THE EFFECT OF PolySOM MOBILE APPLICATION ON STUDENTS' ACHIEVEMENT IN STRENGTH OF MATERIALS SUBJECT AT PREMIER POLYTECHNICS IN MALAYSIA



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FACULTY OF TECHNICAL AND VOCATIONAL SULTAN IDRIS EDUCATION UNIVERSITY

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DEDICATION

I would like to dedicate my thesis to my family who has been a great source of motivation and inspiration,

parents

father, Kannapiran s/o Sabapathy and mother, Kamala Devi d/o Saravana Muthu and also loving sisters Vidhiyavaani, Shaliny, Saranhea.

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> Perpus guidance. Bainun Kampus Sultan Abdul Jalil Shah

05-45068

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ABSTRACT

The purpose of this study was to determine the effect of PolySOM mobile application on students' achievement in the strength of materials subject at the premier polytechnics in Malaysia. The main research design used in this study was a quasi-experimental design. The PolySOM mobile application was developed on Android platform using ADDIE model. The population of the study consisted of all third-semester mechanical engineering students at the premier polytechnics. A random sample of 43 students was assigned to an experimental group and 33 students were randomly assigned to a control group. In developing the PolySOM mobile application, the learning styles of the students were identified using VAK learning style model. The treatment was conducted for the experimental group using PolySOM mobile application for four-week period whereas the control group was given the conventional lectures on the strength of materials subject. The instruments used in the study were a set of tests and questionnaires. The instruments were validated by seven experts. The internal consistency reliabilities of the instruments using Alpha Cronbach were ranged between $\alpha = 0.80 - 0.95$. The empirical data were analysed using descriptive and inferential statistics such as frequency, percentage, mean, standard deviation, and t-test. The result showed that there was no significant difference between means of the pre-test between experimental and control groups. However, there were significant differences between the means of the post-tests of experimental and control groups based on the three cognitive levels. It was found that there were statistically significant differences in the cognitive level one [t (74) = -3.03; p<0.05), level two [t (74) = -4.56; p<0.05], and level three [t (74)=-2.65; p<0.05]. But for cognitive level four [t (74) = 0.51; p>0.05), the means for both groups were not significantly different. The questionnaire data showed that the respondents who used the PolySOM mobile application agreed that the application was useful. In conclusion, the main finding illustrated that PolySOM mobile application is effective in enhancing the students' achievement in the strength of materials subject. The implication of the study is that PolySOM mobile application could be implemented in other higher learning institutions for mechanical engineering students.







KESAN APLIKASI MOBIL PolySOM TERHADAP PENCAPAIAN PELAJAR DALAM SUBJEK KEKUATAN BAHAN DI POLITEKNIK PREMIER MALAYSIA

ABSTRAK

Tujuan kajian ini adalah untuk menentukan kesan aplikasi mudah alih PolySOM terhadap pencapaian pelajar dalam subjek kekuatan bahan di politeknik premier di Malaysia. Reka bentuk utama penyelidikan yang digunakan dalam kajian ini adalah reka bentuk kuasi-eksperimen. Aplikasi mudah alih PolySOM dibangunkan pada platform Android menggunakan model ADDIE. Populasi kajian terdiri daripada semua pelajar kejuruteraan mekanikal semester ketiga di politeknik premier. Seramai 43 orang pelajar telah dipilih secara rawak untuk kumpulan eksperimen dan 33 orang pelajar juga dipilih secara rawak untuk kumpulan kawalan. Dalam membangunankan aplikasi mudah alih PolySOM, gaya pembelajaran pelajar dikenal pasti menggunakan model gaya pembelajaran VAK. Rawatan telah dijalankan untuk kumpulan eksperimen menggunakan aplikasi mudah alih PolySOM untuk tempoh empat minggu manakala kumpulan kawalan diberi ceramah konvensional mengenai subjek kekuatan bahan. Instrumen yang digunakan dalam kajian ini adalah satu set ujian dan soal selidik. Instrumen tersebut telah disahkan oleh tujuh orang pakar. Kebolehpercayaan dalaman instrumen kajian menggunakan Alpha Cronbach adalah $\alpha = 0.80 - 0.95$. Data empirikal kajian dianalisis menggunakan statistik deskriptif dan inferens seperti frekuensi, peratusan, min, sisihan piawai, dan ujian-t. Hasil kajian menunjukkan bahawa tidak terdapat perbezaan yang signifikan min ujian pra antara kumpulan eksperimen dan kumpulan kawalan. Walau bagaimanapun, terdapat perbezaan yang signifikan min ujian pasca antara kumpulan eksperimen dan kawalan berdasarkan pada tiga tahap kognitif. Didapati bahawa terdapat perbezaan yang signifikan secara statistik pada tahap kognitif satu [t (74) = -3.03; p <0.05), tahap kognitif dua [t (74) = -4.56; p < 0.05], dan tahap kognitif tiga [t (74) = -2.65; p <0.05]. Tetapi bagi tahap kognitif empat [t (74) = 0.51; p> 0.05), min kedua-dua kumpulan menunjukkan tiada perbezaan yang signifikan. Data soal selidik pula menunjukkan bahawa responden yang menggunakan aplikasi mudah alih PolySOM bersetuju bahawa aplikasi tersebut adalah berguna. Kesimpulannya, dapatan utama kajian menunjukkan bahawa aplikasi mudah alih PolySOM adalah berkesan dalam meningkatkan pencapaian pelajar dalam subjek kekuatan bahan. Implikasi kajian pula menunjukkan bahawa aplikasi mudah alih PolySOM boleh dilaksanakan di institusi pengajian tinggi yang lain untuk pelajar kejuruteraan mekanikal.





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LIST OF ABBREVIATIONS

	11MP	Eleventh Plan of Malaysia
	API	Application Program Interface
	App	Application
	CD-ROM	Compact Disc-Read Only Memory
	DL	Distance Learning
	DPCCE	Department of Polytechnic and Community
		College Education
	DVD	Digital Video Disc
05-4506832	g pus El a.upsi.edu.my	ereustakaan Tuanku Bainun a E-Learning ul Jalil Shah
	FSLM	Felder-Silverman Learning Style Model
	HTML	Hypertext Markup Language
	IBTE	Institute of Brunei Technical Education
	ICT	Information and Communications Technology
	IT	Information Technology
	ISD	Instructional System Design
	LOTS	Lower Order Thinking Skills
	HOTS	Higher Order Thinking Skills
	MBOT	Malaysian Board of Technologists
	MBTI	Myers-Briggs Type Indicator
	MCMC	Malaysian Communications and Multimedia
		Commision
	MMS	Multimedia Messaging Service
	ML/m-learning	Mobile Learning
	NBOS	National Blue Ocean Strategy

PCs	Personal Computers
PDA	Personal Digital Assistants
PIS	Polytechnic Ibrahim Sultan
PolySOM	Polytechnic Strength of Materials
PSA	Polytechnic Sultan Salahuddin Shah
PUO	Polytechnic Ungku Omar
SDK	Software Development Kit
SMS	Short Messaging Service
SPSS	Statistical Package for Social Science
SES	Social Economical Status
TAM	Technology Acceptance Model
TBTL	Technology Based Teaching or Learning
pus TEL upsi.edu.my	Technology Enhanced Learning Bainun
TVET	Technical Vocational Education and Training
UNESCO	United Nations Educational, Scientific and
	Cultural Organisation
UPSI	Universiti Pendidikan Sultan Idris
VAK	Visual, Auditory & Kinesthetic
VAKT	Visual, Auditory, Kinesthetic, & Tactile
VARK	Visual, Aural, Read/Write & Kinesthetic
WAP	Wireless Application Protocol
Wi-Fi	Wireless Fidelity
WWW	World Wide Web

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CHAPTER 1

INTRODUCTION

1.1 **Preface**

The development of technology takes a crucial role in education 4.0 to be conducted. Roles of technology these days are being used as support for teaching and learning process in this digital era. Due to those roles, it has helped students to be autonomous learners in our current generation. It means that students can learn everything and everywhere by clicking many features or platform in the internet which relates to their subject studied. This is how mobile learning (ML) has been emerged in our 21st century. ML or formally known as m-learning which use handy mobile or wireless technological devices where learners can learn in anytime, anywhere, and anyplace and anytime (Attewell & Savill-Smith, 2005).

The hand held portable devices and wireless technology has enhanced the evaluation of today's progress and are remolding individuals in their daily affairs (El-Hussein et al., 2010). The core reason is due to the accessibility being wireless and portable. Latest mobile devices such as Personal Digital Assistants (PDAs), cell phones, laptops and tablet PCs uses a computer aided learning style also known as ML by Prensky (2001). The common examples of gadgets or devices such as cell phones, smart phones, palmtops, hand held computers, tablet PCs, laptops, and personal media players are used for ML (Kukulska & Traxler, 2005). Lately, ever since the year 2000s, people have accepted mobile devices worldwide because it works by reaching them easily at a fast and cheap rate. Based on the statistics by Gartner (2015), the sales of tablets quantity in 2013 was 206.8 million. As in 2014, the record sale had increased to 256.3 million. The sales quantity for cell phone was 1.807.0 billion in 2013 and increased in 2014 with 1.862.8 billion.

The effectiveness of ML in the process of learning activity has approved evidences that it can improve students' focus, interest and performances of the learning (Isham et al., 2011). Besides, the dynamic learning of technology based environment and accessibility of fast information no matter at what time and place provides comfortable learning (Chen & Kinshuk, 2005). Even Kukulska and Traxler (2005) stated that having such facility encourages students to utilize information attained in variety of environment. Information is knowledge which enhances the skills of learners Hereby, students are able to use the skills in analyzing and solving the problem. In most cases, a student-centered

learning is cultivated via mobile phones. Henceforth, students are able to access and transfer information to meet their educational goals as to strengthen the knowledge and skills (Sharples et al., 2007). Since, the way each student learn varies and differ in preferences of learning the different types of information, ML caters to different learning styles for learners. Furthermore, it increases their understanding and achievements that differs in different rates.

The operating trend to perceive information differs too (Felder, 1993). There are many learning styles were introduced and among them are Felder Silverman Learning Style Model (FSLSM), Honey and Mumford, Dunn and Dunn, Kolb, VARK (Visual, Aural, Read/Write & Kinesthetic) which is from VAK (Visual, Auditory & Kinesthetic), Myers-Briggs Type Indicator (MBTI) and others. In addition, learning styles are basically individualized studying materials and presentations which enable learning (Liegle & Janicki, 2006). Even Cobcroft et al., (2006) mentioned that students prefer interesting learning methods which engage them actively with a combination of information and communication technologies with face-face traditional learning styles. In 2012, a search was done by Portio research (2013) where 1.2 million people all over the world use mobile applications (apps). It is assumed that the number will be increasing as years go on. ML is the type of studying that provides its students the freedom in their studies. ML is flexible learning in which learners can learn anywhere at any time.

Thus, this research investigates the usage of ML among mechanical engineering students at premier polytechnic students in their difficult subject. To provide best possible

experience of learning for students, it is important to know their needs in achieving a complete successful study by Watson (2006). Hence, this study is conducted to explore the usage of ML among polytechnic students upon the subject found difficult according to their learning style. Therefore, a mobile application (app) is developed to cater the selected students in their course of study using VAK learning style. VAK learning style is a model that can be considered as basis among the said learning styles. It is designed by Sarasin (1998) and developed by Chislett and Chapman (2005). One of the learning style characteristics that shape a students' learning style is based on the sensory modality which are known as VAK (Neil, 2016). This learning style is used as a guide to develop the content to suit the students and deliver appropriate contents based on the topics upon Strength of Materials subject. The aid of an interesting app promotes active learning as it is an adaptive learning environment that suits their learning style. This method of study definite to enhance ML and helps them to achieve better in Strength of Materials subject which they find it difficult.

1.2 **Background Study**

In this day and age as we are living in the decade of multimedia and millennium years, Internet is also known as the World Wide Web (WWW) by Melor et al., (2009). Currently many children now start school with technologically literacy. They can and are able to use a keyboard with familiarity of tablet technology and not forgetting smart phones. The use of mobile phones has been mushrooming and reached tremendous level

in everyday life. All over the world millions of people are using hand held computers. By the 2002, 4.4 million palm devices, 1.6 million Hewlett Packard PDAs, and 1.3 million Sony PDAs were sold (Kavurmacı, 2003). Even DigitalBuzz (2011) stated that the global populations of 57 percentage or in other words 1.08 billion users have a PDA.

The number of mobile phone subscriptions has surged up to 28.914 million between January and March 2009 according to Malaysian Communications and Multimedia Commission (MCMC). Nevertheless, Department of Statistics conducted a comprehensive study that the percentage of people owning a mobile device in year 2000 is 21.0 percentages and this figure has dramatically raised to 85.1 percentages in 2007. In developing world, the usage of ML and access to mobile phones is available everywhere as mentioned during the press release entitled 'Maximizing Mobile' by The World Bank in the year 2012. These days everyone has access to a mobile phone including the developing world countries with more than three quarter of the world population (Russell & Ciesliek, 2012). At present more and more both in pre-paid and post-paid mobile subscriptions is increasing nonstop. As such opportunities are on the increase for the young new generation to equip in ML. The progress in ML is inevitable and provides opportunities with better communication.

Learning activities without any limitations can take place with no consideration to place and time. Yamaguchi (2005), states that ML mainly emphasis on its mobility and its usage. ML provides learning facilities whenever and wherever the learner wants to learn. ML is portable and affordable enabling learners to have the comfort of studying. Mobile

technologies have advanced and its availability is now available with the infrastructure of high bandwidth. The advancement of wireless technologies and hand held devices has emerged e-learning(EL) to ML by Sharples (2000). EL is a platform whereby the instruction or medium is delivered electronically. It can be done partially or as whole using a web browser via internet or even by means of intranet. Besides, the use of multimedia with compact disc-read only memory (CD-ROM) or digital video disc (DVD) is also known as EL (Hall, 1997). ML is very much related to E-learning from aspects of technological viewpoint. The availability and ability offered by mobile technologies provides learning that occurs anywhere, anytime without prior fixation or predetermined venue that encourages learning to happen at their advantage of learning opportunities (O'Malley et al., 2003). The following Figure 1.1 shows how EL exists in a wider field of endeavor and have a relationship that overlaps with many different approaches.

Figure 1.1. Learning technologies, mode and relationship (Urdan & Weggen, 2000)

Henceforth, it can be concluded that ML occurs as long there is availability and accessibility of mobile media and communications. This new paradigm is well suited with current phenomenon of computing at anytime and anywhere (Lehner & Nösekabel, 2002). Mobile computing and learning could occur regardless of the location for instance information can be decentralized by just in a click of buttons using the mobile phones as long there is a stable internet connection. Even while waiting in an airport, commuting on public transport or transit as well as waiting for the call at a doctor's office, ML occurs as to encompass gain of knowledge. Generally, it can be said and argued that ML is an approach of e-learning whereby it requires a mobile device and yet can provide a different learning experience as mentioned by Traxler (2005). Indeed, ML has special limitations and benefits on mobile devices to be aware upon delivery. For EL and ML context, one 05 simply cannot apply required known design. Tuanku Bainun Shah

These days it is vital for students to know on how information is used, managed and evaluated not merely to repeat it (Mann, 1994). In some polytechnics here at Malaysia, for example the teacher-centered approach is still used and preferred by lecturers and students. As in TVET (Technical Vocational Education and Training), a comprehensive term referring to those aspects of the educational process involving not just towards general education also the study of technologies of related sciences. Also, practical skills are acquired along with attitudes, an understanding and knowledge relating to occupations in various sectors of economic and social life (UNESCO, 2001). This factor hinders and opportunity is not given for students to develop their own thinking skills when teacher-centered approach is used. As Mann contend the case where the

different achievements among students prove that students are inactive in receiving information. Various situations proved that the understanding was limited and the students by just vomiting what they had memorized or received from their teacher.

In Malaysia students are able to further their TVET studies in vocational schools, community colleges, polytechnics and higher education institutions (Md Yunos et al., 2005). At present there are a total of 36 polytechnics all over the states in Malaysia which are divided into three categories known as premier, conversional and metro. Mostly offering engineering programs and other skill programs as seen in the official website at mypolycc.edu.my. Polytechnics system is one of the tertiary education systems which provide pre-university engineering education in Malaysia. Engineering courses are included in TVET which enables students to graduate as engineers (Haas, 1999). Diploma programs are offered in various fields to enhance skill training among students. Engineering is a broad field of science, mathematics and technology to invent, design, build and to maintain a product or a machine. Mechanical is one of the traditional field of engineering and it is expanding in this era of globalisation. This research is conducted among mechanical engineering students to determine the most difficult subject faced in their studies which is Strength of Materials.

Strength of Materials subject is among the core subjects in mechanical engineering field. Students find the subject difficult in understanding this subject due to the concept stated by (Martin & Mats, 2005). Even, based on the results obtained from the premier polytechnics Malaysia recorded that many students failed in this subject from the

exam unit. It is further discussed in the following chapter. As learning in the 21st century is a global education transformation that encompasses 21st century skills with high order thinking skills, high information and technological skills, high communication skills and interpersonal and self-directed skills. These skills can be inculcated in teaching and learning with an emphasis on knowledge, skills and values in confronting everyday problems logically and systematically (Saavedra & Opfer, 2012; MOE, 2013c; MOE, 2017). Now, the question is whether this teaching and learning approach applicable in meeting the needs of students in this era of globalization. Therefore, the style of instructor teaching in classrooms which is often conducted orally with no teaching aids nor tools definite to make students have no interest.

(C) 05-4506832 Classrooms only provide limited and restricted area for students for learning. It should be able to take activate and initiate at any place that is anywhere and also everywhere. Indeed, learning and education should not be restricted in classrooms only. Learning is important in maturing changes and modify ideas that involves having and experiencing potential changes. Learning enhances knowledge which enlightens one's character, values and thinking skills (IIIeris, 2000 & Ormrod 1995). The learning efficiency and the processes of learning differ with each individual. The biological and psychological differences play a main role in the learning process. There are individuals who are capable in learning fast. The quality and effectiveness of learning depends on the process of teaching and learning.

1.3 **Problem Statement**

The factors involved using mobile technology among students will be the access, connectivity, integration, and ownership. As Korkala and Abrahamsson (2007) did mention the limited physical resources and frequent changes of specifications in mobile platforms applies to technological constraints. In this era of technology advancement there is a wide range of devices available at the store of which each device has its distinct hardware, firmware and operating systems. On the other hand, with the implementation of ML method it will elevate their interest, encourage learners to focus and boost their performances (Isham et al., 2011).

(C) 05-4506832 The teacher centered or lecture centered with minimal teaching aids is known as the traditional teaching method. Many classrooms in Malaysia are dominated with a didactic teaching style using instructional methods instead of the advance technology which is recognized in the progress of information technology (Ali & Noordin, 2010). Students find difficulty to understand the concept and theory in engineering field. For instance, during teaching and learning process several supporting materials such as reference books, notes and handouts are used. Therefore, such methods upon teaching tends to bring boredom and results in a poor lesson delivery. Nevertheless, students these days do not spend time to refer the reference materials that leads to an incomplete learning process (Marwan et al., 2013). Learners have their own learning preferences that explicitly require a mobile device which is suitable to their learning culture or learning behavior.

In addition, the availability of various media, students are able to learn in different ways based on their preferred learning styles. Studying methods include cognitive, affective and psychological behaviors which are signify on students' achievement, react and interact with the learning environments (Triantafillou et al., 2003). The experience endured by learners during the implementation and integration of ML into the curriculum indicates their acceptance of aforementioned learning. However, research has shown that the design of a mobile app and its operating system to support the pedagogy is a challenging task as it requires to adhere the various value systems of users that comes from different experience and backgrounds (Huang, 2009).

It has been said that using technology leads to a higher cost in terms of implementation and maintenance. But these days, the cost is affordable as seen in the statistics sales of mobile devices which has been increasing yearly recorded by Gartner (2015). Thus, the term technology itself can be referred to as the programs or systems that are used to develop a mobile based system. Moreover, there are various emerging apps of which are available in store. However, there is a knowledge gap about mobile technology and its devices as well as apps existing between the lower incomes children compared to the higher income group children by Rideout et al., 2011. Besides, only two percentage children of the lower income have the opportunity to access to a mobile device or portable technology devices used in homes in contrast to 17 percentage used in rich families who have better facilities (Rideout et al., 2011). Indeed, it is vital and essential for students to know the usage of mobile technology to facilitate in their learning attributes.

Furthermore, predominantly most of the learning process is commonly carried out in and within classroom. It is difficult to conduct a discussion or evaluation outside the class time (Marwan et al., 2013). It is important to look into this matter when the timetable of lecturers and students are compact. The time constraint causes both lecturers and students to face problems in replacing the classes. Students and lecturers often encounter difficulties in conducting the classes as there are limited of lecture hall or inadequate learning facilities. Hereby, the mobile technology is very useful in learning environment. This mobile technology is very flexible as this device can incorporate with other learning devices and function in wireless local area network. It can also function on electronic whiteboard. Teachers and students benefit in all learning processes of communication, exchange of ideas and information, interactions, collaboration in team work too to solve problems (Clark, 2009).

Therefore, students might need training in the basic functions and applications of ML technologies (Cheon et al., 2012). This can also be said that there is lack of technical skills among students. Even, Corbell and Valdes Corbell (2007) had forewarns that nontechnical students who are not acquaint or familiar to technologies find it difficult to follow and feel a sense of isolation in the ML activities. These limitations on the app of ML can hinder using mobile technology widely in learning. Some researchers state that, there is an imbalance and differential potential access to higher education, unprepared students and faculty requirement intensive and also institutional support via internet and digital technologies (Corbell & Valdes-Corbell, 2007; Guri-Rosenbilt, 2005). As such, a

mobile based education should be based on criterions designed and adapted to be dynamic. It should be easily scalable, measured and applied at all times and at any places.

Moreover, Heng et al., (2012) have stated that many higher educational providers are having difficulty in developing an effective mobile app to support a pedagogical model of ML. Students should be able to extract information provided from the learning system designed catered according to their needs. Also, the system designed should include all information required in accordance to students' needs (Chen & Kinshuk, 2005). The future ML inclines that learning can happen anywhere and at any time when there is need for it acclaimed KyunBaek and Cheong (2005). Moreover, these features imply an adaptive learning strategy whereby learning is flexible and preference to learner's learning style. There is an establishment of infrastructure and standardization of the learning contents as well. Hereby, these constraints are to be examined in this study.

Objectives 1.4

The objectives of this research are:

- To develop mobile app (PolySOM) based on a unit in Strength of i. Materials that enhances ML among mechanical engineering students at premier polytechnics.
- To differentiate the academic achievement among students between ii. control and experimental groups using Bloom's taxonomy.

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- To examine the functionality of PolySOM among mechanical engineering iii. students at premier polytechnics.

1.5 **Research Question**

The research questions are based from the objectives that are as stated below:

- i. Which type of learning style is preferred for mobile development to enhance ML among mechanical engineering students at premier polytechnics?
- ii. What is the most favourite mobile device used among mechanical engineering students at premier polytechnics? **S**PustakaTBainun
- iii. Is there any difference in the achievement among students between control and experimental groups using Bloom's taxonomy?
 - a) Is there difference found in the cognitive level one (remember) among students between control and experimental groups?
 - b) Is there any difference found in the cognitive level two (understand) among students between control and experimental groups?
 - c) Is there any difference found in the cognitive level three (apply) among students between control and experimental groups?
 - d) Is there any difference found in the cognitive level four (analyze) among students between control and experimental groups?

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iv. Did PolySOM enhance ML among mechanical engineering students at premier polytechnics?

1.6 Hypothesis

- Ho₁: There is no difference found in the achievement of students between control and experimental groups.
- Ho₂: There is no difference found in the cognitive level one (remember) among students between control and experimental groups.
- Ho₃: There is no difference found in the cognitive level two (understand) among students between control and experimental groups.
- 05-4506832 Bustaka upsi edu my the Perpustakaan Tuanku Bainun Pustaka TBainun Pustaka TBainun Ho4: There is no difference found in the cognitive level three (apply) among students

between control and experimental groups.

- Ho₅: There is no difference found in the cognitive level four (analyze) among students between control and experimental groups.
- Ho₆: PolySOM did not enhance ML among mechanical engineering students at premier polytechnics.

1.7 Conceptual Framework

An outline to present a preferred approach to an idea or thought is known as conceptual framework. The framework of a study complies with a set of ideas, ideology derived

principal which are used to encourage information on a detailed study on its design (Robson, 2002). From the framework in Figure 1.2 shows an overall concept of this research. At first the favourite mobile device used among the students was investigated. It is to find out the skills they have in themselves which leads to the capability of themselves towards ML. Besides, the app they preferred in mobile device is identified. These are known via developed instrumentation that has been distributed. The evaluation of the developed mobile application is examined later to determine the effectiveness among polytechnic students.

Figure 1.2. Conceptual framework

1.8 **Significance of Research**

The significance in this detail study is to understand and learn more about the usage in ML among mechanical engineering students at polytechnics students. Indeed, the researcher also hopes to bring some benefit to researcher, students, educators, and also future researcher.

a) Researcher

From this study, researcher intends and will be able to obtain the depth of knowledge in ML among mechanical engineering students at premier polytechnics. Researcher also gets to know how frequent students are engaged towards m-learning. This indeed helps of researcher to have a detail study in the application preferred among them in ML. Opposite

b) Students

This research helps students to create a life-long learning process at any means of wherever and at any time they go. The usage of m-learning will assist students to get information immediately and discussion held to clear their doubts. Hence, students will be at par with the enhancement of technology via ML.

c) Educators

It will be useful for educators to get an overall view on how students are using their mobile phones in their studies nowadays. Indeed, this research will encourage educators

to allow students to use mobile phones in classrooms to be more effective during the process of teaching and learning.

d) Future Researcher

This research can be utilized as the beginning in the detailed study to be continued for the future study in the usage of ML among students for betterment.

1.9 **Research Scope and Limitation**

The scope of this study is conducted at premier polytechnics in Malaysia that are Polytechnic Ungku Omar (PUO) at Ipoh, Polytechnic Sultan Salahuddin Abdul Aziz Shah (PSA) at Shah Alam, and Polytechnic Ibrahim Sultan (PIS) at Pasir Gudang. This research mainly focuses on the usage of ML during teaching and learning process. These three polytechnics are selected since they are known as premier and ought to become universities soon. The students are selected based on the merit qualification whereby they have at least five subjects obtained with grade C and the required passed subjects for the course applied. Therefore, current usage of ML is investigated in premier polytechnics among mechanical engineering students. These students are also chosen for having the similar course content in mechanical engineering field.

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1.10 **Research Framework**

Research framework provides an overall concept about this research which can be seen as a guide and method to complete the study. As in Figure 1.3 shows the flow of this research.

Figure 1.3. Research Framework

Figure 1.3 shows the flow from the beginning of this research where the problem statement was identified till the process of data collection from questionnaires with the analysis of it and conclusion with any relevant suggestion in future. It is important to identify the problem statement in this research to proceed with the purpose of the study that is on the usage of m-learning among polytechnic students. The next step is to develop the research questions to assist in proving the study. Research questions are developed since it is a formal statement of the goal in the study. Then, researcher conducts a pilot study based on the questionnaires to ensure the reliability of the items. The Cronbach's alpha is used to determine the reliability of the questionnaire. The questionnaire developed is said as reliable and acceptable if the score of the Cronbach-alpha is more than 0.7 (Gardy, 2002).

After accomplishing the pilot study without any problems, researcher proceeds with the next step that is distribution of the questionnaire to the targeted students in the premier polytechnics which are PUO, PSA and PIS. Upon completion of answering the questionnaires by respondents, collected questionnaires are analyzed with the data received to develop PolySOM based on their learning style. From here another set of questionnaires were constructed to evaluate the developed PolySOM for the experts and students. PolySOM is the app developed and its abbreviation stands for Polytechnic Strength of Materials. Technology acceptance model (TAM) is referred to construct the conceptual framework for the mobile app. The usage of PolySOM is then conducted among the experimental group of students and their perceptions towards the usage of PolySOM were obtained via questionnaire. Last but not least is the conclusion with

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summary of research completion, the contribution and implication of this research and also future recommendations or suggestions upon this research.

1.11 **Operational Definition**

In this study there are some of the terms have other, more common, generic meaning. They are described as following:

i) M-Learning (ML)

There are two distinct and powerful words that implies to ML which are mobile and learning. Let's look at the "m" first in short for "mobile," means "on the move" whereby it is not fixed or situated at particular place or time. When the word "learning" is added to the definition, it now becomes "knowledge on the move." As Sharples (2000) affirms that learning and technology has converged and advanced. Ever since in the early 1970s, the progress and setting of for a successful ML environment has embarked. It further developed and made learning to become more individualized, learner-centred and collaborative with ubiquitous technology based.

Similarly, at this day and age learning is now more personalized, user-centered and mobile networked. Hereby, this definition highlights the mobile in the aspect of ML more onto student-centered since technology is changing rapidly nowadays to fulfill the

needs of an individual in this era of globalization. Therefore, development of a suitable mobile application upon the required features commonly used among students sure to enhance ML from any field to study the subjects interestingly.

ii) Learning Style

Learning styles relate to how an individual prefer to learn, process, perceive, receive and understand information. Learning style has been defined by various scholars. Kolb (1984) and Honey and Mumford (1992) describe learning style as an individual's preferred or habitual ways of processing and transforming knowledge. Dunn and Dunn (1986) claims that an individual is able to retain new and difficult information only from the way he or she has perceived the information from the specific learning styles. Their concentration, focus and mental processing also helps in retaining the information based on their preferred learning styles.

On the other hand, Felder and Spurlin (2005) pits on that environmental factors also influences a learner in obtaining the information. Nevertheless, an individual's previous learning experiences will enhance the formation of learning styles. It is important to know the type of learning styles among students for them to study at their convenience. Thus, to enhance ML among mechanical engineering students the learning styles have to be identified. There are several learning styles which can be used according to learners' preference. Henceforth, selection of learning style is needed to cater ML among the students. Indeed, due to several factors ML has been progressively utilized in

intuitions for further studies and is widely used in their studies and programs in the education system (Embi & Nordin 2013). The enhancement of ML among students should adhere to suit their learning styles.

xiii) Difficult Subject – Strength of Materials

Engineering subject has always been considered as a difficult subject because due to its abstract concepts involved. At advanced level, students often have difficulty seeing the connection between real-life apps or situations and the theory. Moving from one level to another is not easy for students to do on their own (Giancarlo & Slunt, 2004). This is because of the multitude and variety of degree courses does not make selection easy. As for the "classic" engineering disciplines such as mechanical engineering, electrical engineering or civil engineering the prospective among students find a very broadly to differentiate the range of courses where many of them interdisciplinary in nature.

Furthermore, the lack of concurrent and suitable devices to use as teaching aids unsuitable use of teaching approaches has inevitably caused the low or weak understanding of engineering concepts among the learners (Martin & Mats, 2005). This has been proved by previous researches (Sergey, 2002) and (Eigen & Komoski, 1989) where the problems of mechanical engineering education through lecture occur due to unsuitable teaching aids or approaches. Therefore, students face difficulties in the subject to understand concepts and to relate between theory and reality since teaching aids are not suitable. An ideal basis is attained when learners are able to independently and

analytically think. Strength of Materials subject relies on the experience as well as the theory and is a science in development. It also has no prerequisite of other subjects for students to understand this subject.

In addition, students found difficulty to understand the theory as the dimensions of elements and details depend on the characteristics of the used materials. Nevertheless, the external forces acting upon the structures where they have to be determine it carefully. This particular subject studies the bodies possessing the ability to deform for example the ability to change its initial shape and dimensions under the action of external forces. Students are unable to see and imagine the changes happening in the materials. It is due to the deformations at each point are assumed to be small relative to the dimensions of

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The term application (app) is a shorter form derived from application program. Application program is used and designed to perform particular function for its users or via another application system or program. Some of the examples of applications (apps) are word processors, databases, web browsers, drawing, paint and image editing as well as communication programs. There is a computer operating system or supporting app as to aid and provide the service of the apps. The formal term used to operate the means of communicating such app program is called the application program interface (API).

Cui and Wang (2008) stated that mobile devices such as cell phones, PDAs, smart phones, etc., are carrying powerful functions as do personal computers. This means that there are some functions in the cell phone equivalent with a personal computer. Voice telephony was the main function of a traditional mobile handset but in the last decade, these devices have mutated into a complex multi-platform system that includes email, a web browser, address book, calendar, clock, games, video camera, GPS, music player, ebook reader, access to radio and television content, and also thousands of downloadable and upgradeable apps (Scolari et al., 2012). These features in mobile phones also known as the smart phones do cater as an aid for teaching and learning process. The advancement of technology definite to enhance fun learning among students. In current era generation of students, they are growing together with technology and usage of 05 mobile devices is common among themselves. Abdul Jalil Shah

Hence, the usage of a mobile app as an aid to learn the subject they found difficult sure to be convenient for studying at anywhere and anytime. In line with the multiplatform system, students are able to communicate and discuss any doubts immediately among their friends and lecturers using the mobile app for this particular subject. The app developed is to focus on studying the subject which is found difficult to be more interactive and at the same time enhancing ML among students. These tools, apps and services act as one of the effective way in attracting attention (Skeele & Stefankiewicz, 2002). Thus, having an interactive and interesting app sure to get the students engaged towards ML. A suitable design of mobile app development definite to cater ML among the learners. The more incorporated mobile technologies used effectively in teaching and

learning environment help learners to study better via ML method. This ML method of studying promises freedom and flexibility from traditional method of learning.

1.12 Conclusion

Overall, this research is based on the usage of ML among premier polytechnics students in mechanical engineering field with the mobile application developed according to their learning styles related to their course of study. Conceptual framework is designed specifically to have a concrete understanding in this research. The importance and definition operational were clearly discussed too. In chapter two, the learning background with learning theories, learning models and learning styles also having the ML background are discussed. As in chapter three the methodology used is stated while chapter four focuses on the mobile application development. Chapter five and chapter six involves the analysis of data and the discussion with further recommendations and conclusion from the research study.

