In this study, the PTEchLS WebQuest on Gas Laws was evaluated. It was designed for Form Four students with active learning styles. The focus of the evaluation was on the usability and effectiveness of the PTEchLS WebQuest. Data were collected from interviews and students’ achievement scores. Two teachers and eight students volunteered to participate in the usability evaluation. In addition, a pretest-posttest design was used to measure the effectiveness of the PTEchLS WebQuest on students’ achievement and was implemented with 32 learners with active learning styles. The findings showed that the PTEchLS WebQuest for learners with active learning styles was effective in facilitating learning Gas Laws in Physics. In addition, teachers and students had positive perceptions toward PTEchLS WebQuest.

Keywords: Physics, Usability Evaluation, Webquest, Gas Law

INTRODUCTION

Malaysia’s aspiration to be a developed nation by 2020 can only be achieved with a large science and technology-based skilled workforce. Towards this vision, the Malaysian government instituted the 60: 40 Science/Technical: Arts (60:40) Policy in education in 1967 (Ministry of Education Malaysia (MOE), 2013). However, studies in 2011 showed that we were far from this target as only 45% of students were graduates from the science, technical and vocational streams (MOE, 2013). Furthermore, the Programme for International Student Assessment (PISA) results, which measure rankings in reading, mathematics and science, have shown that Malaysia is ranked in the bottom third among the 74 participating countries in 2009. Malaysia has also dropped below the international average for both the PISA 2009 and 2012 results and the 2011 Trends in International Mathematics and Science Study (TIMSS) for both science and mathematics subjects (MOE, 2013; Organisation for Economic Co-operation and Development (OECD), 2012). In consideration of these studies, Malaysia’s Education Blueprint 2013-2025 notes the need for intervention in achieving the targeted STEM careers.

Science Technology Engineering and Mathematics (STEM) education should relate to engineering and increasing student understanding of how things work while improving their use of technology (Bybee, 2010). Scientific processes and skills should also be taught in line with skills needed in the 21st century (Bybee, 2010; MOE 2013). Studies have shown that integrating technology has potential for improving learning in science (Lin, Tsai, Chien, & Chang, 2013; Shieh, Liao, & Hu, 2013). Furthermore, recent studies have indicated that webquest has high potential to be an effective tool for teaching and learning (Alshumaimeri & Almasri, 2012; Laborda, 2009; Segers & Verhoeven, 2009), can enhance students’ potential (Allan & Street, 2007; Zacharia, Xenofontos & Manoli) and create a positive environment for learning (Allan & Street, 2007; Chang, Chen & Hsu, 2011; Kleemans, Segers, Droop & Wentink, 2011).
A webquest is a research-based activity that requires the learner “to collect information about a subject using the web” (Sharma & Barrett, 2007: 24). The Webquest model first developed by Dodge (1995) consists of six components: introduction, task, information, process, evaluation and conclusion. A webquest guides students to specific websites to enable a problem task to be solved, thus eliciting higher-order thinking and is not a simple information search and recall (Gülbahar, Madran & Kalelioglu, 2010). Webquests are common ways of managing and linking online resources in the research of a topic, and when appropriately used can trigger the situations necessary to stimulate both written and oral communication (Laborda, 2009). Allan and Street’s (2007) research on the impact of webquests in primary teacher-training, show that webquests have the potential to promote higher order learning within different disciplines in higher education. It also creates a new environment in learning.

Most studies on Webquests employ quasi-experimental research design (Alshumaimeri & Almasri, 2012; Chang, Chen, Hsu, 2011; Halat & Peerker, 2011; Hsien, Chung, Chien, & Chih, 2012; Segers & Verhoeven, 2009), with some using design and developmental research (Gülbahar, Madran & Kalelioglu, 2010; Mohd Nordin & Ngau, 2009) and evaluation (Lee & Mohd Saat, 2008).

A web-based interactive system, Web Macerasi, developed for teaching-learning and assessment, was evaluated to investigate the possible effects of using the system (Gülbahar, Madran & Kalelioglu, 2010). The two-stage study consisted of the design, and the implementation stage. The first stage was the design and development of a webquest site as an interactive system in which various internet and web technologies are linked for infusion of technology into the teaching and learning process. The Web Macerasi site was used by 92 prospective students who attended different courses in different years to complete their project work. A questionnaire and a focus group interview were used to collect data on the students’ perceptions of the effectiveness of the system. The design of the Web Macerasi system was enhanced based on input from data gathered in the previous phase. For the implementation phase, 27 students from different courses used the system. The analysis of their perceptions of the system showed that students favoured the technology-supported media, were more willing to collaborate, found the feedback very useful, and agreed that the planned tasks contributed positively to their learning experience. This would mean that the Web Macerasi site was effective.

In the Malaysian context, there have been limited research studies that focused on webquests for science instruction. Mohd Nordin and Ngau (2009) developed a webquest, Computer System WebQuest, for the subject of ICT in secondary schools. The main objective of the study was to evaluate students’ perception of WebQuest as a teaching tool. A questionnaire was used to evaluate the graphical user interface and the structure of the content knowledge in the WebQuest. The results showed that the learners found the overall presentation of the Computer System WebQuest suitable and interesting for learning. Hence, this implies that there is a potential for webquests to be used as a tool for teaching and learning.

In another study by Lee and Mohd Saat (2008), a webquest for instruction on Nutrition using the webquest template, NutriQuest, was evaluated. The study used a qualitative-naturalistic-formative approach, where the focus was on program improvement. It also explored the various effects on participants. The study showed that the NutriQuest websites facilitated the learning of nutrition in science for Form Two students, and that both teachers and students showed a positive attitude toward webquest for science instruction. The use of webquest for instruction depended on several factors such as teacher’s role, technical problems, and curriculum content.

In the literature reviewed, there was not much information on the use of webquests related to learning style. It is important to identify a learner’s unique learning style to ensure that learners are engaged in learning (Graf, Kinshuk, & Liu, 2009; Larkin-Hein & Budny, 2001; Naimie, Siraj, Ahmad Abuzaid, & Shagholi, 2010; Yang & Tsai, 2008). This is because when instruction is aligned with the learners’ learning styles, in addition to having affective and motivational