

CHAPTER ONE

INTRODUCTION

1.0 Background to the Study

The emergence of the Information Era has initiated a paradigm shift in education. Very often, a choice has to be made by educators to transform the traditional teaching and learning process to one that is more in tune with the Information Age. Although the impact of the "Information Superhighway" on education is only in its infancy, higher educational institutions, colleges and schools throughout the world are pushing ahead with establishing connectivity to the Internet and exploring the potential of Information and Communications Technology (ICT). In the United States, for example, the prospectus of the Clinton Administration's proposal for reauthorization of the Elementary and Secondary Education Act released by the U.S. Department of Education in 1999 indicated that the percentage of public schools and classrooms getting connected to the Internet has increased from 3% in 1994 to 51% in 1998 (The Educational Excellence for All Children Act, 1999). Classrooms in high poverty schools are equally motivated to connect to the Internet. The figure has increased from 2% in 1994 to 39% in 1998. Indeed, most schools' (meaning Kindergarten through Grade 12) networking activity has occurred in the U.S. (Parker, 1994). According to Kumari (1998), the U.S. administration is aimed at getting every school and library wired in the near future. The U.S. President George W. Bush even planned to allocate \$400 million for linking Internet access to student achievement (Wilson, 2000). Integration of telecommunication technology into

technology into instruction in schools can be said to be a means to promote the quality of education particularly Mathematics and Science education (Shepardson, 1995).

For the United Kingdom (U. K.), all schools and colleges will be connected to the Internet by the year 2002 (Lawson & Comber, 1999). In New Zealand, a 1996 survey on the use of computers and Internet connections in 2673 schools revealed that 68% of the secondary schools have an Internet connection (Owens, 1996).

Japan has embarked on a 100-school networking project to accelerate Internet connections by schools (Goto & Nakayama, 1995). It is hoped that all the students are able to access the Web and have their own email account. In Australia about 20 schools are linked (Tsang, Henri & Tse, 1994). Singapore has 14 junior colleges and 24 secondary schools linked to the Internet (Johnson, 1996) with a plan to have all the 350 schools on the island wired in the near future. In fact, Northern America, Australia and Asia's Four Dragons (Korea, Taiwan, Hong Kong and Singapore) have initiated special plans to incorporate Internet into K-12 education (Tsang, Henri & Tse, 1994). This is the scenario relating to connectivity in the advanced regions of the world. What about developing countries like Malaysia? Malaysia is not lacking in its enthusiasm in getting the schools connected to the Internet. Malaysia's National Education Network at its trial phase has wired 50 schools to the Internet (Asian Technology Information Program: The Internet in Malaysia, 1999). In addition, the Ministry also planned to equip 8000 primary and secondary schools with information and communication facilities (IT facilities for 8000 schools: First stage to involve 1,500 of them, 2000).

In fact, there is a dramatic increase in the use of computers in both elementary and high school classrooms during the last decade (Fowler & Wheeler, 1995). The computer

networks as a medium provide greater affordances as compared to other media such as face-to-face communication, text, videos and computer software. They (networks) synthesize the capabilities of all the other media. They can provide face-to-face interaction through video conferencing and all the text, videos, and software that the world produce. The two most profound effects of networks to date have been (a) to connect people all over the world into communities of interest, and (b) to support ordinary people, including children, into becoming producers of materials, as well as consumers. The computer networks no doubt led to the birth of the Internet and the succeeding digital learning environment.

Politicians, reformers and educators hold out the hope that the Internet will have a profound positive impact on education generally, and K-12 education particularly. Indeed, the Internet is already having a significant impact on education at all levels (Dwyer, Barbieri & Doerr, 1995). Online instruction will have a very significant positive effect on traditional instruction (Burgos, 1998) and the Web will change the nature of teaching and learning forever (Cunningham, 1999).

Educators around the globe maintain that Internet technology does provide a new medium for delivery and instruction. Through the World Wide Web (WWW), the Internet provides us with global resources; through email, it provides us with a great communication tool and through some advanced technologies (like desktop video conferencing and virtual activities like tours and scientific experiments), the Internet provides us with the possibility of changing our students' environment. The integration of information technology productivity tools is indeed beneficial to the learning experience of the students (Seeburg, 2000). It encourages interactive learning, it facilitates

collaborative working, it helps to bridge the gap between abstract and concrete ideas, it broadens learning styles, and most importantly it gears the learners towards achieving higher level of competencies (Fields, 1993). It is a major step to produce individuals who are able to participate in a networked, knowledge-based economy (Harasim, 1997).

1.1 The Problem

Literature supports the notion that educators around the globe are enthusiastically connecting their students to the Web. However, literature also indicates that the Web is merely used to deliver educational content more efficiently rather than creating new learning experiences and opportunities (Schutte, 1997). Hewson & Hughes (1998) asserted that in many cases where the Web is used for teaching and learning, there is a lack of sound instructional design in the learning materials. Ritchie and Hoffmann (1997) advocated the use of instructional design principles to amplify learning on the Web. Only with these (instructional design principles) the Web can be transformed from its function as an informational resource medium to an instructional medium. According to Howard and Terry (1997), appropriate instructional design principles are needed to create an effective WWW courseware. He further suggested the use of learner-centered design principles to increase the effectiveness of the instructional materials. Henke (1997) asserted the consideration of students' learning styles in designing web-based instruction besides the application of learning theories. Likewise, Smith (1989) called for the considerations of student learning preferences (auditory, visual and tactile/ kinesthetic) in the development of computer related instructional materials. The research therefore indicates two critical elements in web-based learning, that is the creation of a learning

environment based on some learning principles and the consideration of students learning preferences in designing learning activities.

1.2 Rationale for the Study

The Web has drawn more and more educators' attention and has been employed as a delivery tool. The major idea on web-based learning focuses on using the Web as a bridge to provide communications and instructional activities between teachers and students. However, without relevant pedagogical techniques and learning activities, web-based learning might not be effective. Therefore, the Bio-WebClen is designed by infusing constructivist learning principles into the web-based learning environment. Constructivism as a type of learning environment has been a very popular idea in the teaching and learning of Science.

The study on the effect of web-based learning is still limited. For constructivist web-based learning environments, there is little indication of the evaluation of its effect on student learning. As it is important to assess whether a web-based learning environment improves learning, evaluation of the Bio-WebClen may provide an indication of its effectiveness in promoting learning. As effective learning requires appropriate interaction and cognitive engagement, it is deemed necessary to examine the pattern of interaction and the learners' time on task during the learning process.

Researchers have always advocated the design of a learning environment to accommodate individual differences. Although it is difficult to custom design lessons to benefit all students, it is important to prepare a learning environment that is most suited for effective learning.

1.3 Purpose of the Study

The primary purpose of this study was to investigate the effect of the Biology web-based constructivist learning environment (Bio-WebClen) on learning among students of different learning styles. Efforts were made to identify the learning activities that promote learning and content acquisition among learners of different learning preferences. The secondary purpose was to explore the nature of the learning process in terms of interaction and time on task.

As the majority of the Malaysian students have not been exposed to teaching and learning in a web-based constructivist environment, it is important to note how the students perceive and react towards the new technological environment.

1.4 Research Questions

The following research questions guided the study:

1. What is the effect of the Biology Web-based Constructivist Learning Environment (Bio-WebClen) on learning among students of different learning styles (auditory, visual, and tactile)?
2. Do the activities in the Bio-WebClen enhance content acquisition among students of different learning styles?
3. What is the nature of the learning process in the Bio-WebClen?
4. How do the students perceive the Bio-WebClen?

1.5 Significance of the Study

The emergence of Internet and Information Communication Technology (ICT) has initiated changes in all aspects of our lives. These technologies have revolutionized the teaching and learning approach. Educators around the globe have begun to realize that traditional approaches of teacher-centered learning may not be able to produce individuals that characterize the information age. Therefore, a viable solution is to have student-centered learning. A web-based environment is said to encourage this type of learning.

According to Reeves (1998), it is customary for technology to be used in schools in the "from" approach, which means that students learn "from" the technology. Examples of these are instructional television and computer-assisted instruction. The other approach of using technology, the "with" approach which means learning with technology, is very much neglected. Examples of these are the cognitive tools and constructivist learning environments. It is time to rethink to engage technology using the "with" approach to increase the effectiveness of learning in a technology-mediated classroom.

Teaching and learning using the Bio-WebClen serves as an initial step to assist students in preparing for an adult life which will be very much based on information. Students are expected to learn about how to deal with the ample resources and make learning part of the so called "information society".

The participation of students in the study may help to promote their interest in integrating the World Wide Web technology into learning. It is hoped that the students may find learning more meaningful and motivating. In addition, they may find their

experiences in real life having a close relationship to the knowledge pursued and be able to demonstrate the ability to transfer learning.

Overall, it is hoped that the findings from this study will contribute to an understanding of the web-based learning environment, as preferred by students of varied learning styles. Also, teachers in the process of designing environment will be more sensitive to the learning styles as compared to teaching styles.

1.6 Definitions of Terms Used in the Study

(i) WebClen

WebClen refers to Web-based Constructivist Learning Environment. It is an Internet-based learning environment designed with reference to constructivist learning principles. The WebClen was created by Abtar (2000) for teaching Geoscience in the Malaysian primary schools.

(ii) Bio-WebClen For Form Four Students

The Bio-WebClen was adapted from WebClen to support teaching and learning of a sub-topic, namely "Vitamins" in the Form Four Biology Syllabus in the Malaysian Secondary Schools.

(iii) Learning styles

Learning styles refers to the characteristic preferences in the ways a student takes in information. Some students respond strongly to visual images (visual learners), others get more from verbal forms (auditory learners). Some, however, prefer to learn interactively (tactile learners).

(iv) Nature of learning process

The nature of the learning process refers to two of the dimensions of learning: the pattern of interaction among learners and the learners' time on task.

(v) Internet

Refers to computers interconnected through the worldwide communication system.

(vi) World Wide Web (WWW)

Also known as the Web. It refers to an Internet-based system of linked pages of information.