The Effectiveness of Physics PTechLS Module in a Rural Secondary School in Malaysia

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ABSTRACT

The PTechLS module combines learning styles with the use of technology to increase students' learning experience, especially in learning abstract concepts. The PTechLS module prototype was developed by Norlidah Alias (2010). The aim of this study is to evaluate the effectiveness of the implementation of the Physics PTechLS module in a rural secondary school in Malaysia. The PTechLS module was implemented from year 2012 to year 2014. The study adopted the exploratory implementation design which incorporates a quasi-experimental research design. 15 students agreed to participate in this study. In addition, a retrospective usability evaluation of the the implementation of thePTechLS module, with two Physics teachers as the users was conducted. The findings of this study showed that there were significant difference in the pre-test and post-test scores. This indicates that students' achievement score could improve after using the Physics PTechLS module. The interview with the teachers showed that the Physics PTechLS module could be used as a resource. In addition, further improvements of the PTechLS module were suggested. Hence, there is possibility that the Physics PtechLS Module could be used in other secondary schools in rural areas in Malaysia to improve students' achievement and interest in Physics.

Keywords*:* Physics education, Exploratory implementation design, Learning Styles, Technology.

INTRODUCTION

The global learning landscape of the twenty-first century is being transformed and shaped by the uptake of digital communication tools and online-networked applications, along with the changing characteristics, needs, and demands of students. Learning is also shifting toward more self-directed, self-regulated learning, supported by the socially based tools and technologies of the Web 2.0 movement (McLoughlin & Lee, 2010).Teaching strategies that try to match learning styles with a particular technology can enhance the learning experience of students (Norlidah Alias, 2010; Norlidah Alias & Saedah Siraj, 2012; Norlidah Alias, Dorothy DeWitt, & Saedah Siraj, 2013).

Students receive and process information in different ways, which means that they have different learning styles or preferences (Felder & Spurlin, 2005).In addition, identifying the unique learning styles of students is essential to ensure that students are engaged in learning (Graf, Kinshuk, & Liu, 2009; Larkin-Hein & Budny, 2001; Yang and Tsai, 2008; Aimie, Siraj Ahmad Abuzaid, & Shagholi, 2010). Specifically, active-style learners prefer to be engaged in teamwork. Such learners learn new information well through actively discussing, applying, working together and explaining to other learners. On the other hand, reflective learners absorb the new information better by independent working, thinking of the question, quietly studying. Learners with sensing or intuitive learning styles perform better by leveraging learning materials with more examples than theories. Sensing-style learners understand better if the new information can be connected to their past concrete experiences and daily lives. It is hard for sensing-style learners to understand abstract concepts. On the other hand, intuitive-style learners have the ability to comprehend abstract materials and they are more creative than sensing-style learners. They dislike learning materials that give away too many details (Wong, L-H & Hsu, C-K , 2014).

Therefore, this study found that when the instructions given by the teacher is in line with students' learning styles, student achievement will increase along with motivational and affective components (Aviles & Moreno, 2010; Franzoni & Assar, 2009; Lau & Yuen, 2010 ; Saeed, Yang, & Sinnapu, 2009). Learning style is defined as how a student tries to concentrate, process and retain information during a learning process (Dunn, 1990).

Past studies showed that matching specific topics in Physics to technology and learning styles can enhance students' grasp of a concept (Hein, 1997; Ross & Lukow, 2004; Tsoi, Goh, & Chia, 2005). Physics pedagogical module (PTechLS) used in this study was developed by Norlidah Alias (2010) to enhance learning of abstract concepts in physics by matching learning styles with the right technology. This module is then carried out to 120 students in schools in urban areas in the Klang Valley (Norlidah Alias & Saedah Siraj, 2012) involving 30 students of every learning style (visual / verbal, active / reflective). The results of this study suggested that this module is effective for students of visual learning style, active, reflective but less suitable for verbal students. Researchers also compared the effectiveness of Physics module according to gender. The findings show that the Physics module is suitable for students with oral and reflective learning style is effective for female students, but less suitable for male students. This module is then extended and implemented in a rural school in Negeri Sembilan, a state in Malaysia.

This article will focus on the effectiveness of the PtechLS Physics module to improve student achievement in a Felda Learning Center in the Jempol district, Negeri Sembilan. PTechLS Physics module has been implemented for two years from 2012 to 2014. In addition, the usability evaluation was also carried out involving two physics teachers who are involved in the implementation of the PTechLS module.

A study conducted by Rashidah Rashid (2007) found that the most dominant learning styles in the rural areas students is auditory, followed by kinesthetic and visual. The study also showed a significant relationship between rural students' learning styles and motivation. The findings of this study differ from Azizi Yahaya and Nurfaizah Abdul Majid (2011), which shows that the most dominant rural students' learning styles is visual. The study also found that there was a significant relationship between learning styles and achievement in rural areas students.

In addition, previous studies also showed that academic achievement was associated to students' learning styles. According to Wan Zuraida Wan Hamid (2002), there are a variety of learning ways such as to understand, discuss, self-learning, group learning and so on. Each individual has their own learning style. Therefore, excellent students have their own effective learning styles.

Studies conducted by researchers within and outside the country similarly highlighted the effective use of technology to the learning styles to improve student achievement, particularly in rural areas. For example, a study by Hazura Mohamed, Hairulliza Mohamad Judi, Siti Fadzilah M. Noor and Zawiyah M. Yusof (2012), shows the level of ICT among rural students is low but the mastery of basic ICT skills is moderate. Thus, the efficiency of teachers to adapt the use of technology with students learning style could improve students' achievement.

However, the study by Lai (2008) showed a lack of opportunities to use ICT becomes a barrier to access digital services among students in Malaysia, especially in rural areas. The findings show that students lack with digital skills due to the technology that is non user-friendly, less ICT training and social support services.

THE STUDY

The aim of this study was to evaluate the effectiveness and usability of PTechLS Physics Module to improve students' achievement in Felda Learning Center in Jempol District in Negeri Sembilan. This study aims to answer the following research questions:

- Do PTechLS Physics Module effective in improving achievement among Grade 10 students?
- What are the teacher's perspectives on usability of Physics PTechLS Module to Grade 10 students?

SCOPE AND LIMITATIONS

In this study, the samples were 15 students in rural secondary school in Negeri Sembilan. In this study only one topic in Physics has been designed in the PTechLS Physics module for Grade 10, entitled "Gas Law". This topic has been identified as a topic involving abstract concept which is difficult for students to understand. The scope is over two learning styles namely, active and reflective. This study is limited to only one rural school in a district in Negeri Sembilan and the findings can not be generalized to other schools in Malaysia.

METHODS

In this study, the quasi-experimental design with a group (treatment) was used. The selected school is from rural areas in Negeri Sembilan; mostly inhabited by FELDA (Federal Land Development Authority) settlers children

from nearby villages, and has been proposed by FELDA Education Unit. Treatment group (n = 15) were exposed to pre-test before learning using PTechLS Physics Module under the topic "Gas Law" in the subject of Physics Grade 10 for two weeks. Prior to that, students were grouped according to their learning style after they sat for the Learning Style Index test (proposed by Felder-Silvermen).

Modules and instruments to measure the pre- and post-test have been developed by an expert in physics education. Physics module comprises of learning activities which is supported by the linkage (WebQuest, Youtube) corresponding to the learning styles of the students. Post-test has been carried out to the top students a week after the treatment was given. Data were analyzed using SPSS and t-test was performed.

In addition, assessment on P~~t~~eccLS Physics module from teachers retrospective was determined by interviewing both the teachers using semi structured interview protocol, two weeks after the implementation of the module. The interview was transcribed and cross- checked by both of the respondents

INSTRUMENTATION

Instruments used include pre- and post-test, semi structured interview protocol to get feedback on the userbility of the module. Pre and post test were designed to assess whether the objective of the production of the module is achieved.

RESULT AND DISCUSSION

T-test (One-Sample)

T-test (one sample) was used to compare pre- and post-test scores of students who have used PtechLS physics Module.

Table 1: t-Test of Grade 10 Students Physics Score

Constructs	Test	N	Mean (M)	Standard deviation (S.D.)	t- Value	Significant
Grade 10 Physics students	Pre Test	15	55.73	4.13	37.14	0.00
	Post Test	15	76.53	7.9		

* Significant at p <.05

t- Test (one sample) that have been undertaken to compare the Pre and Post Test scores after PTechLS physics module implementation shows that there is a significant distinction in the pre-test scores (Min = 55.73; S. D = 4:13) and post test (Min = 76 , 53; S.D = 7.9; t (df) = 37.14, p <0.05). This indicates that the PtechLS Physics Module execution effects the students achievement.

Retrospective evaluation of Physics Module PtechLS

Transcription of the interview with the two teachers using Module PtechLS Physics was analyzed based on the emerging themes. The results show that these modules provide opportunities for students to master abstract concepts in physics and increase their interest in learning physics based on their learning styles respectively.

Suitable for different types of students

Both the physics teachers were satisfied with the implementation of PtechLS Physics Module because it provides space and opportunities for students to learn according to their own learning style.

From the analysis of the interview, Teacher A explains that:
"It is a very good program. It can consider all the different learning styles of students which teachers always overlooked. This module assists in the delivery of instruction for different types of students"

Teacher B stated:
"... Overall, this Website helped me a lot in the process of teaching and learning, especially in addressing the

problems of student learning. Each student has an individualized learning system for determining their success .. "

Mastering the physics abstract concept

Students can master the abstract concepts in physics after using the PtechLS module.

Teacher B explains:

"On the whole, ... the objectives have been achieved. In my opinion, it is accomplished and ... information or the results of the students' work, he did achieve its overall objectives. That is, students, everything student does ... 100% it follows our learning objectives. What we want, he (student) will try to find and send it to us .. "

IT Skills Enhancement

Analysis of interviews with both teachers of physics shows that PTechLS Physics Module can improve their IT Technology Skills.

One teacher explained:

'I love it. I really liked it because it gave me the opportunity, for example in terms of the use of IT, ok, the use of IT because if we use the regular education system, chalk-and-talk, so we have a slight advantage at the moment, right. So we apply it to what we have in terms of IT'

There are weaknesses noted by teachers in the assessment. Teachers indicated that PTechLS Physics Module is quite unsuitable for most materials and learning resources associated with this module because it is in English while teaching activities in the classroom is conducted using Malay Language. Teachers suggested that the module should be fully developed in the Malay language, including links to web resources. In addition, it should be supported by the resources of additional reading for the students.

IMPLICATIONS AND CONCLUSIONS

The PtechLS Physics module is effective as evidenced by the significant increase in student achievement after its implementation. However, it does not specify whether this increase is due to the module only, or whether other factors such as extra lessons in the classroom or extra classes contributed to the increase in test scores. Effectiveness of the module may indicate that the module is suitable for students who are active and reflective learners. Similar studies that have been conducted have also shown that the PTechLS Physics module effective to students' with active, reflective, visual and verbal learning style (Norlidah Alias, 2010; Norlidah Alias, Saedah Siraj, Dorothy Dewitt, Mohammad Attar and Abu Bakar Nordin, 2013). However, it is still uncertain if this module will prove to be effective for other learning styles than the one used in this study. Further research should be conducted to investigate this concern.

In addition, the effectiveness of the module was only measured by students' achievement. The assessment is similar to past studies conducted by Norlidah Alias (2010) and Sahasrabudhe and Patnaik (2014). Other additional factors such as motivation, critical thinking skills, and social interaction can be measured to determine the effectiveness of the module. Usability evaluation proves that the teachers, who were the implementers of the module, found that the module can be used for teaching according to students' learning styles, and can be used for students to master science concepts. In addition, students' interest can also be improved.

Teachers are important agents of change and their perceptions are important for the success of the module implementation. In this study, the teachers showed that they agreed with the usability of the modules and understand the benefits towards the students. However, they stated that the content was inappropriate because of language used (English) was quite challenging for students.

Overall, the findings this study showed that the matching of learning styles with activities, using appropriate technology benefited the students. The discussions were conducted among teachers on how to deal with different learning styles while conducting activities in the classroom. This awareness will assist teachers in designing the teaching activities; taking into consideration the students different individual learning styles. Therefore, the researchers suggest that further studies should be conducted to determine whether this PtechLS Physics Module is effective to different environments of learning, and whether it can be used by other rural secondary schools from other areas in Malaysia. In short, this project was able to identify relevant technologies

for teaching to different learning styles so that students can master the science abstract concept. In future, it is hopes that teachers and students will be able to use ICT tools suitable for the learning according to the students learning style.

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