember to avoid when developing multimedia. According to Laurillard (1993), while learning, students should focus on the content but not on how to operate the program. She has identified a series of computer related activities which cause dislike towards the interactive multimedia product.

Some of them are,

- Looking for the ON button
- Wondering why nothing is happening
- Discovering you are unable to get back to where you were
- Being told you're wrong when you know you're right
- Wondering how long this is going on for
- Trying to guess the word the program is waiting for
- Coming upon the same feeble joke for the fifteenth time
- Trying to work out how to get the point you want
- Having to listen to the full piece of introductory music every time you get to the main menu.

Developing an Interactive Multimedia Learning Package

What are interactive multimedia?

Multimedia is a single, integrated medium that consists of various media like text, audio, video, graphics, animations, etc. Fenrich (1997) describes multimedia as the exciting combination of computer hardware and software that allows you to integrate videos, animations, audios, graphics as well as text resources to develop an effective presentation on an affordable desktop computer.

It is clear that 'multimedia' component is characterized by presence of text, pictures, sounds, animation and video: some or all which are organized into some coherent program. The 'interactive' component refers to the process of empowering the user to control the environment usually by a computer (Phillips.R.,1997). This type of learning package can be called an interactive multimedia learning package.

A computer-based interactive multimedia package will include hypermedia and hypertext. Hypertext is non-linear, organized text and static media such as diagrams, pictures and tables which are linked by associations. Hypermedia are computer-based systems that allow interactive linking of multiple format

information including text, still or animated graphics, movie segments, video and audio (Roblyer et al., 1997).

Although inclusion of hypermedia and hypertext will allow making a multimedia learning package interactive, to be effective it has to be 'real interactivity'. Just allowing the user to choose from a set of options or turn pages with cute animations cannot be claimed as either interactivity or user control. User thinking is required before making a response. (Hedberg, Brown and Arrighi, 1997). Thus, the capacity of hypertext and hypermedia should be appropriately utilized to provide a purposeful and a meaningful interactivity in a multimedia learning package.

Scripting for multimedia

A script or a storyboard is the basic building block of multimedia courseware development. A storyboard is a visually illustrated script, which is a sequence of simply drawn pictures that visually represent the multimedia lesson.

The script writing process has the following stages:

i. Program idea

The program idea needs to be discussed vis-à-vis the strength of multimedia. You must ask at this stage: why is it necessary to have a multimedia program for this idea?

ii. Program brief

At this stage, the program idea needs to be expanded to include the title, target audience, learning outcomes of the program, content outline, etc. A rationale for the multimedia program and project beneficiaries is useful, if included in the program brief.

iii. Research

Prior to designing multimedia it is useful to carry out a through research on the topic of the program idea and the target audience. Identifying relevant graphics content and experts on the programme will be useful to consult and select appropriate content.

iv *Identify and select content elements*

Having done the research, it is appropriate to develop the best way or a sequence to deliver the message. The content elements can be visualized in terms of text, audio, video, graphics, animations, etc.

iv. Interface design and layout

This is the one of the most creative stages of scriptwriting of multimedia. Here, the look and feel of the program needs to be decided. While deciding on this, it is important to keep in mind the target audience's choice and the nature of the topic. Some of the possible layouts that can be prepared on the computer are as follows

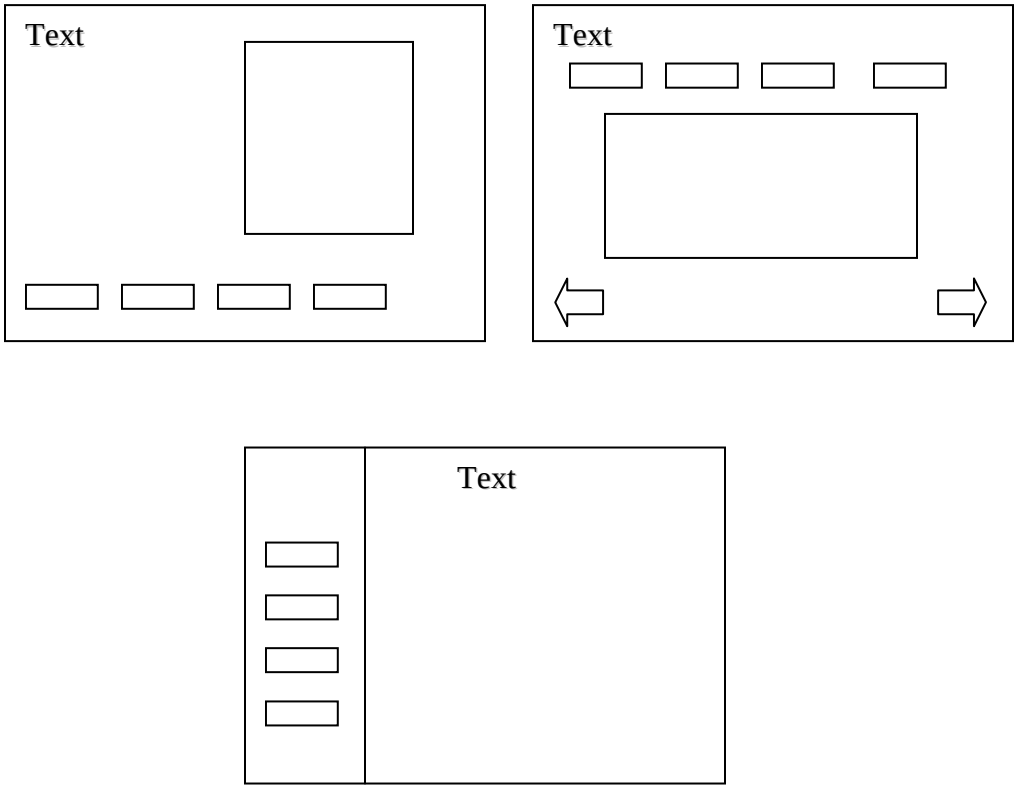


Figure 2 : Some examples of layout designs

There can be so many ways of designing the interface depending on creativity of the designer. However, it is essential to decide on one layout design at the beginning and stick to that for uniformity and also for the reason that the learners will not appreciate a different layout for all the different screens of the multimedia package.

vi *Preparing the storyboard*

This is the detailed shot-by-shot or screen-by-screen description of the program on sheets of paper or cards. The storyboard forces the script writer to think in terms of multiple media used in a multimedia program. It is also a blueprint for action that can be given to the multimedia designer to execute as depicted in the storyboard. It allows working of different groups of people in the same project developing different components of it with similar design and compatibility. (Reddi & Mishra, 2003)

Storyboard Development

Since multimedia is an integrated platform it can deliver text, audio, visuals (video and graphics), animation and navigation – which is the interactive feature. Therefore a storyboard should represent all these five components in a two-dimentional page or card. There are many ways of preparing multimedia storyboards. Here we shall look at one such format. Figure 3 represents five different cards placed over one another to depict a single screen/shot of a multimedia program .

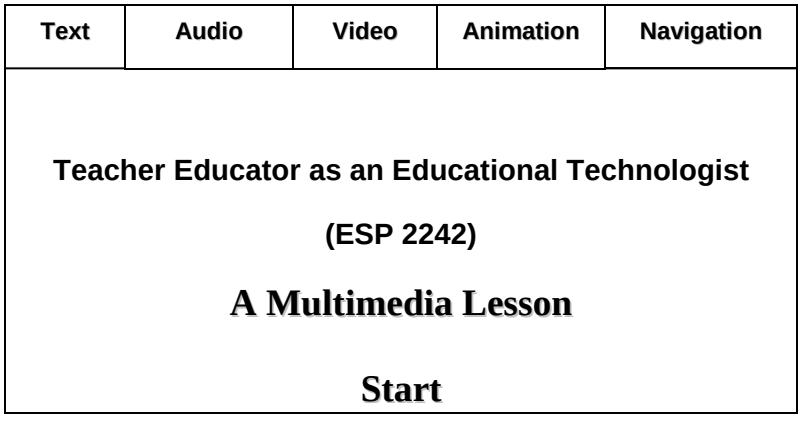
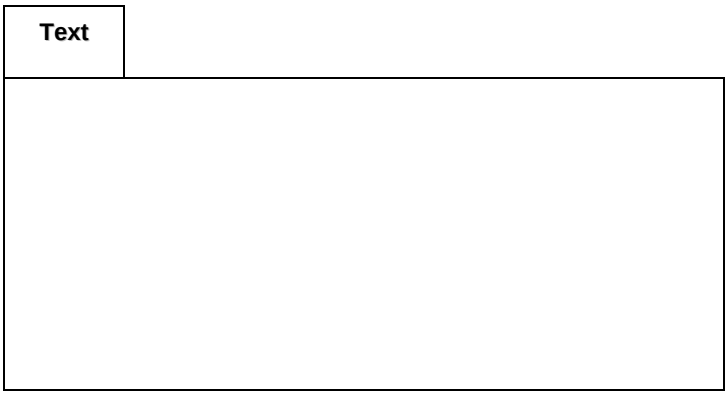


Figure 3: An example of a single screen in a storyboard

Now let us look at each of the five cards.

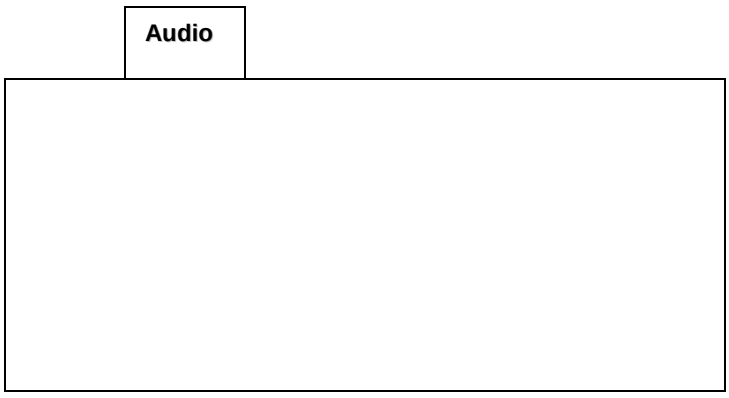
Text

- Write down the text you expect to go in the screen.
- Also you can suggest the font size, style and color that is needed.
- Suggest the placement of the text in small chunks of less than 200 words (important to present the text in a readable way.)
- To have more text, multiple shots/screens can be used in continuation



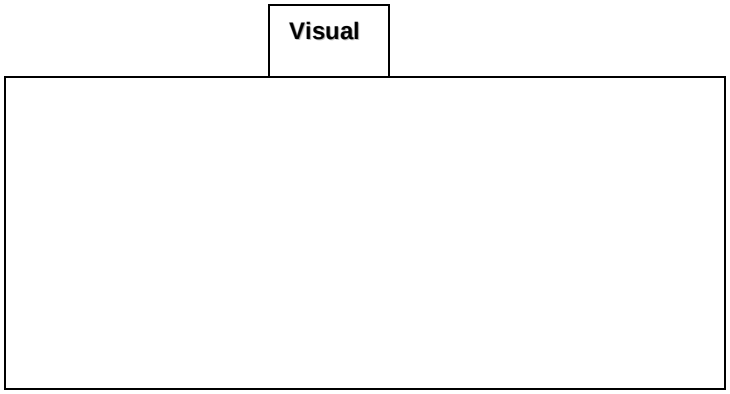
Audio

- Three types of audio is present: Narration or Voice Over (VO), Music (M), and Sound effects (SFX)
- You have to specify the types of audio to be used
- You can have two audio channels in one shot, and it is important to specify both audio channels. If required you can use two cards.
- Specify the kinds of music you want and the kinds of sound effect you want
- If you have voice over, prepare the script of the voice and write it on the card.



Visual

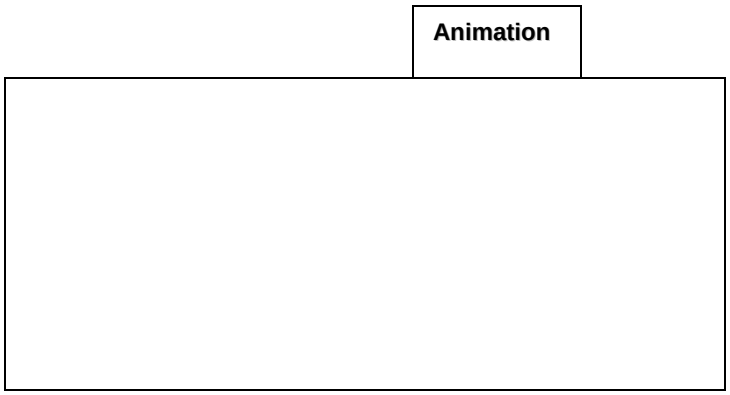
- There are 2 types of visuals -- static (graphics) and motion (video)
- In the card you have to specify the kind of visual and its placement on the screen.
- Give the description of the graphic or video : the description of what it will show, its purpose… etc



Animation

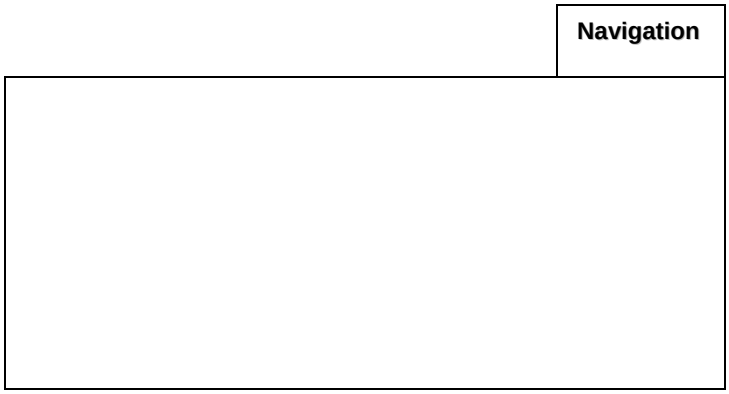
- There are various kinds of animations: text, graphics or even a specialized animation program itself in the multimedia lesson.

- The nature and the purpose of the animation needs to be explained in this card with specific movements (e.g. fade in, fade out, zoom in, zoom out, etc.) of different elements.



Navigation

- This is the mechanism through which a multimedia program moves from one shot to another.
- The navigation is to be designed through hyperlinks from a word/sentence/phrase or from organized button for navigation
- Some of the important navigation buttons are Start, End, Next Previous/Back, Home, etc.
- In the navigation card you have to mention the type of navigation button and its action (what will happen if it is clicked, eg. go to S-3)
- The placement of the buttons and/or hyperlinks also needs to be specified.



Since a multimedia project will have a number of screens/ shots, organizing the cards are very important. The best way is to name these cards is as follows,

- S-1/T (for text of shot 1)
- S-1/A (for Audio of shot 1)
- S-1/V (for visual of shot 1)
- S-1/ An (for animation of shot 1)
- S-1/N (for navigation of shot 1)
- S-2/T (for Text of shot 2) and so on.

The number of shots in a storyboard will depend on the content that you have and how you are presenting the multimedia. Some of the standard screens/shots for an educational multimedia lesson could be given as,

- Title (normally referred to as Home), which welcomes the learner;
- Introduction, which depicts the context and sets the tone of the programme;
- Learning outcomes
- Contents/ Structure / Index
- Glossary
- References
- Self- Assessment Questions

In addition, the content of the lesson will also have a number of shots. Depending upon the requirements, the above shots can be depicted on more than one screen. Scripting for multimedia and preparation of storyboard is not a simple process. It should be done in a highly systematic way. Analyses and breaking of the contents into smaller, manageable chunks will facilitate development of the storyboard as well as the multimedia lesson. A clear storyboard is the key to a successful and effective multimedia lesson. The storyboard should be reviewed by experts and users of the multimedia, especially for the navigation part to see the smooth flow of the multimedia programme. (Reddi & Mishra, 2003)

Multimedia Authoring Software

Creating a multimedia presentation is called 'multimedia authoring'. There is a wide range of software to design multimedia (multimedia authoring tools) available today. These tools are used to design the user interface, integrating various media elements to create a single presentation.

The basic tool set for building a multimedia project can be divided into five categories:

- Painting and drawing tools (eg: Corel Draw)
- 3-D Modeling and animation tools (eg: 3D Studio Max)
- Image editing tools (eg: Adobe Photoshop)
- Sound editing tools (eg: Sound Forge)

- Animation, Video and Digital Movie editing tools (eg: Macromedia Flash, Adobe Premier)

The software in your multimedia toolkit and your ability to use it will determine the quality of your multimedia package. Microsoft PowerPoint which is a simple presentation software, allows users to easily integrate multimedia resources and links into their presentations making them very effective. Powerful features are continuously being developed and added to multimedia software. Emergence of more powerful authoring tools greatly extend the possibilities of multimedia authoring.

Some software commonly used in multimedia project development are,

- Macromedia Director
- Macromedia Flash
- Adobe Photoshop
- CorelDraw

Selecting software for multimedia development will depend on their usability, animation capabilities, smoothness, integration capability, delivery, user-friendliness and clientele needs. (Reddi & Mishra, 2003).

(Read Additional Reading 1- section 3 for more details on Hardware and Software for Multimedia development)

Delivery of Multimedia

There are two basic approaches to deliver the multimedia lessons –

- Independent approach: Web delivery and CD- delivery
    - Web delivery- Placing multimedia lessons on the World Wide Web for Online learning
    - CD Delivery- Provided through stand alone CD-ROM for offline learning

- The blended approach : Supplementary and Complementary
    - Supplementary –becomes supplemented to the print version of learning materials. This is more useful since it can strengthen the learning process by providing multiple points of view.
    - Complementary – Print medium is limited to some areas of content and other areas are through multimedia delivery. In this way both the media approaches become complements to each other, forming an integrated approach. (Reddi & Mishra, 2003)

Summary

In this Reading we looked at various aspects on developing technology-enhanced learning materials. Some important factors to consider in this process were discussed including planning the learning process and various components that constitute the instructional design for multimedia learning systems such as learning outcomes, content, media options and evaluation options. Introducing Interactive Multimedia as one mode of the technology-enhanced learning, different stages in developing an interactive multimedia learning package was discussed with a detailed explanation on storyboard development. Commonly used multimedia authoring software and modes of delivering multimedia were also introduced.

References

Distance education course design Available URL: <http://coe.sdu.edu/eet/Articles/FredDesign/star > Accessed:

ES-316 *Curriculum Development for Distance Education*, Staff Training and Research Institute of Distance education-Indira Gandhi National Open University.

Fenrich, (1997) cited in Reddi, U.V. & Mishra S. (Eds.) (2003) *Educational Multimedia- A handbook for teacher-developers vVersion*1.1 March 2003 New Delhi:CEMCA

Gynn, Catherine M (1997). *The Pedagogy of Technology Enhanced Learning Environments* Available URL : <**http://telr.ohio-state.edu/lti/TELR-pedagogy.pdf** > Accessed:25.07.05

Hedberg. J., Brown, C. & Arrighi, M. (!997). Interactive multimedia and web-based learning: Similarities and Differences. In B.H. Khan (Ed.) Web-based instruction. (pp.75-80) New Jersey:Educational Technology Publications

Kane. M, Real-*World experiences can revitalize teaching*, Available URL: <http://www.nwrel.org/nwreport> Accessed**:** 25.07.05

Laurillard, Diana (1993) cited in (Phillips. R., (1997) *The developer's handbook to interactive multimedia*, London: Kogan Page publishers

Phillips.R., (Ed.) (1997)*The developer's handbook to interactive Multimedia*, London: Kogan Page Publishers

Reddi, U.V. & Mishra, S. (Eds.) (2003). *Educational Multimedia- A handbook for teacher-developers* Version1.1 March 2003, New Delhi:

Rowntree. D, (1994) *Teaching through self instruction*, London:Kogan Ppage, London

Phillips, R.& Jenkins, N. (1997). *Interactive multimedia development* In Phillips.R., (Ed.) (1997)The developer's handbook to interactive Multimedia, London: Kogan Page Publishers

Recommended Readings

Phillips.R., (1997)*The developer's handbook to interactive Multimedia*, London: Kogan Page publishers

Reddi, U.V. & Mishra, S. (Eds.) (2003) *Educational Multimedia- A handbook for Teacher-Developers* version1.1 March 2003, New Delhi:CEMCA

Roblyer M. D. (2003) *Integrating Technology into Teaching* New Jersey:Pearson Education Inc.

Rowntree. D, (1994) *Teaching through self instruction*, London:Kogan Page,

Resources

Educational Multimedia: A CBT for Teacher Developers

An Interactive Multimedia package developed by Commonwealth Educational Media Centre for Asia (CEMCA)- Available on CD