An Evaluation of Gas Law WebQuest Based on Active Learning Style in a Secondary School in Malaysia

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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.

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; Kleemens, Segers, Droop & Wentink, 2011).

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State of the literature

- Numerous studies have been carried out in evaluating the effectiveness of webquests.
- Various studies on learning styles indicate that it is important to align learning activities to the learning style.
- This study will fill the gap in knowledge by investigating whether webquests could be used effectively by active learners in Science, Technology, Engineering and Mathematics (STEM).

Contribution of this paper to the literature

- This paper tests the effectiveness of PTechLS WebQuest on the achievement of students with active learning styles.
- Webquest could be used to facilitate learning for STEM.
- The paper offers insights on the usability evaluation of the PTechLS WebQuest by teachers and students.

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, 2012Segers & 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

advantages, the learner's achievements improve as well (Aviles & Moreno, 2010; Franzoni & Assar, 2009; Hsieh & Wu, 2013; Lau & Yuen, 2010; Lin, Tsai, Chien, & Chang, 2013; Saeed, Yang, & Sinnapan, 2009). Learning styles define how a learner concentrates, processes and retains information during learning (Dunn, 1990).

Alias, DeWitt and Siraj (2013) have developed a Physics pedagogical module based on learning styles and technology. In their study, a match of the appropriate technology according to the learning styles of students was identified using a modified Delphi Technique involving 21 experts in Physics and technology. The findings suggest that webquests are suitable for active learners. The findings from Lee and Mohd Saat's (2008) study also show that the constructivist nature of webquests enable students to be involved in active learning, and problem solving in cooperative groups.

Hence, this study was aimed at evaluating the PTechLS Webquest on Gas Laws, designed for Malaysian secondary school science learners with active learning styles and also to test its effectiveness on students' achievement. The PTechLS WebQuest may develop students' interest in learning science and encourage them to choose careers in STEM.

THE PURPOSE OF THE STUDY

This study is part of a larger study on the design and evaluation of a Gas Law WebQuest based on learners with active learning styles. The main purpose of this study was to evaluate the PTechLS WebQuest on Gas Laws and to test its effectiveness on the achievement of students with active learning styles. The PTechLS WebQuest was developed (as shown in Figure 1 and Figure 2) to improve Form Four secondary school students' understanding of fundamental Gas Law concepts and its application in daily life (in Malaysia, Form Four is the equivalent of Grade 10). In the evaluation of PTechLS WebQuest, the focus was on its usability and effectiveness on students' achievement.

This study seeks to answer the following research questions:

- What are the students' and teachers' perceptions toward the usability of PTechLS WebQuest?
- Is PTechLS WebQuest effective for students' achievement in learning science?

SIGNIFICANCE OF THE STUDY

This study is significant as the findings can be used by educators to determine whether the PTechLS WebQuest for students with active learning style is effective on students' achievement. This is important as there seems to be more active learners in Malaysian

schools and STEM education also stresses on active learning. In turn, educators would also be able to design instruction based on the PTechLS WebQuest. It is also hoped that students' interest in learning science would develop and thus encourage them to consider a STEM career.

In addition, student perception of the PTechLS WebQuest would provide input for further enhancement. This would enable instructional designers to design new models for effective learning with the PTechLS WebQuest.

THEORETICAL FRAMEWORK

Social Constructivist Theory

Vygotsky believed that learning occurs when an individual works in the zone of proximal development (ZPD). In the social constructivist perspective, when students are unable to solve an assignment, they are in the ZPD. However, with the help and assistance from adults and friends, the students are scaffolded so that they are able to understand the concepts and ideas involved in completing the assignment (Slavin, 2006; Woolfolk, 2007). Scaffolding is important as guidance from competent individuals such as teachers or friends, given at the beginning of a lesson could gradually be reduced until students take on full responsibility for learning, when they are ready (Slavin, 2006; Woolfolk, 2007).

This study employed the social constructivist theory in implementing PTechLS WebQuest for secondary school Physics. The instructional module required the students to complete assignments as they explore and generate ideas on Physics concepts such as Charles's Law and Boyle's Law. The teachers would guide the students if they had problems and the students could refer to their peers during the teaching and learning process. As Vygotsky explained, the zone of proximal development is the gap between the 'actual developmental level as determined by independent problem solving' and the higher level of 'potential development as determined through problem solving under adult guidance or in collaboration with more capable peers' (Vygotsky, 1978, p. 86).

ZPD and scaffolding were employed in this research. Scaffolding was given whereby the teacher guided the students in troubleshooting technical problems when accessing the wireless internet connectivity, until they were able to access the internet on their own. In addition, students could always refer to the teacher and their peers during the teaching and learning process to reduce the ZPD. Finally, digital resources through the WebQuest support learning and provide scaffolding to learners by providing suitable links, and this eventually enables the students to select their own links.

A WebQuest is a learning activity used by educators. During this activity learners read, analyze, and synthesize information using the World Wide Web. Webquests werw invented by Bernie Dodge and Tom March at San Diego State University in 1995.

According to Dodge's original publication a Webquest is " an inquiry-oriented activity in which some or all of the information that learners interact with comes from resources on the internet, optionally supplemented with videoconferencing" (Dodge, 1995a; Dodge, 1995b).

http://www.tommarch.com/ozblog/

http://www.webquest.org/

http://edweb.sdsu.edu/people/bdodge/

http://en.wikipedia.org/wiki/WebQuest

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No recent posts

Figure 1. Screen Capture of the Main Page of the PTechLS WebQuest

Lesson 1 - Active Learner Physics Pedagogical Module - Windows Internet Explorer

http://pedagogifizikactive.webs.com/lesson1.htm

File   Edit   View   Favorites   Tools   Help

Google   modul pedagogi fizik   Search ▾   Share   More »

Favorites   Lesson 1 - Active Learner Physics Pedagogical M...

The task

You are given a task to become a teacher. You are suppose to produce a power point to:

1. explaining gas pressure, temperature and volume in terms of the behaviour of gas molecules.

2. determine the relationship between pressure and volume at constant temperature for a fix

mass of gas.

The Process

1.   Make a title page for your power point. The title page should include the title of this project , your name, class period and a picture that deals with that topic.

2.   Find the theory of gas pressure, temperature and volume in terms of molecules.

http://www.grc.nasa.gov/WWW/K-12/airplane/kinth.html

Figure 2. Screen capture of the task and process in the PTechLS Webquest

PTechLS WebQuest

The PTechLS WebQuest was designed to provide students with active learning styles with a suitable learning environment when learning science. The PTechLS WebQuest was developed based on Dodge's model (1995) with the six components as follows: introduction, task, information, process, evaluation, and conclusion. An online web development site, *Freewebs*, was used and the activities, tools, information, and relevant media were linked through the PTechLS WebQuest.

The learners would access the webquest using laptops provided for the groups. The task was an assignment in the form of a group project, and guidance on the information required was provided through the webquest. The process involved accessing the activities through links in the webquest. The activities were centered on group project tasks which required answers to the exercises to be posted on the blog. The

evaluation and conclusion was to be completed on the blog as well. The elements of the PTechLS WebQuest based on learning style are in Table 1.

Usability Evaluation Using Retrospective Evaluation

This research employs the usability evaluation framework by Chai and Chen (2004). This framework provides clear guidelines for classifying types of usability evaluation based on the three parties involved.
They are:
a. *the system under evaluation which can be in a product form that has been released, a prototype, or design document*
b. *the user*
c. *the evaluator.*

The three parties, depending on the focus of the evaluation, may change their roles in certain situations, and this will determine the choice of evaluation methods. Table 2 shows the role of the three parties in determining the choice of evaluation methods. Based on Table 2, there are four methods for usability evaluation. Usability tests and observations are used when the system is present. On the other hand, user retrospective and evaluator retrospective evaluations are used when the system is not present. This means that the evaluation of the user or evaluator's experience with the system was done when the system was not present. In this research, the users' retrospective evaluation was selected as the most suitable method to evaluate the PTechLS WebQuest for learners with active learning styles. This was because the teachers involved in this research had experience using the PTechLS WebQuest, and evaluation was done through interviews after the use of the webquest to investigate their reactions. The users did not have the PTechLS WebQuest at the time of evaluation.

METHOD

Design of the Study

This study is part of the evaluation phase of a design and developmental research study. A pretest-posttest design was employed to test the effectiveness of the PTechLS WebQuest on the achievement of students with active learning styles.

Selection of Site and Samples

The school selected for this study was an urban secondary school in the state of Selangor which had a multiracial student population reflective of the multiracial communities in Malaysia. Students in Form Four with active learning styles were identified using the Index of Learning Styles (ILS). The ILS, developed by Felder and Soloman (1988) and translated into the national language, Bahasa Malaysia, by Siraj and Badar (2005), was administered to 120 Form Four students. The ILS has a Cronbach alpha reliability score of .72.

A sample of 32 learners identified as having active learning styles was selected for participation in the pretest-posttest study. The students were divided into groups of four and the study was conducted in the Physics Laboratory. The students worked in groups, with each group sharing a laptop with wireless internet connectivity to access the PTechLS WebQuest. The Groups were named as follows: Group A, B, C, D, E, F, G, and H (see Table 3).

In the next phase of the study, eight students and two teachers were selected to be involved in the usability evaluation of the PTechLS WebQuest. Their perception of the strengths and weaknesses when they used the PTechLS WebQuest was elicited through interviews.

Table 1. Active learning style elements in the PTechLS WebQuest for Gas Law

Elements	Technology Tools	Electronic Digital Resource	Teaching Technique	Activities	Exercises
Details	Laptop	Webquest	Group Project	Post answers on the Blog	Do group work

Table 2. Usability evaluation method framework (adapted from Chai and Chen, 2004)

Role of the System	Users' Role	Evaluator's Role	Evaluation Method Type
Presence	Users perform certain tasks using the system	Evaluator evaluates the interaction between user and the system	Usability Test
(System exists during evaluation)	No real user involved	Evaluator evaluates the interaction between evaluator and the system	Usability Observation
Absence	Users have finished certain tasks using the system	Evaluator evaluates user reaction towards interaction with the system	User Retrospective
(System is not present during evaluation	No real user involved	Evaluator evaluates her/his reaction towards interaction with the system	Evaluator Retrospective

Instruments

A set of two multiple choice tests was used as instruments for pretest and posttest. These tests were designed to analyze students' achievement on the understanding of Gas Laws (Charles's Law and Boyle's Law). There were 25 items in each of these instruments. The instruments were content-validated by three Physics teachers while the language was validated by two language teachers. These teachers were experts who had more than 10 years' working experience.

Data Collection Method

Interviews and pretest-posttest were used for data collection. The purpose of conducting interviews was to gain in-depth information about the perception of the teachers and students in the usability evaluation. Secondly, the researchers would be able to enhance the PTechLS WebQuest by better understanding the needs, and problems faced by the teachers and students during the implementation. All interviews conducted in this study were audio-recorded in order to avoid missing any useful information and later transcribed for verbal documentation.

The purpose of pretest-posttest is to determine the effectiveness of PTechLS WebQuest on students' achievement.

Data Analysis

The evaluation of the PTechLS WebQuest was guided by the usability evaluation framework for analysis and data reporting. The pre-post test results were analyzed using *t*-tests.

FINDINGS

Usability of the PTechLS WebQuest

The usability evaluation of the PTechLS WebQuest according to the responses as perceived by the teachers and students were categorized into several themes.

There were several strengths of the PTechLS WebQuest noted by the students in the retrospective evaluation. Firstly, the students were amazed and delighted at being able to learn according to their learning styles. This was evidenced by student D3 who stated "Learning style? No teacher allows me to learn alone.", and student A1 "I think learning this way - I like it. It definitely suits me." The PTechLS WebQuest provides the opportunity to learn according to the individual's learning style and was an advantage as A2 noted "It becomes easier to learn because I understand better."

Table 3. Groups and Group Members

Group	Members
A	A1, A2, A3, A4
B	B1, B2, B3, B4
C	C1, C2, C3, C4
D	D1, D2, D3, D4
E	E1, E2, E3, E4
F	F1, F2, F3, F4
G	G1, G2, G3, G4
H	H1, H2, H3, H4

Learning according to the individual's learning style provided the opportunity to understand Physics concepts. "I had to think. Not only copy and paste the content," explained student C4. Students B3 and B1 were excited about learning this way and exclaimed respectively "Unbelievable! I can still remember what I learnt," and "Effective, that's it. I can still remember what I learnt, even now."

The students were encouraged to communicate when using the PTechLS WebQuest. This was clarified best by C1, "So if we learn using this way, we communicate. Through communication, we give our opinions before doing any work."

Student interest and motivation in studying Physics improved with the PTechLS WebQuest. Student D1 shared "Physics normally does not interest me. I know the basics of Physics but I do not know how to apply them. When I use the PTechLS WebQuest, I am really clear on the whole topic." Another student E3 clarified, "Learning Physics becomes much more fun this way. All the exercises help. I really hope that someday I might learn at school with technology like this."

The use of the PTechLS WebQuest requires some ICT knowledge and skill. In fact, the participants noted that their ICT skill had improved. Student F4 explained, "It's a new experience as I explore using the internet more, using it to search for knowledge, and to apply the knowledge to what I learn."

There is potential for the PTechLS WebQuest to be implemented as many of the students rationalized that it was useful. Student G3 says "I want it and hope that the researchers will strive to make it a success," while A3 says, "It's suitable. There are some students who do not care for Physics as they think it is a difficult subject, and they would neglect this subject as there is no one to motivate them. I think this PTechLS WebQuest is useful for encouraging students like these." Finally, H2 feels that PTechLS WebQuest should be made available to everyone, "I think you (the researchers) should produce more WebQuests based on learning styles and not only do it for your experiment. You should also publish the PTechLS WebQuest for public use."

The students found the PTechLS WebQuest useful and noted that one of the strengths was that it was easy to follow. In addition, they found it interesting. Student C4 shared "If I use the text book I can get only the facts, but when using this PTechLS WebQuest, I can get the real picture." In addition, another student D2 stated, "This module is easy to understand. If the module used a lot of words, it would be difficult to understand. If all words, it's boring too. This module attracts my attention and is easy to use."

On the other hand, the students noted a weakness in the PTechLS WebQuest. Many of them had difficulty in completing one particular exercise. This was stated as a weakness by student C1, "There is one exercise that requires conversion from "atmosphere" to "torr". That's all. Others are technical problems."

The teachers' retrospective evaluation indicated that the strength of the PTechLS WebQuest was that students were able to learn according to their learning styles. Teacher Y states: "Different groups of students wish to study in different ways, so this definitely follows the students' wishes. Therefore, in my opinion the PTechLS WebQuest fulfils the individual students' learning styles." Teacher X admits that it is important to take into account learning styles, which is often ignored: "A very good program. It is able to consider different learning styles of students which teachers always forget."

The PTechLS WebQuest enables students to understand the Physics concepts better. Teacher X states, "Yes. We feel very happy when the students get all the concepts that we taught them. When compared to "chalk and talk", sometimes they don't get anything at all." In addition, she notes that "when the students don't know. They will ask. Then we are able to know which concept they understand less or don't understand. We will know."

The findings show that the strengths of the PTechLS WebQuest are similar to that outlined in the students' usability evaluation. Teachers also noted that there was more effective communication. Teacher X states "If we use chalk and talk, there is no two-way communication. But using this WebQuest, there is two-way communication. If the students don't know, they will ask us." In addition, teacher Y shares "When the students explore on their own, they will ask the teacher if they encounter any problem. Hence, there is two-way communication."

Students were also motivated to study and begin to like the subject, Physics. Teacher Y shares "The strength is students will like Physics more. Because when they understood what they learnt, they will explore more, even when they were at home."

In addition, the teachers also perceived that their ICT skills improved. Teacher Y says, "I really like it. Because it gives me the opportunity to use ICT. For example, the normal lesson is boring, and with ICT we have extra advantage now. Therfore we can apply our knowledge of ICT." Teacher X also shares, "This WebQuest is able to improve my internet skills and knowledge."

The teachers agreed that this PTechLS WebQuest has the potential to be implemented in the future. Teacher X says, "Good. It can be applied to not only Physics but also other subjects like Biology." She also states "It is correct. My perception has changed. I can see that in future if we use this PTechLS WebQuest, and categorize students according to their learning style, I can see the results will be better than ordinary teaching and learning. Therefore the results of this study are really encouraging."

The teachers also noted that the module was easy to use. Teacher Y states "Hence, students just have to follow step 1, 2, and 3. Then we can achieve the results, and get the conclusion. Therefore, in my opinion it is very structured."

However, the teachers noted the same weakness as the students did on the exercises. The lack of variety of exercises given was noted as a weakness of the PTechLS WebQuest for learners with active learning styles. Teacher X suggests, "We can give some variety. From what I saw just now, we can highlight some facts like conversion of 1 Atm to Torr. We can add remarks here. That's all I noticed as other aspects seems okay." Teacher Y had another suggestion on the questions. "The questions need to be updated from time to time. If possible provide different options for the learner to choose.

Effectiveness of PTechLS WebQuest

In order to determine the effectiveness of the PTechLS WebQuest, the difference in means of the pretest and posttest results were analyzed. The findings from the module evaluation by 32 students suggest that the module is effective on students' achievement as there were significant differences between the groups in their achievement scores as shown by the t-tests (Table 4). Findings from module evaluation suggest that the module is effective for learners.

Table 4 shows that there is a significant difference between pretest (mean = 52.07, SD = 18.18) and posttest (mean = 55.03, SD = 16.58) marks, t (32) = 5.55, $p < .05$. The mean scores indicate the posttest scores are significantly higher than the pretest scores for achievement in the PTechLS WebQuest.

Table 4. *t*-Test comparison of means of pre/posttest achievement towards PTechLS WebQuest

	Pretest (*N* = 32)	Posttest (*N* = 32)	*t*-value	*p*	Effect size
M	52.07	55.03	5.55	.03	0.69
SD	18.18	16.58			

DISCUSSION AND CONCLUSION

This study is similar to other developmental studies where a webquest template is designed (Gülbahar, Madran & Kalelioglu, 2010; Mohd Nordin & Ngau, 2009). Although this study investigates the perception towards a webquest template similar to Web Macerasi (Gullbahar, Madran, & Kalelioglu, 2010), it differs from other studies as it was done in the framework of usability evaluation.

The findings derived from students' and teachers' retrospective evaluation indicate that the PTechLS WebQuest for learners with active learning styles can help students understand Gas Law concepts in Physics. These results support literature that state technology and learning style have the potential to enable better understanding of abstract concepts (Tsoi, Goh, & Chia, 2005).

There are also indications that the PTechLS WebQuest encouraged effective two-way communication between teacher and students, consistent with other studies (Lee & Mohd Saat, 2008).

PTechLS WebQuest was also found to have improved teachers' and students' ICT skills. This supports the viewpoint of Shuib (2009) that the use of laptops and wireless technology can improve students' ICT skills. However, other studies with teacher trainees have shown that teacher trainees may not be prepared to change and use new technologies such as WebQuests (Koc & Bakir, 2010). Further studies could be conducted to determine if Malaysian teachers also hold this view.

The use of PTechLS WebQuest had improved students' achievement in Physics. This supports findings by other researchers using technology (Allan & Street, 2007; She, 2007). This also seems to be consistent with literature that state students who are taught in learning situations that take into account differences in learning styles can easily receive and are more interested in learning new and difficult information (Hein, 1994). Finally, this study revealed that the PTechLS WebQuest is interesting, and practical in implementation, thus reflecting the findings of Lee and Mohd Saat (2008) is using WebQuest.

This study had several limitations. Although there was a significant improvement in the achievement of students' test scores, there was no evidence that this was solely due to the use of the PTechLS WebQuest. There might have been other factors such as the novelty effect of the technology resource used. A longer implementation period would be required to determine if the effects were permanent. In addition, the sample size was small as it involved only 2 teachers and 32 students. However, this study indicates that there is a possibility that Webquests can be used effectively for STEM. Further studies however, would be required to determine if Webquests can be effective for other STEM subjects.

In conclusion, it can be said that PTechLS WebQuest for learners with active learning styles has many strengths as identified through teachers' retrospective evaluation. Firstly, it gives space and chance to students to learn according to their learning styles. Secondly, the module can help students understand abstract Physics concepts. Thirdly, it also allows effective two way communication between teacher and student. There is also evidence that students liked learning Physics using WebQuests and it also helped upgrade their ICT skills. This indicates that the PTechLS WebQuest for students with active learning styles has the potential to be implemented in the future as it is practical, and had a positive impact on cultivating student interest in learning Physics. Hence this indicates that the PTechLS WebQuest can be implemented for STEM education as it stimulates learners' interest in science by improving their understanding of abstract concepts, and creates interactions which mimic the collaboration among scientists (Emdin, 2010).

The use of the PTechLS WebQuest has been shown to be effective for learning when implemented with a small group of students. This is similar to other findings where academic results improved using WebQuests and guided searches (Segers & Verhoeven, 2009). Hence, it seems to negate the findings which loosely-define that search for information was more effective for learning (Kleemans, Segers, Droop, & Wentink, 2011).

The researchers propose that the STEM curriculum should include the PTechLS Webquest as a resource for learners with active learning styles. The STEM content and tasks can be updated and refined to suit the diverse requirements and time of the learners. These findings Table models to fulfill the current and future needs of teachers and students. The PTechLS WebQuest module is one way to develop students' interest in learning science. As it caters to the individual's learning style it can cater specifically to the students' needs in learning abstract concepts in science. In addition, the use of ICT tools, which promote interest in learning science, may influence the students to opt for STEM careers in the future.

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