STUDENT LEARNING ISSUES: FACTORS TO CONSIDER PRIOR TO DESIGNING WEB-BASED LEARNING FOR MILITARY ACADEMY STUDENTS

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Abstract — *As educational schemes come and go to restructure and enlighten students' learning, Web-based learning is now becoming an emergent educational approach in its own right. In Chinese Military Academy, learning academic subjects of course cannot be immune from such scheme. Therefore, rethinking how to go about helping students get more out of education via Web and Internet is a challenge for military academy faculty.*

In this paper, the major pedagogical theories for Web-based learning are described. Then, the learner characteristics (motivation, student conceptions, social background, learning styles and communication skills) are discussed in more detail, especially with respect to student learning in the military academy environment.

This paper also provides some suggestions that may be helpful on designing Web-based learning. It is hoped these viewpoints can be the references for the military academy faculty on designing web-based programs.

Index Terms ¾ Web-based learning, metacognition, constructivist approach, learner characteristics.

INTRODUCTION

Communication and information technologies (C & ITs) are pervading to campus and would create the possibility for new ways of teaching and learning. Toward this trend, the educational environment will embrace technology to enhance student access to learning resources, promote the development of independent learners and encourage greater student-faculty communication and collaboration. As educational schemes come and go to restructure and enlighten students' learning, Web-based learning is becoming an emergent educational approach in its own right. With the Web environment, learning can be beyond traditional classroom limits, creating virtual environment to experiment and explore. Particularly, the learning environment should be helpful for challenging high order thinking and problem solving tasks.

In Chinese Military Academy, learning academic subjects of course cannot be immune from such scheme. Increasingly, the military academy strongly recommends cadets owing a computer by him/herself. Apart from this policy, cadets also are increasingly using computers in the laboratory. For example, cadets use computers for learning C++, Matlab, CAI program, etc. Although using the Web as an aid of learning a subject has less been implemented, undoubtedly, it will be a perspective by the use of the Web to aid learning amongst the more diverse cadet communities. Therefore, rethinking how to go about helping cadets get more out of education via Web and Internet is a challenge for the military academy faculty.

For designing a web-based course, we need to understand better the relationship between technologies, pedagogy, project oriented curricula, and student learning [1]. One of the more crucial areas required for success in development of any learning environment is an understanding of cadet learning issues in the military academy context. There is somewhat different context between the military academy and other universities.

In this paper the major pedagogical theories for Web-based learning are described. Then, the learner characteristics (motivation, student conceptions, social background, learning styles and communication skills) are discussed in more detail, especially with respect to student learning in the military academy environment. Finally, some of the more important factors that may influence on overcomes of the students' learning are also outlined.

PEDAGOGICAL THEORIES IN WEB-BASED LEARNING

Developing effective Web-based learning materials that facilitate learning requires an understanding of the principles underlying how people learn. There are a variety of theories concerning the process whereby learning occurs. Behavioral theories view learning in terms of observable phenomena and ignore thoughts and feelings of learners. In contrast, cognitive theories stress the acquisition of knowledge and mental structures and the processing of information and beliefs. In other words, cognitive theorists focus on how to engage learners' cognitive processes during learning.

During the recent two decades, constructivism has emerged as a new learning paradigm, and now becomes the mainstream principle on the development of Web-based learning. Following the related principles for learning are described.

Mental Models

Cognitive psychologists view mental models to be critical components of developing knowledge and expertise (e.g., [2]) and focus on how to engage learners' cognitive process of learning [3]. Learners may develop either correct or incorrect mental models, so facilitating the formal is beneficial. When learners must understand complex skills or phenomena, the formation and refinement of mental models is a crucial component of that learning. With this regard, teachers need to consider

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how such mental processes might manifest learners during learning. In other words, teachers have to concern not only how information should be structured and presented but also what activities are best for students.

Very often, learners may not develop mental models instinctively; the question is how instructors can assist students' formation and refinement. Alessi & Trollip [4] suggested that providing conceptual models might help learners develop good mental models. Computer diagrams, animations, and video presentations indeed could be considered as means of providing conceptual models that help develop learners' mental models. Thus, Web-based learning involving multimedia technology has great potential for developing mental models.

Active Learning

For learning to take place, the learner must actively process and make sense of available information. Generally speaking, a more active learner will integrate new knowledge more readily than a passive learner. Educational models based on principles of active learning are to facilitate learning in contexts and help students develop process awareness and skills which are essential to learning [4].

While accessing the Web, although a student is free to make decisions as to which link to pursue, but too often students merely browse information before jumping to another site. Many students ignore that they must be deeply involved in the learning environment.

How can instructors increase the possibility that students actively process information? Dodge [6] suggested eight strategies to enhance learners to produce knowledge actively. These strategies include requiring students to compare, classify, induce, deduce, analyze errors, construct support, make abstractions, or analyze perspectives that they encounter in the course of their Web searches.

Unfortunately, a number of Web-based courses involve lectures in which contents are delivered as live lectures. This format, a transmissive (and delivery) mode of learning, places the student in the position of being a passive receiver of knowledge. There is usually little emphasis on his/her own conceptions or the active participation of students in their acquisition of knowledge. From the pedagogical viewpoint, it would not result in the best learning [7]. Therefore, the biggest impact of the Web learning is to change the viewpoint that education is something that can and should be delivered.

Metacognition

Metacogniton can be defined as "the use of cognitive strategies for finding and organizing information and remembering when and where to use them" [8]. Most good learning behaviors rely on metacognition and this is generally regarded as an essential attribute of good learning. Good learning behaviors include taking risks, challenging the instructor's assertions, and constructing

the big picture as new material is encountered. Instructors can encourage good learning behaviors by sharing control with students, providing opportunities for choice, promoting exploratory talk, and raising students' awareness of what constitutes quality learning ([8], [9]).

The Web, if appropriate instructional design strategies are employed, has potential to enhance metacognition. But, it must be noted that it is unlikely to occur if instructors just mount their printed course material and use the Web as a convenient delivery medium. If the design of courses allows individual exploration coupled with reflection and the comparison of a student's views with others, as well as the encouragement of good learning behaviors, then metacognition can be enhanced and good learning can result.

Constructivist Learning

Information on the Web has to be devised so that the student could turn this information into meaning. The emphasis on meaning making has increased recently due to the influence of constructivist approaches to teaching and in learning. According to a constructivist view of learning, learner's cognitive actions that affect their learning and this can depend on their interaction with learning material. In addition, the constructivist approach to learning emphasises that learners construct knowledge for themselves as a result of their interactions with the learning environment [10]. This knowledge is not developed in isolation but within a social and cultural context. In this regard, constructivist-learning approach usually has some emphasis on social aspects of learning, which depends on communication between peer and instructor, or between peers which is probably the critical main points of the constructivist approach of learning. The Web could be potential to allow classes to be run so that authentic activities are set and understandings are sought rather than content delivered.

The Web, coupled with constructivist views, has been perspective for producing learning environments more complex, more authentic, and more appealing to facilitate the construction of knowledge.

In summary, the main features of constructivist learning which might be relevant to Web-based learning has the following aspects:

- Learning is through collaboration with others.
- Learning is through active involvement.
- Learner should have personal autonomy and control over learning.
- Learning is personal growth.

Therefore, the Web-based program should be well designed as following:

- The program shoulld be available for peer interaction and collaboration.
- The program should provide significnat autonomy in accessing and using learning materials
- The program should personalize and not depersonalize a learning experience

LEARNER CHARACTERISTICS

Ideally Web-based learning should be designed to have learner-centered activities. The learner decides how much she/he needs to learn, in what sequence, to what depth and at what rate. The learning process is usually exploratory. Therefore, the need to take care of individual differences amongst learners is much higher in designing the Web-based learning environment than the traditional classroom instruction.

The issues and factors of learning critical to the design of Web-based materials are very much in flux. In this section, we will focus on the discussions of learner characteristics. Characteristics of learners are many (motivation, student conceptions, social background, learning styles and communication skills, etc.) can have a marked impact on probability of successful learning, and Web-based learning should be designed accordingly ([4], [9]).

Motivation

Student motivation refers to a student's desire to participate in the learning process and to pursue the educational goal [10]. Unfortunately, many students are physically present in the classroom but largely mentally absent; they fail to invest themselves fully in the experience of learning.

Students' intended goals or motivation for learning correspond to their preferences for different kinds of instruction. In essence, students whose main concerns are narrowly pass the examination want the instructor to provide only the minimum materials and to present that in the most straightforward way. On the contrary, students whose concerns are more academic want to be challenged intellectually, and to be encouraged to learn widely either in classroom or by the Web.

Students are more motivated when they are allowed to use approaches they prefer rather than being required to use an approach advocated by somebody else. Research addressed that students benefit most from the Web when they want and choose to use it rather than being told to use it. Instructors must be perceptive to these issues. They should understand their role as providing a variety of learning resources and opportunities from which students can choose; they should not try to develop one program that every one should use. At the same time, it is not always possible to provide such alternative; in which case the instructors should strive to accommodate individual differences in order to facilitate effective learning [2].

In addition, satisfaction with the media and processes that make up the learning environment is a major component in a student's willingness to continue in a program or participate in further learning activities. In other words, a student's personal perception of the appeal of Web-based learning is tied to the student's level of motivation.

Student Conceptions

Students differ significantly in their conceptions of what learning is. Commonly, the conceptual distiction lies between accumulative, the quantitative collection of knowledge for possible future use, and transformative, the use of knowledge of internally rearrange and construct new knowledge for developing personal meaning. This contrasting conceptions of learning are associated with differing forms of learning behavior [11].

According to Marton, et al. study (cited by Marshall, et al. [12]), students' conceptions of learning can be summarized as: (1) memorizing and reproducing, (2) increasing one's knowledge, (3) applying in practice, (4) understanding of reality, (5) seeing something in a different way, (6) changing as a person. The first three conceptions are essentially reproductive, and reflect a lower-level, quantitative view of learning. On the contrast, the latter three conceptions reflect a higher-level, qualitative view of learning as an active process of seeking meaning, leading to some kind of transformation in one's view of things.

Marshall, et al. [12] indicated that conceptions of learning are considerably dependent on the educational context. That is, the educational context of students will influence the way they go about learning. The military academy has a particular educational context which is somewhat different from that of other unversities. Thus, it would seem critical for instructors to have insights into the specific nature of the conceptions of academic learning that the students have, and to think about how to develop online program for effective learning.

Social Background

Students who are less social or shame to do face-to-face communication with instructors and peers may find the online environment more comfortable for them. They may become more expressive because of the perception of privacy and the informative nature of mediated communication. By contrast, students who like to communicate with live instructors and peers may be anxious about online tasks. These students may struggle with independent learning and feel insecure with an amorphous teacher. Hence, how to develop an appropriate program to accommodate students' background is also a challenge for the instructors.

Learning Styles

Jonassen and Grabowski [12] indicated "individuals differ in their general skills, aptitudes and preferences for processing information, constructing meaning from it, and applying it to new situations."

Learning style refers to the environmental conditions under which the learner prefers to learn. They are internally based characteristics, containing many different cognitive, social, and affective elements. Learning styles are also general approaches often unconsciously used to intake and understand new information. They are both nature and nurture. Some are biological and stable, such as individual's responds to sound, light, temperature, perception, persistence, etc., which are unchangeable; some are developmental and flexible, such as sociological preferences, motivation, and need for structure, which can

be trained and improved.

It was suggested that most people have only 6 to 14 strongly preferred learning styles, though at least 21 have been categorized. No matter what learning styles individuals prefer, learning style alone makes no sense in affecting learning consequences.

Learning styles are value-neutral, that is, on one learning style is better or worse than another. What contributes to learning outcome is styles' fitness to appropriate learning tasks and special learning purposes. It is believed that learning styles are influenced by some factors, such as subject matter, context, age, prior knowledge, gender, motivation, learning strategy, ethnicity, teaching styles, and so forth.

Students learn things in different ways and at different rates. Many students have a personal preference for either reading or listening. Some students learn better by seeing (visual); some, by hearing (auditory); some, by hands-on (kinethetic/tactile); and some, by combinations. Therefore, if we expect students are adults and if a program contains extensive verbal information, the option to choose speech or text is much better than providing just one or the other. At the same time, instructors also have to encourage students to "stretch" their learning styles to become more empowered in a variety of learning situations.

Communication Skills

With regard of accessing the Web, some students may have a fear of technology. Others may have a low level of technology skills, though this is changing as the military academy are training students and most students are familiar with the network practice. However, there are some students do not possess the communication skills. The effective use for educational communication depends on students possessing certain skills, especially those that allow them to unambiguously convey what they mean across a range of potentially complex interactions. Thus there is still a need to help students to acquire the communication skills and strategies necessary to adapt to the technologies that happen to be available to them in their own particular circumstances.

The characteristics and needs students bring with them would influence the effectiveness of Web-based learning. Consequently, Web-based learning must be designed to meet students' needs and take into account their learning characteristics.

Strategies for Dealing with Learning Issues

As discussed above, learner characteristics often constrain the effectiveness of learning. Therefore, some strategies for developing a Web-based learning should be considered:

- *Providing immediate feedback*: Feedback is important in online courses. Students need many opportunities for feedback on their assignment, discussion participation and overall progress [14]. However, feedback will be beneficial only if it attracts the

learner's attention. The mode of feedback, such as an attractive text or graphic, visual or auditory, is better choice.

- *Rethinking teaching style*: Teaching style and teaching materials must reflect the unique features of online leaning. Therefore, instructors must think about new ways to assist online learning and update the course materials.

- *Understanding student needs*: The instructor must understand student's feelings and experiences. Either communicating by email or by face-to face talking, instructors must show that he/she pays attention to giving prompt replies to questions.

- *Giving students choices*: Giving the students free choice of the resources to review and more assignment that is flexible is the Web-based learning feature. Students must have a variety of possibilities to choose what they need. However, it is sometimes necessary to be some compelling need for students to engage in the discomfort attending the learning environment [9].

- *Encouraging metacognition*: Students who are aware of the learning attributes, such as the nature of learning, effective learning strategies, and their learning strengths and weakness, can have some control over their learning and better cognitive and affective outcomes.

- *Promoting active involement*: what a student "know" is not passively received, but actively assembled by the student. However, many students are in passive learning attitude. Consequently, not only must it allow but also force the students to interact with the instructor during they are learning.

- *Partnerships with the learner*: The biggest impact of the Internet is to change the point of view that education is something that can and should be delivered. Education comes from learning, not teaching. Leaning on the Web requires partnerships. Students learn best when they learn in context. It requires partnerships between instructor and individual student or students, also, among students [7].

- *Learner-centered activities*: Ideally Web-based learning should be designed to have learner-centered activities. The learner can decide how much she/he needs to learn, in what sequence, to what depth and at what rate.

- *Overcoming technophobia*: Technophobia is common because it seems there is always some new technology demanding to be learned on theWeb. Technophobia typically is triggered when two things are coupled: a belief in the value or necessity of learning and using a new technology; and feelings of incompetence or inability to learn the new technology. Ironically, the higher someone values the technology, the more extreme the phobia can become.

- *personal compatability*: Technology sometimes conflicts with students' learning styles, self-concepts. Some students are anxious about the use of the

network. Therefore, the instructor has to consider how to induce students being interested in the course learning. Learning strategies are activities engaged by the student and largely at the student's own initiation. They may be on-line activities like reading the program material, or they may be off-line activities like taking notes on paper. Unfortunately, many cadets do not have a good repertoire of learning strategies, so it can be very helpful to include in hypermedia programs features that encourage, support, and enhance them.

- *Making students' voice heard*: Students should not be "silent partners" in the learning process. For improving teaching and learning, feedback from students ratings is of value. Instructors give student interviews is another way to obtain useful feedback on what, how much, and how well the students are learning.

CONCLUSIONS

As the quality and quantity of military cadets shift, academic education is seen as vital to help the military workforce gain requisite skills and knowledge. The military academy strongly advocates that academic education be viewed as the equivalent of military training. Education in the military is a multibillion-dollar investment each year, and the author believes that using networking technologies for cadets' learning will be a vital trend to make sure this large investment reaches its full potential. While providing Web-based learning the students' learning issues should be considered as the first step in the development of Web-based learning.

This paper has outlined some of more important pedagogical theories and learner characteristics considered relevant to the development of Web-based learning environments. As an instructor, he/she must concern whether the students have been adequately oriented to this new method of education delivery. Unless the students feel comfortable with this method of teaching and learning, its use will be a distraction that shifts the focus from the contents that are to be learned.

There are still more works should be carried out in developing Web leaning environments.

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