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Some Challenges in Designing and Implementing Learning Material for Ubiquitous E-learning Environment

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Abstract: In the present work we have made a systematic study on various issues and challenges in ubiquitous teaching learning methodology. Due to massive development in IT the entire teaching learning process has been changed. The open learning and distance education methodology has drastically changed the teacher student relationship. In open learning system there is no fixed class room concept. The teaching learning process is now transformed towards student centric rather than teacher centric. The new challenge has come i.e. how to prepare learning material appropriate for ubiquitous learning environment. A thorough revision is required for preparing learning material for ubiquitous environment. The present work shows us the different methods used in ubiquitous learning environment and also its merits and demerits.

Keywords: Ubiquitous, E-learning, open learning, distance education

INTRODUCTION

Ubiquitous computing also known as pervasive computing is a model of human-computer interaction in which information processing has been thoroughly integrated into everyday objects and activities. In day to day in our life someone "using" ubiquitous computing engages many computational devices and systems simultaneously, and may not necessarily even be aware that they are doing so. The main concept of ubiquitous computing is "invisibility", where the user is not aware of the presence of technology but it is very much there. It is a paradigm shift where technology becomes virtually invisible in our lives. Instead of having a desktop or laptop computer, the technology we use will be embedded in our environment. Because of the pervasiveness of this technology, the user tends to use it without thinking about the tool. Instead, the focus is on the task, making the technology effectively invisible to the user.

The new technology gives the opportunity to the user to think more on the subject as the user will get all kinds of assistance from the new technology. Ubiquitous computing is the extensive use of embedded micro-controllers and automatic in built systems in ways that are transparent to the user. Some examples are the engine control computer in a car, TiVo, DVD, blue-ray players and other audio-video gear etc. Similarly location dependent services on mobile phones are another example of ubiquitous computing. Among the emerging technologies expected to prevail in the Ubiquitous computing environment of the future are smart homes, smart buildings. Ubiquitous Computing is a computing technology that spreads through the users' environment by making use of seamless connectivity of multiple independent information devices embedded in the environment of the users. This is done by:

a) Making use of multiple independent information devices (fixed or mobile, homogeneous or heterogeneous) .

b) Interconnecting the above devices seamlessly through wireless or wired computer communication networks.

c) Providing a class of computing / sensory / communication services to a class of users, preferably transparently and can provide personalized services while ensuring a fair degree of privacy / non-intrusiveness.

Ubiquitous computing is changing our daily activities in a variety of ways. Now we give more priority on collaborative study than individual study. We can learn more when we attend some class in a video conference. Self study is now amalgamated with collaborative study. Using digital tools now a learner can connect to another learner who may be in a different country. The geographical barrier is now not a barrier at all in teaching learning process.

UBIQUITOUS LEARNING METHODOLOGY

The term 'e-learning' has undergone a paradigm shift due to pervasiveness of technology. Till very recently. all kinds of learning-related activity that can potentially be e-enabled and e-learning were mainly done through ownership of technologies coupled with access to social software. Now, these can no longer be viewed as a purely institutionally based or narrowly defined set of activities. The concept of e-learning is thus becoming much wider than just providing technology enabled learning resources. The shift is towards how learning can be enhanced by more effective and far-reaching uses of digital technologies. Learning and teaching in a digital age are being intensely altered in a wide variety of contexts by the additional prospective offered by technology. Due to tremendous growth in internet services and mobile communication the entire learning methods have been modified. No one is ready to wait for to get some information which was not true or not possible a few years back. Now we will discuss how e-learning has been modified to enhance learning:

E-LEARNING → ENHANCED LEARNING

'e-Learning' is still widely used to refer to the application of technology to learning. However, the term **'technology-enhanced learning'** highlights on how technology adds value to learning. The key features of 'technology-enhanced learning are :
1) Connectivity to information and to others
2) Access to learning resources for 24 hrs a day and 7 days per week
3) Free choice over the time, place and pace of study
4) Alternative modes of study: distance, blended work-based, partially or wholly campus-based or virtual campus based
5) Knowledge-sharing and co-authoring across multiple locations
6) Opportunities for reflection and planning in personal learning spaces
7) Rapid feedback on formative assessments
8) More active learning by means of interactive technologies and multimedia resources
9) Participation in communities of knowledge, inquiry and learning
10) Learning by discovery in virtual worlds
11) Development of new skills for living and working in a digital age

The concepts stated above can be implemented successfully by the use of ubiquitous computing technologies which lead to ubiquitous learning. Ubiquitous learning allows embedding individual learning activities in everyday life. Hereby, a learning activity is not constrained by schedules and physical spaces; rather, it is pervasive and ongoing, widespread in many interactions among students, faculty, parents, administration and others. Ubiquitous learning is equivalent to some form of simple mobile learning, e.g. that learning environments can be accessed in various contexts and situations. The ubiquitous learning environment may detect more context data and may use more context awareness to provide most adaptive contents for students. So, a ubiquitous learning environment is a situation or setting of pervasive or omnipresent education or learning. Education is happening all around the learner but the learner may not even be conscious of the learning process. Information is present in the embedded objects and learners do not have to do anything in order to learn. They just have to be there. Ubiquitous learning is the next step in performing e-learning and is expected provide various new ways of learning. The potential of ubiquitous learning results from the enhanced possibilities of accessing learning content and computer-supported collaborative learning environments at the right time, at the right place, and in the right form. Furthermore, it enables seamless combination of virtual environments and physical spaces.

THE CHARACTERISTICS OF UBIQUITOUS LEARNING

The characteristics of ubiquitous learning are as follows:

a) **Permanency**: Learners can never lose their work unless it is decisively deleted. In addition, all the learning processes are recorded on a regular basis.
b) **Accessibility**: Learners have access to their documents, data, or videos from anywhere. That information is provided based on their requests. Therefore, the learning style is self-directed.
c) **Immediacy**: Wherever learners are there they can get any information immediately. Therefore learners can solve problems quickly. Otherwise, the learner may record the questions and look for the answer later. The answer they can see afterwards when they are free.
d) **Interactivity**: Learners can interact with experts, teachers, or peers in the form of synchronous or asynchronous communication. Hence, the experts/teachers are more reachable and the knowledge is more available.
e) **Situating of instructional activities**: The learning could be embedded in our daily life. The problems encountered as well as the knowledge required are all presented in their natural and authentic forms. It helps learners to notice the features of problem situations that make particular actions relevant.
f) **Adaptability**: Learners can get the right information at the right place in the right way. The method we apply here is like Just In Time (JIT). We can not wait for tomorrow. We want to know something immediately.

Students frequently get into situations, where, with spare time they could use for learning if only they had learning material at hand or had access to the learning resources. For example a student may feel the urge to learn while waiting in a doctor's waiting room or at the airport. To support these learning situations ubiquitous computing can be of great help. Students will not only learn by means of desktop and mobile PCs but also by means of a set of diverse local and mobile devices based on ubiquitous technology. In such situations, learning material is not semantically related to the physical environment.

To understand the potential of ubiquitous technology and ubiquitous e-learning may be explored in six different parameters:
a) **Connectivity** – access to information is available on a global scale.
b) **Flexibility** – learning can take place any place and any time.
c) **Interactivity** – assessment of learning can be immediate and autonomous.
d) **Collaboration** – use of discussion tools can support collaborative learning beyond the classroom.
e) **Extended opportunities** – e-content can reinforce and extend classroom-based learning.
f) **Motivation** – multimedia and rich-media resources can make learning more effective in all levels.

However, a big challenge lies in identifying when and how technologies are best deployed, including the appropriate matching of devices with learners and learning outcomes in the effective design of learning activities.

PLANNING AND DESIGNING LEARNING ACTIVITY AND MATERIALS FOR UBIQUITOUS LEARNING ENVIRONMENT

A learning activity represents the means by which the educator brings about learning and seeks to influence the development of learners.

What is important to the successful adoption of e-learning is understanding how practice involving learning technologies can enhance the development of learning activities and how e-learning can be effectively integrated into and alongside established practice, to ensure that, whatever the approach and the intended learning outcomes, the learning potential of all learners is maximized. Furthermore, learning takes place in a social and curricular as well as physical context. The individual's relationship with the group or groups that surround the learning activities will also partly define the learning outcomes. The curricular context may also influence the process by suggesting a particular approach which in turn must be matched to learners, the resources available in the learning environment and the intended outcomes. The Figure-1 below, **'A model of learning activity design',** illustrates more fully the process of creating and sequencing learning activities, by highlighting the importance of aligning three essential elements at the heart of learning activity design with the overall pedagogical approach and practice. Each of the three elements

brings with it factors which will have some influence on the designing process.
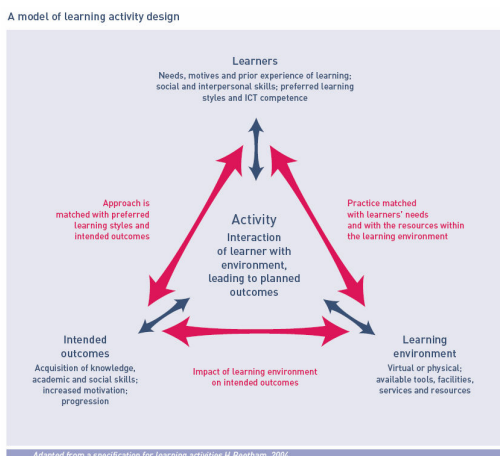

Figure-1

From a student perspective, for designing a learning activity for a technology-rich context the following issues need to be considered:
a) **Learners** - their needs, motives for learning, prior experience of learning, social and interpersonal skills, learning preferences and ICT competence.
b) **Intended learning outcomes** - acquisition of knowledge, academic and social skills, increased motivation and ability to progress.
c) **Curriculum aspects** - approach to learning, assessment criteria, formative assessment strategies; feedback.
d) **Support for learning -** extension or reinforcement activities; involvement of others; accessibility considerations; learning preferences.
e) **Evaluation & Assesment**- outcomes for learners, achievement of learning objectives, feedback.
f) **Reflections -** personal impressions, lessons learnt, conceptualization of knowledge.

Further, it is important to consider the basic curriculum for which the technology-enhanced learning activity is designed.

Some of the important aspects are :
a) Curriculum objectives and other outcomes desired
b) Place where the activity will take place
c) Resources and technologies available
d) Approach towards the activity and description of the learning activity
e) Assessment and feedback strategies to be used
f) Follow-up activities and support during and after the activity
g) Additional support for slow learners and how the fast learners are challenged
h) Assessment of effectiveness of the activity and judging the learning outcome

The following table depicts the effective activity planner for designing and evaluating learning activity in the technology-enhanced learning environment.

Table-1: Designing learning activity

Issues in connection to designing learning	Main focus areas
Learners - their needs, motives for learning	• Prior experience of learning
	• Social and interpersonal skills • preferred learning styles and ICT competence.
Intended learning outcomes	• Acquisition of knowledge • Academic and social skills • Increased motivation and ability to progress.
Learning environment to match with the learners' needs	• Place of activity • Available resources and technologies • Important features of the activity
The learning activity	• Describe the learning activity
The approach taken related to learners' needs	• Individual focus • Social focus • Learning styles • Inclusion • Assessment

In most ubiquitous learning approaches the physical environment is directly and semantically related to learning objectives and activities, for example, a visitor to a museum gets information seamlessly based on his current location. Information and services are "brought" to the environment and/or situation they "belong to". The fundamental question is how to utilize ubiquitous computing technology to enhance learning processes. The main challenges are:
• How to support learning processes while the learner makes use of ubiquitous computing technology?
• Which learning material would be most effective for a student who may use them in various situations and environment?
• What learning activities will be appropriate for the student's understanding of the content and will be able to gather student perspectives and feedback?

For planning to use ubiquitous learning, the activities will still be based on the key elements of the learner, the learning environment and the learning outcome, and the dynamic interaction between these elements. Designing activities which provide opportunities for personalized learning – for example in the place, time or frequency of access to learning materials, is a challenge that educators need to address. Implementation of such activities on a wider scale is a challenge for the institution as a whole.

When designing activities for ubiquitous learning, it is important to consider whether:
a) The activity, and use of technology within it, will support personal routes to learning goals
b) Educators have understanding of learner-centred requirements
c) Assignments based on ubiquitous technologies can be adequately supported
d) Staff development in the associated technical and teaching skills is available

CONCLUSION AND DISCUSSION

After a prolonged and thorough research into the impact of technology-enhanced teaching-learning, it is found that the most challenging task is to prepare an effective learning material and activity to support ubiquitous learning. Ubiquitous learning emphasizes on the concept of anytime and anywhere learning. This brings in the wider concept of unsupervised and collaborative learning, in which the presence of the teacher is inbuilt in the material and the activity. The design for learning material and activities are inclined to be variable and influenced by the established norms in the institution or subject discipline. At the

same time the design also depends on the access to the knowledge and experience of experts and it is highly important constituent of the design process. Implementation of ubiquitous technology-enhanced learning will involve long term planning and will be ideally linked to teaching and learning strategies, audits of current infrastructure and e-learning provision, knowledge derived from pilot studies and student perception surveys, and an understanding of the long-term gains that can be achieved. At the same time the significance of learning material and efficient activities associated with the learning process cannot be undermined in comparison to the technology. More research is required and educators from diversified fields must come together to plan and design activity oriented learning resources to made available to technologists for implementation of ubiquitous learning. Hence, the introduction of ubiquitous technology in learning process is more desired in a phased process. The development of learning resources on a learning platform and moving on to policies to ensure easy accessibility is more effective than uncoordinated experimentation.

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