

# E-Pedagogy: The Heart of Today's ICT

R. V. Dharaskar,

MP Institute of Engineering & Technology, Gondia, India

V. M. Thakare,

Amravati University, Amravati, India

## ABSTRACT

The Education was a very stable sector till 1990. The E-Learning has converted it into a dynamic sector. Every year hundreds of new technologies have been introduced. It gives new shape to e-learning. The major components of e-learning system are technology, content and pedagogy. For using the e-learning technologies effectively there is a need to re-define the old pedagogy or cognitive science. This re-defining process has given birth to the new field, namely e-pedagogy or e-cognitive science. Still it is in initial stage. This paper describes the new e-pedagogy techniques to develop efficient multimedia based e-learning products.

In the case study the 50 hours C language CBT has been developed and tested over 300 students. It has produced very encouraging results.

## KEYWORDS

E-Learning, E-Pedagogy, E-Cognitive Science, Learning Intelligence, CBT

## INTRODUCTION

The old cognitive science can not satisfy the needs of the today's e-learning system. There is a need of new cognitive science. The old cognitive science is specially design for classroom teaching. But in last two decades the e-learning has replace 60% classroom training in developed countries. The today's e-learning uses latest computer technology and tools. To use these tools effectively there is a need of e-cognitive science or e-pedagogy. This paper describes the new techniques. In the case study the 50 hours C language CBT has been developed and tested over 300 students of engineering discipline.

The E-Learning system has four components viz. Content, Technology, Human Factor and Delivery Mechanism. Each one relates to the human factor and in turn to the e-pedagogy. This paper describes it along with some important principles or thumb rules.

## EVOLUTION OF E-LEARNING AND TECHNOLOGY

The journey of e-learning has started from 1985 with the help of audio and video tapes and CBT. Along with the technology the face of e-learning has been changed. To use this technology effectively altogether new pedagogical concepts are needed. The Figure 1 shows the evolution of e-learning.

## CONTENTS

Today's content creation process is much more complicated. It has to follow the concept of Reusable Learning Objects and various standards like AICC, IEEE, IMS, ADL and SCORM. It is developed for multiple contexts like

- ❑ Online instructor based courses
- ❑ Just in time search of content
- ❑ Reference bookmarked content
- ❑ Online training manual content

and for different type of devices. While creating this content and Graphical User Interfaces the human factor and pedagogy plays very important role.

## DELIVERY MECHANISM

The classroom training is a linear process. But the CBT and Web based training is not a linear process. The Client-Server and Peer to Peer systems need totally different type of pedagogy considerations. Today various delivery systems are available like Computer, Laptops, PDA, Mobile phones etc. Each one has unique features and needs help of cognitive science with a different shade.

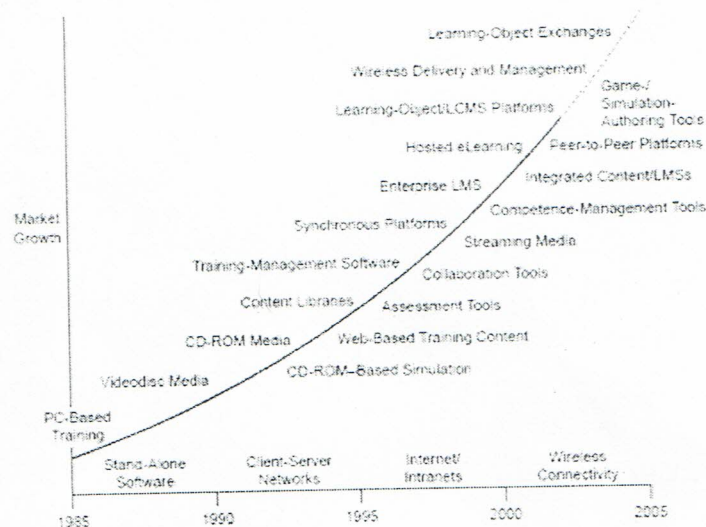


Figure 1. Evolution of E-learning

## E-PEDAGOGY

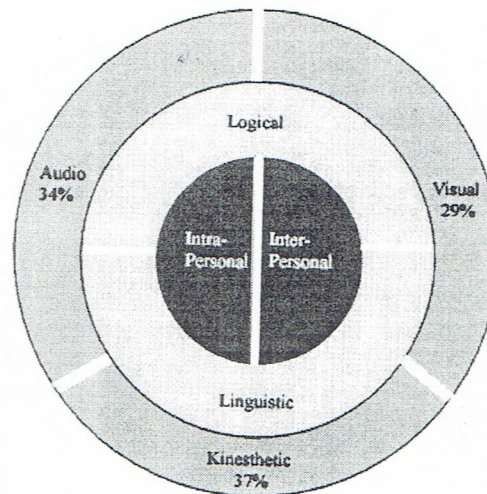
### Learning Styles and Cone of Learning

Dr. Howard Gardner of Harvard University dismisses the IQ test of human brain. This test ignores the vast potential of the human brain and measures only a small part namely 'intelligence'. He has developed a theory of multi-intelligence and identified 7 areas of intelligence. This is shown in Figure 2. These 7 areas are present in each individual brain to a greater and lesser extent depending on genetic and environment factor. The 7 intelligence are:

- ❑ Linguistic Intelligence: language, expression through words etc
- ❑ Logical-Mathematical Intelligence: manipulation of numbers, problem solving etc
- ❑ Visual-Spatial Intelligence: visualization, model-making, spatial awareness etc



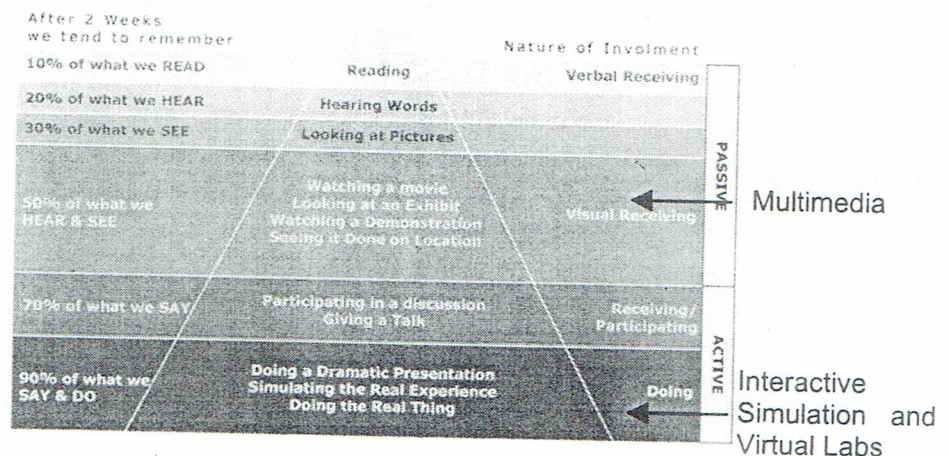
- Bodily-Kinesthetic Intelligence, movement, use of body etc
- Musical Intelligence: sensitivity to sound, music and rhythm etc
- Interpersonal Intelligence: sensitivity to other people, good communication...etc
- Intrapersonal Intelligence: sense of self, aware of emotions, strengths etc



**Figure 2. Gardner's Learning Intelligence modified diagram**

It is found that the classroom training system has been utilizing mostly the two types of intelligence i.e. Linguistic and Logical-mathematical. To develop effective and efficient e-learning software it is necessary to consider all types of human learning intelligence.

The human being basically learns using combination of three types of learning intelligence i.e. Visual, Audio or kinesthetic (hands on training). The Multimedia technology can satisfy first two types of learners and the interactive simulation or Virtual laboratory techniques can satisfy the third type of learners. In Figure 3, the cone of learning has shown this fact.



**Figure 3. Cone of Learning**

(Edgar Dale Audio Visual Methods in Teaching, Holt, Rinehart, and Winston)

The collaborative activities in the classroom and in the web based delivery system are totally different. To satisfy the needs of the people with Intra Personal learning intelligence it is needed. The latest Collaborative tools like Groove Work Space or Presence AR provides very advanced facilities for collaboration activities. To use these collaborative environments effectively the new pedagogy based techniques are needed.

## E-PEDAGOGY FOR USING MULTIMEDIA TECHNOLOGY

While using the multimedia technology the memory overloading consideration is very important. It has shown in Figure 4. It can hamper the learning process. The working memory has limited capacity. It can store only 5 plus minus 2 items and entire thinking or processing of the information happens at this place. Thus while designing of multimedia based e-learning product memory overloading should be avoided. In addition to this the encoding and retrieval of knowledge from long term memory should be handled properly. For designing virtual labs or remote control labs the memory-overloading problem should be tackled properly.

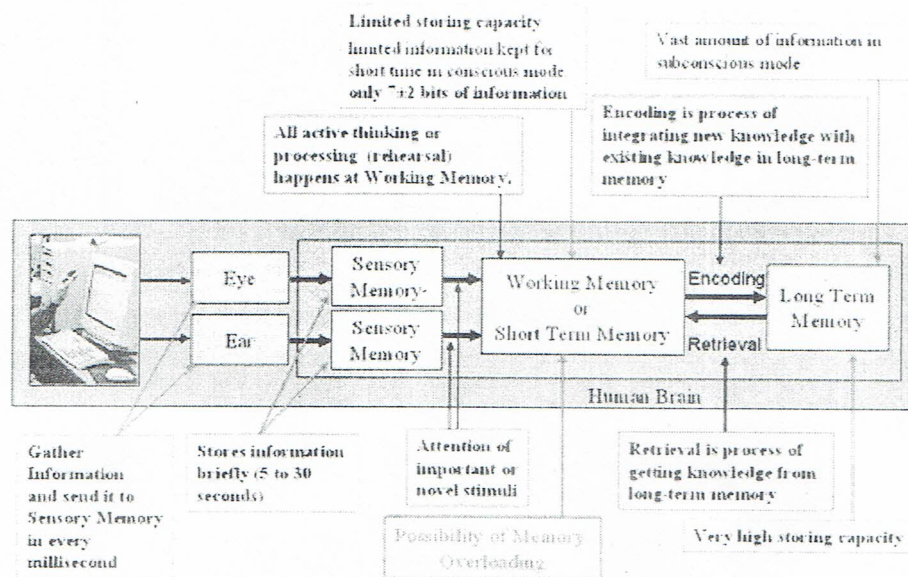


Figure 4. Memory Overloading and working of brain

While using multimedia technology the following basic principles are very useful.

- ❑ Words be spoken rather than presented as printed text to avoid memory overloading. Reduces pressure on visual processing since both incoming information channels (visual and auditory) are used not just visual.
- ❑ Use Mind Maps techniques. Memory works by creating a network of associated ideas. A mind map imitates this pattern and so the brain can relate to the information more easily
- ❑ Emotion, motivation are the important factors to enhance learning process. People do not learn effectively when placed under negative stress – low stress, high challenge is the ideal state for learning. The use of technology should not create stress. For motivation use personalization techniques.



- ❑ Learning is greatly enhanced when the whole brain is engaged. The brain stores different type of information like audio, visual, graphics, animated information at various locations in the memory and hook them together. So presents the information in variety of ways to satisfy different type of learners.
- ❑ Recall is dramatically improved when the information is regularly reviewed. Without review, the information is forgotten almost immediately. While designing the e-learning product this fact must be considered.
- ❑ The brain integrates the information in working memory with existing knowledge from long-term memory. Thus the level of target audience should be considered while designing the e-learning system.
- ❑ The management of limited capacity in working memory to allow for rehearsal is a very complex process. The e-learning designer should take proper care of this process.
- ❑ Avoid graphics that merely decorate
- ❑ Use words and graphics rather than words alone to promote active learning
- ❑ Use graphics
  - to illustrate concepts
  - to teach facts
  - to show relationships
- ❑ Reduces need to search for which part of graphic relates to which words
- ❑ Extraneous sounds can overload working memory capacity
- ❑ Students learn better when the instructional material does not require them to split their attention between multiple sources of mutually referring information.

These are the only important few principles but the list is quite long and impossible to cover in this paper.

## CASE STUDY

The experiments of e-learning product development had been started in 1991 without any help of any software and got the real breakthrough after the introduction of Multimedia and Internet in 1997. The first e-learning software, the C language training kit, had been developed with the help of Screen Recording (SR) utility namely MS Camcorder. This kit contains approximately 50 hours audio-video clips. Comparatively the executables clips produced by MS Camcorder are very small in size. Thus it has been preferred. This technique simulates the perfect subject teacher. The students always feel the teacher presence as if he is teaching the subject directly using the personal computer.

Various complicated technical issues have been considered for faster and efficient audio-visual recording using the SR. To increase the apprehension level of the student, the teaching-learning optimization techniques have been used. This is the iterative process and applied over 300 students for getting optimized results. For automatic and flexible content management as well as for selecting the better teaching strategy the student model technique has been used. Again in this phase, testing has been done with the help of more than 150 small groups of students of various disciplines like 10<sup>th</sup> standard students, undergraduates of various disciplines, postgraduates and teachers. The entire work has been reorganized and modified in the next development phase.

The human learning process is equal to learning plus memory retention. The memory retention is generally overlooked in teaching process. The multimedia is very useful to



increase the human memory retention process i.e. storing the knowledge in long term memory.

In addition to this the 7 learning intelligence has been considered. Each clip is recorded in such a way that it should address more than 3 learning intelligence. All the principles mentioned above have been used very thoughtfully. It makes the design process very complex and time consuming. Special care has been taken for providing the collaborative environment for geographically distributed students.

This CBT covers almost every aspect of the C programming language. Each concept has been taught with the help of recording of online program execution, diagrams, animations etc. In SR the online outputs, compiler errors, warning messages, integrated development environment, help files; etc. can be watched along with the audio explanation. In development phase more than 100 books on C language have been referred. It is designed for beginners to most advanced level C language learner. Over 1000 kits of this film have been distributed throughout India and thousands of students are getting extensive training of C language programming without the help of a teacher. It's a teacher less classroom.

## **OBSERVATIONS**

In the testing phase of older version of C language, which was implemented without considering memory retention techniques and learning intelligence, was less acceptable to the students. The student's feedback has shown it clearly. The test results has shown that even after 3 months students remember more the 60% details of the articles and it is very easy to recollect the information. It is difficult to implement the e-learning software if the memory retention techniques and learning intelligence has been considered. It takes more time for planning as well as execution.

## **CONCLUSION**

To develop effective e-learning products with the help of latest technologies the new pedagogy techniques are very helpful. It is quite difficult to measure the exact effect but the student feedback has shown very encouraging results.

## **REFERENCES**

- Brain Based Learning Theories, [http://www.suffolkandnorfolkscitt.co.uk/Student support/Brain Based Learning Theories.htm](http://www.suffolkandnorfolkscitt.co.uk/Student%20support/Brain%20Based%20Learning%20Theories.htm)
- Dale, E. Audio Visual Methods in Teaching, (3rd ed), Holt, Rinehart, and Winston. (1969).
- Discover Your Learning Styles Graphically, <http://www.learning-styles-online.com/>
- "Generalized P2P Collaborative Technique for Multimedia Based CBT", IETE (Institution of Electronic and Telecommunication Engineers) Technical Review, Volume 22, No 1, January-February, 2005
- Groove Workspace, [www.groove.net](http://www.groove.net)
- Improving Memory, [http://brain.web-us.com/memory/improving\\_memory.htm](http://brain.web-us.com/memory/improving_memory.htm)
- International Data Corporation, [www.idc.com](http://www.idc.com)

Jane Carlson- Pickering, "Multiple Intelligences and Technology: A Winning Combination!", [http://www.ri.net/RITTI\\_Fellows/Carlson-Pickering/MITechPP.ppt](http://www.ri.net/RITTI_Fellows/Carlson-Pickering/MITechPP.ppt)

Karen M. Gibson, "Learning Styles and Hemispheric Dominance - Right or Left Brain: Which is Dominant in Your Family? ", <http://www.leapingfromthebox.com>

Learning Styles, [http://intranet.ccb.ac.uk/LearnerParticipation/Newlpsite/new\\_downloads/lsdownload/LSadvicel3.doc](http://intranet.ccb.ac.uk/LearnerParticipation/Newlpsite/new_downloads/lsdownload/LSadvicel3.doc)

Memletics Learning Styles Inventory, <http://www.memletics.com>

MS-Camcorder, [www.microsoft.com](http://www.microsoft.com)

Right Brain vs. Left Brain, [http://www.funderstanding.com/Funderstanding-Right Brain vs\\_Left Brain.htm](http://www.funderstanding.com/Funderstanding-Right_Brain_vs_Left_Brain.htm)

R. V. Dharaskar, "Selection of Better Multimedia Recording Techniques for Quality of CBT", Proc. National Conference on Digital Convergence for Quality Education, Dec 2003, pp. 128-137

R. V. Dharaskar, "Special Technique for Optimizing Teaching-Learning Process in CBT Software", Proc. ITCC 2004, IEEE CS Press, Las Vegas, NV, USA, April 2004, pp. 246-250

R. V. Dharaskar, "Optimization of Teaching-Learning Process in E-Learning Software Using Student Model for Appropriate Selection of Teaching Strategy", EISTA '04, Orlando, Florida, USA, July 2004

R. V. Dharaskar, "Effective Use of Multimedia Technology for Enhancing the Memory Retention Process of Human Brain in E-Learning through CBT Software", Proc. RPTI'04, March 2004, pp. 139-143

Stephen Abram, "eLearning", Micromedia ProQuest, Computers in Libraries 2003, March 13, 2003, <http://www.micromedia.ca/presentations/CIL-eLearning.pdf>