THE RELATIONSHIP BETWEEN PRE-CLASS TASK AND ACADEMIC PERFORMANCE IN AN INTERMEDIATE OPTIC COURSE: A CASE STUDY

NUR FARALINA BINTI ASRAB ALI

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

THESIS SUBMITTED IN FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF EDUCATION (PHYSICS)
(MASTER BY RESEARCH)

FACULTY OF SCIENCE AND MATHEMATICS
SULTAN IDRIS EDUCATIONAL UNIVERSITY

2018

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

ABSTRACT

The aim of this case study was to determine the correlation between pre-class task score and academic performance in an intermediate optics course. The study was also aimed to identify the correlation between pre-class task score and students' expectation. Pre-class Reading Task for Waves and Optics (PRT-WO) was developed to examine student knowledge acquisition in term of pre-class task score. A group of 37 undergraduates taking intermediate optic course in one of Malaysian higher education institutions were involved in this study. PRT-WO was uploaded in series prior to the corresponding classes throughout the semester. Student's academic performance in the course was measured by the final examination. Maryland Physics Expectation (MPEX) was distributed at the end of the semester to measure student's expectation about physics and physics learning during the PRT-WO instruction. A group of ten students from the sample was selected to form a focus group to obtain more insight about their views on pre-class task. In addition, a survey about student's approach during the completion of the PRT-WO assignments was administered at the end of the semester. Finding showed positive moderate correlation ($r=0.396$, $p<.01$) for the first research aim and no significant correlation ($r=0.058$, $p<.733$) for the second aim. Students have positive feedback in the survey including the intention to continue reading habit before class in other courses. In conclusion, the correlation between pre-class score and academic performance is significantly moderate, and no significant different between pre-class task score and expectation. The implication in this study indicated that there is a possibility of pre-class reading instruction could increase student's achievement in an intermediate optics course.

HUBUNGAN ANTARA TUGASAN PRAKELAS DENGAN PENCAPAIAN AKADEMIK DI DALAM KURSUS OPTIK PERTENGAHAN: SATU KAJIAN KES

ABSTRAK

Kajian kes ini bertujuan untuk menentukan korelasi antara skor tugasan prakelas dengan prestasi akademik dalam kursus optic pertengahan. Kajian ini juga bertujuan untuk mengenal pasti korelasi antara skor tugas prakelas dengan jangkaan pelajar. *Pre-class Reading Task for Waves and Optics* (PRT-WO) telah dibangunkan untuk menyiasat perolehan pengetahuan pelajar melalui tugasan prakelas. Sekumpulan 37 pelajar siswazah yang mengambil kursus optic pertengahan di salah sebuah institusi pendidikan tinggi Malaysia terlibat dalam kajian ini. PRT-WO di muat naik secara berurutan sebelum kelas sepanjang semester. Pencapaian akademik pelajar dalam kursus itu diukur dengan Peperiksaan Akhir. Kaji selidik *Maryland Physics Expectation* (MPEX) diedarkan pada akhir semester untuk memperoleh jangkaan pelajar tentang fizik dan pembelajaran fizik ketika menerima intruksi PRT-WO. Seramai sepuluh pelajar dari sampel dipilih secara rawak membentuk kumpulan fokus untuk mendapatkan lebih banyak pandangan mengenai tugasan prakelas. Di samping itu, kaji selidik tentang pendekatan pelajar semasa menyiapkan tugasan PRT-WO ditadbir pada akhir semester. Keputusan menunjukkan korelasi sederhana positif ($r=0.396, p<.01$) untuk tujuan kajian yang pertama dan tiada kolerasi signifikan ($r=0.058, p<.733$) bagi tujuan kajian yang berikutnya. Pelajar menunjukkan maklum balas positif dalam tinjauan termasuklah untuk meneruskan tabiat membaca sebelum ke kelas bagi kursus lain. Kesimpulannya, kolerasi antara skor prakelas dan prestasi akademik adalah sederhana signifikan dan tidak terdapat perbezaan yang signifikan antara skor tugasan prakelas dan jangkaan pelajar. Implikasi dalam kajian ini menunjukkan potensi intruksi tugasan bacaan prakelas untuk meningkatkan pencapaian pelajar dalam kursus optic pertengahan.

CONTENTS

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

CGPA	Cumulative Grade Points Average
MPEX	Maryland Physics Expectation
PRT-WO	Pre-reading Task for Waves and Optics
SPSS	Statistical Package for the Social Sciences

LIST OF SYMBOLS

	Meaning
r	Correlation unit
r_{test}	KR20 unit
p	Significant level unit

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Introduction

The study on the relation between pre-class task and student's academic performance in physics course was introduced in this chapter. This chapter consists of several parts which are: background of study, problem statement, research objectives, research questions, significance of study, scope of study, scope of thesis.

1.2 Background of Study

Malaysian Government concerns about the importance of education in preparing the foundation for nation building and sustainable economic growth in line with the goal of transforming Malaysia into a high income nation. The 6th Malaysian Prime Minister,

Dato' Sri Mohd Najib has launched the Malaysia Education Blueprint 2013-2025 and said that the major contributor to the development of country and economy is the education. The main backbone of national development is our education system. This system has been spur economic growth and prosperity of the country by providing the knowledge and skills to the younger generation and the older generation. After our country was granted independence, Malaysia managed to raise education standard in a very short period which has been recognised by international organisations. However, to ensure that the Malaysian education system in line with international education system, a transformation in the education system should be implemented in order to produce individuals who can grow rapidly and be competitive on a global level. Thus, the Malaysia Education Blueprint was designed to provide a comprehensive development framework for realising the transformation of the education system for rapid and sustainable, including submitting a comprehensive plan to ensure an international education (Malaysia Education Blueprint, 2013).

Education is a prerequisite to increase the socio-economic status of the individual and the household, resulting in a quality of life. Someone who is high-income will be educated and highly educated people read to acquire knowledge. Therefore, a person who reads a lot tend to enroll in higher education as well as towards a high-income person. Thus reading habit is consistent with the objective of transforming Malaysia into a high income nation. (Free Malaysia Today, January 3rd, 2014).

Reading is a starting point to explore the knowledge. Reading is a movement to gain knowledge and information. According to Tarin (1987), reading is a process that is carried and used by readers to get the message conveyed through the medium of

written language by an author. Numerous benefits and advantages can be achieved and gained if students read. Reading can increase knowledge about the science around us depends on the reading materials or books being read. Moreover, by reading students can readily become an active students and participate in the classroom discussion. Successful classroom and meaningful lecture discussions requires students to be familiar with the topics covered in the lecture. Instructors normally ask and tell their students to read textbook before coming to class on the basis that reading the textbook prior coming class is one of the best way which will expose students with basic content knowledge. However, it is difficult to make students read before class happen. Instructors will face challenge in finding method to encourage students that frequently do not prepare themselves before coming to the class.

Physics is a branch of science that deal with the study of matter and energy, and interaction between them. It is however very disappointing that despite the key role and much emphasis being laid on physics, students are still performing woefully in this subject has being an issue of great concern to stakeholders in education, most especially those in the science field (Mohd Shamim, Tabasum Rashid and Ruhee Rashid, 2013). Student's performance in Physics course need to be elevated at optimum level. A simple way to achieve that is via advising the students to read the textbook before enters the class. Most of the students doesn't prepare before enter the class. N. Podolefsky and N. Finkelstein (2006) study show that less than 18% of student only prepare and read textbook before enter the class and found out that student who follow this advice will perform better overall in the course. A significant message is given by Cumming (2002) that most of the students have not figured out themselves that reading is a potentially useful intellectual endeavour.

Students knows that education at university involve a lot of reading. With such huge set of assignments, students might not read before class. When student read before the class, they will be more likely to understand and better in the classroom on that particular week class. Besides, if the student's prior-class preparation attending helps students understand the topic material better. When students read before enters the class, they can focus and paying more attention at the most parts of lecture and engage in class. It will also be easy to participate in class the discussion when the students expose little knowledge about the topic. M. Marcell (2008) state that student who doesn't prepare which was not taking the online quiz tended to be more passive and less willingness to shape the direction of the class activities with initial questions and comments. In some cases, students are aware that reading is important and helpful but they could not find the relation between reading textbook and learning, as measured by course grades and examination (N. Podolefsky and N. Finkelstein, 2006).

One of the way of providing the necessary basic exposure to the content is through reading the textbook prior face-to-face class. However to make student read the textbook is a difficult goal to achieve (Stelzel et al, 2008). There are an interaction between reading and quiz were suggested to students to read before enter the class. Dobson JL (2008) uses online quizzes to enhance class preparation and score in examination. This online quiz can be administrated before the class start. In addition, this could also help instructor to retrieved information about the problems and difficulties faced by the students can be seen before the class start and it provide instructor in class preparation with appropriate materials. This method could optimum the teaching and learning time of the courses with focusing to the problem concept part which has been identified. To ensure this study flow fluently, some researcher suggest

that the active engaging students in learning activities result in better conceptual understanding compared to passive listening to lectures (R.R. Hake, 1998).

This type of study had been conducted previously in the Faculty of Science at the University of British Columbia in Vancouver, Canada by Cynthia E. Heiner, Amanda I. Banet and Carl Wieman and result gave positive feedback which the researcher manage to get students to read the textbook to prepare for class. (Heiner *et al*, 2014). The purpose to repeat this study is to test either it can be adapted in Malaysian education setting or not. Furthermore, most of the students in one of Malaysian universities enter the class and lecture without any preparation. Lacking of preparation bring a passive classroom students.

1.3 Problem Statement

The Ministry of Education would like to ensure that every student obtain quality education that is unique to Malaysia and comparable to high-performing education system (KPM, 2013). Therefore, performance improvements involving all subjects including Science needed to achieve the goal based on the benchmarks of other systems according to standard internationally. The Ministry will try to provide experts who are able to transform student achievement in certain subjects, but they also need to investigate and see the interest and willingness of students to explore the wider world of education.

Physics is one of the subjects that are compulsory for students taking science stream from the upper secondary level which start from Form 4 in Malaysia (KPM, 2013). Students always thought that science stream is a difficult choice. As in the study Anjell and friends (2004), students agreed that physics is the difficult subject. Some students in this country also assumed that the subject of science such biology, physics and chemistry are the subjects that are difficult and abstract (Subahan, 1997; Ruhaizan 1999). Therefore, most schools in Malaysia lack of students taking this course. On average more students prefer to major in literature or non-science stream.

One of the main goals of science education is to raise interest and literacy in science among students to enable them to develop manipulative skills, understand the process of life and the ability to analyse, synthesise and evaluate hypotheses forming (Lay, 2010). Recognizing this, physics lecturers and teachers are always scrambling to find strategies and ideas for improving student achievement in the subjects of physics. Various ways that have been made by educators to make teaching an attractive and able to attract students to study physics. However, at times, other factors that affect the student such as the student's willingness to class. To evaluate the willingness of students to classes is to see whether the student is making preparations such as reading before entering the classroom. Prior knowledge of some students that supplies, combined with their systematically preparation to the classes in learning something new knowledges makes the students knowledgeable and confident.

However the public especially the students do not like to read. In one of the study done by Frank and Associates on behalf of *Perpustakaan Negara Malaysia* in 1996 found that overall citizen in Malaysia read book twice only a year and the interest

of reading decrease as the age increase. University students in Malaysia having a huge problem phenomena that is lazy in reading. In one of the research done by Lee & Abu (2005) students in *Universiti Teknologi Malaysia* prefer choosing non-academic reading material compare to the academic reading material during in university. Currently, the country facing this problem and if student do not read and study during their studies, it would be a huge loss in the quality of human capital development.

Due to the less activity of reading, students nowadays enter the class with minimum information and knowledge on that particular lecture content. Almost 82% of students does not prepare and read text book enter before enter the class (N. Podolefsky and N.Finkelstein, 2006). This phenomena is immensely annoying to most of the lecturer. Mostly all the lecturer, teacher and instructor faced a classroom full of blank stares, with seems that no one prepared to answer the question asked about the topic in the class.

In this study, a case study was carried on a physics course. The instructors of the course was very keen to improve student learning. One of the instructional strategies introduced was the pre-class task. He believed that the strategy will improve students academic performance. This will need quasi-experimental design where two group of students, one controlled group and the other one is for experimental group. However, due to low enrolment of the class, he was not able two treat two group separately. Thus, a case study approach was embraced and correlational study was decided as to see whether there is the relation between the pre-class task strategy and the students performance, as well as their expectation toward the course.

Based on the issues raised, the researchers have developed an instrument that was expected to resolve some problems that exist in the learning and teaching of physics. The study will provide information on how students approached on their reading assignment.

1.4 Research Objectives

The aim of this study is to investigate the relation of pre-class task toward the students is academic performance in an intermediate optics course. The study embrace a case study method. To achieve the aim, there are several objectives in this study which are:

1. To develop an instrument to measure pre-class task score in an intermediate optics course.
2. To find the correlation between the pre-class task score and academic performance.
3. To investigate student approach in pre-class task.
4. To find the correlation between the pre-class task score and students' expectation.

1.5 Research Questions

Research questions are developed to drive the purposes of this study and guide the direction of this study.

1.5.1 Is the pre-class task validated and reliable?

1.5.2 Is there any statistically significant correlation between the pre-class task score academic performance?

1.5.3 What approach students use during completing pre-class task?

1.5.4 Is there any statistically significant correlation between the pre-class task score and students expectation

1.6 Research Hypothesis

In this research, three hypotheses testing will be employed to achieve research objectives 2 and 4.

For objective 2, hypothesis testing involves analysis using Pearson-product moment correlation

H_1 (the research/alternate hypothesis)	There is a statistically significant correlation between pre-class task score and academic performance.

For objective 4, hypothesis testing involves analysis using Pearson-product moment correlation

H_1 (the research/alternate hypothesis)	There is a statistically significant correlation between the pre-class task score and students expectation.

1.7 Significance of Study

Main part of the learning experience was the class preparation. Tertiary education level learning requires students to have prior information and knowledge which will encourage them to participate in class. Preparing for class before attending helps students understand the lecture material better. Majority of the lecturer construct their lectures with the assumption that students have read the materials or prepare with some knowledge before class. The teaching methods used by teacher and lecturer totally difference due to the time constrain. When students prepared for the class, they can offer knowledgeable participation and learn better. At the end of this research, researchers might bring out students who will read and well prepare before enter the class.

Besides that, cultures of reading is essential to nurture mind especially students. Students should be exposed in reading before class to produce a generation of leaders for the future that well prepared. Generally, this research made by researchers is an effort to explore the field of physics education in generating innovation and invention for the benefit of the community such as students, instructors and educators as well as producing a thesis or journal that is recognized by the academic world. For the students, it is important that they realise the importance of reading prior to coming into the class.

Significance of this study also introduces methods of reading before the class to all students which might help students understand the process of learning in the classroom and be able to participate directly in the classroom. Therefore, this way can reduce passive student in classroom. Even a result from a case study may not be

generalised to bigger population, multiple case studies on the similar research goal may outlined some ideas on how reading habit among students are related to their academic performance and learning expectation.

1.8 Scope of Study

This study was carried on at Universiti Pendidikan Sultan Idris. It is limited for the undergraduate student who took the SFT 3023 Vibrations, Waves and Optics course in Semester 1 Session 2015/2016 (D151). The course is refered as an intermediate optics course in this thesis. The pre-class task were devised based on the main reference of the course, which was University Physics 13th Edition (Young and Freedman,2012).

1.9 Scope of Thesis

Five chapters were divided into this thesis. In the first chapter, CHAPTER 1 covers the background of study, problem statement, research objectives, research questions, significance of the study and the scope and limitation of study. While in CHAPTER 2, its describes about the literature reviews related to the student achievement in physics subject, student expectation in physics learning, reading issues and theoretical framework

CHAPTER 3 describes about the research design, population and sample, instrument, validity and reliability, research procedure, data collection, pilot study and data analysis. CHAPTER 4 describes about the finding and discussion of the research. Finally, CHAPTER 5 covers the conclusion and recommendation for the further study.

1.10 Operational Definition

Some of the operational definition terms related to the objectives were described.

1.10.1 Pre-Class Task

Pre-class task was defined as the score obtained in the series of online quizzes which students need complete prior to the class on the particular topic. This assignment is divided into two parts targeted pre-class task and the online quiz. The targeted pre-class task assume students to spent about one hours before answers online quiz is administered by the Google form which will take not more than 10-15 minutes. The assignment was built to be simple with connection to the material to be covered in upcoming classes. The online quiz was built refer to the some of the JITT criteria and the previous study from Cynthia E. H, Amanda I. B, Carl W. (2014) as supplied in Appendix A. The online quiz consists of eight chapters and each chapter is divided into two parts. Hence the online quiz was short with 5 to 10 multiple choice questions. At each of the quiz, a feedback review will be provided for each questions that lead to the

correct answers and page number for students to review. The online quiz questions of PRT-WO are provided in Appendix B.

1.10.2 Academic Performance

Academic performance according to the Cambridge University Reporter (2003) is frequently defined in terms of examination performance. In this study academic performance referred to final year examination for physics course. In this intermediate optic course, learning assessments is divided into two part that is assignment and final year exam. The assignment consists of exhibition, pre-class task, activities, midterm examination with 60% of carry marks while final year examination contribute 40% marks. The final examination will be at end of the semester normally held on June. Each of student's performance will be calculated and correlated with the online quiz marks and frequencies.

1.10.3 Intermediate Optics Course

Physics covers a wide range of phenomena, from the smallest sub-atomic particles, to the largest galaxies. Intermediate optic course only focus on optical science with elementary engineering applications intermediately. The course refers to SFT3023 Vibrations, Waves and Optics offered by Department of Physics, Faculty of Science and Mathematics, Sultan Idris Education University.

1.10.4 Focus Group

Small group of students were choose based on their Cumulative Grade Performance in Academic (CGPA) and interviewed. Three student from each level. These students were called separately and were given several questions to answer. The list of question were attached in the Appendix D.

1.10.5 Expectation

Expectation of students were gain through the Maryland Physics Expectations (MPEX) Survey; a 34item Likert-scale (agree-disagree) survey that probes student attitudes, beliefs, and assumptions about physics. From the survey, students understanding of what physics is about and how it is done and their expectations as to what goes on in a physics subject play a powerful role in what they can get out of intermediate optic course.

1.11 Conceptual Framework

Figure 1.1 shows the conceptual framework of the case study on the connection of pre-reading, academic performance and the student's attitudes in the intermediate optics course. PRT-WO was intended to prepare students before enter the class. PRTWO was created to help students recognise the benefits of reading and prepare before class. In order to facilitate the process of teaching and learning in the classroom researcher built

the PRTWO by referring to the University Physics with Modern Physics. The 13th edition book was used as the main reference book in the Vibration, Waves and Optics course for 37 undergraduate students Semester 1 2015/2016 I Universiti Pendidikan Sultan Idris. At the end of the semester, students were asked to complete the MPEX survey. The survey were used to probes the changes in student's attitudes, belief and assumption about physics. Forty percent of the mark from the final examination which was taken at the end of the semester by the students was used as the academic performance. This study was viewed in terms of correlation between pre-class score, academic performance score, correlation between pre-class score and MPEX, student approaches in pre-class task and focus group discussion

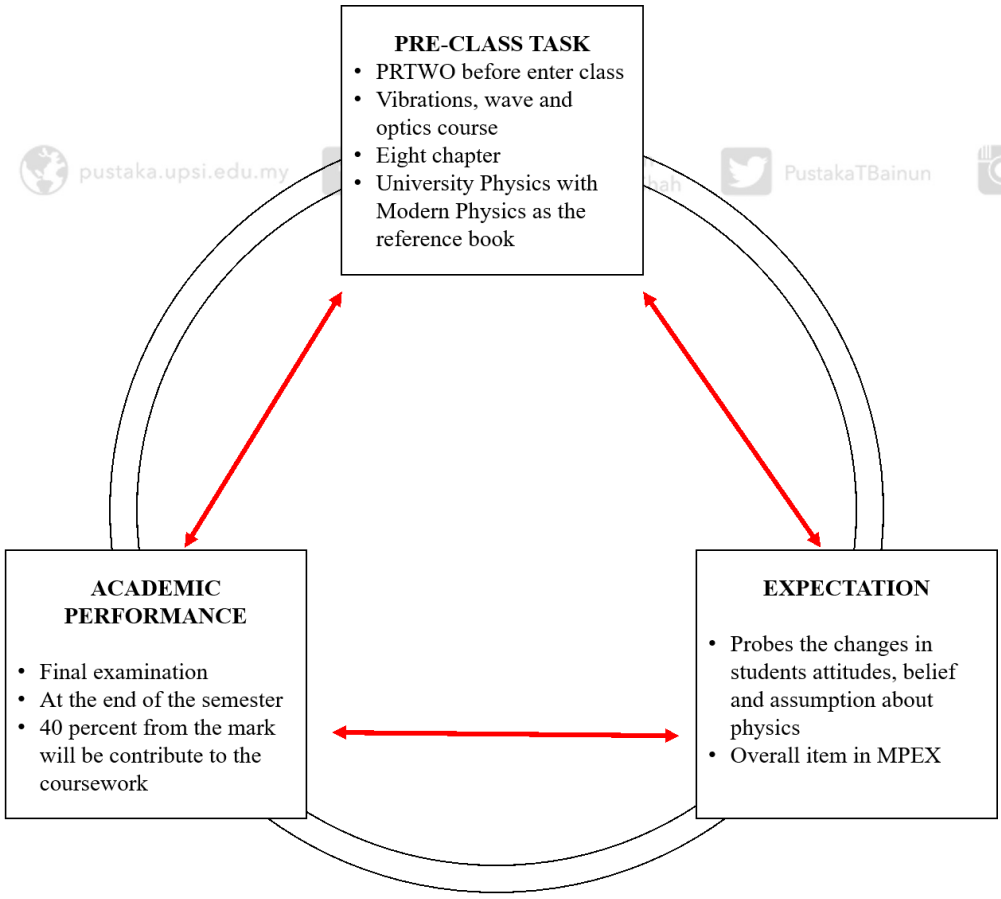

Figure 1.1. Research Conceptual Framework

1.12 Summary

In this chapter, researcher have explained the purpose and importance of the study to the students, especially undergraduate students who have taken the Vibrations, Waves and Optics at the university level. This study is to find the correlation between pre-class task and also academic performance in a physics course. Their perceptions of the instruments developed disbursed were also analysed for improvement.

In order to achieve the objectives of this study, researcher will answer all the research questions submitted one by one based on the analysis of the findings. This study is important because it can be the basis of creating the next generation to read in the future among university students especially undergraduate students of physics.