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WOTES

Wood Technology, Engineering and Science Social

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Wood Technology, Engineering and Science Social

WoTES EDISI 1, 2018

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eISSN 2672-717X



9 772672 717005

ISI KANDUNGAN

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KATA ALUAN TIMBALAN PENGARAH
PRAKATA KETUA UNIT *CENTRE OF TECHNOLOGY* (COT)
JAWATANKUASA PENERBITAN DIGES

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ALUAN PENGARAH

Assalamualaikum warahmatullahi wabarakatuh, Salam Sejahtera dan Salam PKK Unggul.

Alhamdulillah, pertamanya marilah kita bersama-sama melafazkan rasa syukur kepada Yang Maha Esa kerana dengan rahmatNya dapat kita menjayakan penerbitan *Wood Technology, Engineering and Science Social (WoTES) Edisi 1 Tahun 2018* ini.



Pada kesempatan ini, saya ingin mengucapkan penghargaan dan terima kasih terutama sekali kepada Unit *Centre of Technology (COT)* serta semua pihak yang terlibat secara langsung atau tidak langsung dalam menyempurnakan penerbitan ini.

Penerbitan ini merupakan salah satu landasan bagi mempamerkan hasil penyelidikan, inovasi, kreativiti serta buah fikiran para warga akademik PKK. Semoga penerbitan seumpama ini mampu memberi dorongan kepada semua warga akademik PKK untuk melakukan lebih banyak lagi penyelidikan serta inovasi yang mampu membawa impak ke arah pembangunan sosio-ekonomi negara yang mampan pada masa hadapan.

Semoga penerbitan ini juga membawa kita kepada penghasilan kerja dan produk dengan membawa kesan yang lebih signifikan, nilai tambah serta berdaya saing. Saya juga berharap, penyelidikan, inovasi dan kreativiti akan sentiasa menjadi asas kepada warga akademik PKK dalam mempertingkatkan lagi prestasi kerja, kualiti serta produktiviti.

Akhir sekali, tahniah dan syabas diucapkan kepada Unit *Centre of Technology (COT)*, Sidang Editor dan Ahli-ahli Jawatankuasa Penerbitan *WoTES Edisi 1* serta semua penyelidik yang berjaya menerbitkan penyelidikan dan hasil inovasi mereka. Semoga memberi manfaat kepada warga PKK khususnya.

PKK Unggul.

Sekian. Terima kasih.

Ts. ZAINAB BT OTHMAN A.D.K.

Pengarah Politeknik Kota Kinabalu, Sabah

Penaung I, WoTES EDISI 1/2018

KATA ALUAN TIMBALAN PENGARAH

Assalamualaikum warahmatullahi wabarakatuh,

Terlebih dahulu marilah kita merafakkan kesyukuran ke hadrat Allah S.W.T kerana dengan limpah dan kurnia-Nya sekali lagi kita berjaya menyempurnakan penerbitan WoTES Edisi 1, Tahun 2018.

Saya mengambil kesempatan ini untuk merakamkan ucapan syabas dan tahniah kepada Unit *Centre of Technology* (COT) serta semua ahli-ahli jawatankuasa penerbitan WoTES Edisi 1 ini. Tahniah dan syabas juga diucapkan kepada para warga penyelidik PKK yang telah berjaya menerbitkan hasil penyelidikan dan inovasi masing-masing pada kali ini.



Kekuatan dan kecemerlangan akademik sesebuah Institusi Pengajian Tinggi biasanya bergantung kepada input yang datangnya dari hasil penyelidikan dan juga inovasi. Saya percaya bahawa pengajaran dan pembelajaran yang disandarkan daripada sumber – sumber penyelidikan mahupun inovasi ini mampu menjamin kualiti kandungan-kandungan akademik khususnya di Politeknik Malaysia ini.

Umumnya, penyelidikan dan inovasi merupakan hasil cetus idea-idea yang kreatif dan inovatif dalam aspek kerja yang mana mampu meningkatkan kualiti dan produktiviti kepada seseorang secara individu mahupun sesuatu organisasi. Maka, besarlah harapan saya agar penerbitan seumpama ini mampu memberi peluang kepada kita semua untuk berkongsi ilmu agar ilmu tersebut sentiasa tersebar luas, terus diperkaya dan berkembang.

Akhir kata, bersama-samalah kita terus memantapkan budaya penyelidikan dan inovasi di kalangan warga akademik Politeknik amnya dan Politeknik Kota Kinabalu khususnya.

Sekian. Terima kasih.

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Assalamualaikum, Salam Sejahtera, Salam PKK Unggul,

Dengan Nama Allah Yang Maha Pemurah lagi Maha Penyayang,

Alhamdulillah syukur ke hadrat Allah SWT kerana dengan rahmatNya, Jawatankuasa Penerbitan WoTES, Edisi 1, 2018 telah berjaya melaksanakan misinya. Penerbitan seperti ini dilihat mampu memberikan impak yang tinggi terhadap pencapaian kecemerlangan warga akademik, Politeknik Kota Kinabalu. Setinggi-tinggi penghargaan dan ucapan terima kasih diucapkan kepada Ts. Zainab Binti Othman, Pengarah Politeknik Kota Kinabalu (PKK) Sabah dan Puan Norhanom Binti Awang, Timbalan Pengarah Akademik (TPA) secara langsung dan tidak langsung untuk menjayakan program penerbitan ini. Ribuan terima kasih juga diucapkan kepada pihak pengurusan PKK kerana telah melantik saya sebagai Pengarah Program Penerbitan WoTES untuk edisi kali ini.



Setinggi-tinggi penghargaan dan ucapan terima kasih diucapkan kepada ahli-ahli Jawatankuasa, Sidang Editor / Redaksi, serta semua pihak yang terlibat secara langsung mahupun tidak langsung dalam menjayakan aktiviti ini. Kerjasama yang erat berserta dengan dedikasi serta komitmen yang tinggi daripada semua pihak yang terlibat telah berjaya merealisasikan penerbitan WoTES pada tahun ini.

Akhir kata, saya mengucapkan syabas dan tahniah sekali lagi kepada semua penyelidik dan perekacipta yang datang daripada pelbagai latar bidang kerana telah berjaya menyumbangkan hasil penyelidikan dan inovasi masing-masing. Adalah diharapkan menerusi aktiviti seperti ini, ia dapat disebar luas, dikongsi dan diaplikasikan bersama oleh warga PKK khususnya serta warga Politeknik dan Kolej Komuniti, Malaysia secara amnya.

Sekian, terima kasih.

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SENARAI JAWATANKUASA WOTES EDISI 1 2018

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Rock Slope Stabilization Design Using Rock Bolt at Minyak Beku

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Abstract - Rock slope stabilization design requires an understanding and evaluation of the process that govern the rock slopes behaviour which formed by sets of discontinuities including joint, fault and folds. This geological data are pre-requisite to any stabilization measure that might be necessary to ensure the rock slopes long-term stability. The required stability conditions of rock slopes will vary depending on the type of project and the consequences of failure. A suitable method to be undertaken is necessary to reduce the risk. Hence, it is important to analyse the factor of safety (FOS) of the particular rock slope by taking a different analysis procedures for plane, wedge, circular and toppling failures. All these values can be calculated using the rules of thumbs or computer software itself. In this study, all these factors will be applied in order to achieve a proper design at the selected location using a suitable method. Generally, this study was conducted at Minyak Beku within 100 metres rock slope and been divided into 4 main section. After undergo the analysis process, it could be said that the main failures of this slope consist of wedge failures in Section C and Section D. Hence, it need to be stabilize using the appropriate method; rock bolt.

Keywords - *Discontinuities, Stabilization, Factor of Safety*

I. INTRODUCTION

Nowadays, the demand on land used for construction activities has increased. Most of the recent developments are being undertaken in hilly areas. Major civil construction work is almost always involved in designing safe and economical slope faces both in rock and soil.

Slope failures are major natural hazards in many areas throughout the world due to many reasons. To safeguard the safety of the public from rock slope failure hazards, proper geotechnical input by the engineers with geotechnical experience is very important. Rock slopes should be analyzed to check its stability. The stability of rock slope is significantly influenced by the structure geology of the rock in which the slope is excavated. Hence, we need to apply an effective method in minimizing the hazard of rock slope failure. We need to determine all the geological data as it dictated the mode of failure, which in return is relevant to the determination of stabilization methods.

This paper will discuss on the flow of works in conducting a suitable design process of rock slope stabilization from early gathering site data until the determination of rock bolt quantity.

A. Problem Statement

Rock slopes fail from time to time without prior indication and sometimes, due interference of man. The rock fall which occurred at 21 km of North Klang Valley Expressway (NKVE) on 26th November 2003, shocked the nation and remains as a lesson to the public.

Experienced from the above mentioned, a comprehensive understanding of rock slope behaviour and its failure mechanism is essential in designing and installation of appropriate stabilization system. The selection of a proper stabilization method for certain rock slope depends on the failure mode. The economic aspect should also be considered to avoid over-design and consequently burden the client. Nowadays, a number of user friendly computer software has been developed to facilitate the design work of rock stabilization. However, they require relevant experience for their usage. Therefore, understanding the design concept and correct geological data input are important.

B. Aims and Objectives of Study

The objectives of this study are as below :

- To understand the characteristics of rock slope and its various mode of failure.
- To understand the rock slope stabilization method using rock bolts.
- To study on the process of designing a rock slope stabilization system using Rock Pack III software.

C. Significance of Study

Rock slopes failure is natural hazard that has been threatening man for centuries. With the development of technology, the impact of the hazard can be minimized through effective stabilization method. However, different mode of failure needs different technique of stabilization. Sometimes, a rock slope is treated with combination of several support method. How to select an appropriate and effective treatment for stabilizing a rock slope, which performs various mode of failure become questionable. Therefore, knowledge on the cause of failure and relevant treatment are important in ensuring slope stability and subsequent maintenance.

II. LITERATURE REVIEW

A. Introduction

Slope failures are responsible for millions of damages to public and private property every year. Because slopes consist of native or transported earth materials, engineering properties and behaviors are quite variable and unpredictable to precise limits. Nowadays, the analysis and solution of this particular problems as well as prevention it requires the understanding of geology, hydrology, seismology, geotechnical exploration and engineering, computerized analytical methods, as well as practical and constructible engineering solutions.

Geological structures are the study of permanent deformation of rock failure and created by the changes in stress through geologic time. Rock discontinuities include joints, fractures, faults and other geological structures. Rock joints are by far the most common discontinuity encountered in rock masses. Rock fractures are random features. Rock faults and folds are major but localised geological structures and therefore are dealt individually.

Large scale discontinuities are bedding plane, folds, faults and joints. Bedding planes represent interruptions in the course of sedimentary rock grain deposition, which are separated by beds or strata. Folds are caused by a bend in the strata of layered rock. While faults are fractures of fractured zones along this has been appreciable shear displacement. Joints are fractures in rock along which there has been little or no displacement or very slight movement perpendicular to the joint surface.

B. Modes of Failure

Rock slopes failures depend on the interaction of discontinuity orientation, face orientation and shear strength. Generally, there are four types of failures including planar, wedge, circular and toppling.

Plane failure occurs when a discontinuity dips in a direction close to that of the face and the magnitude of the dip is greater than the angle of friction for the discontinuity. Wedge failure occurs when the orientation of two discontinuities results in a line of intersection that dips in a direction close to that of the face and the dip of this line is significantly greater than the angle of friction for the discontinuities. Another failure is circular. It is call circular failure when the material is weak (as in soil slopes) or when the rock mass is heavily jointed or broken, the failure surface is likely to be circular. And the last one is toppling failure which occurs when form of columnar separated by steeply dipping discontinuities.

Hoek and Bray [6] classified the rock slope failure into two categories; either factors of safety can be calculated and vice versa. Modes of rock slope failure that can be calculated including plane failure, wedge failure and circular failure. Factor of safety can be defined as the ratio of the total force available to resist sliding to the total force tending to induce sliding. The critical state is when the factor of safety (FOS) equal to 1. The most suitable FOS that taking of the factors

that affecting to the rock slope stability like presence of water, fractured, and method of excavation is greater than 1.5 [5].

C. Factors Influencing Rock Slope Stability

Generally, failure itself is frequently initiated by the additional factors that not related to geometry. The geometric boundaries imposed by orientation, spacing and continuity of the joints, as well as the free surface boundaries imposed by the excavation, defined the modes of potential failures. Erosion, groundwater, temperature, in-situ stress and others are some of factors contribute slope instability [14].

D. Rock Bolt

To meet support needs in various geological and geotechnical settings, a variety of bolt types have been developed. The installation of such bolt-based support systems is often complex and specialized, and thus imposes a challenge for engineers to identify the specific cause and to take appropriate remedial measures once problems arise. Since the first use of primitive slot and wedge rock bolts in 1927, rock bolting has become the most important support system in mining engineering [8].

Rock bolting is more economic than other methods because it saves material and manpower consumption. Most important of all, rock bolting is more effective and efficient because it is an active support method, utilizing the rock to support itself by applying internal reinforcing stresses. Furthermore, rock bolting can be satisfactorily used to meet a variety of geological conditions and various support requirements.

In general, rock bolting is very effective in a variety of geological and geotechnical conditions. The main function is to bind together stratified or broken rocks consisting of natural joints and fractures, or rocks with artificial fractures and cracks caused by the use of explosives [11].

III. MATERIAL & METHODOLOGY

This section discusses on the structure of research. This will help to understand the fundamental stages of methodology executed or steps of process carried out in order to achieve the aims and objectives of this study. The framework of methodology represented diagrammatically in Figure 1 to show the distinctive stages and sequence carried out.

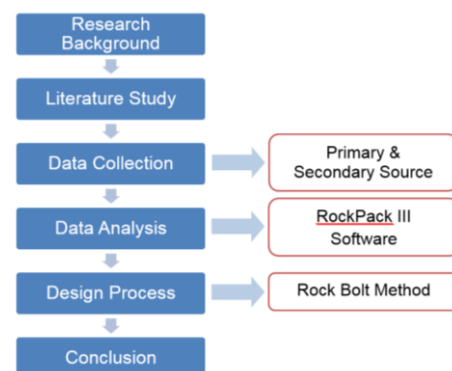


Figure 1 : Flow chart diagram of research methodology

A site investigation in Minyak Beku conducted in order to get the geological data; geologic nature of site, rock types, types of discontinuities and their general characteristics, obvious clustering of discontinuity orientations, surface drainage, ground water characteristics, and major features will be noted. All this data were collected using a geological compass and record it in the scanline logging sheet.

Nowadays, there are many intelligent computer software being develop in order to makes our life easier. In this study, for analysis purposes, Rock Pack III software (Fig.2) was used. It is a full package programs for all phases of rock slope analysis and design where stability is controlled by the orientations and characteristics of rock mass discontinuities.

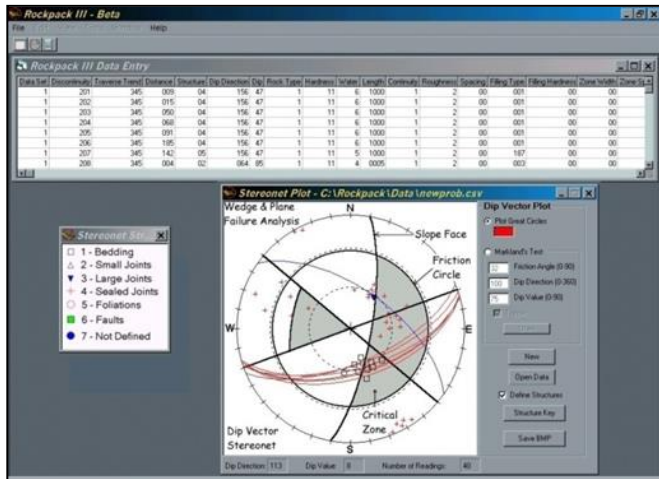


Figure 2 : Rock Pack III Software

This study limiting the equation for evaluating plane and wedge failures are based on equilibrium method come from Hoek and Bray [5]. The formula for plane and wedge failure is as in Eq. 1 and Eq. 2 below. All these equations also used in the safety factor calculation in Rock Pack III software.

$$Failure, F = \frac{cA + (W \cos \beta - U - V \sin \beta) \tan \phi}{W \sin \beta + V \cos \beta} \quad (1)$$

Where,

- | | | | |
|---------|---------------------------|----------|-----------------------------|
| A | = Failure plane area | ϕ | = Friction angle |
| C | = Cohesion | U | = Vertical water pressure |
| W | = Weight of failure block | V | = Horizontal water pressure |
| β | = Failure plane angle | α | = Slope angle |
| H | = Height of slope | Z | = tensional cracks |

$$FOS = \frac{3}{\gamma H} (C_a \cdot X + C_b \cdot Y) + \left(A - \frac{\gamma_w}{2\gamma} \cdot X \right) \tan \phi_a + \left(B - \frac{\gamma_w}{2\gamma} \cdot Y \right) \tan \psi_s \quad (2)$$

Where,

- | | | | |
|----------|-------------------------|----------------------------|-----------------------------------|
| C_a | = Cohesion | ϕ_a | = Friction angle |
| H | = Height of wedge | $\frac{\gamma_w}{2\gamma}$ | = Dip angle for plane A |
| Ψ_a | = Dip angle for plane B | Ψ_s | = Dip angle of wedge intersection |

X, Y, A, B are factor which depend upon the geometry of wedge.

$$X = \frac{\sin \theta_{2a}}{\sin \theta_{45} \cos \theta_{2,na}}$$

$$Y = \frac{\sin \theta_{13}}{\sin \theta_{35} \cos \theta_{1,nb}}$$

$$A = \frac{\cos \Psi_a - \cos \Psi_b \cos \theta_{na,nb}}{\sin \Psi_s \sin^2 \theta_{na,na}}$$

$$B = \frac{\cos \Psi_b - \cos \Psi_a \cos \theta_{na,nb}}{\sin \Psi_s \sin^2 \theta_{na,na}}$$

IV. RESULT AND DISCUSSION

Generally, this study was conducted in Minyak Beku rock slope within 100 m. Then, it's divided into 4 main sections – Section A, Section B, Section C, and Section D (Fig. 3).



Figure 3 : Section A, Section B, Section C, Section D

All the data collected using geological compass and recorded into the data sheet. Overall, there are 103 data within 100 metres distance. Then, all the data collected will undergo a proper analysis of rock slope stabilization using software – Rock Pack III. Figure 4 below shows the stereonet plotting in both pole and dip vector format for all 4 sections.

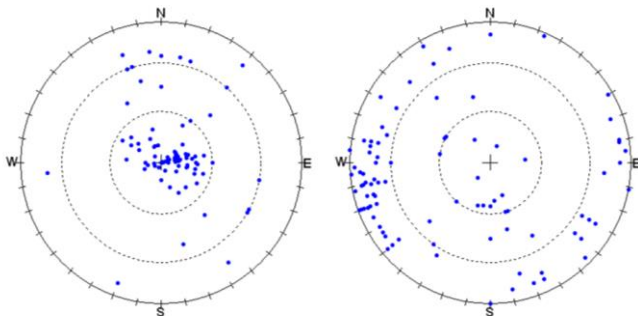


Figure 4 : Dip Vector Plot and Pole Plot (Left to Right)

From the stereonet plotting, all the data are used to represent individual discontinuities in this area of study. Results in Table 1 below show the value of slope face, cohesion and friction angle. All these data will be used in analysis process.

Table 1 : Slope results

Section	Slope Face	Cohesion Value	Friction Angle
A	210°/80°	50 kPa	30°
B	280°/70°		
C	310°/60°		
D	340°/70°		

Rock slope in Minyak Beku was formed by granite type. Granite is characterized by a granular texture, has feldspar and quartz (at least 20%) as its too most abundant material, and in consequences most granite is light coloured. In assumption, this type of rock has a value of 30° for friction angle and cohesion value of 50 kPa.

From this analyses, by referring to the suitable standard of rock bolt, a rock slope stabilization design process using rock bolt can be determine to prevent the rock slope from fail. Table 2 below shows the overall result of rock slope analysis using Rock Pack III software.

Table 2 : Overall result

Section	A	B	C	D
Height (m)	± 20	± 20	± 15	± 20
Distance (m)	0 – 25	25 – 50	50 – 75	75 – 100
Slope Stabilization	Stable	Stable	Unstable (Wedge)	Unstable (Wedge)
Planar (FOS)	w/o RB	1.43	1.53	1.51
	with RB	1.59	1.59	1.59
Topple	Safe	Safe	Safe	Safe
Wedge (FOS)	-	-	0.89	0.87

From the table above, it can be concluded that both Section A and Section B are safe and stable from all three failures. With factor of safety (FOS) value of 1.59, after the rock bolt value inserted, the slopes are more safe. On the other hand, wedge failure was identified in Section C and Section D. With values of 0.89 and 0.87 each, a proper observation must be conducted in this section. If not, worried that the failure will take in place.

When factor of safety (FOS) < 1, driving forces exceed resisting forces and failure is expected to occur. A safety factor of 1.3 is often considered the minimum acceptable value in rock slope work, although this may vary with site condition.

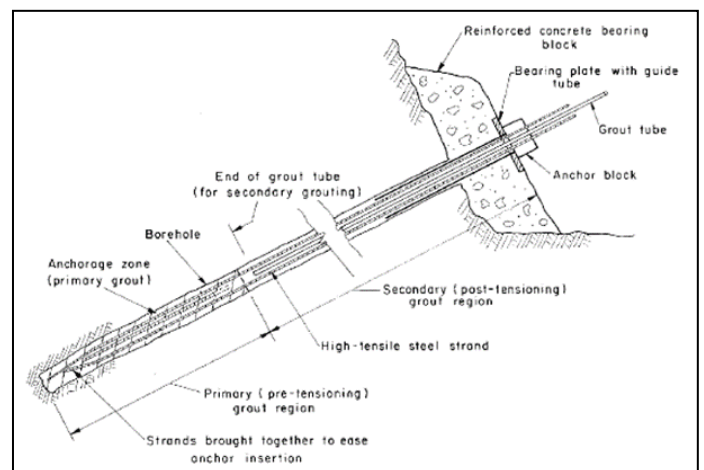


Figure 5 : Typical bolt installation for slope stabilization [12]

In designing process, it will not involve the detail rock bolt design, as it will only involve the particular important parameter. Basically, rock bolt (Fig.5) comprising a bolt rod adapted to be secured in a borehole, a bolt head for a retaining plate adapted to be attached outside the borehole, and a compressively loaded deformable member, which surrounds the bolt rod, incorporated in the supporting connection between the retaining plate and the bolt rod. Usually, bolt are installed vertically, sometimes at an incline.

To determine the factor of safety (FOS) of the slope, for design purposes, a total of 100 kN bolt tension was about to be applied to the bolt. Table 3 below shows the specification of rock bolt to be used suggested by [14] for rock slope at Minyak Beku in order to stabilize the slope from failed.

Table 3 : Rock Bolt Specification

<i>Specification</i>	<i>Range</i>	<i>Common</i>
Length	0.5 m – 5 m	1 m – 2 m
Outer Diameter	1 cm – 3 cm	2 cm
Nozzle	Opening less than 1/3 diameter	0.15 – 0.3 x Diameter
High Pressure Fluid	70 – 1400 km/cm ²	350 – 700 kg/cm ²
Insertion Rate	2-3 cm / sec	2-3 cm / sec

As classified by [6], the rock slope failure into two categories; either factors of safety can be calculated or cannot. Modes of rock slope failure that can be calculated are plane failure, wedge failure and circular failure. Factor of safety (FOS) can be defined as the ratio of the total force available to resist sliding to the total force tending to induce sliding. The critical state is when the factor of safety (FOS) equal to 1. The most suitable FOS that taking of the factors that affecting to the rock slope stability like presence of water, fractures, and method of excavation is greater than 1.5.

Since the rock slope at Minyak Beku are stable in term of planar and topple failures, but not for the wedge failure. Need to be aware that the slope can also failed because of those two failures – planar and topple – since the factor of safety (FOS) values near to the allowable value. Hence, rock bolt is the suitable method as a structural support since it compatible with all type of failures.

V. CONCLUSION

Generally, rock bolt is an example of stabilization structural support that gives positive solutions to all failures that occur on the rock slope; plane failure, wedge failure and toppling failure. As a conclusion, in the end of this study, a proper basic design of rock slope stabilization (rock bolt) being determined based on the geologic data that observed from Minyak Beku site.

The failures modes of slopes are various and are closely associated with the special distributions of discontinuities in relation to slope geometry and their mechanical resistance as well as those of intact rock as compared with soil slopes.

From the several researches thru this project, it can be concluded that the effect of stabilization is influenced by few external factors such as discontinuity orientation, face orientation and shear strength. In this research, a total of 103 discontinuities data were taken and recorded in the data sheet. Then, all the data undergo the analysis process using Rock Pack III software before proceed to the design step. Overall, all the objectives on this study achieved.

ACKNOWLEDGEMENT

The authors wish to express deepest gratitude to the supervisor, Ir. Agus Sulaeman for invaluable guidance, direction and kind encouragement throughout the study. Besides, the authors want to thank all individuals for the advice and assistance during the preparation of this paper.

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Penggunaan *Moment-Force Ruler* sebagai Alat Bantu Mengajar dalam Pengajaran dan Pembelajaran Analisis Berstruktur

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Abstrak—Sebahagian program-program kejuruteraan yang ditawarkan di Institut Pengajian Tinggi Awam dan Swasta di negara kita mengandungi kursus-kursus yang menekankan kepada keperluan pengetahuan dalam pemahaman terhadap pengiraan matematik dalam menjalankan analisis struktur sesuatu binaan. Ianya merupakan sub-topik penting yang perlu dikuasai dan difahami oleh pelajar-pelajar yang terlibat. Pengiraan yang melibatkan keperluan kepada penggunaan imaginasi dalam kiraan matematik analisis struktur binaan telah menyebabkan segelintir pelajar tidak dapat menguasai dan memahaminya dengan baik kerana lemah dalam kemahiran imaginasi, seterusnya akan memberi kesan kepada kecemerlangan akademik pelajar tersebut. Oleh itu, pendekatan kepada penghasilan dan penggunaan alat bantu mengajar '*Moment-Force Ruler*' dalam pembelajaran dan pengajaran bagi kursus-kursus yang melibatkan analisis struktur dicadangkan dan diaplikasikan. Tahap penerimaan pelajar dan kebolegunaan alat bantu mengajar '*Moment-Force Ruler*' dianalisis berdasarkan input yang diperolehi daripada soal selidik yang disediakan sebelum dan selepas pengaplikasiannya dalam aktiviti pengajaran dan pembelajaran. Responden yang terlibat dalam maklumbalas keberkesanan alat bantu mengajar ini terdiri daripada pelajar-pelajar sesi Disember 2015 dari program Diploma Kejuruteraan Awam (DKA), Diploma Ukur Bahan (DUB dan Diploma Teknologi Berasaskan Kayu (DBK) di Jabatan Kejuruteraan Awam serta pelajar-pelajar dari Diploma Kejuruteraan Mekanikal di Jabatan Kejuruteraan Mekanikal yang sedang mengikuti kursus melibatkan kandungan silibus analisis struktur binaan. Antara kriteria-kriteria yang terlibat dalam menentukan tahap penerimaan dan kebolegunaan produk inovasi ialah kriteria kriteria Persembahan, kriteria Mudah Digunakan, kriteria Bahasa, kriteria Paparan Produk dan kriteria Penilaian Keseluruhan. Merujuk kepada maklumbalas pelajar bagi setiap kriteria-kriteria tersebut, secara keseluruhannya penggunaan alat bantu mengajar adalah praktikal untuk dilaksanakan dalam aktiviti pembelajaran dan pengajaran bagi kursus yang melibatkan silibus analisis struktur binaan. Kesimpulannya, produk '*Moment-Force Ruler*' yang dihasilkan adalah memenuhi konsep kebolegunaan dan sesuai untuk digunakan sebagai alat bantu mengajar bagi kursus yang melibatkan silibus analisis struktur binaan memandangkan

keseluruhan responden bersetuju terhadap kesemua item kebolegunaan yang diutarakan.

Katakunci: Analisis struktur, pengiraan matematik, produk '*Moment-Force Ruler*',

I. PENDAHULUAN

Pengiraan matematik yang menggunakan rumus keseimbangan daya statik merupakan antara kandungan yang terdapat dalam sebahagian kursus dan program kejuruteraan di Institusi Pengajian Awam dan Swasta di negara kita yang wajib dikuasai oleh pelajar. Ini adalah kerana sebahagian daripada kandungan kursus yang melibatkan analisis bagi struktur binaan menggunakan rumus keseimbangan daya statik untuk menganalisis sesuatu struktur yang dibebani oleh sesuatu daya. Pengiraan matematik yang melibatkan kiraan momen lentur dan daya-daya paksi merupakan perkara asas yang wajib diketahui dan dikuasai oleh pelajar dalam mempelajari kursus-kursus analisis berstruktur binaan. Pengetahuan dari segi teori dan kiraan dalam penggunaan rumus momen lentur dan daya-daya paksi adalah amat penting supaya kiraan yang dibuat memberikan nilai yang betul.

Sebahagian dari pelajar yang mengikuti kursus analisis berstruktur dilihat lemah dalam mengaplikasikan rumus keseimbangan daya statik yang mana ianya memberi kesan terhadap kesinambungan pembelajaran yang seterusnya dalam kursus tersebut. Mereka dilihat lemah untuk menggunakan teori putaran momen lentur dalam rumus momen lentur kerana kurang daya imaginasi yang mana rumus momen lentur memerlukan imaginasi dari segi penentuan jarak dan arah putaran momen yang betul. Oleh kerana itu, satu alat bantu mengajar yang di panggil *Moment-Force Ruler* dihasilkan bagi tujuan untuk membantu pelajar-pelajar yang lemah dalam pengiraan dan imaginasi yang melibatkan rumus keseimbangan daya statik untuk kursus analisis berstruktur. Ianya diwujudkan berdasarkan dari satu soal selidik maklumbalas pra-inovasi pengajaran dan pembelajaran yang telah diedarkan kepada pelajar. Melalui soal selidik yang diedarkan, diketahui bahawa

sebahagian daripada pelajar tersebut didapati lemah dalam mengaplikasikan rumus keseimbangan statik yang telah diajar. Mereka memerlukan satu teknik atau kaedah atau alat bantu mengajar tambahan bagi tujuan peningkatan dalam pemahaman melibatkan penyelesaian matematik yang berkaitan dengan rumus keseimbangan daya statik tersebut.

II. OBJEKTIF INOVASI

Inovasi ini dijalankan adalah bertujuan untuk:

- 1) Menghasilkan produk inovasi 'Moment-Force Ruler' untuk tujuan kiraan daya sokong bagi analisis berstruktur yang dibebani daya.
- 2) Menjalankan analisis tentang persepsi pelajar terhadap kandungan kursus analisis berstruktur serta tahap penerimaan dan kebolegunaan produk inovasi 'Moment-Force Ruler'.

III. KUMPULAN SASARAN

Inovasi 'Moment-Force Ruler' ini mensasarkan kumpulan pelajar-pelajar dari jabatan kejuruteraan di Politeknik Kota Kinabalu yang mengambil kursus melibatkan analisis berstruktur pada sesi Disember 2015. Antara pelajar-pelajar yang terlibat ialah:

A. Pelajar dari Jabatan Kejuruteraan Awam

- 1) Pelajar semester lima Diploma Kejuruteraan Awam (DKA5A) yang mengikuti kursus "Structural Analysis 2 – CC601".
- 2) Pelajar semester satu Diploma Ukur Bahan (DUBIA) yang mengikuti kursus "Principle of Structure – DCQ1102".
- 3) Pelajar semester empat Diploma Teknologi Berasaskan Kayu (DBK4A) yang mengikuti kursus "Mechanic Structure 2 – DCW5112".

B. Pelajar dari Jabatan Kejuruteraan Mekanikal

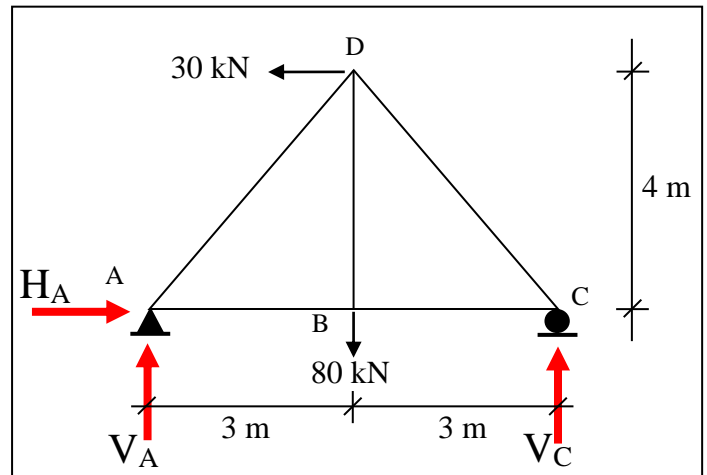
- 1) Pelajar semester satu Diploma Kejuruteraan Mekanikal (DKM1B) yang mengikuti kursus "Engineering Science – DBS1012".

IV. METODOLOGI PENYAMPAIAN INOVASI

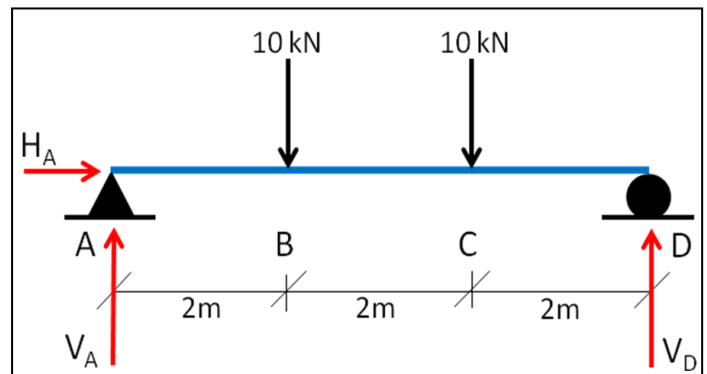
Alat bantu mengajar yang diwujudkan akan digunakan pada masa yang betul untuk tujuan pengajaran dan pembelajaran dalam kelas mengikut kandungan kursus yang sesuai. Ianya akan ditunjukkan tentang cara penggunaannya dalam mengira daya tindakbalas sokong menggunakan rumus keseimbangan daya statik seperti $\sum M = 0$, $\sum F_y = 0$ dan $\sum F_x = 0$. Penggunaan kaedah pengajaran cara demonstrasi akan digunakan dalam menerangkan cara penggunaan alat bantu mengajar tersebut.

Penggunaan alat tersebut memerlukan rajah soalan bagi tujuan pengiraan daya tindakbalas sokong. Contoh rajah soalan

yang digunakan ialah seperti dalam Rajah 1 dan Rajah 2 di bawah. Pengiraan bagi soalan penentuan daya tindak balas sokong dijalankan dengan menerbitkan persamaan kiraan berdasarkan nilai beban daya dan nilai jarak yang terdapat pada rajah soalan tersebut. Alat 'Moment-Force Ruler' akan digunakan dalam pengiraan tersebut. Penggunaannya untuk tujuan penentuan arah putaran momen positif atau negatif di samping dapat mencari nilai jarak serenjang yang betul membolehkan satu persamaan yang mewakili rumus $\sum M = 0$, $\sum F_y = 0$ dan $\sum F_x = 0$ dapat diterbitkan dan ini membolehkan pengiraan nilai daya tindak balas sokong yang betul dapat diketahui.



Rajah 1: Contoh Soalan Kiraan Tindakbalas Sokong Bagi Struktur Kerangka Boleh Tentu Statik



Rajah 2: Contoh Soalan Kiraan Tindakbalas Sokong Bagi Struktur Rasuk Sokong Mudah

Setelah cara penggunaan alat bantu mengajar tersebut ditunjukkan kepada pelajar, pelajar akan diminta membuat kiraan sendiri menggunakan soalan latihan yang akan diberikan dalam bentuk kumpulan. Pelajar akan menyelesaikan soalan penentuan kiraan nilai daya tindakbalas sokong secara berkumpulan dengan menggunakan alat bantu mengajar yang disediakan mengikut giliran. Setiap pelajar akan dapat memahami konsep penggunaan rumus keseimbangan daya statik melalui kiraan yang dibuat menggunakan alat bantu

mengajar tersebut. Persamaan kiraan yang betul dapat diterbitkan dengan bantuan alat itu.

produk inovasi yang sebenar ditunjukkan dalam Rajah 4 di sebelah.

V. ISU DAN MASALAH YANG DITANGANI OLEH PRODUK INOVASI

Pengiraan matematik bagi penyelesaian dalam penentuan nilai daya tindakbalas sokong untuk sesuatu struktur binaan adalah amat penting, kerana ianya adalah pengiraan yang paling asas dan awal yang perlu dikuasai oleh pelajar sebelum mereka mempelajari analisis struktur yang lebih rumit. Sebahagian pelajar dilihat tidak dapat melakukan pengiraan dan menerbitkan persamaan matematik yang betul berdasarkan rumus keseimbangan daya statik yang telah dipelajari kerana mereka tidak dapat memahami konsep putaran momen positif dan negatif disamping wujudnya kesalahan dalam penentuan jarak lengan momen yang betul memberikan nilai yang betul.

Melalui penggunaan alat bantu mengajar 'Moment-Force Ruler', beberapa masalah dalam pengiraan nilai daya tindakbalas sokong sewaktu pengajaran dan pembelajaran dalam kelas dapat ditangani seperti:

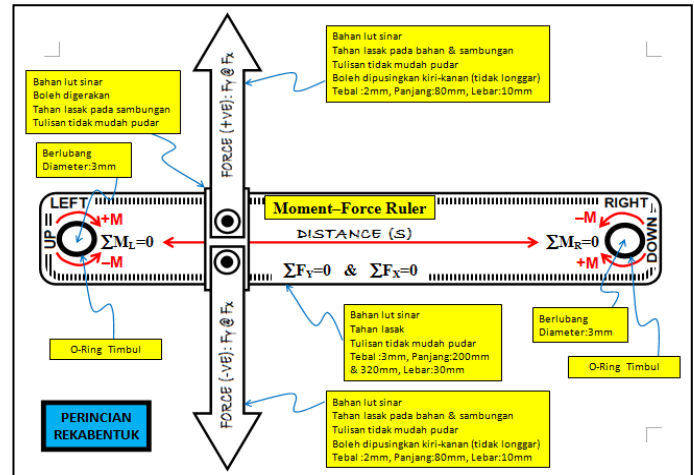
- 1) Masalah penentuan putaran momen positif dan negatif dalam persamaan kiraan keseimbangan daya statik; Jumlah Momen Lentur Pada Satu Titik Bersamaan Dengan Kosong $\sum M = 0$.
- 2) Masalah penentuan jarak lengan momen yang betul dalam persamaan kiraan keseimbangan daya statik; Jumlah Momen Lentur Pada Satu Titik Bersamaan Dengan Kosong $\sum M = 0$.
- 3) Masalah Penentuan daya pugak positif dan negatif dalam persamaan kiraan keseimbangan daya statik; Jumlah Daya Pugak Bersamaan Dengan Kosong, $\sum F_y = 0$.
- 4) Masalah Penentuan daya ufuk positif dan negatif dalam persamaan kiraan keseimbangan daya statik; Jumlah Daya Ufuk Bersamaan Dengan Kosong $\sum F_x = 0$.

VI. HURAIAN INOVASI

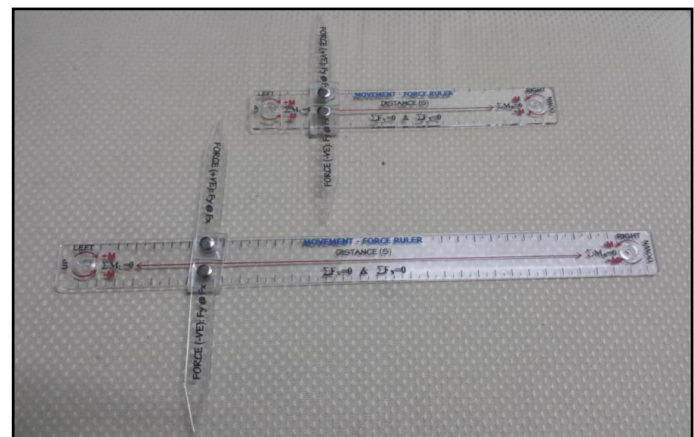
A. Rekabentuk Produk Inovasi

Produk inovasi yang digunakan adalah menggunakan bahan plastik "ACRYLIC" yang berbentuk pembaris lut-sinar. Ianya dilengkapi juga dengan dua lengan daya boleh digerakkan yang diperbuat daripada bahan yang sama. Pada permukaan pembaris dan lengan daya tersebut dilengkapi dengan beberapa rumus, simbol dan perkataan berwarna yang akan digunakan untuk tujuan kiraan nilai daya tindak balas sokong.

Produk inovasi tersebut yang terdiri daripada dua saiz panjang iaitu 20 sentimeter dan 32 sentimeter masing-masing mempunyai lebar dan tebal yang sama iaitu 3 sentimeter dan 3 milimeter diwujudkan untuk dua kegunaan iaitu untuk kegunaan pensyarah yang mengajar dan untuk kegunaan pelajar secara berkumpulan. Rekabentuk perincian produk inovasi secara penuh ditunjukkan dalam Rajah 3 dan gambar



Rajah 3: Perincian Rekabentuk Produk Inovasi



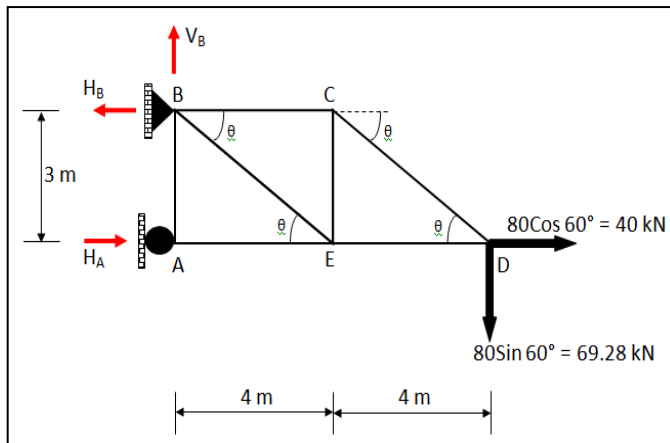
Rajah 4: Produk Inovasi 'Moment-Force Ruler'

B. Cara Penggunaan Produk Inovasi

Produk inovasi yang dihasilkan digunakan untuk menyelesaikan masalah kiraan penentuan nilai daya tindakbalas sokong pada sesuatu struktur binaan samada struktur rasuk atau kerangka. Ianya digunakan berdasarkan teori dan rumus keseimbangan daya statik bagi sesuatu struktur binaan. Melalui penggunaan 'Moment-Force Ruler' pada rajah soalan struktur binaan, rumus keseimbangan daya statik dapat di hasilkan dengan betul bagi tujuan mengira pembolehubah (*unknown*) daya tindakbalas sokong yang tidak diketahui.

Kaedah penyampaian pengajaran menggunakan produk inovasi ialah melalui cara demonstrasi kiraan yang ditunjukkan dahulu oleh pensyarah dan diikuti oleh pelajar secara berkumpulan mengikut giliran. Setelah kiraan selesai

dilakukan, nilai tindakbalas sokong yang diperolehi oleh pelajar disemak. Contoh rajah kiraan daya tindakbalas sokong bagi struktur kerangka ditunjukkan dalam Rajah 5 dan penyelesaian yang akan diperolehi oleh pelajar melalui penggunaan alat bantu mengajar ini ditunjukkan dibawah.



Rajah 5: Rajah Kiraan Daya Tindakbalas Sokong Bagi Struktur Kerangka

Penyelesaian bagi kiraan daya tindakbalas sokong menggunakan rumus keseimbangan daya statik dengan bantuan alat produk inovasi 'Moment-Force Ruler' untuk struktur kerangka dalam Rajah 5 diatas adalah seperti berikut:

$$\sum M_B = 0,$$

$$69.28(8) - H_A(3) - 40(3) = 0$$

$$H_A = (554.24 - 120) / 3$$

$$H_A = \underline{144.75 \text{ kN}} (\rightarrow)$$

$$\sum F_y = 0,$$

$$V_B - 69.28 = 0$$

$$V_B = \underline{69.28 \text{ kN}} (\uparrow)$$

$$\sum F_x = 0,$$

$$H_A + 40 - H_B = 0$$

$$H_B = 144.75 + 40$$

$$H_B = \underline{184.75 \text{ kN}} (\leftarrow)$$

C. Kos Penghasilan Produk Inovasi

Oleh kerana produk inovasi yang dihasilkan adalah produk prototaip awalan, kos yang telah dibelanjakan untuk penghasilannya ialah sebanyak RM 159.00 bagi dua keping alat bantu mengajar 'Moment-Force Ruler'.

D. Keberkesanan Produk Inovasi dalam Pengajaran dan Pembelajaran

Melalui pemerhatian secara semakan kiraan untuk jawapan yang diperolehi bagi soalan latihan yang dibuat, didapati pelajar-pelajar yang lemah dalam kiraan matematik menggunakan rumus keseimbangan daya statik menunjukkan peningkatan dalam pemahaman dari segi penggunaan teori dan rumus tersebut.

E. Potensi Produk untuk Disebarluas dan Dikomersilkan

Produk ini mempunyai potensi yang baik untuk disebarluaskan atau dikomersilkan kepada Institusi Pengajian Awam dan Swasta yang lain kerana hampir kesemua institusi-institusi tersebut mempunyai kursus atau program yang melibatkan kandungan pembelajaran analisis berstruktur menggunakan rumus dan teori keseimbangan daya statik.

VII. ANALISIS PERSEPSI PELAJAR

Satu kajian untuk melihat persepsi pelajar terhadap kandungan kursus analisis berstruktur serta penerimaan dan kebolegunaan produk inovasi pada masa hadapan dijalankan melalui kaedah borang soal selidik yang telah dilakukan setelah pelajar menggunakan produk tersebut dalam pembelajaran.

A. Analisis Kajian Soal Selidik

Analisis kajian soal selidik ini dibahagikan kepada tiga bahagian utama iaitu :

- i. Analisis Pra-Inovasi;
- ii. Analisis persepsi terhadap kandungan kursus analisis berstruktur; dan
- iii. Analisis tahap penerimaan dan kebolegunaan produk yang dihasilkan.

B. Analisis Pra-Inovasi

Analisis Pra-Inovasi seperti yang dinyatakan dalam Rajah 6 dilakukan terhadap 73 orang pelajar yang terdiri daripada 30 orang pelajar DKA5A, 14 orang pelajar DUB1A, 15 orang pelajar DBK4A dan 14 orang pelajar DKM1B sebelum produk inovasi ini digunakan dalam pengajaran dan pembelajaran untuk kelas mereka bagi kursus yang berkaitan. Hasilnya, semua responden bersetuju perlunya diwujudkan satu kaedah atau teknik atau alat bantu mengajar tambahan bagi memudahkan mereka dalam menyelesaikan masalah kiraan matematik untuk mencari nilai daya tindakbalas sokong dalam kursus analisis berstruktur.

SOALAN MAKLUMBALAS PRA-INOVASI PENGAJARAN DAN PEMBELAJARAN

- Jantina: Lelaki () Perempuan ()
- Keturunan: Melayu () Cina ()
India () Lain-lain ()
(Nyatakan: _____)
- Kursus: DKA () DBK ()
DUB () Lain-lain ()
(Nyatakan: _____)
- Adakah anda mengambil kursus yang melibatkan teori dan kiraan bagi prinsip/analisis/ mekanik struktur pada semester ini?
Ya () Tidak ()
- Adakah anda faham atau tahu tentang teori dan rumus bagi Keseimbangan Daya untuk tujuan kiraan daya tindak balas sokong bagi struktur rasuk dan kerangka? Jika jawapan anda YA, tuliskan persamaan tersebut diruangan yang disediakan dibawah.
Ya () _____
Tidak () _____
- Apakah tahap kemahiran anda dalam mengaplikasikan/menggunakan Rumus dan teori Keseimbangan Daya untuk mengira daya tindakbalas sokong bagi struktur rasuk dan kerangka?
Sangat mahir () Mahir ()
Sederhana Mahir () Lemah ()
- Adakah anda perlukan satu kaedah /teknik/alat bantu mengajar yang lain untuk lebih memahami proses kiraan daya tindakbalas sokong bagi struktur rasuk dan kerangka yang menggunakan rumus dan teori Keseimbangan Daya?
Ya () Tidak () sila nyatakan kenapa.

Rajah 6: Soalan Maklumbalas Pra-Inovasi Pengajaran dan Pembelajaran

C. Analisis Persepsi Pelajar Terhadap Kandungan Kursus Analisis Berstruktur

Analisis bahagian ini dilakukan terhadap 82 orang pelajar yang terdiri daripada 32 orang pelajar DKA5A, 18 orang pelajar DUB1A, 16 orang pelajar DBK4A dan 16 orang pelajar DKM1B setelah produk inovasi ini digunakan dalam pengajaran dan pembelajaran untuk kelas mereka bagi kursus yang berkaitan. Di dalam bahagian ini, analisis data yang dikemukakan adalah mengenai lima (5) item persepsi pelajar terhadap teori dan rumus keseimbangan daya statik yang telah diajar dalam kursus analisis berstruktur. Ukuran tahap persepsi pelajar terhadap item kajian dinilai berdasarkan skor min yang ditunjukkan di dalam Jadual 1 dibawah. Jadual 2 dibawah pula menunjukkan analisis skor min bagi kesemua item yang ditanya.

Jadual 1 : Analisis Skor Min

Skor Min	Pernyataan
1.00 – 1.50	Sangat Tidak Setuju
1.51 – 2.49	Tidak Setuju
2.50 – 3.49	Setuju
3.50 – 4.00	Sangat Setuju

^a (Diubahsuai daripada Mohd. Najib Ghafar, 1998)

Bil	Item	Skor Min				Purata Skor Min
		DKA	DUB	DBK	DKM	
1.	Saya diberi pendedahan terhadap teori dan rumus bagi keseimbangan daya untuk analisis berstruktur.	3.25	3.39	3.38	3.25	3.30
2.	Saya mengetahui cara penggunaan teori dan rumus bagi keseimbangan daya dalam pengiraan daya tindak balas sokong untuk analisis berstruktur.	3.03	3.17	3.00	3.25	3.10
3.	Saya agak lemah dalam pengiraan untuk mencari nilai daya tindak balas sokong bagi analisis berstruktur.	2.75	2.83	2.50	2.69	2.71
4.	Pengiraan daya tindak balas sokong dalam analisis berstruktur dengan menggunakan rumus keseimbangan daya statik memerlukan kemahiran berimajinasi.	3.25	3.28	3.38	3.25	3.28
5.	Alat bantu mengajar perlu diwujudkan dan digunakan dalam pengajaran dan pembelajaran kursus analisis berstruktur bagi tujuan meningkatkan pemahaman dan tahap imaginasi pelajar terhadap asas teori dan kiraannya	3.44	3.56	3.38	3.56	3.48

Jadual 2: Analisis Persepsi pelajar Terhadap Teori dan

Bagi item 1 dan 2, purata responden bersetuju bahawa teori dan rumus keseimbangan daya telah diajar dan cara penggunaannya sudah diketahui. Bagi item 3, purata responden bersetuju bahawa mereka agak lemah dalam pengiraan untuk mencari nilai daya tindakbalas sokong bagi analisis berstruktur. Bagi item 4 dan 5 pula, purata responden bersetuju bahawa pengiraan daya tindakbalas sokong dengan menggunakan rumus keseimbangan daya statik memerlukan kemahiran imaginasi dan mereka juga bersetuju bahawa alat bantu mengajar tambahan diperlukan untuk kegunaan pengiraan daya tindakbalas sokong.

D. Analisis Tahap Penerimaan dan Kebolegunaan Produk Inovasi

Bahagian ini akan meninjau tahap penerimaan dan kebolegunaan produk yang dihasilkan iaitu produk inovasi 'Moment-Force Ruler' dan analisis untuk kesemua item yang dinilai ditunjukkan dalam Jadual 3 dibawah.

Jadual 3: Analisis Tahap Penerimaan dan Kebolegunaan Produk Inovasi

Aspek	Item	Skor Min					Purata Skor Min Aspek Penilaian
		DKA	DUB	DBK	DKM	Purata	
Persembahan	Menarik	3.53	3.50	3.19	3.44	3.44	3.41
	Penggunaan tulisan pada produk adalah sesuai	3.53	3.11	3.00	3.44	3.32	
	Cetakan berwarna menarik minat pembaca	3.53	3.11	2.88	3.63	3.33	
	Kreatif	3.59	3.56	3.38	3.56	3.54	
Mudah digunakan	Ringkas	3.69	3.44	3.44	3.38	3.53	3.55
	Ringan	3.72	3.44	3.38	3.38	3.53	
	Boleh dibawa ke mana saja	3.81	3.61	3.44	3.31	3.60	
Bahasa	Bahasa yang digunakan jelas	3.63	3.44	3.00	3.50	3.44	3.45
	Bahasa yang digunakan tepat	3.66	3.22	2.88	3.56	3.39	
	Bahasa yang digunakan mudah difahami	3.66	3.33	3.00	3.56	3.44	
	Penggunaan simbol yang betul	3.72	3.61	3.13	3.50	3.54	
Paparapan Produk	Kandungannya menggambarkan teori dan rumus bagi keseimbangan daya statik	3.47	3.44	3.06	3.56	3.40	3.42
	Rumus keseimbangan daya statik dipaparkan pada produk	3.59	3.50	2.94	3.50	3.43	
	Penggunaan lengan daya yang boleh digerakkan sesuai untuk kiraan momen dan daya paksi	3.56	3.44	3.13	3.31	3.40	
	Rumus yang dipaparkan boleh digunakan untuk mengira daya tindakbalas sokong bagi kursus analisis berstruktur	3.56	3.50	3.06	3.44	3.43	
	Bersistematis dan tersusun	3.53	3.50	3.06	3.44	3.41	
	Arahan dan panduan adalah senang difahami	3.53	3.44	3.13	3.50	3.43	
Penilaian keseluruhan	Sesuai digunakan oleh pelajar kejuruteraan yang mengambil kursus analisis berstruktur	3.69	3.56	3.38	3.56	3.58	3.55
	Sesuai diaplikasikan di dalam kelas	3.69	3.78	3.25	3.38	3.56	
	Praktikal untuk dilaksanakan	3.69	3.44	3.25	3.56	3.52	

Analisis bahagian ini dilakukan terhadap 82 orang pelajar yang terdiri daripada 32 orang pelajar DKA5A, 18 orang pelajar DUB1A, 16 orang pelajar DBK4A dan 16 orang pelajar DKM1B setelah produk inovasi ini digunakan dalam pengajaran dan pembelajaran untuk kelas mereka bagi kursus yang berkaitan. Soal selidik yang digunakan dalam Bahagian C merangkumi aspek persembahan, mudah digunakan, bahasa, paparan produk dan penilaian keseluruhan. Produk yang dihasilkan dinilai menggunakan borang dalam Bahagian C setelah pelajar-pelajar menjalankan aktiviti pengiraan untuk penyelesaian tindakbalas sokong di dalam kelas. Keputusan analisis ini ditunjukkan dalam Jadual 3. Hasil analisis digunakan untuk menjawab persoalan tentang tahap

penerimaan dan kebolegunaan produk inovasi 'Moment-Force Ruler' yang dihasilkan.

Berdasarkan Jadual 3, dari segi persembahan yang memperoleh nilai purata nilai skor min keseluruhan 3.41, menunjukkan keseluruhan responden bersetuju bahawa produk yang dihasilkan adalah menarik, dan penggunaan cetakan yang berwarna dalam produk ini kreatif dan sesuai sebagai alat bantu pembelajaran.

Bagi aspek mudah digunakan yang memperoleh purata nilai skor min keseluruhan 3.55, menunjukkan keseluruhan responden sangat bersetuju dengan keadaan produk yang ringan, ringkas dan boleh dibawa ke mana saja. Bagi aspek bahasa, keseluruhan responden bersetuju dengan kriteria-kriteria bahasa yang ditanya. Purata nilai skor min keseluruhan yang diperolehi ialah 3.45, menunjukkan bahawa bahasa yang digunakan adalah jelas, tepat, mudah difahami dengan penggunaan simbol yang betul.

Aspek paparan produk yang memperoleh purata nilai skor min keseluruhan 3.42, membawa maksud keseluruhan responden bersetuju terhadap aspek paparan produk yang dipaparkan pada produk yang dihasilkan. Ini bermakna produk yang dihasilkan dapat menggambarkan teori dan rumus keseimbangan daya statik yang dinyatakan untuk kegunaan pengiraan daya tindak balas sokong sesuatu struktur.

Aspek penilaian keseluruhan pula menunjukkan responden memberikan purata nilai skor min keseluruhan 3.55 yang bermakna responden bersetuju dari aspek kesesuaian produk ini digunakan didalam kelas oleh pelajar kejuruteraan yang mengambil kursus analisis berstruktur serta ianya adalah praktikal untuk dilaksanakan.

VIII. KESIMPULAN

Kesimpulannya, produk inovasi yang dihasilkan adalah memenuhi konsep penerimaan dan kebolegunaan serta sesuai untuk diaplikasikan memandangkan keseluruhan responden bersetuju terhadap kesemua item kebolegunaan yang disuarakan. Produk inovasi 'Moment-Force Ruler' yang dihasilkan sesuai digunakan sebagai alat bantu pengajaran dan pembelajaran bagi kursus analisis berstruktur

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Kajian Terhadap Peratusan Minima HPNM Graduan Diploma Kejuruteraan Elektronik Komunikasi Politeknik Kota Kinabalu

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Abstrak — Dalam menyokong aspirasi negara bagi menempuh Revolusi Industri 4.0, graduan cemerlang dan berkaliber merupakan pemangkin dalam menjayakan hasrat negara dalam menghasilkan tenaga kerja separa professional. Kebelakangan ini pertambahan bilangan graduan politeknik Kota Kinabalu tidak selari dengan kelayakan minima yang ditetapkan oleh Politeknik Kota Kinabalu sebagai syarat seseorang graduan itu dianugerahkan diploma. Dengan mengambilkira faktor-faktor latarbelakang pendidikan, minat, kaedah pengajaran pensyarah, sikap dan kemudahan pembelajaran, graduan PKK yang terdiri dari program DEP, berdasarkan data yang dikumpulkan oleh pegawai peperiksaan mendapati empat semester terkebelakang graduan DEP tidak mencapai objektif kualiti yang ditetapkan oleh politeknik, iaitu sesi Jun dan Disember bagi kedua-dua tahun 2015 dan 2016. Berdasarkan data ini satu kajian terhadap ketidakcapaian 35 peratus peratusan minima Himpunan Purata Nilai mata (HPNM) pelajar bersamaan dengan 3.00 dijalankan. Kajian berbentuk deskriptif ini melibatkan sampel 70 orang pelajar dari kedua-dua program Diploma Kejuruteraan Elektronik Komunikasi di Jabatan Kejuruteraan Elektrik, Politeknik Kota Kinabalu Sabah. Analisis dapatan kajian mendapati ketidakcapaian objektif kualiti tersebut telah disumbang oleh beberapa faktor utama seperti terdapatnya beberapa “killer subject” dan latar belakang bukan dari kejuruteraan. Diharapkan kajian ini dapat memberikan tindakbalas serta merta kepada pihak terlibat dalam mencapai objektif kualiti tersebut agar graduan yang dihasilkan sejajar dengan misi dan visi Politeknik Kementerian Pendidikan Malaysia.

Kata kunci — minima 35% HPNM \geq 3.00

I. PENDAHULUAN

Setiap graduan yang lahir dari Politeknik Kota Kinabalu seharusnya cemerlang dari segi pelajaran mahupun sahsiah, namun begitu bagi mencapai tujuan ini, Politeknik Kota Kinabalu telah menetapkan objektif kualiti yang mana setiap jabatan samada bidang kejuruteraan dan bukan kejuruteraan mestilah mencapai sekurang kurangnya 35% graduan mereka

mendapat HPNM (Himpunan Purata Nilai Mata) melebihi 3.00. Objektif ini digariskan bagi menghasilkan graduan yang berkualiti yang menjadi tarikan kepada industri masakini yang memerlukan modal insan bertaraf global.

A. PERNYATAAN MASALAH

Hasil keputusan mesyuarat peperiksaan yang dipengerusikan oleh Pengarah Politeknik Kota Kinabalu bagi setiap semester, daripada data yang dikumpulkan oleh pegawai peperiksaan mendapati 4 semester terkebelakang graduan DEP tidak mencapai objektif kualiti yang ditetapkan oleh politeknik, iaitu sesi Jun dan Disember bagi kedua-dua tahun 2015 dan 2016.

B. OBJEKTIF KAJIAN

Kajian yang dijalankan ini adalah untuk menjawab persoalan mengenai beberapa faktor yang telah dikenalpasti oleh pengkaji terhadap ketidakcapaian objektif kualiti ini yang terdiri dari beberapa faktor, iaitu :

1. Mengenalpasti faktor latarbelakang pendidikan pelajar mempengaruhi ketidakcapaian objektif kualiti.
2. Mengenalpasti faktor minat pelajar terhadap sesuatu kursus mempengaruhi ketidakcapaian objektif kualiti.
3. Mengenalpasti faktor sikap pelajar terhadap sesuatu kursus mempengaruhi ketidakcapaian objektif kualiti.
4. Mengenalpasti faktor kaedah pengajaran dan penilaian pensyarah mempengaruhi ketidakcapaian objektif kualiti.
5. Mengenalpasti faktor kemudahan dan prasarana pembelajaran mempengaruhi ketidakcapaian objektif kualiti.

C. KEPENTINGAN KAJIAN

Kajian ini dijalankan bertujuan untuk memberi satu panduan dan penambahbaikan dalam membantu pensyarah-pensyarah, pihak pengurusan, pelajar-pelajar dan unit peperiksaan politeknik dalam bersama-sama meningkatkan

peratusan pencapaian objektif kualiti yang ditetapkan oleh politeknik.

Hasil kajian ini juga diharap dapat membantu para pelajar meningkatkan minat mereka terhadap kursus-kursus tertentu yang menyebabkan menurun HPNM mereka. Ia juga penting bagi pelajar mengetahui kaitan antara sikap mereka dengan kursus yang diambil dan kesannya terhadap penurunan dan peningkatan HPNM diakhir semester, ini kerana perkaitan antara sikap pelajar dan juga kursus yang diambil mempunyai hubungkait yang sangat kuat dalam mempengaruhi keputusan atau gred nilai mata sesuatu kursus yang diambil.

Kaedah pengajaran dan penilaian pensyarah juga penting dalam menentukan peningkatan atau penurunan gred nilai mata sesuatu kursus yang diajar. Ini kerana pencapaian pelajar terhadap sesuatu kursus mempengaruhi HPNM pelajar. Melalui kajian ini juga pensyarah-pensyarah akan dapat mengenalpasti dan membuat penambahbaikan kepada pengajaran dan penilaian mereka dalam membantu meningkatkan peratusan HPNM graduan.

Kajian ini juga diharap akan membantu pihak atasan, iaitu pengurusan politeknik dalam memantapkan kemudahan dan prasarana pembelajaran dalam membantu pelajar mendapat lebih fokus ketika sesi pengajaran dan pembelajaran di dalam kelas mahupun ketika menjalankan ujian di makmal dan bengkel. Impak ataupun kesan terhadap faktor ini diharap dapat meningkatkan peratusan HPNM graduan dengan cemerlang.

D. BATASAN KAJIAN

Penyelidik membataskan kajian terhadap pelajar-pelajar yang mengambil jurusan program Diploma Kejuruteraan Elektronik Komunikasi (DEP) di Jabatan Kejuruteraan Elektrik, Politeknik Kota Kinabalu Sabah. Batasan kajian hanya kepada pelajar semester semasa dan merupakan pelajar semester akhir yang telah menjalani latihan industri iaitu dari program DEP6A dan DEP6B. Data-data yang telah dianalisis daripada Sistem Pengurusan Maklumat Politeknik (SPMP) yang telah dianalisis menunjukkan terdapat penurunan dan peningkatan tidak sekata HPNM bagi setiap semester.

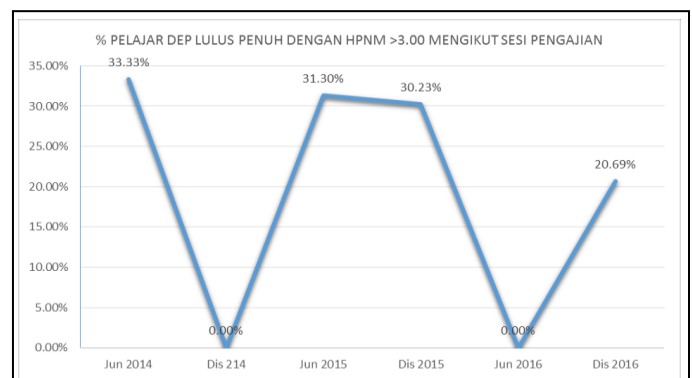
Dalam mengkaji faktor-faktor yang menyebabkan ketidakcapaian objektif kualiti ini, sebenarnya terdapat beberapa lagi faktor-faktor lain yang menjadi punca kepada ketidakcapaian ini, tetapi penyelidik hanya memilih beberapa faktor sahaja yang difikirkan antara punca utama iaitu faktor latarbelakang pendidikan, minat dan sikap pelajar. Dua faktor lain adalah dari segi kaedah pengajaran dan penilaian pensyarah dan akhir sekali adalah faktor kemudahan dan prasarana pembelajaran yang merangkumi aspek persekitaran tempat pembelajaran, peralatan latihan dan kemudahan sumber pengetahuan.

II. METODOLOGI

Sebelum pengkaji meneruskan mengenai kaedah yang digunakan dalam mendapatkan jawapan kepada persoalan kajian ini, pengkaji telah menjalankan sebanyak mungkin analisis data peperiksaan daripada Sistem Pengurusan

Maklumat Politeknik (SPMP). Data-data telah diambil secara atas talian daripada <http://spmp.polikk.edu.my/login.jsp> dengan mendapat kebenaran bertulis dari Ketua Program DEP, Ketua Jabatan Kejuruteraan Elektrik, Ketua Unit Peperiksaan dan Juga Pengarah Politeknik Kota Kinabalu. Pengkaji diberi kebenaran mengakses data menggunakan katanama (Username) dan katakunci (Password) yang diberikan. Data-data yang diakses oleh pengkaji akan dipindahkan ke perisian yang lebih mudah untuk dianalisis iaitu Microsoft Excell.

Hasil analisis data mentah dari 6 semester terdahulu mendapati peratusan HPNM graduan DEP bermula dari sesi Jun 2014 hinggalah sesi Disember 2016 mendapati hampir kesemuanya tidak mencapai objektif kualiti politeknik iaitu sekurang-kurangnya 35% graduan mestilah mendapat HPNM lebih dari 3.00. Hanya pada sesi Jun 2015 sedikit tinggi iaitu 31.30% graduan hampir mencapai objektif kualiti ini. Graf 1 menunjukkan peratusan HPNM graduan lulus penuh dengan HPNM melebihi 3.00 mengikut sesi pengajian.



Graf 1. Statistik peratusan graduan Politeknik Kota Kinabalu mengikut program bermula sesi Jun 2015 hingga Disember 2016. (Sumber: Unit Peperiksaan Politeknik Kota Kinabalu)

III. ANALISIS KAJIAN

Responden terbahagi kepada dua program yang mana data diambil dari SPMP adalah berasingan, jadi analisis yang dijalankan oleh pengkaji juga dibuat secara berasingan mengikut program iaitu DEP5A dan DEP5B, ini kerana setiap program telah diajar oleh pensyarah yang berlainan. Bagi memudahkan penambahbaikan dapat dijalankan terus kepada pensyarah terlibat, sebaiknya data dianalisis mengikut program dan ianya tidak dicampurkan.

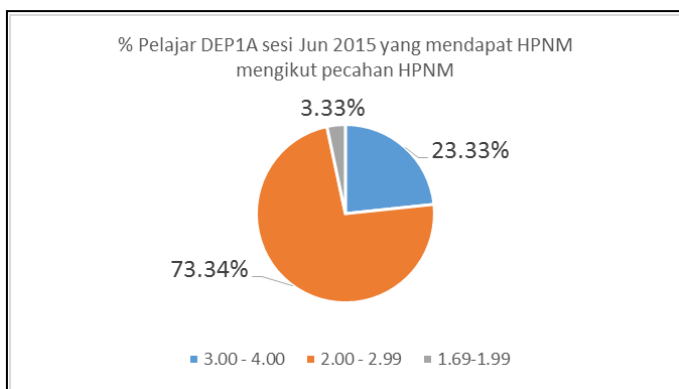
Analisis data dijalankan bermula dari pelajar tamat sesi pengajian pada semester satu, ini kerana bagi mengenalpasti apakah kursus yang menyebabkan punca kepada HPNM pelajar menjadi rendah seterusnya pengkaji dapat mengalpasti kursus berkaitan. Kursus-kursus ini yang akan dijadikan item kepada soal selidik.

A. Analisis data pelajar DEP 5A

Pelajar DEP5A seramai 30 orang telah disenaraikan untuk diambil sebagai responden pada semester ini dan keputusan peperiksaan mereka telah kumpulkan bermula dari mereka

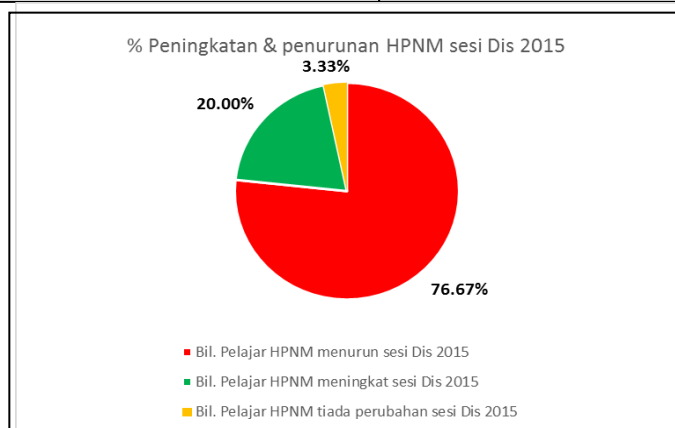
berada di semester satu pada sesi Jun 2015 hingga sesi Disember 2016. Data yang diambil dari SPMP ini telah dianalisis menggunakan kaedah kumpulan data ordinal iaitu skala yang memberikan nilai pemeringkatan atau pangkatan. Data ordinal boleh disusun sama ada daripada terendah kepada nilai yang tertinggi atau yang lemah kepada yang cemerlang, dari kategori yang kurang baik kepada kategori yang lebih baik. Data juga disusun mengikut bilangan kekerapan, peratusan, purata dan ukuran minima dan maksima.

Permulaan analisis, data telah diolah dalam bentuk graf, carta pai dan juga dalam bentuk jadual agar lebih mudah dijelaskan. Peratusan kadar lulus dan gagal mengikut subjek sememangnya penting bagi mendapatkan hubungkait kemerosotan HPNM pelajar berkadar terus dengan bilangan kursus yang gagal. Hasil analisis data yang dikumpulkan dari data mentah mendapati pada semester satu terdapat empat kursus penyebab rendahnya HPNM pelajar, kursus-kursus ini memberikan peratusan pelajar gagal yang tinggi, kursus-kursus tersebut ialah DBM1013 – Engineering Mathematics 1, DBS1012 – Engineering Science, DEE1012 - Measurement dan DET1013 – Electrical Technology. Purata markah untuk setiap kursus yang diambil oleh semua pelajar juga agak rendah merupakan satu faktor penyumbang kepada HPNM yang rendah pada permulaan semester. Dari segi HPNM pula mendapati purata HPNM berada pada 2.59 bagi setiap pelajar DEP1A sesi Jun 2015. Seramai 73.34% pelajar mendapat HPNM di bawah 3.00 seperti yang ditunjukkan pada Rajah 1 di bawah.



Rajah 1. Peratusan HPNM pelajar Sesi Jun 2015.

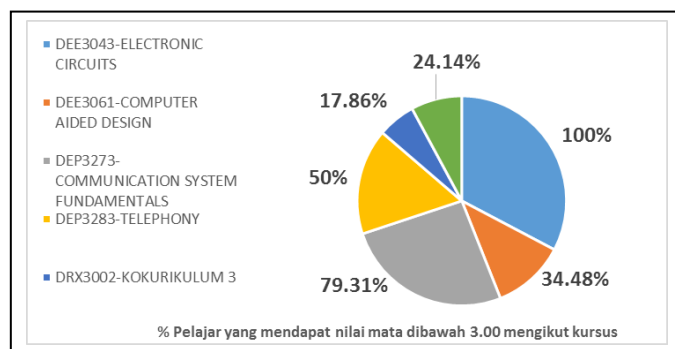
Pada semester kedua iaitu sesi Disember 2015 mendapati terdapat 20% peningkatan dalam HPNM tetapi kadar lulus yang tinggi bagi semua pelajar DEP2A untuk semua kursus yang diambil. Namun begitu masih ada beberapa pelajar yang gagal kursus-kursus tertentu tetapi kadar kegagalan tidak terlalu tinggi. Hasil analisis data mentah yang telah dikira secara purata mendapati HPNM pelajar berada pada 2.50. Merujuk kepada rajah 3 berlaku penurunan kepada purata HPNM, ini kerana pelajar kebanyakannya hanya lulus dibawah gred 2.33 iaitu C+. Sebanyak 76.67% pelajar HPNM menurun pada semester kedua, iaitu pada sesi Disember 2015.



Rajah 2. Peratusan penurunan HPNM sesi Disember 2015.

Pada semester ketiga, iaitu sesi Jun 2016, terdapat peningkatan mendadak sebanyak 93.33% HPNM pelajar DEP3A. Rajah 2 di atas menunjukkan peratusan peningkatan HPNM pelajar. Purata HPNM mengikut pelajar adalah 2.64. Hanya 6.67% sahaja pelajar yang mengalami kemerosotan HPNM.

Apakah faktor atau katakunci kepada peningkatan ini?, hasil analisis pengkaji terhadap data mentah mendapati terdapat beberapa kursus pada semester ini yang menjadi pemangkin kepada peningkatan HPNM pelajar. Kursus-kursus yang ditawarkan disemester tiga tidak membebankan pelajar. Ini dapat dibuktikan melalui data yang telah diselidiki bagi setiap kursus yang diambil oleh pelajar-pelajar DEP3A sesi Jun 2016. Merujuk kepada Rajah 3 dibawah, jelas menunjukkan hanya dua kursus sahaja yang memberikan peratusan gred nilai mata dibawah 3.00, iaitu kursus DEE3043-Electronic Circuits memberikan 100% pelajar mendapat gred di bawah 3.00 dan juga DEP3273-Communication System Fundamentals sebanyak 79.31% pelajar mendapat gred nilai mata dibawah 3.00. Selebihnya untuk kursus-kursus yang lain lebih ramai pelajar mendapat nilai mata 3.00 ke atas.



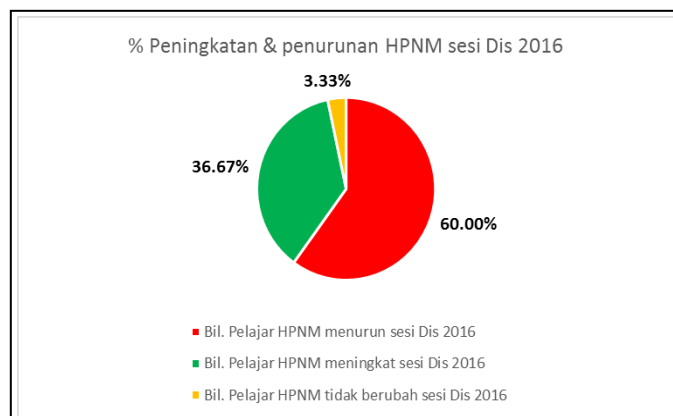
Rajah 3. Peratusan pelajar yang mendapat nilai mata di bawah 3.00.

Ada beberapa kursus yang membantu pelajar menaikkan HPNM mereka iaitu kursus-kursus yang tidak mempunyai peperiksaan akhir. Kursus-kursus ini jika pelajar memberikan perhatian ia mampu memberikan keputusan yang cemerlang yang seterusnya akan meningkatkan HPNM

pelajar. Analisis data yang dijalankan juga mendapati, 100% pelajar yang mengambil DEE3052-Electronic Equipment Repair mendapat nilai mata 3.00 ke atas, begitu juga kursus DEE3071-Electronic Computer Aided Design dan kursus DEE3061 – Computer Aided Designed masing-masing dengan 93.1% dan 65.52% yang mana kedua-dua kursus ini tidak mempunyai peperiksaan akhir.

Pada semester keempat pula, iaitu sesi Disember 2016 sekali lagi berlaku penurunan HPNM dalam skala yang agak besar. Fakta ini disokong dengan analisis pengkaji terhadap data sedia ada yang menunjukkan sebanyak 60% pelajar dari DEP4A mengalami kemerosotan HPNM. Sekali lagi perkara ini telah diteliti secara terperinci mengenai gred nilai mata bagi semua kursus yang terlibat pada semester Disember 2016 ini. Berikut disertakan Rajah 4 penurunan HPNM pelajar DEP4A pada sesi pengajian yang lepas.

Lebih banyak kursus yang menyebabkan penurunan HPNM dengan memberikan purata markah untuk setiap kursus ada di bawah B-, 2.67, iaitu ramai pelajar yang hanya mendapat markah secara purata untuk semua kursus adalah antara 60-64 markah. Jika diperincikan disini didapati terdapat beberapa analisa terdahulu membuktikan wujudnya kursus-kursus tertentu yang sememangnya sukar untuk pelajar mendapatkan nilai mata yang tinggi atau lebih dikenali dengan ‘Killer Subject’.

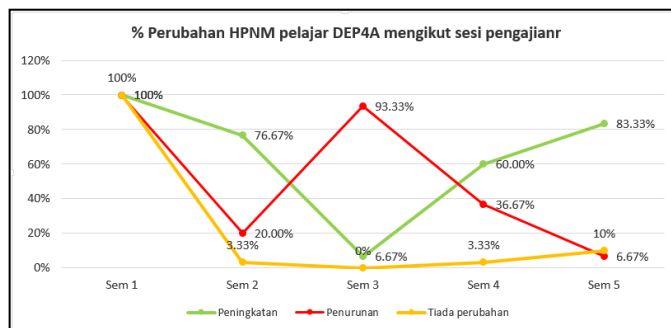


Rajah 4. Peratusan peningkatan dan penurunan HPNM sesi Disember 2016

Sesuatu kursus yang sukar untuk mendapat gred kepujian biasanya dilabelkan oleh pelajar dengan panggilan tersebut kerana kursus tersebut seringkali memberikan purata lulus yang amat rendah sehingga boleh berada dibawah paras C, 2.00. Keadaan ini sangat kritikal sekiranya pelajar masih beranggapan “killer subject” adalah kursus yang membebankan mereka. Jika tidak diterapkan dengan nilai-nilai pemikiran positif pelajar akan sentiasa berada pada titik lemah setiap kali berhadapan dengan kursus-kursus sedemikian.

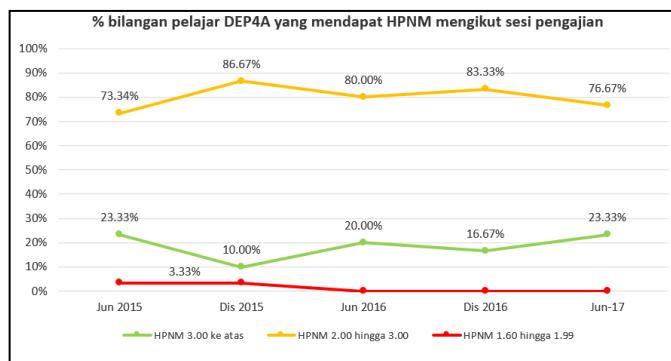
Terdapat 4 kursus yang memberikan peratus pelajar mendapat nilai mata di bawah 3.00. Iaitu kursus DEC5052 – Embedded System Application dengan 96.43% pelajar mendapat nilai mata yang sangat rendah juga sebanyak 14% pelajar yang mengambil kursus tersebut gagal dan perlu mengulang kursus tersebut. Kursus lain yang terlibat dalam menyumbang penurunan HPNM pada sesi Disember 2016 ini

adalah DEP5293 – Data Communication And Networking, 82.14%, DEP5313-Fiber Optic Communication System, 55.56% dan DEP5303 – Microwave Device. Pengkaji beranggapan faktor ini juga merupakan faktor yang kuat dalam menyumbang kepada ketidakcapaian objektif kualiti jabatan. Pemberian nilai mata yang rendah secara puratanya akan menyebabkan HPNM juga rendah. Graf 2 di bawah menunjukkan peratus perubahan HPNM pelajar DEP4A mengikut sesi pengajian.



Graf 2. Peratus perubahan HPNM pelajar DEP4A mengikut sesi pengajian

Di akhir analisis data ini dapat dipamerkan pada Graf 3 di bawah mengenai bilangan pelajar yang mendapat HPNM lebih dari 3.00, bilangan pelajar yang mendapat HPNM antara 2.00 hingga 2.99 dan juga pelajar yang mendapat HPNM 1.60 hingga 1.99.



Graf 3. Peratus bilangan pelajar mengikut kumpulan HPNM

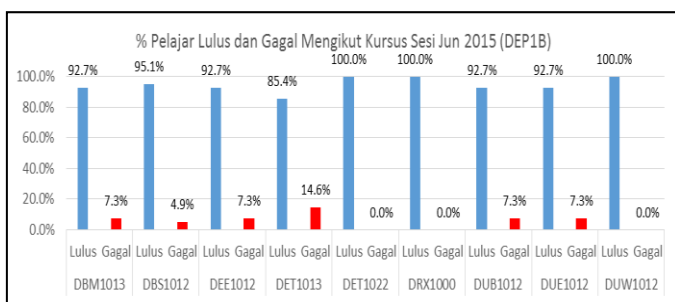
Analisis data yang terdapat pada graf di atas menunjukkan sebanyak 76.67% pelajar DEP4A mempunyai HPNM di antara 2.00 hingga 2.99. Manakala hanya 23.33% yang berada di lingkungan HPNM 3.00 ke atas dan setakat ini, sesi Disember 2016 masih tiada pelajar yang HPNMnya berada di bawah 1.60 hingga 1.99. Bagi mencapai objektif kualiti Politeknik Kota Kinabalu sekurang-kurangnya 35%, jadi DEP4A masih memerlukan 12% lagi pelajar yang perlu menaikkan HPNM mereka kepada 3.00.

B. Analisis data pelajar DEP 5B

Seramai 29 orang pelajar DEP5B telah diambil sebagai responden kumpulan kedua, kaedah yang sama dengan

mengambil keputusan peperiksaan dan HPNM bermula dari semester satu pengajian iaitu sesi Jun 2015. Peratusan bilangan pelajar lulus dan gagal dalam sesuatu kursus ditunjukkan pada graf palang dibawah.

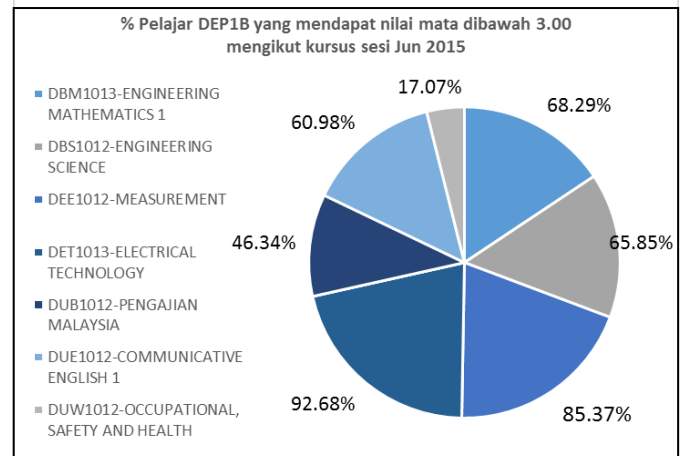
Corak peratusan pelajar lulus dan gagal bagi DEP5B tidak berapa ketara jika dibandingkan dengan kumpulan responden yang pertama iaitu DEP5A, disini terdapat dua katakunci atau faktor yang dianggap boleh menyumbang kepada penurunan HPNM pelajar. Pensyarah yang berlainan akan memberikan keputusan peperiksaan yang berlainan. Jadi kumpulan lebih sesuai diasingkan bagi mengenalpasti faktor-faktor seperti ini. Persekitaran pembelajaran juga seperti rakan belajar yang bagus atau rajin, rakan belajar yang bersemangat dan sikap positif pelajar-pelajar lain juga boleh mempengaruhi corak pembelajaran rakan-rakan mereka yang lain yang boleh menyumbang kepada peningkatan gred nilai mata bagi sesuatu kursus.



Graf 4. Peratusan pelajar lulus dan gagal DEP1B Sesi Jun 2015

Jika diperhatikan pada Graf 4 kursus DBM1013 - Engineering Mathematics 1 hanya 7.3% pelajar gagal, DBS1012 - Engineering Science 4.9%, DEE1012 - Measurement 7.3% dan DET1013 - Electrical Technology memberikan kadar gagal tertinggi iaitu 14.6%. Terdapat juga kursus-kursus lain iaitu DUB1012 - Pengajian Malaysia dan DUE1012 - Communicative English 1 masing-masing dengan 7.3% bilangan pelajar gagal. Pelajar-pelajar ini wajib mengulang kursus di sesi pengajian berikutnya. Secara teori, kegagalan sesuatu kursus sememangnya menurunkan HPNM pelajar ini kerana, mengikut buku Arahan- Arahan Peperiksaan Dan Kaedah Penilaian yang digunakan oleh semua politeknik Malaysia, gred markah pelajar yang gagal adalah 1.00. Perbandingan kumpulan DEP5A dan DEP5B terdapat sedikit perbezaan sebanyak 11.15% pelajar gagal kursus. Ketidakteraturan ini boleh dikaitkan dengan faktor pengajaran dan penilaian pensyarah yang berlainan dan juga sikap pelajar yang dipengaruhi oleh persekitaran pembelajaran.

Rajah 5 merupakan statistik mengikut kursus mengenai peratusan pelajar yang mendapat gred nilai mata di bawah 3.00. lebih kurang 7 kursus telah memberikan keputusan pelajar gred nilai mata di bawah 3.00.

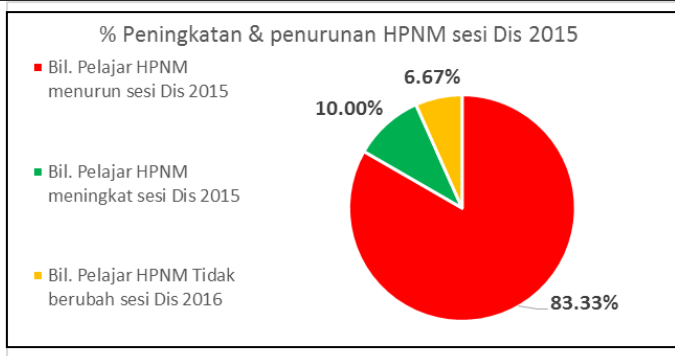


Rajah 5. Kadar lulus pelajar mengikut kursus Sesi Jun 2015

Jika diteliti mengenai peratusan bilangan pelajar yang mendapat HPNM 3.00 di awal sesi pengajian, hanya 34.45% sahaja yang mencapai. Selebihnya HPNM pelajar tertumpu antara 2.00 hingga 2.99 sebanyak 62.07%.

Pada sesi pengajian berikutnya iaitu Disember 2015, peratusan HPNM pelajar menurun dengan drastik iaitu sebanyak 83.33%, rujuk Rajah 6. Hasil analisis terdapat perubahan ketara dari segi kadar lulus dan gagal untuk sesuatu kursus yang diambil oleh pelajar. Terdapat satu kursus yang memberikan peratusan gagal yang tinggi dalam kursus DEE2023 - Semiconductor Devices iaitu sebanyak 42.43%. Terdapat sedikit kejanggalan pada data yang dianalisis kerana hanya kursus ini yang memberikan kadar gagal yang tinggi. Di sini, kursus ini dikesan oleh pelajar-pelajar sebagai 'Killer Subject' dan juga kaedah pengajaran dan penilaian dari pensyarah tersebut akan diambil kira sebagai salah satu faktor untuk dijadikan soal selidik terhadap responden. Selainnya kursus-kursus di mana terdapat pelajar gagal memberikan kadar peratusan yang rendah dibawah 10%.

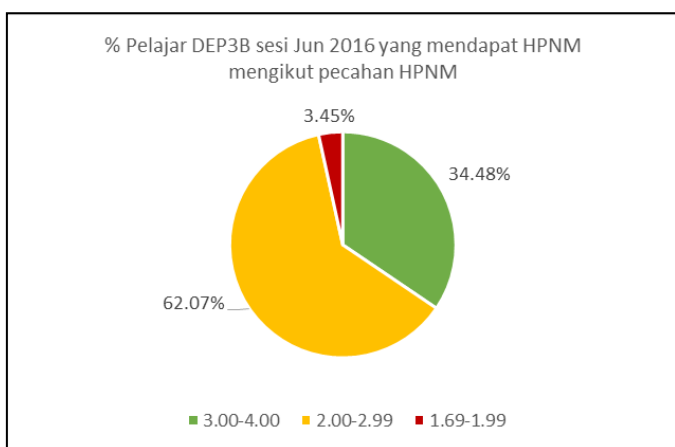
Analisis diteruskan dengan melihat peratusan bilangan pelajar yang mendapat gred Nilai Mata kurang dari 3.00. Peratusan pelajar yang mendapat nilai mata di bawah 3.00 mengikut kursus lebih dari lima kursus dengan kursus DEE2023 - Semiconductor Devices semua pelajar iaitu 100% mendapat gred Nilai Mata di bawah 3.00. Hampir semua pelajar pada semester ini mendapat gred Nilai Mata bawah 3.00 pada semua kursus. Hal ini dapat dijadikan punca ketara penurunan HPNM dan ketidakcapaian objektif kualiti. Apabila purata gred Nilai Mata pelajar untuk semua kursus berada di bawah 3.00 menjadikan HPNM mereka juga pada semester tersebut mesti berada di bawah 3.00. Ini dapat dibuktikan melalui formula kiraan HPNM pelajar yang dinyatakan dalam garis panduan. Sesi Disember 2015 ini juga memberikan kadar penurunan HPNM yang agak ketara dari pelajar-pelajar DEP5B, sebanyak 83.33% pelajar mengalami penurunan HPNM. Berpandukan Rajah 6 di bawah, dapat diteliti hanya 10% sahaja yang berjaya meningkatkan HPNM mereka dan selebihnya tidak berubah.



Rajah 6. Peratusan peningkatan dan penurunan HPNM Sesi Dis 2015

Pada sesi Jun 2016, dilihat banyak kursus-kursus ulangan pada semester dua yang gagal dan diulang semula oleh pelajar pada semester tiga masih gagal untuk lulus. Contohnya kursus DBM2013, DEC2012, DEE2023, DET2033 dan DUA2012. Namun begitu bilangan pelajar yang sedikit memberikan nilai peratusan yang tinggi. Untuk sesi Jun 2016 ini laporan terperinci mengenai pelajar mengulang kursus dan juga mengenai status mereka telah di perincikan diruangan laporan penuh. Perincian mengenai mata kredit yang diambil apabila mengulang, pelajar berstatus Gagal Berhenti, tangguh pengajian, ditahan dari menghadiri peperiksaan akhir juga memberikan kesan kepada penurunan HPNM.

Melihat kepada peratusan HPNM pelajar meningkat dengan ketara dalam sesi ini. Terdapat 10% peningkatan dalam bilangan pelajar yang mendapat HPNM 3.00 pada sesi Jun 2016 ini. 93.33% pelajar telah Berjaya meningkatkan HPNM mereka pada sesi Jun 2016 ini, namun begitu kenaikan HPNM itu tidak sehingga melebihi 3.00. Ini kerana, purata pelajar lulus untuk setiap kursus itu hanya setakat gred nilai mata lulus, iaitu di antara julat 2.00 hingga 2.99. Carta pai berikutnya menunjukkan peratusan HPNM untuk sesi Jun 2016.



Rajah 7. Peratusan pecahan HPNM Sesi Jun 2016, DEP3B

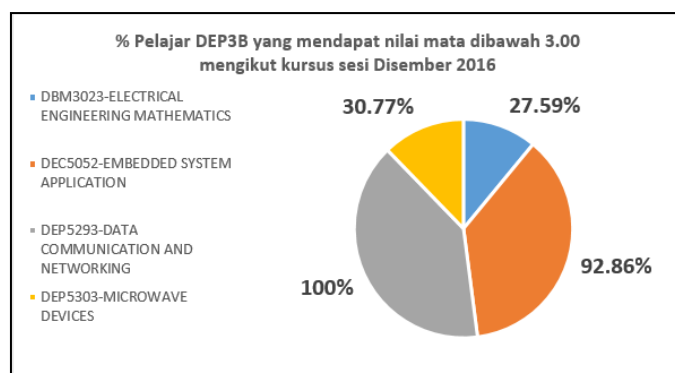
Bagi pelajar-pelajar DEP3B, peratusan yang mendapat HPNM 3.00 ke atas sama seperti keputusan yang ada pada sesi Jun 2016 iaitu 34.48% pelajar, rujuk Rajah 7. Seperti mana pelajar-pelajar DEP3A, terdapat juga keseimbangan dalam

pemarkahan setiap kursus yang diambil oleh pelajar-pelajar DEP3B. Secara purata mereka lulus di tahap gred yang baik tapi bukan sehingga tahap cemerlang. Faktor ini mungkin di dorong oleh pengajaran dan penilaian oleh pensyarah pada sesi tersebut.

Sesi pengajian Disember 2016 pula memberikan gambaran bahawa agak sukar untuk pelajar-pelajar selesa di tahap HPNM yang mencapai objektif kualiti. Ini kerana daripada 13 kursus yang didaftarkan oleh pelajar-pelajar DEP4B pada semester Disember 2016, hanya ada satu kursus sahaja yang terdapat pelajar gagal. Kursus tersebut ialah DEP3273 – Communication System Fundamentals iaitu kursus ulangan bagi pelajar yang gagal pada sesi sebelumnya. Daripada analisis oleh pengkaji kursus tersebut hanya diambil oleh tiga orang pelajar sahaja, apabila terdapat seorang pelajar yang gagal ia menjadikan peratusan gagal itu kelihatan tinggi. Di sini, kursus ulangan tidak diambilkira di dalam skop kajian pengkaji, ini kerana kursus ulangan jam kredit pelajar tidak dikira dan banyak faktor lagi yang boleh menyebabkan kajian menjadi lebih meluas dengan punca-punca atau hipotesis-hipotesis yang pelbagai.

Secara keseluruhannya sesi Disember 2016 adalah sesi yang terbaik bagi pelajar-pelajar DEP4B kerana hampir 100% pelajar lulus kesemua kursus yang telah didaftarkan. Untuk melihat lebih terperinci bagaimana kadar lulus yang tinggi tidak menjamin tercapainya objektif kualiti, kita lihat kepada Rajah 8 di bawah di mana peratusan pelajar lulus memang tinggi tetapi keseluruhannya mereka hanya lulus dan diberi gred mata 3.00 ke bawah. Jika diteliti terdapat dua kursus yang telah memberikan pelajar nilai mata di bawah 3.00 iaitu kursus DEP5293 – Data Communication And Networking 100% pelajar lulus di bawah gred nilai mata 3.00 dan DEC5052 – Embedded System Application memberikan 92.86% pelajar juga lulus setakat di bawah gred nilai mata 3.00.

Secara terperinci, jika dibandingkan kursus yang sama diambil oleh pelajar-pelajar DEP5A, kita dapati peratusan tersebut hampir sama. Ini memberikan kata kunci iaitu adakah kedua-dua kursus ini boleh dilabelkan sebagai ‘Killer Subject’.



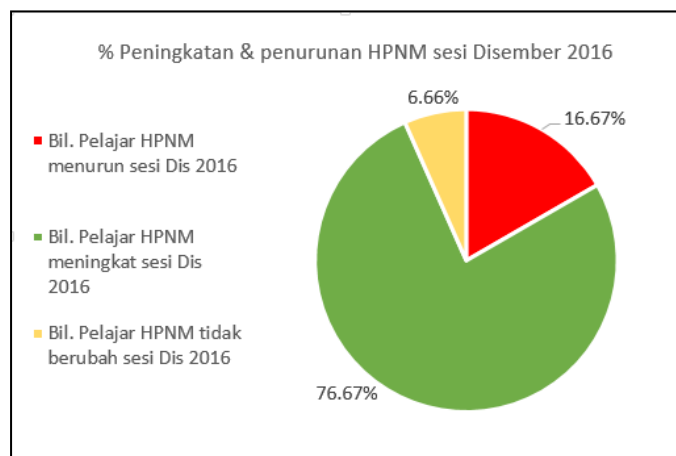
Rajah 8. Peratusan Nilai Mata di bawah 3.00 mengikut kursus

Daripada data yang diterima oleh pengkaji, untuk kedua-dua kursus yang memberikan peratusan yang tinggi

terhadap penurunan HPNM pelajar ini, kursus DEP5293 – Data Communication And Networking diajar oleh pensyarah yang sama untuk kedua-dua program DEP4A dan DEP 4B, manakala untuk kursus DEC5052 – Embedded System Application telah diajar dan dinilai oleh pensyarah yang berlainan untuk kedua-dua program ini. Adakah corak pembelajaran dan penilaian oleh seseorang pensyarah merupakan satu faktor kepada keputusan pelajar dan adakah kursus yang sama diajar dan dinilai oleh pensyarah yang sama untuk program yang berlainan telah menunjukkan sikap pelajar terhadap kursus tersebut kurang minat?. Ini kah yang dikatakan pelajar sebagai ‘Killer Subject’?. Persoalan ini yang akan di terjemahkan kepada item soal selidik dan seterusnya akan diedarkan kepada responden.

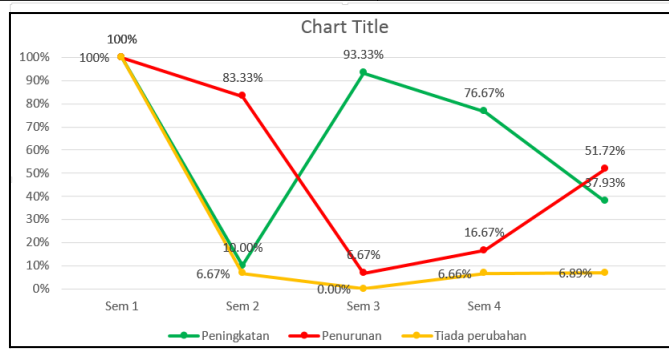
Untuk sesi Disember 2016 ini, harus diteliti dari aspek peratusan pelajar yang mendapat HPNM 3.00 ke atas. 34.48% pelajar DEP4B pada sesi Disember 2016 mendapat HPNM di atas 3.00 manakala selebihnya 65.52% HPNM pelajar di bawah 3.00. Masih lagi tidak mencapai objektif kualiti sekalipun pelajar telah berada di semester ke empat pengajian.

Dari segi peningkatan dan penurunan HPNM pada sesi Disember 2016, statistik Rajah 9 di bawah menunjukkan 76.67% HPNM pelajar DEP4B meningkat tetapi tidak mencapai 3.00 ke atas. Hanya 16.67% sahaja yang mencapai HPNM lebih 3.00 pada sesi Disember 2016.



Rajah 9. Peratusan peningkatan dan penurunan HPNM sesi Disember 2016

Secara kesimpulannya perubahan HPNM bagi pelajar-pelajar DEP4B boleh diringkaskan melalui Graf 5 di bawah. Perubahan bermula sejak sesi pengajian yang pertama sehingga ke semester pengajian ke lima iaitu dari Jun 2015 hinggalah Jun 2017. Terdapat penurunan dan peningkatan bagi tiga kategori HPNM, iaitu 3.00 ke atas, 2.00 hingga 2.99 dan juga 1.67 hingga 1.99.



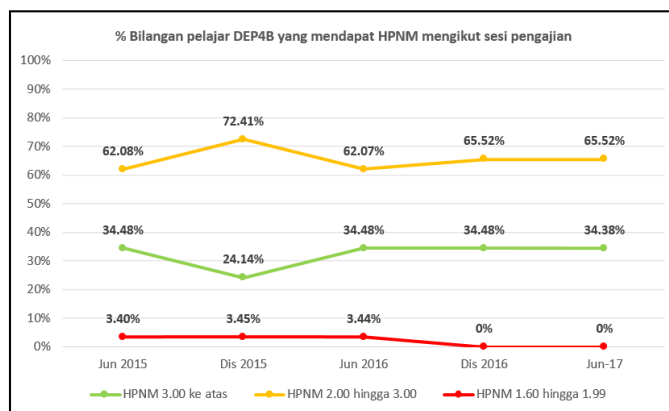
Graf 5. Perubahan HPNM DEP4B sepanjang 5 semester pengajian.

Semester kedua, iaitu sesi Disember 2016 menunjukkan penurunan HPNM yang paling ketara, kemudian sesi Jun 2016 iaitu semester ketiga menunjukkan peningkatan 93.33% HPNM dan kembali menurun sedikit pada semester ke empat. Terdapat polar peningkatan HPNM yang positif dikalangan pelajar-pelajar DEP4B ini kerana peningkatan HPNM adalah berterusan selama dua semester pengajian iaitu sesi Jun 2016 dan juga Disember 2016.

	Jun 2015	Dis 2015	Jun 2016	Dis 2016
HPNM 3.00 ke atas	34.48%	24.14%	34.48%	34.48%
HPNM 2.00 hingga 3.00	62.08%	72.41%	62.07%	65.52%
HPNM 1.60 hingga 1.99	3.40%	3.45%	3.44%	0%

Jadual 1. Peratusan HPNM mengikut semester.

Secara jadual pula, peratusan pelajar DEP4B yang mendapat HPNM 3.00 ke atas ditunjukkan pada Jadual 1. Corak perubahan ketiga-tiga pecahan HPNM ini dapat digambarkan melalui Graf 6 di bawah.



Graf 6. Peratusan pelajar DEP 5B mengikut HPNM sepanjang pengajian.

Setiap sesi pengajian didapati bilangan pelajar yang mendapat HPNM dibawah 3.00 hampir dua kali ganda bilangan pelajar yang mendapat HPNM 3.00 ke atas. Ketiga-tiga pecahan HPNM hampir menunjukkan perubahan secara malar (lurus). Ini kerana kadar peningkatan HPNM pelajar tidak berapa ketara setiap kali sesi pengajian tamat.

Hasil daripada analisis data-data kedua-dua program ini pengkaji dapat mengenalpasti punca penurunan HPNM pelajar-pelajar adalah disebabkan beberapa faktor dibawah yang menjadi sandaran kepada soal selidik yang akan dijawab oleh responden. Bagi menyenaraikan item soalselidik yang perlu dijawab oleh responden dari kedua-dua program ini iaitu DEP5A dan DEP5B pada sesi semasa ini, kata kunci terhadap faktor-faktor penurunan HPNM dapat disenaraikan seperti berikut:

1. Minat pelajar terhadap sesuatu kursus.
2. Sikap pelajar terhadap sesuatu kursus (pengaruh persekitaran pembelajaran).
3. Kaedah pengajaran dan penilaian pensyarah.
4. Terdapat beberapa '*Killer subject*' bagi setiap sesi pengajian.

Dua faktor lain iaitu latarbelakang pelajar dan juga kemudahan dan prasarana pembelajaran diambilkira di sini oleh pengkaji sebagai dua faktor luaran. Jika pengkaji hanya meneliti dari sudut dalaman pelajar dan juga pensyarah, faktor luaran juga boleh menjadi penyumbang kepada kesemua faktor yang disenaraikan di atas. Kemungkinan latarbelakang pelajar yang bukan kejuruteraan boleh menyebabkan sesuatu kursus itu dilabelkan sebagai '*Killer Subject*' dan juga kemungkinan ketidakcukupan alat radas makmal, perkakasan bengkel ataupun kesukaran capaian internet menghadkan pengetahuan pelajar untuk mendapatkan maklumat yang lebih berkaitan kursus yang mereka pelajari. Jadi, dua faktor luaran ini juga sangat penting dalam pengkaji mendapatkan item soalselidik yang berkualiti.

C. Populasi dan Sampel Kajian

Populasi kajian yang dipilih adalah terdiri daripada 58 orang pelajar yang mengambil jurusan program Diploma Kejuruteraan Elektronik Komunikasi (DEP) di Jabatan Kejuruteraan Elektrik, Politeknik Kota Kinabalu Sabah. Pelajar-pelajar ini merupakan pelajar semester semasa dan merupakan pelajar semester akhir yang akan menjalani latihan industri iaitu dari program DEP5A dan DEP5B.

D. Instrument Kajian

Instrumen yang digunakan untuk mengumpul data merupakan satu set soal selidik. Menurut Syed Arabi (1992), penggunaan soal selidik amat sesuai digunakan kerana ianya lebih praktikal, berkesan dan menjimatkan masa. Soal selidik selalu digunakan untuk mengukur konsep yang berkaitan dengan sikap, persepsi dan pandangan selain dari keterangan latar belakang (Mohd Najib, 1997). Bagi tujuan ini, penyelidik merasa kaedah ini adalah merupakan yang paling sesuai untuk mendapatkan maklumat serta data-data daripada pelajar kerana responden mudah memberikan tindak balas terhadap aspek yang dikaji berbanding kaedah temu bual. Melalui kaedah ini juga, responden tidak banyak membuang masa dan tidak melibatkan perbelanjaan. Soal selidik tersebut mengandungi dua bahagian iaitu Bahagian A dan Bahagian B.

Dalam Bahagian A, maklumat yang diperlukan oleh pengkaji adalah berkaitan dengan biodata responden seperti umur, jantina, bangsa, tempat tinggal semasa belajar, jumlah kusus yang mendapat gred A, bilangan kursus yang diambil pada semester semasa, PNM setiap semester, HPNM terkini mengikut semester semasa dan gred ataupun nilai mata keputusan beberapa kursus yang telah dikenalpasti pelajar seringkali mendapat gred sederhana.

Bahagian B pula mengandungi 30 soalan yang dibahagi-bahagikan kepada 4 bahagian mengikut persoalan-persoalan kajian iaitu faktor minat dan sikap pelajar, faktor kaedah pengajaran dan penilaian pensyarah dan faktor kemudahan dan prasarana pembelajaran.

Responden diminta menyatakan tahap persetujuan ataupun tidak terhadap pernyataan yang dikemukakan. Tanggapan responden dalam bahagian ini akan dilihat dengan menggunakan Skala Likert yang terdiri daripada lima nilai skor seperti berikut:-

1. = Sangat Tidak Setuju (STS)
- 2 = Tidak Setuju (TS)
- 3 = Tidak Pasti (TP)
- 4 = Setuju (S)
- 5 = Sangat Setuju (SS)

E. Kajian Rintis

Kajian rintis ini bertujuan untuk menguji item-item soal selidik dari segi tatabahasa, isi kandungan, kejelasan dan kebolehpercayaan. Selain itu juga, kajian ini bertujuan untuk menganggarkan masa yang sesuai yang akan diperuntukkan kepada responden untuk menjawab item soalan kajian. Dengan itu penyelidik telah memutuskan satu kajian rintis akan di jalankan sebelum kajian sebenar. Kajian ini dijalankan ke atas 15 orang pelajar-pelajar dari DET5A iaitu pelajar yang mengambil jurusan Diploma Kejuruteraan Elektrik di Politeknik Kota Kinabalu. Sampel responden atau sampel kajian rintis ini juga merupakan pelajar yang mengambil kursus-kursus teras yang sama sepertimana pelajar-pelajar DEP pelajari. Mereka dipilih kerana terdapat juga pensyarah yang sama mengajar di dalam kelas mereka. Penggunaan prasarana yang sama, juga kaedah penilaian yang sama atau pun lebih mudah dijelaskan di sini ialah set penilaian yang selaras untuk sesuatu kursus yang mempunyai penyelaras kursus tersendiri. Setelah kajian ritis dijalankan, nilai Alpha Cronbach untuk kajian rintis yang diperolehi ialah 0.715. Menurut Mohd. Najib (1997), sekiranya nilai Alpha Cronbach melebihi 0.715, ini bermakna tahap kebolehpercayaan item adalah tinggi dan seragam. Pekali kebolehpercayaan adalah di antara 0 hingga 1.0. Sekiranya kebolehpercayaan menghampiri satu, maka komponennya dikatakan sah. Ini bermakna semakin hampir nilai alpha kepada 1.0, maka semakin tinggi kebolehpercayaannya. Pekali Alpha Cronbach dalam program SPSS 16.0 digunakan untuk mendapatkan pekali kebolehpercayaan. Rujuk Jadual 2.

Case Processing Summary			
		N	%
Cases	Valid	15	100.0
	Excluded ^a	0	.0
	Total	15	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.715	.749	20

Jadual 2. Nilai alpha cronbach daripada analisis SPSS.

F. Keputusan

Bil.	Faktor-faktor	Min Keseluruhan	Tahap Penilaian
1.	Latarbelakang pendidikan	3.7	Positif
2.	Minat pelajar terhadap kursus	3.6	Positif
3.	Sikap pelajar terhadap kursus	3.7	Positif
4.	Kaedah pengajaran dan penilaian pensyarah	3.7	Positif
5.	Prasarana dan kemudahan pembelajaran	3.8	Positif

Analisis keseluruhan item soal selidik bagi setiap faktor

Jadual 3. Analisis skor min semua bahagian soal selidik

Berdasarkan dapatan kajian secara keseluruhannya, dapat dibuat kesimpulan bahawa faktor-faktor yang dinyatakan di Jadual 3 sememangnya mempengaruhi ketidakaapaian objektif kualiti politeknik. Min keseluruhan menunjukkan tahap penilaian yang positif di mana semua pelajar bersetuju dengan faktor-faktor yang disoal pada soal selidik. Cuma faktor kesua iaitu minat pelajar terhadap kursus memberikan min keseluruhan yang paling rendah berbanding dengan faktor-faktor yang lain.

IV. PERBINCANGAN

Adakah latarbelakang pendidikan pelajar yang bukan dari bidang kejuruteraan mempengaruhi keputusan peperiksaan dengan menjadi penyebab kepada HPNM pelajar di bawah 3.00?

Latarbelakang pelajar adalah faktor pertama yang menjadi item soalselidik dalam kajian ini, ini kerana latarbelakang pelajar yang mempunyai sedikit sebanyak hubungkait dengan faktor lain iaitu sikap dan minat. Seseorang pelajar yang bukan dari bidang kejuruteraan iaitu teknikal dan vokasional mahupun dari bidang sains tulen (mengambil subjek Fizik, Kimia, Matematik Tambahan) menghadapi sedikit masalah dalam mempelajari asas-asas kursus kejuruteraan terutamanya dibidang elektrik dan elektronik. Matematik juga amat penting dalam kejuruteraan, asas yang lemah dalam matematik menyebabkan pelajar memerlukan masa yang banyak untuk mempelajari konsep-konsep dan teori-teori yang terkandung di dalam asas-asas kejuruteraan. Faktor ini sememangnya tidak boleh dinafikan dengan sokongan statistik HPNM pelajar kedua-dua

responden pada sesi pengajian yang pertama memberikan peratusan HPNM bawah 3.00 sangat tinggi. Sekiranya keseluruhan pelajar adalah dari latarbelakang sekolah teknik ataupun aliran sains, kemungkinan besar keputusan peperiksaan memberikan nilai statistik yang tinggi kepada pelajar yang mendapat HPNM lebih dari 3.00. Perkara ini seiring dengan pandangan Sulaiman (1996), kecemerlangan pelajar bermula dari bakat dan latarbelakang pendidikan sebelumnya. Sekiranya pelajar yang mempunyai asas yang kukuh mengenai matematik, hal ini memungkinkan peratusan yang tinggi terhadap pelajar yang mengambil kursus DBM1013 – Engineering Mathematics 1, DBS1012 – Engineering Science, DEE1012 - Measurement dan DET1013 – Electrical Technology. Statistik juga jelas menunjukkan kedua-dua kumpulan responden dari DEP5A dan DEP5B mempunyai keputusan kadar lulus cemerlang yang rendah dalam semua kursus asas kejuruteraan ini.

Sebahagian pelajar didapati mengambil jurusan ini atas desakan dan cadangan ibubapa, ini juga merupakan salah satu sebab kemungkinan latarbelakang yang berlainan menjadi sebab kepada keputusan peperiksaan pelajar. Menurut Mohd. Salleh (1994), ibu bapa memainkan peranan yang penting dalam perkembangan mental, emosi, dan fizikal pelajar, ibu bapa juga merupakan mentor dan penyokong kepada kejayaan pelajar. Terdapat dua pihak yang tidak seiring pendapat dimana jurusan yang dipilih adalah daripada pilihan ibu bapa, tetapi dipihak pelajar yang tidak mempunyai latarbelakang adalah terpaksa meneruskan pengajian tanpa asas-asas kejuruteraan yang kukuh menjadi penyebab pelajar tidak cemerlang didalam mencapai HPNM lebih dari 3.00. Sekiranya ibu bapa tidak mendorong pelajar-pelajar ini untuk berusaha lebih dalam jurusan yang mereka tetapkan kepada anak mereka, ini juga merupakan penyumbang kepada faktor ketidakaapaian objektif kualiti politeknik.

Adakah faktor minat pelajar terhadap sesuatu kursus mempengaruhi gred nilai mata (NM) dalam sesuatu kursus yang diambil dalam sesi pengajian yang diikuti?

Menurut Abu Zahari (1987), minat dan kecenderungan memainkan peranan yang penting untuk mempengaruhi pembelajaran. Seseorang yang berminat dalam sesuatu perkara yang dipelajari akan menunjukkan pencapaian yang tinggi dan keadaan sebaliknya akan berlaku jika tiada minat berkaitan. Penyelidik mendapati faktor minat juga adalah penyumbang kepada kualiti peperiksaan pelajar. Ini dapat dilihat dari tahap min keseluruhan menunjukkan 3.6 iaitu pada tahap positif. Dapat diandaikan di sini, pelajar yang berminat terhadap sesuatu kursus akan menghasilkan keputusan yang cemerlang terhadap sesuatu kursus, manakala pelajar yang kurang minat akan memberikan hasil yang sebaliknya.

Faktor sikap pelajar terhadap sesuatu kursus juga telah memberikan skor min yang agak tinggi iaitu 3.7. Hasil analisis kesemua lima item di bahagian tiga soal selidik mendapati pelajar lebih cenderung fokus kepada kursus yang sukar mendapat nilai 3.00 ke atas memberikan skor min yang agak tinggi iaitu 4.02. Keputusan yang positif ini membuktikan sikap pelajar mempunyai perkaitan dengan keputusan peperiksaan mereka.

Kaedah pengajaran dan penilaian pensyarah juga memberikan keputusan yang positif, di mana skor min pelajar yang bersetuju dengan item soal selidik dibahagian 4 memberika nilai 3.7. Skor min yang agak tinggi dan positif ini menunjukkan pelajar bersetuju dengan kaedah pengajaran dan penilaian pensyarah adalah berbeza-beza mengikut pensyarah. Corak penilaian dan kaedah pembelajaran pensyarah memberikan impak kepada keputusan pelajar.

Dalam bahagian 5 item soal selidik, hampir keseluruhan responden dalam kajian ini bersetuju mengatakan prasarana dan kemudahan pembelajaran di Politeknik Kota Kinabalu memberikan kesan terhadap pembelajaran dan keputusan peperiksaan mereka. Jaringan internet dan capaian maklumat yang terhad dan perlahan memberikan skor min yang agak tinggi yang mana kebanyakan responden bersetuju sesi pembelajaran dan ulangkaji secara *e-learning* amat penting dalam membantu meningkatkan tahap pembelajaran mereka.

V. KESIMPULAN

Secara keseluruhannya kajian ini telah memberikan hasil yang agak positif di mana langkah-langkah penambahbaikan perlu dilakukan segera agar keputusan peperiksaan pelajar-pelajar di sesi yang akan datang dapat ditingkatkan. Graduan yang telah tamat pelajar semestinya inginkan kualiti setaraf global yang mampu bersaing dengan graduan-graduan institut pengajian tinggi yang lain. HPNM memberikan gambaran keseluruhan mengenai kualiti graduan samada meneruskan pengajian ataupun persaingan dalam mendapatkan pekerjaan. Dalam merealisasikan matlamat, visi dan misi politeknik, kesemua pihak terbabit perlu menjalankan penambahbaikan terutama dari segi prasarana dan kemudahan di institusi. Pelajar juga perlu mengubah sikap dengan lebih terbuka

minda mengambil kursus-kursus kejuruteraan yang agak rumit ini dengan menganggap ianya sebagai satu cabaran dalam bergelar pelajar lulusan kejuruteraan. Interaksi antara pensyarah dan juga pelajar perlu jalinan yang lebih bersifat mendidik agar penyampaian ilmu menjadi lebih berkesan.

Di masa-masa yang akan datang, kajian ini juga seharusnya dijalankan disemua jabatan bagi menguatkan lagi kebolehpercayaan kelima-lima elemen yang menjadi tunjang utama objektif kajian ini.

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Kajian Kesan Kemasiapan Nitroselulase (NC) Terhadap Sifat Papan Termoplastik Buluh Tamalang (*Bambusa vulgaris*)

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Abstrak— Penggunaan bahan berasaskan kayu dalam industri pembuatan perabot semakin membimbangkan disebabkan kekurangan bahan mentah, kos yang tinggi dan proses penanaman semula pokok yang mengambil masa yang lama. Justeru itu, kajian ini merupakan alternatif penggunaan bahan mentah menggunakan bahan bukan kayu iaitu buluh Tamalang (*Bambusa vulgaris*) sebagai bahan alternatif kepada kayu padu. Kajian ini memfokuskan kepada ujian fizikal dan mekanikal terhadap papan serpai termoplastik daripada buluh Tamalang dengan campuran polietilena berketumpatan tinggi (HDPE). Dalam kajian ini, bod yang dihasilkan telah melalui ujian fizikal (ujian penyerapan air dan pengembangan ketebalan), dan ujian mekanikal iaitu ujian kekuatan lenturan (MOE) dan kekuatan ricihan (MOR). Dapatan ujian fizikal menunjukkan papan serpai termoplastik dengan kemasiapan *varnish* mempunyai kadar serapan air yang tinggi iaitu sebanyak 23.43% bagi tempoh 24 jam dan 24.27% bagi tempoh 48 jam. Dapatan bagi kadar pengembangan ketebalan papan serpai termoplastik bagi kemasiapan *varnish* untuk tempoh 24 jam pula adalah 10.08% dan bagi tempoh 48 jam adalah 10.14%. Melalui ujian mekanikal yang dijalankan, papan serpai termoplastik daripada kedua-dua jenis kemasipan mempunyai purata kebolehan lenturan (MOE) dan kekuatan ricihan (MOR) yang rendah mengikut piawaian JIS A5908-2003. Namun begitu, penghasilan papan serpai termoplastik buluh Tamalang adalah signifikan iaitu $P \leq 0.05$. Ini menunjukkan ianya relevan untuk di hasilkan dan dapat digunakan dalam penggunaan bahan bukan struktur seperti perabot, kemasinan lantai dan dinding dengan penambahbaikan dalam penghasilan. Sebagai kesimpulannya, kajian papan serpai termoplastik HDPE yang telah melalui proses kemasiapan dilihat mempunyai potensi yang baik untuk dihasilkan. Selain itu, papan serpai termoplastik yang telah diberikan kemasiapan ini boleh dijadikan sebagai bahan alternatif dalam industri pembuatan.

Kata Kunci: Papan Termoplastik, Ujian Pembengkakan, Ujian Lenturan (MOE), Ujian Modulus Pecah (MOR), Kemasiapan.

I. PENGENALAN

Industri pembuatan komposit di Malaysia bukanlah satu bidang yang baharu namun kesedaran dan pengetahuan mengenai kepentingan dan penggunaan mengenainya agak kurang. Industri komposit merupakan alternatif terbaik untuk menggantikan penggunaan besi dan aluminium. Merujuk Siti

Zubaidah (2013), dengan menggunakan sisa-sisa kayu untuk menghasilkan komposit dapat mengurangkan penggunaan kayu padu selanjutnya mengelakkan pembaziran kayu berlaku.

Buluh merupakan keluarga Poaceae, pecahan keluarga Bambusoideae. Terdapat 1,200 spesis dengan 50 genus (Chapman, 1996; Zhang *et. al.* 2002). Malaysia adalah satu daripada negara yang mempunyai kawasan hutan yang luas menjadi negara pengeluar produk berasaskan kayu termasuklah buluh. Buluh adalah bahan biologikal yang memberikan keuntungan kepada negara selain daripada sumber yang mudah didapati dan sesuai untuk dijadikan sebagai produk berstruktur seperti produk kayu komposit, dijual untuk digunakan sebagai bahan pembinaan (Chaowana P., 2013) dan produk komersial yang lain seperti *chopstick*, bakul sayur (Azmy, 1989).

Buluh berpotensi untuk dijadikan bahan pengganti semulajadi bagi spesis-spesis kayu tropika yang sedang menghadapi masalah kekurangan bekalan. Buluh dapat menghasilkan rebung baru setiap tahun dan batang buluh akan mencapai peringkat kematangan dengan daya kekuatan yang secukupnya dalam masa empat atau lima tahun berbanding dengan kebanyakan spesies kayu tropika lain yang mungkin memerlukan 100 tahun atau lebih untuk matang (Razak *et.al.*, 1997).

Kandungan utama pada sebatang buluh adalah selulosa, hemiselulosa, dan lignin yang merupakan hampir 90% daripada jumlah kandungan keseluruhan batang buluh, manakala kandungan kimia yang lain adalah seperti resin, tannin, wax dan garam organik. Jika dibandingkan dengan kayu, buluh mempunyai kandungan alkali, abu dan kandungan silika yang tinggi (Tomalang *et.al.*, 1980; Chen *et. al.*, 1985). Salah satu kebaikan penggunaan buluh adalah kandungan karbohidrat dalam buluh yang memainkan peranan penting dalam ketahanan. Ketahanan buluh daripada serangan agen kulapuk, kulat dan penggerek berkait rapat dengan komposisi kimia buluh. Ini menunjukkan buluh mudah terdedah dengan serangan kulat dan serangga. Berdasarkan kajian oleh Liese (1980), ketahanan semulajadi buluh ini boleh dibezakan antara umur 1 hingga 36 bulan bergantung pada spesis dan suasana iklim. Kehadiran jumlah kanji yang banyak mengakibatkan buluh mudah terdedah dengan serangan agen perosak (Mathew and Nair, 1988). Kandungan ekstrak benzene-etanol yang

wujud didalam beberapa jenis spesies buluh juga menjadi satu kelebihan buluh dari segi ketahanan pereputan (Feng *et. al.*, 2002). Sifat kebolehasahan juga merupakan salah satu sifat pada buluh dimana ianya mempengaruhi kesan yang ketara ke atas sifat perekatan dan sifat-sifat lain yang berkaitan. Merujuk kepada Kaoble (1967), pembentukan ikatan melibatkan kebolehasahan, daya serapan air dan kadar penyebaran resin yang bergantung kepada kepekatan sesuatu bahan.

Oleh yang demikian, kajian ini dijalankan untuk melihat keberkesanan penggunaan bahan kemasipan terhadap partikel buluh Tamalang (*Bambusa vulgaris*) sebagai pengisi dalam papan komposit. Selain itu, kajian ini dijalankan bertujuan mengkaji sifat fizikal dan mekanikal papan serpai HDPE buluh Tamalang (*Bambusa vulgaris*) yang telah dikenakan bahan kemasipan.

II. MATERIAL DAN KAEDAH KAJIAN

A. Pengenalan kajian

Kajian ini dilaksanakan di Makmal Komposit Kayu, Jabatan Kejuruteraan Awam, Politeknik Kota Kinabalu (PKK). Dalam kajian ini, papan termoplastik yang dihasilkan dengan saiz setiap papan termoplastik tersebut ialah 300mm x 300mm x 10mm. Sebanyak 10 keping papan termoplastik dihasilkan dimana 5 keping untuk kemasipan jenis *varnish* dan 5 keping lagi untuk kemasipan jenis *syelek*. Penghasilan papan termoplastik ini akan melalui dua ujian utama iaitu ujian fizikal (ujian penyerapan air dan pembengkakan ketebalan) dan ujian mekanikal iaitu ujian penentuan boleh lenturan (MOE) dan modulus pecah (MOR) dengan menggunakan mesin IMAL. Dalam kajian ini, piawaian yang digunakan dalam pemotongan sampel (Fig. 1) adalah JIS A5908-2003. B1-B4 adalah merujuk kepada sampel bagi ujian mekanikal (ujian kekuatan) manakala TS1-TS6 pula merujuk kepada sampel bagi ujian fizikal (Penyerapan air dan pengembangan tebal).

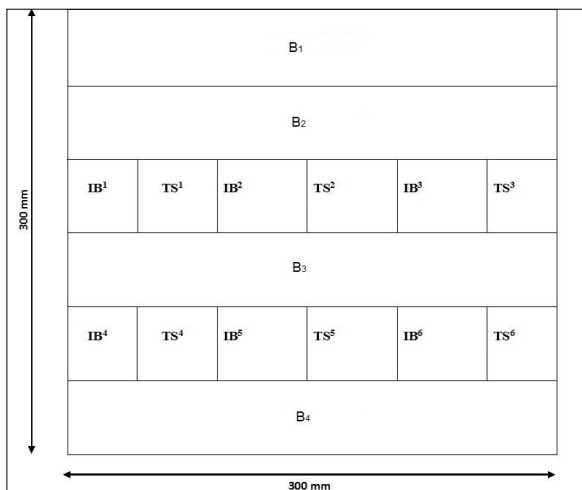


Fig. 1. Gambarajah 2.1a Kaedah pemotongan sampel

Bagi ujian kadar penyerapan air dan pengembangan ketebalan, saiz sampel yang digunakan adalah 50mm x 50mm x 10mm dan sebanyak 30 sampel yang diuji (Fig. 2). Bacaan

bagi setiap sampel diambil (24 jam dan 48 jam) sepanjang proses rendaman dilakukan. Setiap sampel akan diambil bacaan sebelum rendaman dan selepas rendaman. Ujian rendaman ini bertujuan untuk melihat kadar peratusan penyerapan air dan juga kadar peratusan perubahan dimensi sampel papan serpai termoplastik. Piawaian bagi ujian fizikal ini ialah JIS A5908-2003. Berikut merupakan pengiraan yang digunakan bagi mendapatkan peratusan pengembangan ketebalan dan penyerapan air:

1) Penyerapan air (%):

$$\frac{T_2 - T_1}{T_1} \times 100\%$$

Dimana,

T₁ = Berat asal (g)

T₂ = Berat selepas pengembangan (g)

2) Pengembangan ketebalan (%):

$$\frac{T_2 - T_1}{T_1} \times 100\%$$

Dimana,

T₁ = tebal asal (mm)

T₂ = tebal selepas rendaman (mm)

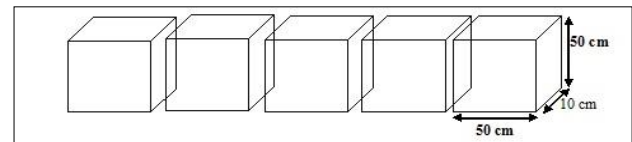


Fig. 2. Gambarajah 2.1b Sampel bagi ujian rendaman

Bagi ujian mekanikal (MOE dan MOR) papan termoplastik buluh Tamalang pula, sebanyak 20 sampel digunakan dengan saiz 300mm x 50mm x 10mm setiap sampel (Fig. 3). Piawaian bagi ujian mekanikal ini adalah JIS A5908-2003.

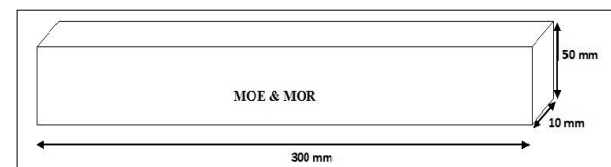


Fig. 3. Gambarajah 2.1c Sampel bagi ujian MOE & MOR

B. Penyediaan bahan utama

Proses pertama penyediaan bahan utama iaitu Buluh Tamalang (*Bambusa vulgaris*), adalah pemilihan buluh yang

masih muda dan mempunyai ukurlilit setiap satunya antara 10 hingga 15cm dan seterusnya buluh tadi akan direndamkan ke dalam air. Kaedah rendaman yang digunakan dalam kajian ini adalah dengan teknik tradisional iaitu dengan merendam buluh yang telah dipilih ke dalam air yang mengalir. Menurut Aini *et.al.*, (2009), tujuan utama buluh direndam ke dalam air yang mengalir adalah untuk membuang kandungan kanji yang terdapat pada buluh dan meningkatkan ketahanan buluh terhadap serangan agen perosak. Proses ini mengambil masa selama 4 minggu.

Buluh Tamalang yang telah direndam tadi akan dikeringkan secara semulajadi dengan menjemur dibawah cahaya matahari dan diproses menjadi partikel dengan menggunakan mesin *Flaker* dan *Chipper*. Saiz partikel buluh Tamalang yang diperlukan ialah 0.01 hingga 3.33mm, manakala kandungan lembapan (MC) partikel buluh adalah 9%. Proses pengeringan menggunakan oven dan dikeringkan selama 24 jam. Pengiraan MC partikel buluh Tamalang dikira dengan menggunakan rumus berikut:

$$MC = \frac{Ma - Mo}{Mo} \times 100\%$$

- Dimana,
- MC = Kandungan lembapan (%)
- Ma = Berat asal (g)
- Mo = Berat kering (g)

Bagi penyediaan plastik polietilena berketumpatan tinggi (HDPE), pemilihan plastik adalah daripada bahan guna semula. Saiz plastik adalah sama dengan saiz partikel buluh iaitu 0.01 hingga 3.33mm. Bagi mendapatkan saiz plastik ini, proses pemotongan dijalankan dengan menggunakan gunting dan kemudiannya dimasukkan ke dalam mesin pengisar untuk mendapatkan saiz yang diperlukan. Penggunaan partikel plastik adalah sebagai alternatif untuk menggantikan penggunaan Urea-formaldehyde (UF) sebagai bahan perekat dalam penghasilan papan termoplastik dan partikel plastik ini berfungsi sebagai pengikat partikel buluh. Plastik yang siap dipotong dan dikisar akan diasingkan menggunakan mesin *Vibration Screening Machine*.

C. Proses pembentukan papan termoplastik

Sebanyak 10 keping papan termoplastik dihasilkan dalam kajian ini di mana ketumpatan setiap papan termoplastik ini ialah 0.6 g/cm³. Nisbah ukuran yang digunakan bagi penghasilan setiap papan serpai adalah 2:1 dimana 2 mewakili partikel buluh (66.7% atau 362g) sebagai bahan utama dan 1 mewakili partikel buluh (33.3% atau 142.32g) sebagai bahan tambahan. Campuran ini digaul berulang kali bertujuan untuk memastikan penyebaran kedua-dua partikel adalah sekata dan partikel plastik dapat memegang partikel buluh dengan baik.

Proses pembentukan papan termoplastik dilakukan dengan menggunakan *Mat Former* bagi tujuan pemadatan dan penghasilan papan serpai yang sama rata. Papan serpai yang terhasil kemudian akan melalui proses penekanan panas (*Hot Press*) dalam jangkamasa selama 30 minit dengan suhu 150°C. Seterusnya penekanan sejuk (*Cold Press*) dilakukan selama 11

minit bagi memastikan tidak berlaku perubahan bentuk saiz papan termoplastik.

Bagi proses kemasiapan pula, setiap sampel akan dikenakan sebanyak 3 kali lapisan agar semua permukaan diselaputi oleh bahan kemasipan dengan menggunakan *spray gun*.

III. KEPUTUSAN DAN PERBINCANGAN

A. Ujian Rendaman

Berdasarkan kajian ini, hasil dapatan untuk ujian rendaman telah dicatatkan. Sebanyak 30 sampel bagi setiap jenis kemasipan telah diuji dan hasil dapatan mendapati keputusan adalah berkadar langsung antara berat dan masa penyerapan air. Kadar penyerapan air bagi papan termoplastik (*varnish*) menunjukkan bacaan berat bertambah bagi tempoh 24 jam (23.43g atau 72%) dan berat makin bertambah selepas 48 jam (24.27g atau 78.9%) dimana sebanyak 6.98% peningkatan berat berlaku selepas 48 jam. Bagi papan termoplastik (*syelek*), menunjukkan bacaan berat bertambah bagi tempoh 24 jam (23.11g atau 71.9%) dan pertambahan berat berlaku selepas 48 jam (24.04g atau 78.7%) dimana sebanyak 6.76% peningkatan berat berlaku selepas 48 jam. Berdasarkan bacaan ini didapati, papan termoplastik yang menggunakan kemasiapan *varnish* lebih tinggi kadar serapan air berbanding kemasiapan *syelek* (0.22% perbezaan kadar serapan air). Ini menunjukkan bahawa, papan serpai termoplastik ini mempunyai kadar serapan air yang baik dan papan termoplastik yang menggunakan kemasiapan *syelek* adalah lebih baik berbanding kemasiapan jenis *varnish* (Jadual 3.1a). Mengikut piawaian JIS A5908-2003, nilai bagi kadar serapan air tidak disyaratkan akan tetapi ujian ini boleh dilaksanakan bagi mempertimbangkan aplikasi penggunaan papan termoplastik ini sesuai digunakan untuk luaran atau dalaman. Merujuk Upadhyaya P. *et. al.*, (2012), kandungan selolusa yang tinggi menjadi penyumbang kepada kadar serapan air dan kadar serapan air yang lemah dipengaruhi oleh penggunaan fiber semulajadi sekaligus menjadikan ketahanan papan termoplastik adalah rendah.

Jenis Kemasipan	Purata penyerapan air (g)	
	24 jam	48 jam
Varnish	23.43	24.27
Syelek	23.11	24.04

^b. Jadual 3.1a Purata penyerapan air untuk tempoh 24 & 48 jam

Merujuk kepada Jadual 3.1b, adalah bacaan bagi purata pengembangan tebal sampel papan termoplastik. Bagi papan termoplastik (*varnish*), bacaan tebal bagi 24 jam diperolehi iaitu 10.08mm (7.5%) dan peningkatan ketara selepas 48 jam bacaan tebal sampel diambil (10.14mm atau 8.08%). Secara tidak langsung, sebanyak 0.58% perubahan peningkatan direkodkan bagi ketebalan sampel berlaku selepas tempoh 48 jam. Bagi papan termoplastik (*syelek*), tebal sampel bagi 24 jam direkodkan iaitu 10.35mm (7.7%) dan ketebalan meningkat selepas 48 jam dengan bacaan 10.39mm (8.07%). Sebanyak 0.34% peningkatan tebal sampel bagi kemasiapan *syelek* berlaku selepas tempoh 48 jam. Oleh yang demikian,

secara keseluruhannya sampel bagi kemasiapan *varnish* dilihat lebih tinggi pembengkakan tebal berbanding kemasiapan *syelek* dimana perbezaan hampir 0.24%. Mengikut kepada piawaian JIS A5908-2003, kadar pembengkakan tebal <12% mencapai piawaian. Menurut Upadhyaya P. *et. al.*, (2012), sampel boleh mencapai piawaian sekiranya penambahan agen gandingan diaplikasikan dalam penghasilan papan termoplastik ini.

Jenis Kemasiapan	Purata pengembangan tebal (mm)	
	24 jam	48 jam
Varnish	10.08	10.14
Syelek	10.35	10.39

^c Jadual 3.1b Purata pembengkakan ketebalan bagi tempoh 24 & 48 jam

B. Ujian Kekuatan Lenturan (MOE & MOR)

Merujuk pada Jadual 3.2 menunjukkan bacaan bagi purata keseluruhan papan serpai termoplastik. Hasil dapatan daripada ujian MOE dan MOR mendapati, sampel papan termoplastik (*varnish*) adalah yang tertinggi (MOE = 386.65 N/mm², MOR = 2.67 N/mm²) jika dibandingkan dengan sampel papan termoplastik daripada kemasiapan *syelek* (MOE = 340.80 N/mm², MOR = 2.50 N/mm²). Menurut John A. Walton A. (1974), menyatakan penggunaan *syelek* yang tidak tahan kepada haba menyebabkan wujudnya rekahan dalam papan termoplastik yang dihasilkan. Bacaan MOR bagi papan termoplastik (*varnish*) dilihat lebih tinggi berbanding MOR papan termoplastik (*syelek*). Dapatan ini disokong dengan merujuk kepada John A. Walton A. (1974), dimana kemasiapan jenis *varnish* merupakan sejenis resin yang tidak meruap iaitu perekat yang selalu terdapat dalam industri serta penggunaan *varnish* dilihat lebih banyak berbanding *syelek*. Daripada hasil dapatan menunjukkan bahawa papan termoplastik bagi kedua-dua jenis kemasiapan ini tidak mencapai piawaian JIS A5908-2003 iaitu nilai bagi MOE (>2000 N/mm²) dan nilai bacaan MOR (>14 N/mm²). Penggunaan saiz partikel yang besar iaitu lebih daripada 2.5mm akan menyebabkan sifat mekanikal papan partikel berkurangan (Jamaluddin *et.al.*, 2000). Bagi memastikan papan termoplastik yang dihasilkan mencapai piawaian, penggunaan bahan mentah buluh perlu diambil kira dimana, merujuk kajian Hung K. C *et. al* (2010) menyatakan bahawa peratus bahan mentah buluh yang digunakan melebihi 60% ke atas akan mempengaruhi penurunan kadar kekuatan kelenturan papan serpai. Oleh yang demikian, sukatan partikel buluh perlu diutamakan bagi memastikan papan termoplastik yang dihasilkan mencapai piawaian.

Jenis Kemasiapan	M.O.E (N/mm ²)	M.O.R (N/mm ²)
Varnish	386.65	2.67
Syelek	340.80	2.50

^d Jadual 3.2 Purata bacaan MOE & MOR untuk 20 sampel

IV. KESIMPULAN

Kesimpulan daripada kajian ini membuktikan bahawa papan termoplastik daripada kemasiapan *varnish* lebih baik berbanding kemasiapan *syelek*. Hasil dapatan telah membuktikan kemasiapan *varnish* lebih sesuai digunakan untuk papan termoplastik buluh tamalang dan potensi papan termoplastik ini boleh diketengahkan dengan adanya penambahbaikan untuk memastikan papan termoplastik yang dihasilkan lebih baik dan mencapai piawaian yang ditetapkan.

Gabungan partikel buluh dan plastik HDPE ini dilihat dapat disatukan dengan baik dan cadangan untuk menambah bahan tambahan ke dalam proses penghasilan papan termoplastik perlu diambil bagi memastikan papan yang dihasilkan lebih sempurna. Tambahan dengan adanya lapisan kemasiapan *varnish* ini sekaligus mampu memberikan kekuatan dari segi fizikal dan mekanikalnya. Penambahbaikan dicadangkan agar semasa proses kemasiapan dijalankan, lapisan kemasiapan yang digunakan kenalah sekata agar semua lapisan terkena dan lapisan yang dicadangkan bagi kajian ini ialah sebanyak 5 lapisan berbanding hanya 3 lapisan yang kebiasaan digunakan.

PENGHARGAAN

Kajian ini turut membabitkan tenaga kerja daripada pelajar tahun akhir Diploma Teknologi Berasaskan Kayu (DBK), Politeknik Kota Kinabalu iaitu Cik Melisa Syharmiela Binti Baharudin dan Cik Jeselia Jonimin. Turut menyumbang tenaga dalam kajian ini daripada Pegawai Lembaga Perindustrian Kayu Malaysia (MTIB) Wilayah Sabah, iaitu En. Mohd Faizal Bin Abdul Rodzak, En. Reza Faizal Bin Md. Daud dan En. Mohd Amin Bin Ehsan. Terima kasih atas komitmen yang diberikan sepanjang menjalankan kajian ini.

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Pengubahan Wang Haram

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Abstrak— Pengubahan wang haram mempunyai impak yang besar terhadap negara dan semua lapisan masyarakat dalam pelbagai cara. Pengubahan wang haram merujuk kepada proses penukaran wang yang diperolehi melalui cara yang tidak sah kepada sumber yang sah. Banyak pihak telah memberi persepsi mereka terhadap pengubahan wang haram dan Akta Pengubahan Wang Haram (AMLA). Justeru, artikel ini menerangkan secara ringkas pengubahan wang haram di sektor perbankan.

Kata kunci—*pengubahan wang haram, perbankan*

I. PENGENALAN

Pengubahan wang haram bukanlah satu fenomena baru. Dalam beberapa dekad yang lalu, bilangan urus niaga di pasaran kewangan telah meningkat dengan ketara. Anggaran jumlah wang haram global dalam satu tahun adalah kira-kira lebih daripada US \$ 2 trilion atau kira-kira pada 2% hingga 5% daripada KDNK global. Pengaturan jenayah kewangan menjadi ancaman global dan memberi kesan kepada institusi kewangan terutamanya industri perbankan. Pada tahun 2012, Bank ABC telah didenda USD 1.9 bilion oleh pihak berkuasa Amerika Syarikat untuk menyelesaikan caj yang berkaitan dengan wang kartel dadah. Bank Perancis BNP Paribas didenda hampir USD 9 bilion oleh pendakwa Amerika untuk memproses pembayaran yang memecahkan sekatan AS di Cuba, Iran dan Sudan. Sementara itu Standard Chartered didenda USD 300 juta pada 2014 kerana gagal mengatasi masalah anti pengubahan wang haram, mereka juga telah didenda USD 340 juta dalam tahun 2012 yang berkaitan dengan sekatan di Iran (Dan Barnes, The Times 2015). Merujuk kepada KPMG Global Anti-Money Laundering Survey 2014, jumlah wang yang besar terus dibelanjakan dan dilaburkan untuk meningkatkan aktiviti pengubahan wang haram (AML).

II. TINJAUAN KESELURUHAN PENGUBAHAN WANG HARAM

Pengubahan wang haram dan Pencegahan Pembiayaan Keganasan Malaysia (Pindaan) 2014 yang mentakrifkan pengubahan wang haram seperti mana-mana individu yang (a) melibatkan diri, secara langsung atau tidak langsung, dalam transaksi dan penglibatan hasil daripada aktiviti haram atau penyalahgunaan peralatan; (b) memperoleh, menerima, memiliki, menyembunyikan, pemindahan, menggantikan, menukarkan, membawa, melupuskan atau hasil daripada

aktiviti haram atau penyalahgunaan peralatan; (c) memindahkan atau membawa masuk ke Malaysia, hasil daripada aktiviti haram atau penyalahgunaan peralatan dan (d) merahsiakan, menyembunyikan atau menghalang pemastian sifat sebenar, sumber, lokasi, pergerakan, pelupusan, hakmilik, hak berkenaan dengan, atau pemilikan, hasil daripada aktiviti haram atau penyalahgunaan peralatan. Dalam definisi yang mudah, menurut Pasukan Petugas Tindakan Kewangan (FATF), pengubahan wang haram adalah satu proses di mana penjenayah menyamar kepemilikan asal dan mengawal hasil jenayah agar hasil tersebut seolah-olah diperolehi daripada sumber yang sah.

Objektif utama daripada aktiviti pengubahan wang haram adalah untuk menghasilkan "wang haram" menjadi wang yang sah dan mengambil keuntungan daripada hasil jenayah. Pengubahan wang haram merupakan kesalahan individu atau organisasi kerana membantu penjenayah mendapat manfaat daripada hasil aktiviti jenayah mereka atau untuk memudahkan komisen jenayah seperti menyediakan perkhidmatan kewangan kepada mereka. Oleh itu, penjenayah akan mencari alternatif kepada pengembangan jenayah kewangan yang sukar untuk mengesan aktiviti mereka. Bagaimana wang diubah? Pada asasnya, pengubahan wang haram telah digambarkan sebagai satu proses yang berlaku dalam tiga peringkat yang jelas iaitu penempatan, lapisan dan integrasi. Di peringkat pertama, dana jenayah yang diperolehi akan diperkenalkan pada sistem kewangan. Jumlah besar wang tunai akan dipecahkan kepada jumlah wang yang lebih kecil atau kurang kemudiannya dimasukkan terus ke dalam akaun bank, atau dengan membeli satu siri instrumen kewangan yang kemudiannya dikumpul dan dimasukkan ke dalam akaun pada lokasi yang berlainan. Menurut FATF, penjenayah biasanya lebih suka untuk memindahkan dana melalui sistem kewangan yang stabil.

Pada peringkat kedua, proses ini disebut sebagai "lapisan". Ianya selepas dana dimasukkan ke dalam sistem kewangan. Proses ini kadangkala merujuk kepada penstrukturan. Peringkat ini merupakan yang paling kompleks dan sering melibatkan pergerakan dana antarabangsa. Tujuan utama daripada peringkat ini adalah untuk memisahkan wang haram dari sumbernya. Penjenayah dapat dikesan melalui satu siri pemindahan wang ke dalam akaun yang berbeza atau perdagangan dalam pasaran kewangan atau melalui pelaburan [1]. Contoh kes adalah seperti yang dilaporkan pada Februari 2016 yang menyatakan \$951,000,000 telah dicuri dari Bank

Bangladesh, lima transaksi telah dikeluarkan oleh penggodam ke Sri Lanka dan Filipina bernilai \$101,000,000 dikeluarkan dari akaun Bank Bangladesh di Bank Persekutuan Rizab New York. Walau bagaimanapun, Bank Persekutuan Rizab New York berjaya menyekat baki 30 transaksi (The Japan Times, 2016). Semasa penempatan dan peringkat lapisan, perubahan wang haram mempunyai impak yang besar dalam bank-bank dan institusi kewangan. Ini adalah disebabkan oleh dana haram yang sedang 'dibasuh' tetapi masih belum diintegrasikan sepenuhnya ke dalam ekonomi [1].

Salah satu faktor risiko politik atau peranan institusi yang penting dalam mempengaruhi aliran kewangan haram ini adalah kestabilan kerajaan atau politik. Faktor politik dan isu makroekonomi merupakan penyebab kepada aliran kewangan haram di Sub Sahara Afrika [2]. Ketidakstabilan politik merupakan faktor yang penting dalam memacu aliran kewangan haram di Filipina [3]. Dalam kajian terhadap 45 buah negara sedang membangun termasuk Filipina, jelas menunjukkan ketidakstabilan politik memberi kesan yang signifikan kepada aliran kewangan haram [3]. Aliran keluar kewangan haram dari Filipina adalah sebanyak US\$16 bilion pada tahun 1970 an, dan terus meningkat kepada US\$36 bilion (tahun 1980 an), dan US\$43 bilion (tahun 1990 an) [4]. Penemuan tersebut disokong oleh Global Financial Integrity, yang telah melaporkan Filipina kehilangan US\$109 bilion dalam pelarian modal melalui imbalan pembayaran dan 'trade mispricing' sepanjang sembilan tahun iaitu dari tahun 2000 hingga 2008.

Dari segi faktor rasuah, Global Financial Integrity (2008) telah melaporkan aliran kewangan haram dijangka akan meningkat apabila kadar rasuah di sesebuah negara itu meningkat. Collier et al. (2001) dalam kajiannya terhadap 45 buah negara sedang membangun dalam tempoh 1980-1989 juga mendapati faktor rasuah signifikan mempengaruhi aliran keluar wang haram. Kebiasaannya negara yang mempunyai kerajaan yang tidak stabil akan mencatatkan kadar rasuah yang tinggi, dan mendorong pelabur-pelabur menyalurkan modal atau wang mereka ke luar secara haram. Di beberapa buah negara yang membangun seperti China, faktor rasuah dikenalpasti sebagai faktor yang mempengaruhi aliran kewangan haram. Kadar aliran kewangan haram di negara China adalah paling tinggi di dunia iaitu US\$2,176 bilion dari tahun 2000 hingga 2008. Kajian Cai (1999) juga membuat rumusan yang sama iaitu pertumbuhan kadar rasuah yang tinggi menjadi penyebab kepada aliran kewangan haram di negara China.

Peringkat akhir dalam perubahan wang haram adalah integrasi atau penggabungan. Ini adalah peringkat di mana dana memasuki ekonomi semula dengan jalan yang sah dan juga memberikan penjelasan yang sah tentang kewujudan dana tersebut. Contoh integrasi termasuk transaksi perniagaan, melabur dalam barang-barang mewah, membeli harta dan usaha perniagaan, perdagangan atau kediaman. Aktiviti wang haram menggunakan sistem perbankan sebagai salah satu alat yang paling penting untuk aktiviti jenayah kewangan mereka kerana bank lebih selesa, mudah dan selamat. Mereka menggunakan pelbagai keseluruhan perkhidmatan kewangan antarabangsa yang moden dan pemindahan kekal melalui talian

dan alat yang penting dalam proses perubahan wang haram [1].

Banyak agensi tempatan dan antarabangsa telah bekerjasama dalam meletakkan usaha yang besar untuk memerangi perubahan wang haram dan isu-isu pembiayaan keagasan. Hampir kesemua rangka kerja AML negara telah dibangunkan di peringkat antarabangsa seperti Pasukan Petugas Tindakan Kewangan (FATF), Kumpulan Asia Pasifik mengenai Perubahan Wang Haram (APG), Bangsa-Bangsa Bersatu dan Kesatuan Eropah. Pendekatan keseragaman ini meliputi keperluan bagi Cadangan 40 Pasukan Petugas Tindakan Kewangan (40 Recommendations FATF) yang memerlukan beberapa langkah perlu diambil seperti perundangan AML dan menubuhkan Unit Kewangan Intelligence (FIU) [5]. Cadangan tersebut dibahagikan kepada empat bahagian. Bahagian Satu: menggariskan skop kesalahan jenayah perubahan wang haram, Bahagian Dua: melindungi institusi kewangan dan perniagaan bukan kewangan dan profesion yang bertujuan untuk mencegah perubahan wang haram dan pembiayaan keagasan. Bahagian Tiga: cadangan-cadangan bagi menangani keinstitutionan yang penting dalam sistem anti perubahan wang haram dan ketelusan orang yang berkaitan, undang-undang dan peraturan. Sementara itu, Bahagian Empat adalah hubungan bersama dalam penyiasatan, pendakwaan dan prosiding terhadap undang-undang yang berkaitan dengan perubahan wang haram dan pembiayaan pengganas (Aspalella A. Rahman 2008).

Malaysia bukanlah pusat utama bagi perubahan wang haram, namun pelbagai perkhidmatan kewangan yang ditawarkan di dalam dan di luar pesisir boleh disalahgunakan oleh mereka yang berniat dalam perubahan wang haram atau menyokong keagasan. Sektor kewangan di Malaysia terdedah kepada salah laku oleh pengedar narkotik, pembiayaan keagasan, dan unsur-unsur jenayah. Malaysia telah meletakkan usaha dalam memerangi perubahan wang haram dengan memperkenalkan Perundangan Pencegahan Perubahan Wang Haram 2001 dan Pencegahan Perubahan Wang Haram dan Akta Pencegahan Pembiayaan Keagasan (Pindaan) 2014 (AMLATFA). AMLATFA terdiri daripada lapan bahagian, 93 seksyen dan dua jadual. Ini termasuk perundangan jenayah perubahan wang haram dan pemeriksaan kerahsiaan bank untuk siasatan jenayah. Undang-undang juga menubuhkan Financial Intelligence Unit (FIU) untuk menerima dan menganalisis maklumat, dan berkongsi maklumat risikan kewangan dengan agensi-agensi penguatkuasaan yang sewajarnya untuk siasatan pada peringkat lanjut (INCSR, 2006). Antara garis panduan Bank Negara Malaysia ialah memerlukan pengenalan pelanggan dan pengesahan, penyimpanan rekod kewangan dan laporan aktiviti yang mencurigakan, peraturan ketat mengenai 'mengenal pelanggan anda' (KYC).

III. IMPLIKASI DASAR

Industri perbankan Malaysia banyak mencatatkan kemajuan dalam mengesan perubahan wang haram dan pencegahan

menerusi Akta Anti Pengubahan Wang Haram (AMLA) 2001 dan Dasar Mengenal Pelanggan Anda (KYC).

Untuk antarabangsa, Pasukan Petugas Tindakan Kewangan (FATF) merupakan penetap standard antarabangsa dalam memerangi pengubahan wang haram dan pembiayaan keganasan. '40 Cadangan' FATF buat masa ini menetapkan standard antarabangsa bagi memerangi pengubahan wang haram (ML) dan pembiayaan penganas (TF), yang mesti dipatuhi oleh institusi kewangan di seluruh dunia. Walaubagaimanapun, Bank Negara Malaysia (BNM) perlu juga merangka satu peraturan yang ketat dan standard sendiri bagi mencegah dan memerangi penggubahan wang haram di Malaysia. Ini kerana BNM juga menyimpan rekod-rekod dan sejarah jenayah kewangan yang pernah berlaku di Malaysia. Oleh yang demikian, BNM lah paling memahami senario semasa jenayah kewangan di Malaysia. Selain itu BNM merupakan pusat rujukan bagi semua institusi kewangan di Malaysia.

Perkembangan ekonomi dan politik yang tidak menentu, ditambah dengan krisis kewangan yang berulang di beberapa bahagian dunia, bank-bank terus terdedah kepada masalah pengubahan wang haram dan pembiayaan keganasan. Oleh itu, BNM dengan kerjasama institusi kewangan di Malaysia perlu membangunkan program bertulis yang mengenal pasti dan mengesan tanda-tanda awal jenayah kewangan dan pembiayaan keganasan. Akta yang sedia ada ialah Akta Pencegahan Pengubahan Wang Haram, Pencegahan Pembiayaan Keganasan dan Hasil daripada Aktiviti Haram 2001 (Akta 613). Kajian berterusan untuk penambahbaikan akta penggubahan wang haram perlu dilakukan. Ini kerana tiada semakan semenjak 2002. Kerjasama di antara intitusi kewangan untuk membincangkan dan berkongsi sebarang tanda-tanda awal akan membantu pihak kerajaan atau BNM untuk mengesan jenayah kewangan dan pembiayaan keganasan sekaligus membasminya pada peringkat awal. Sebagai contoh pertubuhan atau individu yang diragui menggunakan sistem perdagangan antarabangsa dan perbankan untuk memindahkan sumber kewangan haram bagi tujuan salah akan disiasat dengan segera untuk tindakan undang-undang sekiranya berlaku.

Pendidikan Islam dan penerapan nilai-nilai moral yang tinggi di peringkat sekolah adalah antara usaha diperingkat awal. Perlu juga difikirkan semula supaya setiap jabatan atau institusi kerajaan dan swasta berusaha menerapkan nilai-nilai moral yang tinggi di setiap jabatan masing-masing. Sebagai contoh ketua majikan mengadakan tazkirah seminggu sekali dalam masa yang singkat untuk peringatan bersama. Ini kerana proses pengubahan wang haram sebenarnya dilakukan dengan berkesan dan selalunya dengan bantuan golongan profesional seperti peguam, ahli ekonomi dan ahli bank tanpa

meninggalkan jejak. Ini menyebabkan kes-kes seperti ini jarang dibawa ke mahkamah.

IV. KESIMPULAN

Pengubahan wang haram mempunyai impak yang besar terhadap negara dan semua lapisan masyarakat dalam pelbagai cara. BNM dan institusi kewangan perlu menggubal peraturan yang ketat bagi menangani masalah ini disebabkan aktiviti ini memperlahankan ekonomi global dengan teruk. Kegiatan ini sebenarnya membiayai dan menyokong penyeludupan, pemerdagangan manusia, perniagaan dadah, serta pembelian senjata dan bantuan kepada kumpulan penganas adalah dilarang keras oleh Syariah. Sebagai contoh barangan yang diseludup dijual dengan harga yang jauh lebih murah daripada yang dijual oleh perniagaan yang sah, kegiatan ini menjejaskan pendapatan negara. Keuntungan yang diperolehi secara haram juga akan pengakibatkan kerugian negara dalam mengenakan cukai.

Secara kesimpulannya, faktor-faktor berikut hendaklah dititik beratkan dalam menangani isu pengubahan wang haram. Pertama, sokongan daripada pihak pengurusan atasan bank-bank. Kedua, kakitangan bank-bank perlu dibekalkan dengan kemahiran bagaimana mengesan pengubahan wang haram sekurang-kurangnya pada peringkat awal lagi. Ketiga, bank-bank perlu memiliki kemudahan teknologi yang canggih disebabkan jenayah pengubahan wang haram dan pembiayaan keganasan dapat disalurkan melalui atas talian (online) dan sebagainya sehingga aktiviti ini tidak dapat dikesan. Keempat, program pembasmian pengubahan wang haram memerlukan modal yang besar, oleh itu sebahagian kecil dana perlu diperuntukkan untuk perkara ini. Kelima, pemimpin politik juga perlu menitikberatkan perkara ini dalam agenda manifesto politik mereka kerana isu pengubahan wang haram sebenarnya masalah yang besar bagi negara.

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The Factors That Determine Bukit Gemok in Develop as An Ecotourism Destination

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Abstract— Malaysia famous with ecotourism and well-known since tourism directed towards exotic natural environments, intended to support conservation efforts and observe wildlife. Ecotourism is very important for the development of tourism in Malaysia. As we know, Bukit Gemok once had very rich wildlife. In the last century, the calls of gibbons were common, and so were sambar deer, elephants at the foothills and orangutans up on the trees. But, gradually forest round the hill being cut down by greedy politicians in the name of economic development. The objectives of this research is to determine the potential indicators in develop Bukit Gemok as an ecotourism destination, to determine the suitability of the activities in Bukit Gemok and to determine the acceptance level of public towards the Bukit Gemok to develop as ecotourism site. The method that has been use for this research is qualitative method and the result showed that all objectives has been answer. There are 6 respondent show positive respond. There are 8 general indicators has been found in this research. The indicators of this research could help Bukit Gemok in manage and plan for marketing strategies. Meanwhile, the limitation of this research is hard to get transportation, short time to collect data and uneasy to get respondents.

Keywords—Success indicators, SAFODA, ecotourism destination, Sabah Forest

I. OVERVIEW

Bukit Gemok is 428 meters above sea level and is part of the Bukit Gemok Forest Reserve, covering 445 hectares. Get a glimpse of the breathtaking view of Tawau from this high up. The stunning scenery spans the town centre, the picturesque coasting and its surrounding areas. The trek down Bukit Gemok should take a shorter time, the trail becomes muddy and slippery during the rainy season.

Bukit Gemok (Gemok Hill) is a precious untouched forest in Malaysia. Its provide first-hand experience with a natural forest which had been preserved and protected ever since its existence. Here is also an ideal place for adventure

seekers to indulge in jungle hiking and jungle trekking activities in the forest. There are various terrains in the hill available for you to explore with excitement and thrill to hiking experiences in Malaysia. There are naturally build with the

various tracks and terrains in Bukit Gemok, do also witness the beautiful and peaceful green surrounding while hiking. Along the way hiking to the top of the hill, there are seven resting huts provided for you to catch a breath or even to enquire for directions.

In the top of the Hill, the visitors will expose to an amazing canopy walkway. One of the most interesting features about this canopy walkway is the fact that it is the longest canopy walkway in Sabah. Thus, it is definitely photography worthy for you to snap a pictures of yourself or of you and your family and friends conquering one of the hills in Sabah.

The Longest Canopy Walkway is Borneo Rainforest Lodge Canopy Walkway in Denum Valley 300 meters long. An extension to the Tree Top Canopy Walkway made it one the most spectacular walkway in Sabah, with multiple viewing platforms, spanning approximately 300 meter in length and stands at 20 meter at the highest point. The Walkway is designed and engineered to be 'tree friendly' without rigging any of the steel cables direct onto the trees. The spacious and sturdy platforms provide a safe and unobstructed up-close view of the 130 million year old virgin jungle's canopy.

The suspension cables are hung between emergent dipterocarp trees and measure trees at 15-25 meter up the trunks – barely half the height of these enormous trees but sensationally within the rainforest canopy. At each suspension point there is an octagonal shaped observation platform which allows the user time to rest before the next airy bridge. The BRL walkway has five support trees.

The Canopy Walk is 231 meters long, is one of the longest canopy walkway in Sabah. Bukit Gemok admits visitors into tropical rainforests. The Canopy walkway is 100 to 200 ft. Above the forest floor, is an opportunity to appreciate nature up on the trees. Other Canopy Walk in Sabah : 1) Poring canopy walkway - 158 meters long and 41 meters high. 2) Sansakan RDC steel canopy walkway – 147 meter long and 28 meters above the rainforest floor. 3) Borneo

Rainforest Lodge Canopy Walkway – 300 meters long and 26 meters above high longest in Sabah.

Even though this place becomes an educational visitation place and also researchers from overseas, but there are no any proper research or study regarding tourism or ecotourism has been done. The purpose of this proposal is to suggest to the SAFODA to conduct a research to carry out the success indicators for Bukit Gemok as a ecotourism destination.

I. Project rationale

This research will contribute to government especially SAFODA in set up their strategies and planning to rebranding Bukit Gemok. The results of this research will suggest to the SAFODA in determine their goals and the marketing strategies when establish Bukit Gemok as an ecotourism destination. This result also helps SAFODA in collect the feedback of public towards the development of Bukit Gemok. The suitability activities also will be suggested through the research.

II. PROBLEM STATEMENT

Sabah's tourism industry had its best year ever in 2016, achieving record tourist arrivals and tourism receipts despite headwinds, said Minister of Tourism, Culture and Environment Datuk Seri Masidi Manjun. He said Sabah received an all-time high 3.43 million tourist arrivals and estimated RM 7.25 billion for the state economy. He also stressed that hope more ideas on the many untapped new attractions that are available around Sabah. However, according to the statistic provided by Sabah Forestry Development (2016), the number of visitors to Bukit Gemok Hill is decreasing. This situation was worried by the management. SAFODA urged that related parties in give a helping hands in promoting and marketing Bukit Gemok Hill. The purpose of this proposal is to propose a research title to help SAFODA in carry out the success indicators of Bukit Gemok as an ecotourism destination.

III. RESEARCH OBJECTIVE

- i. To determine the potential indicators in develop Bukit Gemok as an ecotourism destination.
- ii. To determine the suitability of the activities in Bukit Gemok.
- iii. To determine the acceptance level of public towards the Bukit Gemok.

IV. RESEARCH QUESTION

- i. What the criteria in develop Bukit Gemok as an ecotourism destination?

- ii. What are the activities that suitable implement in Bukit Gemok?
- iii. How public perceive towards Bukit Gemok develop as ecotourism destination?

V. SCOPE OF STUDY

This research will focus on Bukit Gemok Hills Park, Tawau. The respondents are from tour operator, public and SAFODA workers around Kota Kinabalu, Sabah. They will be interview to obtain a qualitative data. Data will only be valid after data saturation has been made. There is no specific respondent needed as long as the data is saturated.

VI. LIMITATION RESEARCH

- i. Difficult to get transportation for make a survey
- ii. Had short time to collect data
- iii. Uneasy to get respondent

VII. LITERATURE REVIEW

This research aims to carry out the success indicators that help in determine Bukit Gemok Tawau as an ecotourism destination. Gemok Hill once had very rich wildlife. In the last century, the calls of gibbons were common, and so were sambar deer, elephants at the foothills and orang-utans up on the tress. Recent year, due to the inconsistence development and illegal timbering, a lot of flora and fauna extinct. The hill today is surrounded by develop lands; these animals are not present in Gemok Hill any longer. However, town people can see long-tail macaques, squirrels, short-tail macaques, wild boars and barking deer, although the numbers are quite low. There are more bird species, including a few species of hornbills, as they can fly from other nearby forests. According to statistic provided by Sabah Forestry Development (2016), the number of visitors to Bukit Gemok Hill is decreasing. SAFODA urged that related parties in give a helping hands in promoting and marketing Bukit Gemok Hill. They are manly strategies and planning has been implemented to increase the number of visitors, but it does not work.

VIII. INDICATORS

Bukit Gemok (Gemok Hill) is a precious untouched forest in Malaysia. Its provide first-hand experience with a natural forest which had been preserved and protected ever since its existence. Here is also an ideal place for adventure seekers to indulge in jungle hiking and jungle trekking activities in the forest. There are various terrains in the hill available for you to explore with excitement and thrill to hiking experiences in Malaysia. There are naturally build with the various tracks and terrains in Bukit Gemok, do also witness the beautiful and peaceful green surrounding while hiking. Along the way hiking to the top of the hill, there are seven resting huts provided for you to catch a breath or even to enquire for directions.

In the top of the Hill, the visitors will expose to an amazing canopy walkway. One of the most interesting features about this canopy walkway is the fact that it is the longest canopy walkway in Sabah. Thus, it is definitely photography worthy for you to snap a pictures of yourself or of you and your family and friends conquering one of the hills in Sabah. Even though this place becomes an educational visitation place and also researchers from overseas, but there are no any proper research or study regarding tourism or ecotourism has been done. The purpose of this proposal is to suggest to the SAFODA to conduct a research to carry out the success indicators for Bukit Gemok as a ecotourism destination.

Tourism is the world's largest industry. It accounts for more than 10% of total employment, 11% of global GDP, and total tourist trips are predicted to increase to 1.6 billion by 2020 (WWF, 2001). As such, it has a major and increasing impact on both people and nature (WWF, 2001). Effects can be negative as well as positive. Inappropriate tourism development and practice can degrade habits and landscapes, deplete natural resources, and generate waste and pollution (WWF, 2001). In contrast, responsible tourism can help to generate awareness of and support for conservation and local culture, and create economic opportunities for countries and communities (Pengiran Bagul, 2009). Tourism is a global industry with a bearing on the lives of millions of people. Its potential as a tool for development is enormous. With a growing interest to spend leisure time in nature and increasing awareness of environmentalism, ecotourism has become one of the fastest-growing segments of the tourism industry (United States, 2001). Compared with mass or 'old' tourism, benefits out of the country, creating local employment, and fostering sustainable development (Belsky, 1999). Thus, it has been popularly promoted as a means of reconciling wildlife conservation with economic development, particularly in development, particularly in developing countries (Campbell, 2002).

IX. ECOTOURISM DEBATE

Models of tourism development and theories associated with visitors' motivations are two means by which researchers have attempted to explain and predict the nature of tourism's impacts on the host community and environment. Drawing upon concepts of carrying capacity, cycles of tourism development present tourism as passing through phases characterised by differing attitudes and reactions within host communities which may be related directly to the scale and characteristics of tourism (Ap & Crompton, 1993; Butler, 1980; Doxey, 1975). It has been suggested that ecotourism activities constitute the early stages of such cycles of tourism development, thereby running the risk of serving to open up destinations for activities associated with mass tourism (Cohen, 1987; France, 1997). Research into visitor characteristics and motivations is similarly important in that this provides planners with information to help avert the manifestation of negative impacts on local communities whilst also tailoring the product to meet the expectations and needs

of the ecotourist market (Hvenegaard, 2002; Palacio & McCool, 1997).

Though ecotourism is often presented as a relatively new concept, contemporary studies of ecotourism build on decades of research focused on what happens when markets and capitalism are introduced to subsistence societies. In the 19th and early 20th centuries, social philosophers, such as Durkheim, Marx and Weber, devoted much of their work to understanding the social, economic and cultural changes that markets caused in traditional communities. These seminal writings were followed in the post-World War II era with scholarship that examined paradigms of 'modernisation' and 'development', which also predicted trajectories of change for rural societies in the face of market integration (e.g. Foster, 1973; Rostow, 1960). Markets were generally seen as causing a break from tradition and a transition (or 'progress') to some new kind of society (Escobar, 1991).

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Proponents of ecotourism have debated guidelines, definitions, and principles ad infinitum, but many agree on one idea: a greater proportion of tourism benefits should go directly to the peoples and places featured in the brochures, websites, and guidebooks (Weaver 2001). Though local residents almost always pay the social and environmental costs of conventional forms of tourism, they seldom partake fairly in the benefits (West and Carrier 2004). By contrast, ecotourism is designed to channel greater benefits directly to communities. Benefits have figured most prominently in conservationists' discussions of ecotourism. They are often described as incentives for residents to protect the wildlife, forests, rivers, and other attractions tourists pay to see (Ross and Wall 1999a). In a United Nations report, Bovarnick and Gupta (2003) argue that locals are likely to gain incentives for protecting natural resources, but only if they receive a good portion of these benefits. Similarly, directors of the

Biodiversity Conservation Network reason, “If local communities receive sufficient benefits from an enterprise that depends on biodiversity, then they will act to counter internal and external threats to that biodiversity” (BCSNet 1999:3). As a result of these ideas, many in the conservation community have endorsed ecotourism with significant injections of project funds, personnel, and technical support (Doan 2000; Kiss 2004).

Ecotourism has now been debated in theory, and attempted in practice, for at least two decades. Definitions differ in detail (Buckley, 2009; Donohoe & Needham, 2006; Weaver & Lawton, 2007) but all agree that ecotourism is a practical as well as theoretical construct. Its aims are to change real-world operations in the tourism industry, as well as improve our understanding of tourism as a social phenomenon. Have these aims been achieved, or are we at least moving towards them, and how can we tell? There does not seem to be any previous attempt to address this issue. The analysis of academic ecotourism literature carried out by Weaver and Lawton (2007), for example, specifically excluded any attempt to evaluate its practical achievements or outcomes. This contribution proposes an analytic framework for such an endeavour, assesses available data as far as possible and endeavours to identify the research required to improve future evaluations.

Such an evaluation has theoretical significance for the academic analysis of tourism more broadly. Ecotourism may be viewed as an intervention in the tourism industry: an attempt to modify its mode of operation for reasons not entirely commercial. In the words of Black and Crabtree (2007, p. xxvii), ecotourism is “a force within the industry that, in its very essence, aims to minimise tourism’s negative impacts whilst maximising tourism’s positive impacts”. Whilst smaller in scale than external effects such as energy prices and terrorism, ecotourism represents a relatively large internal intervention in the global tourism industry, and one which has now been continued for an extended period. This provides analytical opportunities from the perspectives of tourism policy and tourism entrepreneurship. In addition, any framework for analysing progress in ecotourism may also be relevant to measuring the sustainability of tourism more broadly, which is still a contested area of research (Bramwell & Lane, 2008; Gosling, Hall, Lane, & Weaver, 2008; Gosling, Hall, & Weaver, 2009).

Ecotourism is the fastest growing subsector of tourism in Malaysia as recognised by the national government (WWFNM, 1996). The rapid growth of ecotourism globally illustrates an increasing interest in nature and the environment. This is documented in previous research, such as Eagles and Higgins (1998) who note that changes in environmental attitudes, the development of environmental education and the development of an environmental mass media have led to the pursuit of ecotourism. Likewise, enjoying scenery and nature as well as seeking new experiences or places as a form of novelty have been found to contribute to demand for ecotourism (HLA and ARA Consulting, 1994; Wight, 1996a,

1996b). Epler Wood (2002) claims that the main motivations for ecotourism are observation and appreciation of natural features and related cultural assets. Holden and Sparrowhawk (2002) note that the main intrinsic motivations for ecotourists are learning about nature, being physically active, and meeting people with similar interests, while Ballantine and Eagles (1994) believe that ecotourists’ prime motivation is to learn about nature in wild or undisturbed areas. Both Eagles (1992) and Page and Dowling (2002) confirm that both attractions and social factors play an important role in this context.

X. METHODOLOGY

This research will conduct by using qualitative method. Qualitative method are considered by many social and behavioral scientist to be as much as perspective on how to approach investigating a research problem as it is a method. The strength of qualitative research is its ability to provide complex textual descriptions of how people experience a given research issue. It provides information about the ‘human’ side of an issue- that is, the often contradictory behaviors, beliefs, opinions, emotions and relationships of individuals.

This method is suitable to be applying in this research because this research need to be explore and interview the respondent and get more feedback from interview session. In-depth interviews are optimal for collecting data of an individuals’ personal histories, perspectives and experiences, particularly when sensitive topics are being explored. Purposive sample sizes are often determined of theoretical saturation (the point in data collection when new data no longer bring additional insight to the research questions) purposive sampling is therefore most successful when data review and analysis are done on conjunction with data collection. Data triangulation also will be use to validate the reliability.

XI. RESEARCH FRAMEWORK

Research framework describe as the abstract, logical structure of the meaning that guides the development of the study. All the framework are based on the identification of and relationships among key concepts.

Research framework

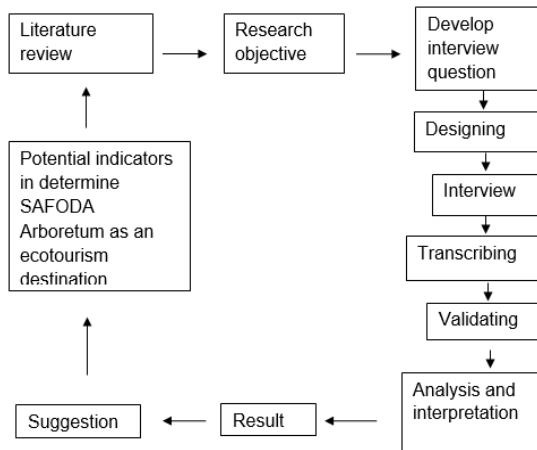


Figure 1: Research Framework for Bukit Gemok

XII. SAMPLING METHOD

Sampling method that will be used in this study is typical sampling method. This technique is appropriate in this study because given that interviewed are aware and familiar with the place and easier to give information to researcher

XIII. RESEARCH SAMPLING SIZE

Sample size in this research are 4 workers of SAFODA Arboretum and 6 local communities

XIV. RESEARCH FINDINGS

A. Potential indicators

Question one and two are for objective number one which is "To determine the potential indicator in develop Bukit Gemok as an ecotourism destination". For question one, majority respondent said that Bukit Gemok had potential in becoming an ecotourism destination, one of the respondent mentioned that Bukit Gemok has been established as an ecotourism destination the respondent said "Bukit Gemok R&D has long been established as an ecotourism destination, but still not many people are aware of this area except tourists who have been involved in our planting activities in our park. Students from local higher institution who have been here are aware of the park's existence".

Indicators is a thing that indicates Bukit Gemok as an ecotourism destination. Researcher obtain 8 indicators from the interviewed which is environment, management, popularity, accessibility, natural resources, facilities and activities.

Indicators
Attraction
Number of visitors
Repeat visitors
Popularity
Management
Activity
Accommodation
Facilities

Figure 2: General Indicators

B. Suggested Activities

The activities offered suitable for public and visitors in Bukit Gemok. Bukit Gemok provided many activities. One of the respondent mentioned, " Lowland Garden walk, recreation, jungle tracking, the waterfall, hot spring, Nature Trail and gallery". Majority respondent said that the activities offered suitable for public and visitors at Bukit Gemok is suit for all ages, especially for family and friends. The respondent also suggested new activities for tourist and visitors in future at Bukit Gemok. Another respondents mentioned, " dance welcoming tourist, canopy walk on trees, kayaking, birds watching and zip lines. This activities can attract people who visit Bukit Gemok because of the beautiful nature.

No	Data collection
1	Activity Bukit Gemok:
	<ol style="list-style-type: none"> i. Bbq ii. Climbing iii. Height Walk iv. Hot spring v. Recreation vi. Jungle tracking vii. Nature Trail and gallery
2	Suggested activity Bukit Gemok in future:
	<ol style="list-style-type: none"> i. Ethnic dance ii. Canopy walk on trees iii. Zip lines iv. Kayaking v. Bird watching

Figure 3: Suggested activities

C. Acceptance level

Majority of the respondent highly agree the Bukit Gemok Tawau as an destination ecotourism destination. This can prove that the respondent say. One mentioned that, "Bukit Gemok had potential to become an ecotourism destination because of the protected forest areas, flora and fauna". As we can see the high level Bukit Gemok get attention around of Asia because of the comments of tourist. Other than that, local community also give cooperate helping the image of Bukit Gemok throughout Asia. Another mentioned, "If given opportunity I would gladly work together to attract tourist to visit this place".

XV. CONTRIBUTION

Researcher would like to thank all of the people who help along with this research and for the respondent who gladly agree to be interviewed and also our supervisor Mr. Tshin Lip Vui that helping us give advised and suggestion to this research. With this 20 activities and 8 indicators that are obtained from the interviewed, researcher hope that it will help SAFODA to becoming an ecotourism destination.

XVI. LIMITATION

- 1) Limitation of time to collect data and to finish the project within 15 weeks.
- 2) Limitation of transportation to go the Bukit Gemok
- 3) The data about Bukit Gemok is limited.

XVII. SUGGESTION FOR FUTURE RESEARCH

This study is about the potential indicators that will help Bukit Gemok as an ecotourism destination. With this 8 indicators will be suggested to SABAH tourism and SAFODA in planning their future plans in marketing strategic.

XVIII. CONCLUSION

For the conclusion, the results showed that Bukit Gemok is accepted by majority of the respondents. There are eight general indicators that has been generated from the interviewed session. There are also 5 activities that has been suggested by the respondents. The results would then be suggest to Sabah tourism and Safoda in planning their management and marketing strategic.

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Salted Fish Dryer

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Abstract - Green technology development is a particularly complicated issue, especially within the context of the built environment. Machine salted fish dryer which exist nowadays has becoming wildly complex system where both natural and social meet. By understanding the sustainability within the surrounding area, the researcher has suggest by using green technology may be one of the way to design machine salted fish dryer that are friendly to the environment. The machine has been design so as no waste energy involve and also by using home nature energy as a source to generate the machine itself. By bridging these idea where no power been consumed, the machine can be operated without cost involved during operational hence for long term will greatly impact the society which involved in salted fish industry.

Keywords—green technology

I. INTRODUCTION

People nowadays are using many techniques in making salted fish. There are varieties of machine in industry that are used for drying the salted fish. The fish are dried in open area where possibility damaged when raining occurred. By using conventional method in drying fish that will exposed to dust, bacteria and also from animal which will result issued to the health and also ergonomic for the industrial operator. The prototype will also can solve when in monsoon seasons where many of the salted fish operator have to settle down during the seasons. These will reduce the production of the salted fish during this period, thus will affect the income salary for the salted fish operator.

A. Objectives

The objectives of this project are:

- To design a salted fish dryer.
- To fabricate a salted fish dryer.
- To analyze a salted fish dryer.

II. LITERATURE REVIEW

The information from the previous finding showing that the product has significant in lack both of ergonomic and health issued[5]. These are the factor

that must be highly focused in order to achieves the objectives. The use of high precision electronic thermostat control temperature in machine manufacturer will result in costing and also increase greenhouse effect.

A review has been studied from existing product where comparison of other product has been made. The concept of the existing system of the machine is to dry salted fish without any contamination especially from the dust and also ergonomic issued, where the operator in salted fish industry has also facing uncomfortable working environment during drying process. This is due to the process which needs the operator to bend the body posture when drying the fish. During raining seasons the operator has to cover up the salted fish from the rain and when the rain stopped they have to start drying from the beginning.

There are few types of machine salted are been review where it have different concept, design charactereristic and function ability.

A. KINKAI Fish Dried

The KINKAI machine KINKAI Fish Drying using quite huge space. The machine features for these types are as follows:

- i. Energy saving & Environmental protection
- ii. Second waste heat recovery technology (patent)
- iii. Exact control temperature and humidity
- iv. Recovery volatilized component
- v. Safe and reliable operation, automatic intelligent control, 24-hour continuous drying.
- vi. Wide application, can be used in agricultural products, seafood, fruits and vegetables, fish, meat, nut, herb, wood drying systems.

B. Electric dried

The electricdried machine feature as Figure 2. required small space compare to KINKAI machine. The machine features for these types are as follows:

- i. Most of the hot air is circulated in the oven, high thermal efficiency and energy saving.
- ii. Positive draft function with adjustable plate to separate air, enables the materials to be dried evenly.
- iii. Wide selection of heating source such as steam, hot water, electronic, far infrared and so on.
- iv. Low noise, balanced running, automatic temperature control, convenient installation and maintenance.
- v. Wide application range, variety of materials can be drying, one kind of general drying equipment.
- vi. Made of high quality materials: carbon steel, stainless steel, product final water content less than 1%.

C. Commercial dried

The Commercial dried feature as Figure 3. Using variety of power supply. The machine features for these types are as follows:

- i. Fruit, food, vegetable and seafood.
- ii. 304S/S industrial food dehydrator.
- iii. Heating way of machine is electric/ gas/ steam heating for your choice
- iv. 60-1000kg/ time.

D. Rotary dried

The Rotary dried feature as Figure 4 can be heating up by using high precisions electronic control. The machine features for these types are as follows:

- i. The use of high-precision electronic thermostat control temperature, drying even better at the same time additional mechanical temperature limiter device, the temperature control system for double protection to ensure the safety of temperature control.
- ii. The use of three-phase power supply models, an increase of phase protection device, safe and reliable.
- iii. The use of high-quality environmentally friendly insulation materials, effectively improve the insulation performance, so energy saving.
- iv. The use of circulating duct, so that the temperature inside the box more uniform.
- v. The use of rotating material rack, so that the material drying more uniform.

B. Design Criteria

The criteria in design the salted fish dryer in Fig. 2 has been promote in good design which focused on smart and tidy design [4]. It also has been design in high safety of factor which is one of the important criteria in term of safety uses. The products also are less in weight which makes it mobile to be located at anywhere. The low cost in developing the product also has been one of the main objectives in order to minimize the bourdon for the operator in salted fish industry.

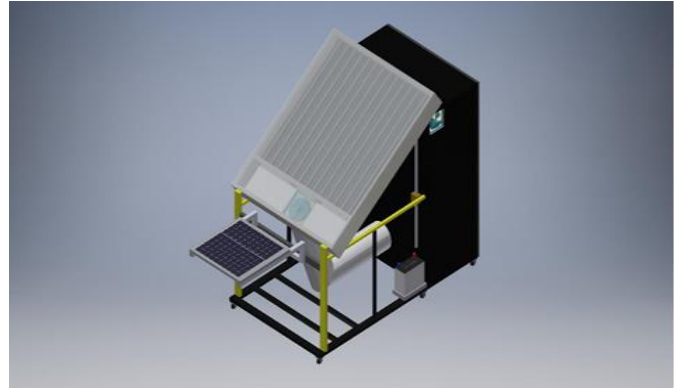


Fig 1 Selected design

III. METHODOLOGY

A. Introduction

Process planning as Fig. 1 has been developed as a guideline in fabricating the salted fish dryer.

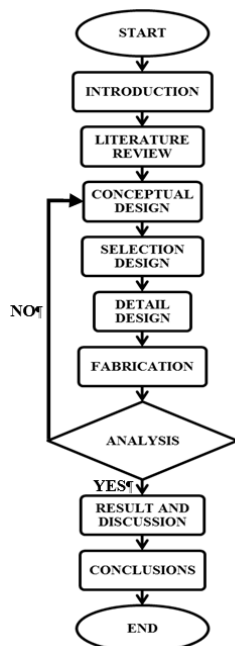


Fig. 4. Process planning

C. Cost Of Material

Table 1 Show the cost for fabricating.

No	Item	Quantity	Cost(RM)
1	Blower	1 (4.5 inch x 5 inch)	45.00
2	Blower	1 (2.5 inch x 2.5 inch)	20.00
3	Glass	1	90.00
4	Cable wire	10 meter	15.00
5	Perspex	1 (40cm X 100cm)	40.00
6	Iron net	14 (60cm X 80cm)	30.00
7	Iron box	1(80cm x 60cm x 140cm)	Used
8	Tin can	135 (radius = 3.5cm, height=10cm)	Used
9	High temp silicon vacuum hose	1	80.00
10	Poly solar panel	1	230.00
11	Others	-	150.00
Total			700.00

TABLE 1 COST

D. Fabrication

The fabrication process in Fig. 3 has been manually obtained by using the design selected earlier during the design selection.



Fig 2 Finish products

E. RESULT AND ANALYSIS

The result from the experiments shows in Table 2 and Fig. 4 has obtained a good result comparing with conventional technique.

TIME	HEAT (°C)		HUMIDITY (%)
	OUTSIDE	INSIDE	
8:00 am	29.4	35.5	85
8:30 am	32.2	39.0	75
9:00 am	28.6	35.2	75
9:30 am	29.5	42.0	63
10:00 am	28.8	39.6	65
10:30 am	28.6	33.8	64
11:00 am	32.4	39.1	65
11:30 am	32.9	52.5	61
12:00 pm	33.4	40.7	62
12:30 pm	32.6	37.1	64
1:00 pm	28.2	35.5	67
1:30 pm	27.3	33.8	70
2:00 pm	27.5	33.0	73
2:30 pm	29.7	32.3	72
3:00 pm	26.9	33.2	72
3:30 pm	27.0	32.7	75
4:00 pm	29.6	31.5	76

TABLE 2 TEMPERATURE RESULTS

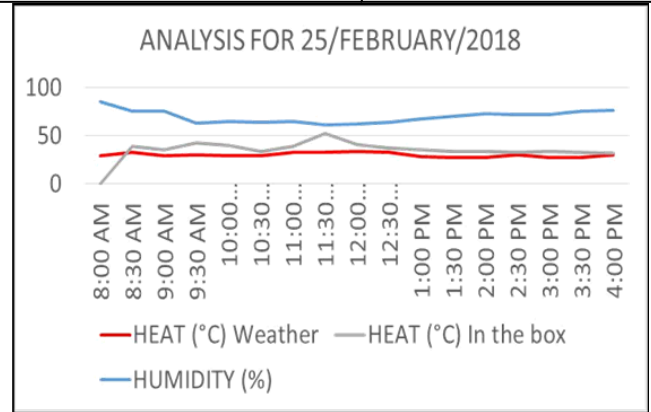


Fig 3 Humidity versus temperature

IV. CONCLUSION

The salted fish dryer has achieved the objectives in designing and fabricating in which the result of dry fish is acceptable for the industry of salted fish product. The dryer of salted fish can dry faster than the conventional technique. The controllable temperature and free from dust also has made it healthier than the open dryer technique. This innovation technique has given a great future for salted fish industry. Hopefully it will give more benefits for the operator in salted industry.

V. DISCUSSIONS

For future, hopefully the salted fish dryer can be introduced widely among the operator of salted fish industry. It is capable to support the salted fish industry to a new era of producing salted fish technique. The product also can be managed and used widely in the industry because of its durability and also its low costing. We believe that the product will be able to support the salted fish industry in terms of its healthiness and more hygiene than open space technique.

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Modulus of Elasticity (MOE) of Particleboard From Oil Palm Stalk/Skewer (*Elaeis Guineensis*)

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Abstract— Oil Palm trees are among many crops that benefit Malaysia. Cooking oil for example was one of the biggest product produced with palm oil. In this paper, oil palm stalks/skewers will be introduce as the main material in producing a particleboard. Oil pal stalks/skewers is a leaf divider attach to the frond. This part of the oil palm is being utilize by residents to produce brooms. But normally most of the oil palm fronds and stalks/skewers are placed in the fields and left to decay. In view of this, the study on stalks/skewer of oil palm was carried out to extend the potential of stalks/skewers of oil palm as a material for the production of particleboard. The additives used for binding agent used of the particle structure of the skewers is Urea Formaldehyde (UF). Bonding can be achieved with a density of 600 kg/m, the weight value for the 542.11g and 96.99g skewers for Urea Formaldehydes. The test that have been done on the production of particle board from the palm oil stalks/skewer are the Modulus of Elasticity (MOE) which was conducted at the Kota Kinabalu Polytechnic Composite Laboratory. As a result of the test, the value (MOE) of particle board of palm oil was 418.583 N/mm. Therefore, the correlation between the value of the MOE and the particleboard from the palm oil stalks/skewer is higher the value of MOE, thus the higher the particleboard in strength.

Keywords—Particleboard, Oil Palm Stalk/Skewer, Modulus of Elasticity (MOE).

I. INTRODUCTION

In a sophisticated era and the modernization involving latest technology diversity, cheaper, high-cost, and cost-effective home-produced materials become very important, including furniture. This is due to the increasing demand and use of furniture. For example, home furnishings such as a dining table, wardrobe and shoe rack are furniture that can be seen in every home. From an observation and reading throughout this study, shows that the production of these furniture is of various sources commonly wood. As being known, wood can produce quality and reliable furniture in terms of strength and finishing. Nevertheless, high quality timber production is declining due to the excessive used of timber with high quality grade.

Therefore, the result of in this study particleboard produced from other sources than timber will be needed for good

furniture manufacturing. In this study, the production of particleboard from oil palm stalks or skewers will be highlighted. This idea is derived from an investigations and previous studies made on particleboard production from wood dust. In addition, this idea is also derived from the potential used of particleboard production in the recent furniture industry, where particleboard can be seen to be expanded as one of a material that can replace or helps furniture industry in producing furniture by using other alternative material other than timber. In this study, procedures on steps to produce particleboard can generally be referred to the previous studies of other researcher. Although the material used by other previous researcher can be seen to be different, but manufacturing of a particleboard will not differ much.

Additionally, the use of additives for the production of the particleboard will emphasize of using Urea Formaldehyde resins. The particleboard produce oil palm stalks/skewer is to be expected to be an alternative wood to make furniture and thus meet the growing needs of furniture.

II. OBJECTIVES

The objectives of this study will consist of three main objectives. These objectives will provide the main target to be achieved during this research. The following shows the objectives expected.

1. Comparison and review of previous related research.
2. Manufacturing of oil palm stalks/skewers base particleboard.
3. Performing the Modulus of Elasticity (MOE) test on the particleboard made.

III. PROBLEM STATEMENT

In this study issues such as the limitation of sources in producing furniture was continue to be an issue which faced by furniture industry in Malaysia. Therefore, in this research paper an idea on using oil palm stalks/skewers has been introduced as an alternative to address the furniture industry issue. Based on observations, the need for timber resources in the country was increasingly limited and expensive. Undoubtedly the demand for quality furniture was well received in the market. Therefore, to produce quality wood products takes a long time. This is due to limited tree cutting in certain areas. In addition,

furniture demand for alternative wood has been limited nowadays. However, on the contrary, furniture is made of quality particles and particleboard in the market recently, is produced from rice husk and wood sawn waste. Therefore, the production of particleboard from this palm oil stalks/skewer can be seen to have the same potential. Furthermore, the sources of oil palm stalks/skewer are more readily available and lesser time needed to be collected. In addition, oil palm stalks/skewer can easily be found and the properties of wood are similar with oil palm stalk/skewer. This allows the study of the particleboard production from oil palm stalk/skewer to be further continued. In conclusion, the problem statement that has been raised contribute to the idea of producing particleboard from palm oil stalks/skewer as an alternative board in this study. Through the fact that more contribution is expected to be available by continuing this research study, it is encourage able that this study research will need to be work on and expectation of positive outcome will be important.

IV. THE RESEARCH SCOPE

The scope of this research study will be focusing on the illustration of the production of particleboard from oil palm stalks/skewer. The production of particle board from the oil palm stalks/skewer will be analyzed and reviewed to identify suitability of the material in this research. Testing will be carried out on the particleboard to determine the level of quality of the product and improvement will be a continuous concern.

Stalks/skewer will be acquired from Palm Oil Company. This oil palm can be also obtained from nearby entrepreneur's oil palm owner and small-scale entrepreneur's owner. Furthermore, the used of additives (Urea Formaldehyde) which it is used as a bonding mixture to the grinded particles with 0.5-1.5mm in length. This bonding mixture will strengthen the bond between the particles.

Finally, the assessment will be performed in order to test and analyze elasticity of the particle board against the environment. This ready-made particleboard will carry out strength tests so that the quality of the material can be improved based on the results of the test. Among the tests carried out on particle board from palm oil skew are the (MOE) Modulus of Elasticity test. This test is conducted to determine the strength of the particleboard strength. Therefore, the correlation between particleboard of this oil palm with the value (MOE) is the higher the value (MOE), the stronger the rate of the particle curve.

V. LITERATURE REVIEW

A. Introduction

In this literature review an overview *all information that has* been derived from previous journals, books, reports and research (thesis) for the study of the production of particleboard from palm oil. In this chapter, investigations will be carried out in relation to the earliest particleboard revenue by analyzing the way of production, the type of material used and the particle structure fastening.

In this literature study will be discussed the comparison between the project to be carried out and the existing partition

board project. This is to determine whether the project is suitable for continued or not. In this research paper, limited references of previous research has been seen to be one of the obstacles and further limited the comparison of related previous and recent research.

B. Defining Particleboard.

"The composite definition is a system of material composed of a mixture or combination of two or more different particle micro and macro boards and their chemical composition bonded to one another". Smith, F William (2000)

Producing particleboard panels requires combining wood particles, such as wood chips, saw dust and rice husks with suitable binders while applying pressure in the presence or absence of heat. (Johnson A. C and Yunus N., 2009)

"The fiberboard is an artificial board made of wood fibers or other materials, with a woven fiber weave with an emphasis on platelets. Adhesive materials or other materials may be added to improve the properties of the board such as mechanical properties, moisture resistance, fire resistance and insects ". (Kollman et al, 1975)

"Particleboard (fiberglass) as an artificial board with a thickness of more than 1.5 mm made of fiber or other ligneous cellulose by enhancing the strength of the fiber comprising the primary bonding of the fiber itself". (Prasetyo, 1994)

"Hard board as a medium to high fiber wood products generally made weighing 1.0. The product is made in flat sheets ranging from 1/6 - 1/2 inches (0.16 - 1.27 cm) thick and can produce various shapes ". (Haygreen and Bowyer, 1989)

"The definition of particle board or fiberboard is one type of composite product or wood panel made of wood particles or other gluten-free materials bonded with adhesive or other adhesive materials". (Maloney, 1993)

C. Materials used in Particleboard Manufacturing.

Stalk/skewer is one of the components in palm oil which is leaf divider attach to frond. Usually, oil palm provides extensive benefits. Among the requirements and the benefits are the brooms, hand fans and additives in paper making. Hence, research finds the most appropriate method of developing the product. There are some comparisons of this material or material with other products. The shape and characteristics of the leaves of palm oil are as shown in figure 5.1 below.



Figure 5.1: Oil Palm Stalk and leaf.

Manufacturing of particleboard various materials including the used of coconut fiber with copal glue as an additives. For example, adhesive as it helps to form the bond between stronger fibers resulting in good board properties. The study chose resin as binder and coconut husk arranged regularly so that composite material was formed, since each composite made from coconut fiber with different value comparison, has different physical and mechanical properties. It can add strength to the particle board. The type and shape of coconut husk is as figure 5.2.



Figure 5.2: Coconut Coir/husk

In other study, selected particles of wood, rice husks and bamboo were conditioned in oven at 60°C during 24 hours, where they reached equilibrium moisture content of nearly 3%. They were used separately or combined in different proportions. In all cases, it was used the urea formaldehyde adhesive (350 cP viscosity and 65% content of solids) – (cP: centipoise) in the proportion of 8% of the particles dry mass. It was still added 1% of paraffin in the same conditions. The particle mass of the particleboards (pure or combined) was represented by 91% of the manufactured particleboard mass loss. (Melo R.R et al, 2014)

The adhesive and the paraffin were added to the particles mass through a pistol triggered by air compressor in a rotating roller. Afterwards, the mass of particles with adhesive and paraffin was taken to a wooden mould with 50 cm × 50 cm × 20 cm, where it was manually pressed. Then, the definitive pressing was carried out in hydraulic press, at 180°C temperature and 3.0 N/mm² pressure. (Melo R.R et al, 2014)

The manufacturing of other non-adhesive particleboard is done by boiling waste materials such as sawdust, sheet form and heat-resistant. The resulting particle board has the physical and mechanical properties that are suitable for interior parts that do not receive high loads. This is because, without using Urea Formaldehyde adhesive, this particle board is also good for health because it does not remove harmful substances or elements. Timber materials used are waste from the wood or agricultural industry. It also functions as a silencer or absorber sound.

Manufacture of particleboard using empty bunches using Aminoplast adhesive consisting of Melamin Formaldehyde and Melamine Formaldehyde, Melanoma Empty Bunch of 20-60 grams of powder with 20 mm length and paraffin. Lowest in density area is found on board particle from debris with heat

treatment of soaking water using adhesive MF. The highest altitude is on board particles from the soaking without powder using adhesive MF. Empty bunches are materials found in palm trees as shown in fig. 5.3.



Figure 5.3: Empty bunch.

VI. RESEARCH METHODOLOGY

In this chapter, this methodology is an area that describes in depth the rules and procedures used in the production of particle board from palm oil skins such as preparation of materials, production processes and data analysis methods.

Therefore, this section will explain the procedure for producing particle board from palm oil stalks/skewer with detailed start with the preparation of materials up to testing.

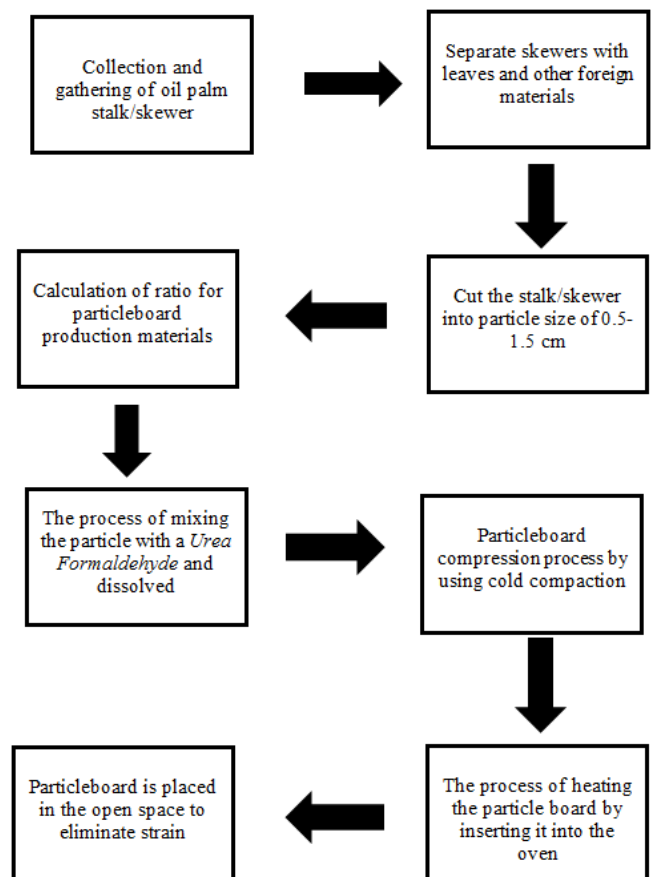


Figure 6.1: Flowchart procedures involved in particleboard making.

Palm oil palms are usually found in oil palm trees and fronds in the vicinity of oil palm plantations. Typically, the leaves and fronds of the palm trees in the flock have not been used. Thus, this stalks/skewer is taken and used to produce particleboard. Palm oil is taken using hand tools such as machetes and knives. After the stalks/skewer has been taken, the stalks/skewer is inserted into saucer and lifted for the next process. Figure 6.2 below indicates that the sputum with palm leaf is put into saucer to make it easy to transport.



Figure 6.2: Oil palm leaf collections.

In this process, after the skewer from the oil palm plantation is lifted, the leaves separation process from the skewers is performed. This process is done manually because it uses an easy knife to cut palm oil leaves. Normally this process takes a long time and requires a lot of workforce to speed up the process. The end of the process will get the palm oil skins needed to produce parcel planks. In figure 6.3 below shows how to isolate the skewer with palm leaves.



Figure 6.3: Separation between the leaf and stalk/skewer.

After the separation of skewer and oil palm leaves, the skids will be cut using a partial cutting machine. This process was conducted at UMS (Universiti Malaysia Sabah). The purpose of partial cutting is to ensure that the bonds between the parties are stronger due to the size difference. However, the work of cutting the stalks/skewers requires those who are skilled in handling the machine. This cutting process is carried out for a week to be fully completed. From figure 6.4 depicted the cutting process of the stalk/skewer which is in progress.



Figure 6.4: Oil palm stalk/skewer grinding process.

Upon completion of the cutting process, the content of water in the particles should be minimized for the purpose of making sure maximum bonding between additive (UF) Urea Formaldehyde and the particle structures can be achieved.

Particles cut with 0.5-1.5 cm size are included in the oven for 24 hours. In addition to minimizing the content of water content, the percentage rate [Ms (Mass of Solid)] moisture content must be monitored and calculated. This data will be used in the calculation of the ratio of the ingredients. Figure 6.5 below refers to the oven used for the drying process of palm oil particles.



Figure 6.5: Oil palm stalk/skewer drying machine.

This process is done when all calculation works required are determined. After the actual weight of the materials used in the production of particle board from the oil palm stalks/skewer, the materials are added in a special case for the purpose of mixing the particle with UF (Urea Formaldehyde).

In this process, the skewers must be mixed with restrictions to produce a sturdy and physically strong board. This process takes 15-30 minutes to ensure that the grout is completely uniform. Figure 6.6 depicted an ongoing process of mixing of grinded stalk and Urea Formaldehyde (UF) as additive.



Figure 6.6: Oil palm stalk/skewer mixing with UF resin.

After completing grout mixing and flattening stage, the mixture of the skewer will be compressed by using an arm compression. Arm compressor is a tool for suppressing particles materials using human energy. The pressure applied to this particle material is intended only to facilitate the work of forming the desired board before being put into a cold compressor. After the particle material being mold into square-shaped, the boards will be inserted into the cold compressing machine. In this process, the board will be left uncompressed for 3 hours to strengthen the bonding of oil palm skewer structures. Figure 6.7 below refers to human compaction and cold compaction.



Figure 6.7: Stalk/skewer human compaction



Figure 6.8: Stalk/skewer cold compaction.

In this process, the compressed board is inserted into the oven for the purpose of creating strong bonding between the additive (UF) and stalks/skewer. This process is done within 30-60 minutes. After that, only the oil palm particle board is

removed and placed in a non-exposed area with moisture and water before drying the maximum particleboard. The oven temperature used is 110 Celsius. Figure 6.9 below shows the compacted board.



Figure 6.9: Particleboard after compaction was done.

VII. ANALYSIS

A. Modulus of Elasticity (MOE) testing.

In the analysis, 10 samples of the size 32cm long and 5cm width particle board were prepared for the Modulus of Elasticity (MOE) test and then results are obtain from particle board produced from oil palm stalk/skewer. This results was then analyzed and further conclusions will be made on the answers or results obtained.

A series of work methods were done after the production of particleboard. In this flow chart gives a slight picture of the processes performed before and during the Modulus of Elasticity (MOE) testing. Figure 7.1 shows the flowchart of testing performed on particle board from palm oil stalks/skewer.

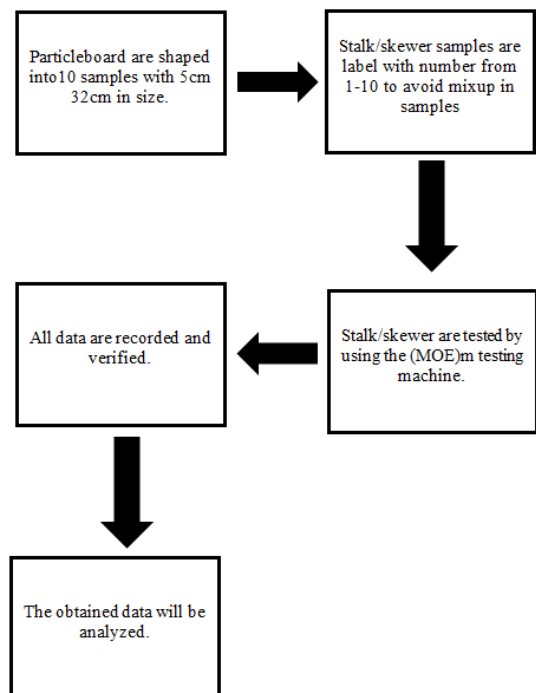


Figure 7.1: MOE flowchart procedures.

The sample will be cut at a uniform size of 5cm x 32 cm before testing. The sample taken from particleboard is 2 pieces to determine the average value (MOE). At the same time the preparation of this sample was made after the board and (UF) binding evenly between the particles. Figure 7.2 below shows the sample of particle board from palm oil prepared.

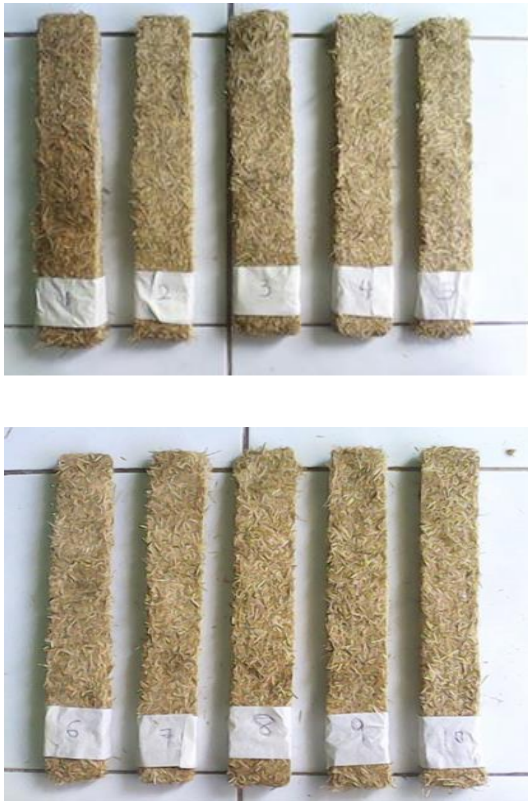


Figure 7.2: Particleboard samples for testing.

Samples that has been divided into small pieces with 5cm x 32cm in size. The sample was the numbered or label to avoid confusion during the testing process. After finishing with the marking the process for every sample, testing process can be made with the first sample by using the I Mal machine to get the value of Modulus of Elasticity (MOE). The observation result shows that data from the testing machine. The data observation value are illustrated from table 7.1, shown as below.

Table 7.1: Modulus of Elasticity (MOE) data results.

Sample No.	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Force (F)	Elasticity Strength (N/mm)	Modulus of Elasticity (N/mm)
01	320	50	10	122.67	20	1.32	510.45
02	320	50.33	10	122.67	20	1.32	511.28
03	320	50.01	10	122.60	20	1.32	509.71
04	320	49.52	10	122.65	20	1.32	511.50
05	320	47.90	10	122.67	20	1.32	490.03
06	320	50	10	122.05	18	1.04	318.34
07	320	50	10	126.10	18	1.04	358.39
08	320	50.02	10	126.01	18	1.04	321.12
09	320	48.34	10	125.69	18	1.04	345.51
10	320	50.34	10	126.99	18	1.04	309.10
Average							418.543

The data analysis is the result of the test that has been done compared to the predetermined particleboard standards. In a value comparison (MOE), a reference to Malaysian Standard Testing has been acquired. Table 7.2 shows the standards reference for MOE testing.

Table 7.2: Malaysian Standard Testing for MOE.

MALAYSIAN TESTING STANDARD	
MOE	> 2000

As a result of the testing performed the on particle board from the oil palm stalks/skewer it was found that the value (MOE) obtained were 418,543 lower than the prescribed standard of > 2000.

Therefore, studies have been conducted on particle board failure factors through the MOE Modulus of Elasticity. Accordingly, the reasons for the cause of the particleboard failure are:

- Particleboard does not pass through heat compression using a hot compressor.
- Formaldehyde urea oil and additive (UF) urea compound are not fully integrated.
- Need to add additives to produce stronger particleboard.

In this regard, the project of particleboard production of this oil palm can be continued by adding appropriate processes and materials to produce new boards, strong and according to specified standards.

B. Secondary mixture testing

Additive testing is a test carried out to the additives or binders of the particle structure to produce a good particleboard. In this test, no data will be obtained because this test is based on data from table 7.1. This experiment will analyze the data from table 7.1 and summarize the additive. Figure 7.3 shows the addition of urea formaldehyde (UF).



Figure 7.3: Urea Formaldehyde (UF) resins.

Experimental materials to be carried out are (UF) Urea Formaldehydes. This material is an additive (binder) in the production of particleboard from palm oil stalks/skewer. There are some content or items in the Urea Formaldehydes solution. Table 7.3 shows the items contained in Urea Formaldehyde (UF).

Table 7.3: Characteristics in Urea Formaldehyde (UF).

CHARACTERISTIC	UNIT	ANALYSIS
Viscosity	Cps	10.5
Specific Gravity	-	1.1950
PH Value	-	7.8
Free Formaldehyde	%	1.22
Pot Life	Min	76
Gel Time	See	-
Solid Content	%	50.9
Water D. Index/Miscibility	30c/25c	-

Table 7.3, above states the items contained in the Formaldehyde Urea. This material has been selected as an additive in the production of particleboard from palm oil as the result of observations and comparisons in that has been described in literature studies. Observation revealed that the addition of Urea Formaldehyde is suitable for the production of particle boards from palm oil because of the physical properties of the palm plant that affects it.

In addition, the use of Urea Formaldehyde (UF) as an additive is easy to obtain from the SEPANGAR CHEMICAL INDUSTRY Sdn Bhd, factory. At the same time, other additives such as (FH), Coal Lem, and others are not provided. Therefore, the use of Urea Formaldehyde (UF) additives as a binder will be used in this research study to produce particleboard from oil palm stalks/skewers.

VIII. SUMMARY.

In conclusion this research shows that the production of particleboard from palm oil stalks/skewer will need to be continued in order to achieve better particleboard. In the first objective, achievement has been made, where review and comparison between previous related researches can be made available through journals, conferences, and reports. The second objective was achieved with the production of several samples of particleboard from oil palm stalks or skewer which going to be tested. In addition, the third objective provide insight of ways to determine appropriate strength evaluation of the skewer particle structure. In the test, it is concluded that the project of particleboard produced oil palm stalks/skewer

would have critical potential based on the result of (MOE) value shown. By adding more additives in the bonding process, thus resulting an increase of strength to the particleboard structure.

All efforts have been made based on many reference of particleboard production by using different kind of materials including paddy husk, wood dust and oil palm bunches. The result is that the research was successful and can be improved from time to time with the addition of compression processes in order to have greater structure strength and compaction level. In addition, the process should be done according to the weight which need to be calculated according to the correct amount. Additionally, balance mixture of additives can greatly reduce the weakness of the oil palm stalks/skewer based particleboard.

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The Effectiveness of Producing Honeycomb Table for Kids

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Abstract - Honeycomb table is a project performed intended to create product that has uniqueness and able to attract the attention of a children as well as to facilitate the children during learning process. This project be produced because the idea that broke out when see the table for children that has form of insects nest. Therefore, the decision was taken to produce table that has a variety of nest shape but for the innovation of this product, the honeycomb was used as addition to make sure the table looked more unique and different from the table that found are out there. In addition, the project was produced is intended to solve the identified problem of by seeing and knowing that the study table for the learning process of children in kindergarten or out there are too brief in terms of pattern and there is no difference. Besides, this product is produced specifically for children aged between 4-6 years because the product is functional for used of children during their study.

Keywords— uniqueness, kids furniture, cognitive, innovation

I. INTRODUCTION

Children naturally love learning because they are naturally inquisitive. A child finds wonder and excitement in discovery. A child feels the thrills of learning something new and being amazed at what he or she had known before. There is a natural appetite for learning that is ravenous. A child wants to take inasmuch as they can from their environment, especially when the environment is rich with new things to discover. This is why nature is so intriguing for children. Everything must be inspected compared, and understood.

Now a child is a child and not an adult, thus there are distinctions that are both childlike and wonderful. A child's imagination is not limited by the constructs of reality. A block of wood becomes a steamship. A paperclip can be big enough to move a house. A child's minds free to create whatever he or she desires and a child often sees creative solutions to complex problems because he or she doesn't worry that it functionally can't work or has not been done before. A child's mind is free and thus has much more creative potential than many nature adults. Playing is the nature of children. Play is also a key activity in the development of children from physical,

intellectual, social and emotional. For children, play is a way that allows children to learn and recognize the environment or her word through exploration, simulation, role-playing, manipulation and tools. Play is an organized and structured approach to provide opportunities for children to learn in an environment that is not so formal but fun and free. Through the play, the children will get the experience that will give a good and beneficial impact on their learning. In the event be held activities are part of play for child, teaching and learning process is more effective if the education of children is based on the activity of play. Through play, children can learn more about the environment and understand the things that happen around them. As an instance of an activity that the child will do is like compile a table according to their creativity especially the table has a unique design. Furthermore, the materials and equipment used by children shall have the right size and height according to their suitability.

Furniture such as chairs and tables should correspond with the child so as to provide comfort to them because it is one of the important things during learning process. When children enjoy and embrace the about something that can give the benefit, they will be more likely to participate in leaning.

II. PROBLEM OF STATEMENT

Generally the table design in kindergarten at present is now less attract the attention children because the order too brief and there is no uniqueness. The child in kindergartens is often performing various activities. Among the activities performed dancing, painting, crossword puzzles, playing cards photos and so on. Play is a form of art children. It is a method to expressing feelings and the cause to get pleasure and joy. While doing the activity, they need wide space. By the arrangement with honeycomb table can be used in kindergarten to develop communication skills in children. With new product, table that produced can be moved and shaped to facilitate guardian and users to laying out the table during learning process or during class tidying.

The learning process for children in kindergarten less creativity to create something new in terms of their learning. This is one of the factors for to make this product. Based on the concept of creativity, it can be said that creativity is ability of a person for process information to produce a novelty and native. The concept of creative thinking was focused on the number of

entities that one can do something in a unique way. Moreover, someone also can think further from the normal thinking or independent of the same pattern. By producing products that have features of distinctive creativity, the children can incorporate the existing of ideas to the formation of a new idea. Besides that, they can create big ideas to small ideas. In addition, most of the table is in kindergarten usually just having a brief pattern and less attracted the attention of children.

The objective of this research are to produce the honeycomb table for kid

The aim or this study is to improve the function of the new product that produced and commercialize the product. Static table could not attract the attention of children for more enthusiastic during leaning system is carried. Such that not even a renewal for children. Therefore, the innovation of a new product is doing to ensure the more flexible product so as to give many benefits to children.

Through the product that will be produced, we can understand and practice all the working of finishing products such as paint, distinctive design and creativity to be derived from the research. Then, we can also learn more knowledge about children in kindergarten. For example, in terms of child care, their thinking and so on. Besides, at the same time, through this study we can learn to create innovative products using materials. For example, we use the space hexagon that can a variety of functions for the products that we produce.

This project will be test at kindergarten and pre-school. This place is become the preferred choice because the product are appropriate with the specified place. Furthermore, the manufactures of this product use block board.

III. LITERATURE REVIEW

A honeycomb is a mass of hexagonal wax cells built by honeybees in their nests to contain their larvae and stores of honey and pollen.

Beekeepers may remove the entire honeycomb to harvest honey. Honey bees consume about 8.4 lb (3.8 kg) of honey to secrete 1 lb (454 g) of wax, so it makes economic sense to return the wax to the hive after harvesting the honey, commonly called "pulling honey" or "robbing the bees" by beekeepers. The structure of the comb may be left intact when honey is extracted from it by uncapping and spinning in a centrifugal machine—the honey extractor. If the honeycomb is too worn out, the wax can be reused in a number of ways, including making sheets of comb foundation with hexagonal pattern. Such foundation sheets allow the bees to build the comb with less effort, and the hexagonal pattern of worker-sized cell bases discourages the bees from building the larger drone cells.

Broodcomb becomes dark over time, because of the cocoons embedded in the cells and the tracking of many feet, called travel stain by beekeepers when seen on frames of comb honey. Honeycomb in the "supers" that are not allowed to be used for brood (e.g. by the placement of a queen excluder) stays light-colored.

Numerous wasps, especially Polistinae and Vespinae, construct hexagonal prism-packed combs made of paper instead of wax; in some species (such as *Brachygastra mellifica*), honey is stored in the nest, thus technically forming a paper honeycomb. However, the term "honeycomb" is not often used for such structures. (Graham, Joe 1992)

Children naturally love learning because they are naturally inquisitive. A child finds wonder and excitement in discovery. A child feels the thrill of learning something new and being amazed at what he or she had not known before. There is a natural appetite for learning that is ravenous. A child wants to take in as much as they can from their environment, especially when the environment is rich with new things to discover. This is why nature is so intriguing for children. An entire world can be found in an anthill, under a log, or in a tree. Everything must be inspected, compared, and understood.

Children learn most naturally through imitation. From infancy, a child hears words and imitates them, sees movement and tries to mimic it, and observes life and seeks to play it. Imitation is the most natural mode of learning for all children. When a child is educated through imitation, then one is cutting with the grain and the child will enjoy learning, learn faster, and bear much fruit in their education. (Danny Breed, 2015)

According to Caplan and Caplan 1973, playing as an important determinant for the development of character, energy, emotional stability, social and intellectual development as well as to develop physical strength, coordination and agility of a student. The game can also give thoughts about justice, and equality regulations and strengthen the ability to think in different ways. For example, physical activity done in the classroom. Through game that involves racing for example.

Also playing is a form of artistic children. It is a channel for expressing feelings and cause for joy and fun. Almy (1984, Fagen) said children playing in direction by themselves without taking into account the purpose of playing. While playing, they are free from all rules. Through the game, children get new behaviors. Children engage actively in the game. What are submitted by Almy appropriate with a view Rubin, Fein, and Vendenberg (1983)

Design is a process for building materials such as printed modules, instructional videos, teaching computer software and multimedia material. In short, instructional design starts from the design process so that the process of building materials. Dick and Reiser (1988) said instructional design is a process to design, develop, implement, and evaluate teaching activities in a systematic and planned manner. Reigeluth (1983) also describes the instructional design is more focused on the methods of teaching as a discipline which attaches importance to the understanding, improvement and application of teaching methods. In the present era, the era of modernity, the design is in accordance with the opinion Richey (1986) say that it is a science to create specifications detailed teaching for the development, evaluation and maintenance for a condition that facilitates learning and lastly, the definition for Gustafson (1991) is a process that is done systematically for the design, construction activities and materials, evaluate and use the entire teaching process

Innovation is a new invention that is different from existing or previously known. Person or entrepreneur who always innovate, then it Pat said as an innovative entrepreneur. Innovative someone will always try to make improvements, presents something new different unique with existing ones. Also innovative is important for the attitude that should be owned by an entrepreneur. Entrepreneurs always do in innovation. The profits and success will it be. Innovative entrepreneurs are the implications of the characteristics that can lead to changes in the surrounding environment. Innovative indirectly to the nature of the difference between entrepreneurs and ordinary people, and entrepreneurs. An entrepreneur will always think of to do something different, not as well thought out and done by most people. Creative and innovative is the ability to move resources to less productive to productive resources to provide economic value. Either directly or indirectly, an entrepreneur is someone who can make a difference in their environment. On the other hand, it is also people who are willing to accept the changes and those changes with a positive attitude. It is also willing to take the risk of success or failure in every way that he took. Entrepreneurs are able to survive in difficult economic conditions and frantically paced. Because when all restless, he has creativity and innovation to move less productive resources into productive resources that provide economic value.

Everett M. Rogers (1983) defines that innovation is an idea, practice or object / objects are recognized and accepted as a new thing by any person or group to be adopted.

Stephen Robbins (1994) defines innovation as a new idea applied to initiating or improving a product or process and services. Based on such understanding, Robbins focuses on three main issues, namely:

1. The idea of a new process to think in observing a phenomenon that is happening, including in the field of education, new ideas can be a discovery of an idea thought, idea, until the system is likely to crystallize ideas.
2. Products and services are the result of the next step of their new ideas followed up with a variety of activities, studies, research and experiments that gave birth to the concept more concrete in the form of products and services that are ready to be developed and implemented as a result of innovations in the field of education.
3. Efforts to improve the systematic effort to make improvements and repairs (improvement) of continuous innovation so that the fruit could be useful.

a) Choosing Appropriate Chair and Table Sizes for Students

Children are more likely to pay attention and are more open to learning if they are comfortable during class. You can positively influence the overall learning environment in your

classroom by choosing chairs and tables that are the right size for the children in your care. At Kaplan Early Learning Company, we understand that figuring out appropriate chair and table heights can be confusing and a little frustrating, which is why we have created some simple guidelines for you to remember as you choose chairs and tables for your classroom. (Hal Kaplan, 1968)

i) How to Choose the Appropriate Chair Size for Students?

Chairs are available in a variety of sizes, designs, materials, and finishes. Be sure to pick chairs that will be comfortable for children to sit in while also complementing the other furniture in your classroom. A general rule to remember when you are trying to determine a suitable chair size is that children's feet should be able to touch the floor when they sit back in the chairs.

Appropriate chair seat height is often based on children's age, but you should also research any state licensing or accreditation requirements on chair size you may have to meet. You can use the chart at the bottom of the page to help you choose comfortable chairs for the age group in your care.

ii) How to Choose the Appropriate Table Size for Students?

The general rule for tables in early care and education classrooms is the space between the seat of the chair and the underside of the table should be 7-8 inches. That is just the right amount of space for children to be able to fit their legs under the table, and it also ensures that the table is low enough for children to comfortably rest their elbows.

When picking out tables, you should also consider any special needs students who are in your class. If a child is in a wheelchair that does not have a built-in table, they will need a table in the classroom that is high enough for them to sit at comfortably. Licensing and accreditation regulations may also play a role in which table size is appropriate for your students.

You should mainly focus on the table height, chair seat height, and children's age when deciding which table size is the right fit for your students. The chart at the bottom of the page makes chair and table recommendations based on those three factors.

Some kids need movement to concentrate, which is why ergonomic Hokki stools and other similar seating options are a popular way to help students pay attention. Read product descriptions for age recommendations when considering alternative seating options. Recommended age groups for Hokki Stools are 3 - 4 years (12" stool), 5 - 8 years (15" stool), 9 years - adult (18" stool), and adult (20" stool).

Remember that these guidelines won't necessarily work in every situation, because there are no one size fits all for classroom furniture. This is an especially true statement for tables and chairs because children are a variety of sizes and heights at any age. Be sure to browse our Furniture section to

view our diverse selection of tables, chairs, and alternative seating.

Table Height	Age	Chair Seat Height
12"	6 – 15 Mo	5"
14"	12 – 24 Mo	6" 9"
15"	18 – 236 Mo	7" -9"
16"	2 -3 Yr	7" 10"
17"	2 -3 Yr	7" -10"
18"	2 -3 Yr	8" -12"
19"	2 -3 Yr	9" -13"
20"	4 – 5 Yr	10" – 16"
21"	4 – 5 Yr	11" - 17"
22"	4 – 5 Yr	12" -18"
23"	4 – 5 Yr	13 " - 18"
24"	6 - 8 Yr	16" - 18"
25"	6 - 8 Yr	17" - 18"
26"	8 Yr	18"

Table 1 : The chair seat height of sample age

f) Block board

The composition of block board is very different from other engineered woods such as plywood, MDF (Medium-density fiberboard) or Particleboards. It is made from solid blocks of wood at its core, sandwiched between layers of wood veneer (usually single layer of ply) on both its front and back faces. The difference in the way block board is made, gives it interesting characteristics and functionality. The advantages and disadvantages of block boards are listed below. Abhijit Phadke

i) Advantages of Block board Lighter in weight:

The block board core is made from solid blocks of wood that is usually obtained from softwood trees such as pine, mango or cedar. In comparison good quality plywood is often made from veneers obtained from hardwood trees (e.g. Gurjan wood which is very popular in India), and the high quality solid wood that is used in furniture is generally obtained from hardwood trees such as teak wood.

Because hardwood is denser than softwood, its weight is also more. So if you take a piece of plywood or solid wood and compare its weight with a block board piece of the same size, you will find that block board is lighter in weight.

The advantage of being lightweight is that it can be more easily transported to the end- location. The most common application of this is in the case of doors that we use inside our homes. Doors are very often made from block board.

Lesser tendency to sag or bend

In cases where very long pieces of wood are required in furniture making, such as in long bookshelves, panels, benches and tables, block board is often preferred over plywood. This is because long plywood pieces tend to bend in the middle, whereas block board is stiffer and less prone to bending. When the board length exceeds 6 or 7 feet, block board is generally used instead of plywood.

Costs Less

Another important advantage of block board is that it is cheaper than good quality solid wood as well as hardwood plywood. This is because softwood costs lesser than hardwood.

Better than Particle Board and even MDF

Compared to other engineered wood products that are popular these days, such as Particleboards (which is made from small particles of wood flakes/chips) and even MDF (which is made from wood fibers), block board is considered to be better. It is comparatively stronger and lasts longer. Also from the carpenters' point of view, the added advantage of block boards is that it is easier to work with, since it can take nails as well as screws. In comparison, particleboard and MDF do not have much nail holding strength and hence only screws are used on them. In fact, most of the carpenters in India who make custom-built furniture work only with plywood and block boards, and not MDF or Particleboards.

ii) Disadvantages of Block board

Not as strong as plywood or good quality solid wood

The major disadvantage of block boards is that since softwood is used in its making, it is not as strong as quality solid wood (such as teak wood) or hardwood plywood. So when it comes to furniture making, plywood is the preferred choice of material (except for cases where lengthy wood pieces have to be used). However, if instead of softwood blocks, hardwood is used to form the block board core (some manufacturers do this), then the strength of the block board increases.

Minor disadvantage for carpenters

In some cases, the blocks (also called strips or battens) that form the core, may have small gaps between them. These gaps cannot be seen from outside since there is layer of veneer on top. Because of this, sometimes the nails that are driven through the board surface may not go into the wood but rather in the gaps between the blocks, which can adversely affect the holding strength of that nail. However, this is only a minor drawback that occurs only sometimes.

b) Edge Bending

An edge banding machine has: a glue-applying unit including a glue container mounted on a mounting plate, and a glue-applying roller rotatable relative to the glue container; a transmission unit including front and rear conveying wheels

and a transmission member connected between the front and rear conveying wheels for driving the glue-applying roller; and a feeding unit including two juxtaposed vertical rods disposed on the mounting plate and spaced apart from each other by a passage distance, and two elongate projecting blocks spaced apart from each other by a distance that reduces gradually in a direction toward the front conveying wheel. The projecting blocks are spaced apart from the vertical rods by a gap distance. A ratio of the gap distance to the passage distance is not more than four. (Chin-Chi Lin, 2013)

IV. METHODOLOGY

This section describes the methodology of the project. The methodology is a description of each work to be done.

a) Process Flow Chart Product Generation

Flow chart is a process that can explain every step that will be conducted in manufacturing a product. It starts with generation of ideas, study research, and material provision until the product being installed.

This chart can help in giving up a picture about the task that will be carried out in order to ensure that the work will done smoothly and orderly. A part from that, this move can help one determined duration that need to be taken to every process that is carried out.

Manufacturing Flow Chart Of Honeycomb Table For Kids

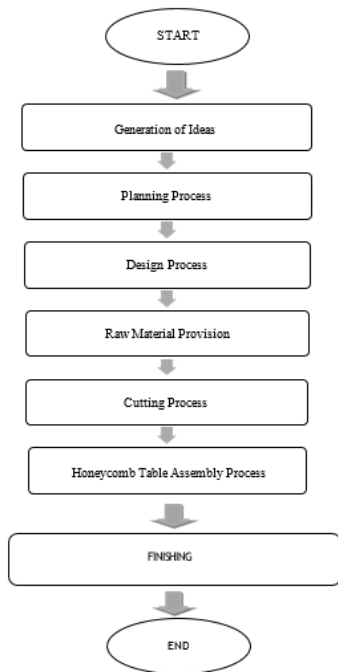


Figure 1 : Flow chart of making the Honeycomb Table For Kids

b) Material Tools and Machine

The machine that we using is table saw to cut every part of Honeycomb Table. After that, we use sander machine to make top and wall of honeycomb table smooth. The screw driver are also needed to assemble every part of honeycomb table after make a finishing.

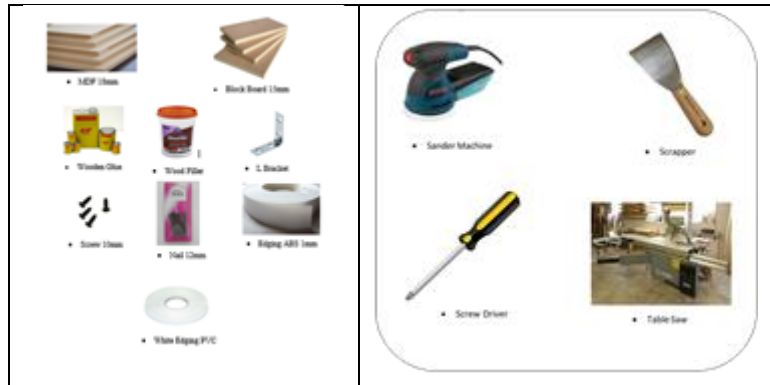


Figure 2

c) Material preparation and cutting process

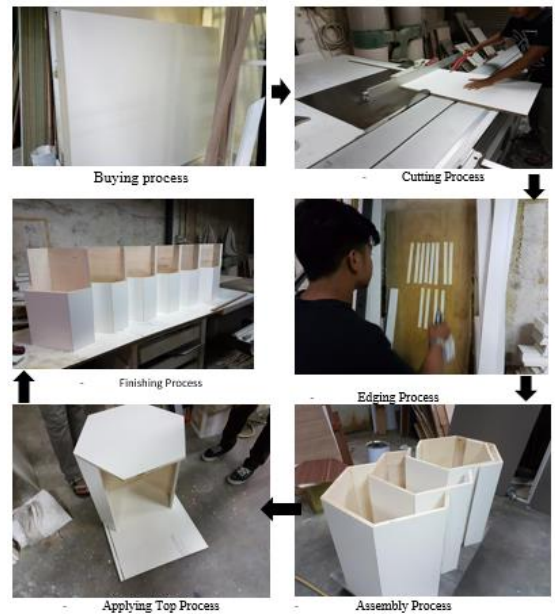


Figure 3 Work progress

V. RESULT AND DISCUSSION

A good features and quality product desired by the users. They are practically, logical or convenient to use. The product that was produce must be able to provide benefits to consumer where the product has a lot of style. In additional, the product

must look interesting in order to attract the user attention. For example, the product design must have ideal characteristics either in term of design, pattern, size or shape that comfortable and useful to the users

Besides that, the safety features also highlight in this project. The quality product also safe from any harm occurred towards the user. Safety features incorporated in the design as not sharp on the corner of the product that might cause injury.

To ensure the quality of the product is good, data analysis is carried out to find out the percentage of respondent that support the product. At the same time, we could know the pro and cons of our product as well as opinions and views from the respondent that can help to improve our product.

a) Result from survey form

No	ITEM	NS	AV	S	VS
1	The material used are suitable for kids product	0	75	25	0
2	The functions of the product ideals for kids	0	75	25	0
3	The quality of the products satisfied the user	0	50	25	25
4	The unique of product designable to attract kids attention	0	0	75	25
5	This product is concern about safety for the user	75	25	0	0
6	Overall, is this a good product to improve their creativity and increase their interest in learning process	0	25	50	25

Table 1 Pai Chart for Honeycomb table for kid

On the first question, we can see that 25 percent of respondent satisfied, 75 percent of respondent said average for the material suitable used for kids product. This is because block board is not too heavy for kids to use, while respondent says might disagree because they fell block board do not have attractive looks and color that can attract kids.

On the second question, all of respondent do not agree that the color of the product that we produce able to attract kids attention. Respondent say that maybe because the color that we use on kids furniture to plain and they prefer we use a different of variety color on the product. Furthermore have to use the different color on every unit to make the product more unique suggest respondent.

Based on the third question, 25 percent of respondent said satisfied, 75 percent of respondent say average for the function of Honeycomb Table that we do that can play, dining and sitting area. This may be because they are prefer to use a furniture product type that is able to eat, sit and play.

On the fourth question, respondent who said very satisfied is only 25 percent, respondent said only 25 percent satisfied and 50 percent of respondent said average to our product is not suitable about our products. This may be because due to their lack of knowledge about our product.

For the fifth question, no respondent who say not satisfied, but there are respondent who said that 25 percent very satisfied, 75 percent respondent say average because the shape of our product is able to attract kids attention. In addition, our product can be arrange to the different arrangement follow the kids creativity.

For the sixth question, 25 percent of respondent said average, and 75 percent of respondent not very satisfied with the product concern about the safety for kids to use. This may be because the edge of our product is too sharp for kids to use. We need to make the edge of our product a bit curve to avoid accident from happened.

On the last question, about 25 percent very satisfied with this product and 25 percent of respondent say average. 50 percent respondent satisfied with the quality product of product to improve their interest in learning process. This may be because to product can be arrange follow their creativity and also this product also help to develop a good nature in learning process

b) Discussion

Throughout this project period, discussion of the final project is one of the important factor that intended to achieve the objective. The main objective of this project is to produce a Honeycomb Table for Kids whereby can easier for kids to use in their learning process. This is because, before the innovation is done, the common table for kids only has a simple design and unable to attract attention of kids.

In this study, the block board is used to produce this project because the Block board have a light in weight and easy to handle. In this project, we use nail gun to attach the part of the Honeycomb table together.

In addition, at the edge of the tabletop we use PVC edging to prevent from injured from happen, while on the chair we use rubber edging. We also use sending paper to make a surface of Honeycomb Table is smooth.

VI. CONCLUSION

The design and produce a Honeycomb Table For kids in the three month of study is really worth it for Final Semester project. By manufacturing and producing Honeycomb Table for Kids is quite challenging and complicated process that required to achieve the goals in making it that needs fairly long period of

time. It does not like easy as ABC what we think before. Common existing Table and Chair for kids in market we had improved and upgraded the design and safety needed to attract kids attention toward the product.

Throughout the process of making Honeycomb Table for Kids, we had experience variety of problems and solved all the problems by ourselves in helping of supervisor. Meanwhile, we are able to train to make fast decision and manage the project so that it runs smoothly as we planned.

Thought this project, we are able to learn to develop critical thinking skills as well as technical skills so that will confident to further studies at higher level or to involve in the challenging work environment in globalized world that full with commitment and responsible. We are believe that valuable experience can be used later in our future career.

Therefore, our objective to produce Honeycomb Table for Kids whereby can help kids to improve their interest in learning process are achieved.

a) Recommendation

Having successfully produced Honeycomb Table for kids we can see from some of the aspect of improvement, such as the color of product and the edge of tabletop and chair the to be a bit more curve to prevent injured. At present, our product used a bit too plain on color because we the original color of block board. Thus, improvement can be made is to color every unit with a different color. This is because, if Honeycomb table with no color it will affect the kid's attention on their learning process.

Furthermore, the improvement that can be made again is like putting a stabilizer on table and put the rubber edging on the tabletop and chair edge. This is because, if not put stabilizer, when the kids when to sit on the chair they will push the table and this will make the table fall and injured will happened.

Next, among other improvement that can be made is to make a hole at the left and right side of table to easier for kids to move the table. Also at the side of table, we can attach the hanger pin, because kids can hanging out their pencil box. From suggestion that we get from respondent, this product also suitable for adult to use as a meeting table.

Finally, by modifying as describe above, the Honeycomb Table for Kids product will like more attractive and safe that the existing for kids to use.

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An Experimental Study to Produce Green High Early Strength Self Consolidation Sustainable Concrete

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Abstract— Polyethylene Terephthalate (PET) are recyclable materials and calcium carbide (CaC₂) are waste from landfills which can be recycled in Malaysia. However, PET and calcium carbide has not been used in producing the Green High Early Strength Self Consolidation Sustainable Concrete (GHESSCSC). The present study deal with the development of GHESSCSC incorporating with PET as additive in the concrete and calcium carbide as a concrete binder. GHESSCSC were prepared with PET, calcium carbide and two different type of high range water reducer (HRWR) that called plasticizer and superplasticizer. In this study, concrete have been mixed with 0.5% PET by weight of concrete, 50% calcium carbide and 1.5% high range water reducer (HRWR) by weight of cement to the concrete mixture. For this study, cube compression test and flowability test was done. Size mould cube which are used is 150mm × 150mm × 150mm and the cube compressive strength was tested at aged one day. Revenue from tests make have pointed out that PET and calcium carbide is successfully to achieve the green high early strength of the concrete value on grades 20 that is 26.58 N/mm² at the age one day. For the flowability test, the diameter for GHESSCSC is 630 mm, while for ordinary plain concrete is 440mm. Diameter 630mm shows the condition of the concrete is workable and according to specifications.

Key words: Polyethylene Terephthalate PET, calcium carbide, green high early self consolidation sustainable concrete and superplasticizer.

I. INTRODUCTION

The total cost of temporary works for normal project costs 20-25% of total cost and sometimes-even 30-35% for complex projects so there were various problems related to economy in the construction work and time taken for the construction work. If temporary works usage time for particular component is more and if the concrete doesn't gets strength earlier so that temporary work can't be used for next component so more temporary work structures are to be purchased so fund that should be used in some other important task are blocked in that temporary work so economy is not achieved. In addition, if the concrete component does not gain strength earlier it will consume more time so as a result time consuming.

So by addition of proper superplasticizer if this study are able to achieve the strengths earlier means if for casting of any concrete component of building if it takes 7 days for casting and if this study are able to achieve high

early strength at 1 days by that superplasticizer so our problems will be solved and this study will be benefitted. Therefore, by addition of that artificial superplasticizer it will help the same concrete mix to achieve high strength earlier and same strength as that of normal mix design at the end of 28 days. So this study able to get success in both the task of economy as well as reduction in time consumption hence it will be revolutionary work in the field of construction and will help many people related to construction activities like contractors, engineers in terms of economy, and residents or to purchaser it terms of early possession of house.

The type and improvement in early strengths is dependent upon the usage of superplasticizer and the type of mix used but mainly on the superplasticizer. In addition, it is using for various construction works such as shot Crete repair, poles, parking garages, and agricultural applications. High-early-strength concrete is used for pre-stressed concrete to allow for early stressing, precast concrete for rapid production of elements, high-speed cast-in-place construction; rapid form reuse, cold-weather construction, rapid repair of pavements to reduce traffic downtime, fast-track paving, and several other uses. In fast-track paving, use of high-early-strength mixtures allows traffic to open within a few hours after concrete is placing.

A. Problem Statement

Since concrete is very useful to humans and it has brought benefit of mankind, the study and research of a more depth should be held to produce green high early strength self-consolidation sustainable concrete that can that can utilize construction industry.

Nowadays, the shortage of raw materials and the high cost in construction caused some to look for other alternatives to save costs and gain more profit. It is one of the most important building materials for the most widely used in a construction project. Therefore, the techniques used to produce good concrete must be understood and considered carefully. The resulting concrete quality depends on the quality of raw materials used as cement, aggregates and water, mixing rate, mixing way, way of transportation and the means of compacting.

Based on these issues, this study see that many large construction projects stalled and cannot be completed on schedule, the planning and the program had to be postponed

and harm many parties due to certain problems (Idris Bin Alias, 2006). The problem is caused by concrete hydration time-consuming. In order to overcome this problem, in this investigation can produce green high early strength self-consolidation sustainable concrete

According to Peterman, high-strength concrete resists loads that cannot be resisted by normal-strength concrete. Not only does high strength concrete allow for more applications, it also increases the strength per unit cost, per unit weight, and per unit volume as well. These concrete mixes typically have an increased modulus of elasticity, which increases stability and reduces deflections.

According to Prof Dr Muhammad Fauzi Mohd Zain (2012) production of Portland cement not only releases 7% of the world's carbon dioxide, the cement industry also uses a lot of natural resources such as limestone, clay, petroleum, coal and other substances. To reduce the use of cement as a binder in the concrete, calcium carbide is one of the perfect binder was replaced with cement because of its cooperation with limestone and is a material that does not pollute the environment.

B. Objectives of Study

The objectives of this study are:

- a) To study the green high early strength self-consolidation sustainable concrete by using optimum ratio.
- b) To compare the strength and workability of concrete when using green high early strength self-consolidation sustainable concrete with ordinary concrete.

C. Scope of Study

The study focus for developing high early strength in concrete, this study use superplasticizer which is manufacture in Sika Kimia Sdn. Bhd, located at Nilai, Negeri Sembilan. This superplasticizer is very advance plasticizer, which is very much used in construction companies and for pavements of various highways as it provide high strength earlier, so it is very much used. The main benefit is that very limited quantity is used. This experimental study also use normal plasticizer in order to see the comparison of concrete strength between superplasticizer and normal plasticizer. This Plasticizer is manufacture in Duracem Coating Industries Sdn. Bhd located at Kg Baru Sg Buloh, Selangor. This plasticizer is a water reducing, plasticizing and set accelerator cement admixture specially designed for the acceleration of the setting time and considerably increases early strength of concrete.

In addition, this experimental study also focus on developing green concrete. This study use PET as waste material which can be recycled and calcium carbide as substitute 50% of ordinary portland cement to reduce the use of cement as a binder in the concrete. Calcium carbide is one of the perfect binder was replaced with cement because of its cooperation with limestone and is a material that does not pollute the environment. This PET waste can be obtained at Ralco Plastic Sdn. Bhd located at Nilai, Negeri Sembilan and for the calcium carbide can be obtained at Magnalium Sdn. Bhd located at Simpang Pulai, Ipoh, Perak.

Material that use in this are ordinary portland cement, sand, course aggregate, fresh potable water, waste

material (PET), calcium carbide and Sika ViscoCrete 1600. The cement use in this experimental effort is Ordinary Portland Cement. For fine aggregates domestically available sand of Pulai Johor Quarry is use in this experimental study. Sand passing from 4.75mm sieve are used. Coarse Aggregates size are 20mm and 10mm available from the domestic site Nilai are used. Fresh potable water free from acid and organic substances was use for mixing and curing concrete.

This study also focus on the testing specimens with design mix and specimens with superplasticizer. Specimens with design mix had tested to find out strength at 1 days. Specimens with superplasticizer had tested to find out strength at 1 days. By performing compression test and flowability test. It aims to get the mixture needs a long-term strength and workability.

All the tests contained in this study will be conducted in the laboratory of concrete Politeknik Merlimau, Melaka.

D. Importance of Study

This study was to ascertain the potential use of green high early strength self-consolidation sustainable concrete in construction. Furthermore, the use of green high early strength self-consolidation sustainable concrete will accelerate the hydration of concrete and improve the strength of concrete.

1) Impact to Environment

This study need to be conducted to add waste material in concrete that can take advantage of the environmental to reduce the pollution and used in the manufacture of concrete. This suggests a two-pronged strategy to help the country for re-use of industrial waste materials and reduce the cost of its disposal.

2) Impact to Building Construction

By using this green high early strength self-consolidation sustainable concrete, this study can reduce the time taken to process the hydration of concrete in construction work, as well as high-strength concrete that can be achieved in a short time.

II. LITERATURE REVIEW

An Experimental Study to Produce Green High Early Strength Self Consolidation Sustainable Concrete was associated with the functions and operation of each component. This experimental study more to green project and this study will involve two types of testing that is compression test and flowability test, all this test are done to determine the long term strength and workability.

A. Component of Concrete

A composite material that consists essentially of a binding medium, such as a mixture of ordinary Portland cement and water, within which are embedded particles or fragments of aggregate, usually a combination of fine and coarse aggregate. Concrete is by far the most versatile and most widely used construction material worldwide. (McGraw-Hill, 2003)

1) Cement

Cement forms paste when mixed with water. Cement paste is the mixture of cement and water without aggregate that acts as binding agent in concrete. (Thomas P.Fahl, 2001)

2) Aggregate

Aggregates are the materials basically used as filler with binding material in the production of mortar and concrete. They are derived from igneous sedimentary and metamorphic rocks or manufactured from blast furnace slag, etc. (S.K.Duggal, 2007)

3) Water

Water is an important ingredient of concrete as it actively participates in the chemical reaction with cement. Since quality of water affect the strength, it is necessary for us to go into the purity and quality of water. (M.S.Shetty, 2008)

4) Plasticizer

Plasticizer work by reducing the interparticle forces that exist between cement grains in the fresh paste. Superplasticizer work by practiced for production flowing, self levelling, self compacting and for the production of high strength and high performance concrete. (M.S. Shetty, 2008)

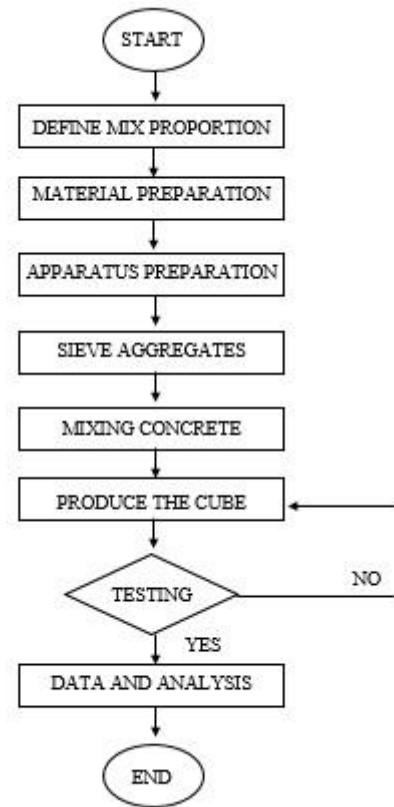
5) Waste Material

The benefits of PET is improve structural strength and work as reinforced in concrete mix. (Liliana Avila Cordoba, 2013)

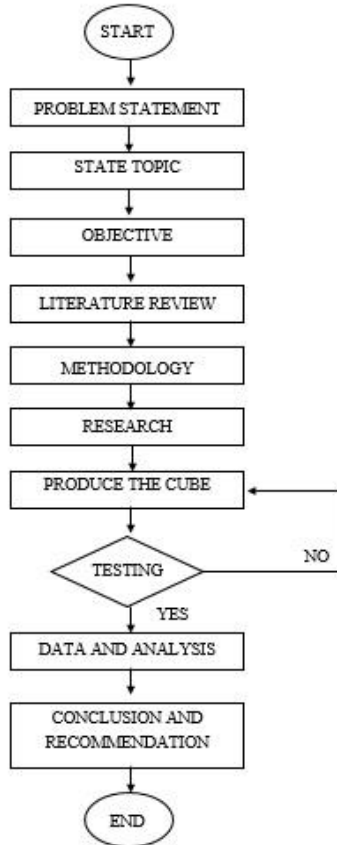
6) Calcium Carbide

Calcium carbide content was the key factor affecting compressive strength of the concrete and as a binder to concrete that can replace the cement. (Aiju Zhang, 2012)

A. Methodology of Concrete Testing



III. METHODOLOGY OF STUDY



1) Define Mix Proportion

The mix proportion of concrete mix design grade 20 for 1 day per m³ in this experimental study is being define which:

Mix Proportion of Control Concrete

Aggregate Size (mm)	Water (kg or liter)	Cement (kg)	Fine Aggregate (kg)	Coarse Aggregate (kg)
10	2.50	5.95	5.49	9.76
20	2.25	5.36	4.70	11.49
10 + 20	2.25	5.36	4.70	11.49

Mix Proportion of Concrete with Calcium Carbide and Additive

Aggregate Size (mm)	Water (kg or liter)	Cement (kg)	FA (kg)	CA (kg)	Calcium Carbide (kg)	SP (liter)	PL (liter)	PET (kg)
10	2.50	2.975	5.49	9.76	2.975	0.089	0.06	0.119
20	2.25	2.68	4.70	11.49	2.68	0.08	0.054	0.119
10 + 20	2.25	2.68	4.70	11.49	2.68	0.08	0.054	0.119

SP/PL: Superplasticizer/Plasticizer

2) Material Preparation

Prepare materials such as Ordinary Portland Cement (OPC), fine aggregates, coarse aggregates, water, Sika ViscoCrete 1600, AA Quickset, PET and calcium carbide.

IV. RESULT AND ANALYSIS

A. Result for Flowability Test

Flow percent Formula:

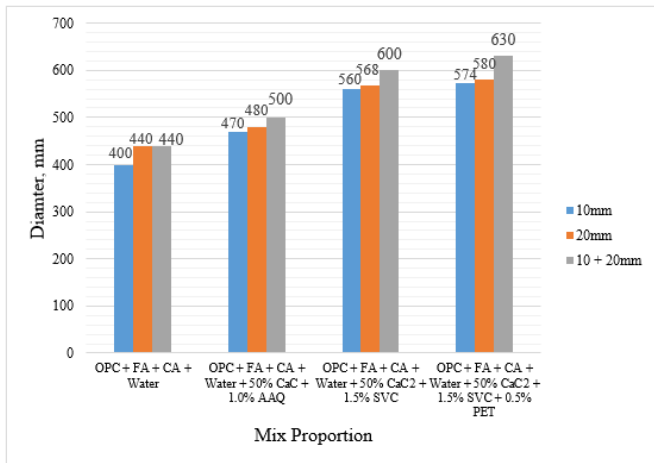
$$\text{Flow percent} = \frac{\text{Spread diameter in cm} - 25}{25} \times 100$$

Explanation of Keyword

Abbreviation	Explanation
OPC	Ordinary Portland Cement
FA	Fine aggregates
CA	Coarse aggregates
CaC2	Calcium Carbide
AAQ	AA Quickset
SVC	Sika ViscoCrete 1600
PET	Polyethylene Terephthalate

Result of the Flowability Test

Mix Proportion	10mm		20mm		10 + 20mm	
	Flow Diameter (mm)	Flow Percent (%)	Flow Diameter (mm)	Flow percent (%)	Flow Diameter (mm)	Flow percent (%)
OPC + FA + CA + Water	400	60	440	76	440	76
OPC + FA + CA + Water + 50% CaC ₂ + 1.0% AAQ	470	88	480	92	500	100
OPC + FA + CA + Water + 50% CaC ₂ + 1.5% SVC	560	124	568	127.2	600	140
OPC + FA + CA + Water + 50% CaC ₂ + 1.5% SVC + 0.5% PET	574	129.6	580	132	630	152



Graph of Diameter vs Mix Proportion

Based on the graph, it shows the diameter of mix proportion OPC + FA + CA + Water for 20mm and 10 + 20mm are equal and the diameter for 10mm size aggregates are the lowest. This is because workability of the concrete is lower. Other than that, the results of the data showed that the diameter of flowability test for OPC + FA + CA + Water + 50% CaC₂ + 1.0 PL mix proportion for 20mm size aggregate is higher than 10mm and 20mm size aggregate. This shows the condition of the concrete is workable and according to specifications. The diameter of flowability test for OPC + FA + CA + Water + 50% CaC₂ + 1.5 SP mix proportion for 10mm and 20mm size aggregate is slightly different by 8mm.

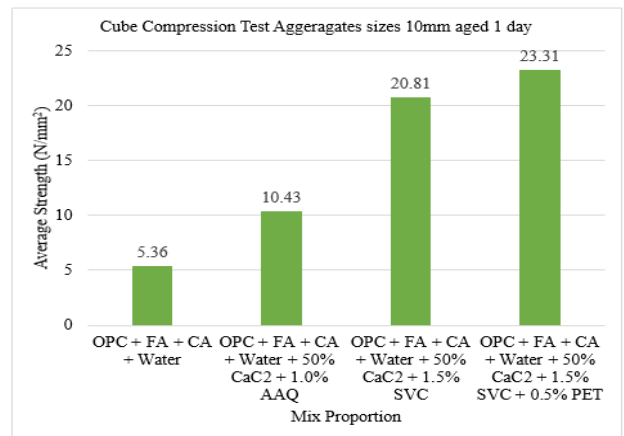
As the conclusions drawn by the graph of data obtained from flowability test are the diameter for OPC + FA + CA + Water + 50% CaC₂ + 1.5 SVC + 0.5% PET mix proportion 20 + 10mm size aggregate is 630 mm, while for ordinary plain concrete is 440mm. Diameter 630mm shows an indication of the good quality of concrete and filling ability of the concrete as well as the condition of the concrete is excellent workability and according to specifications. According to Nagataki and Fujiwara (1995), a slump flow diameter ranging from 500 to 700mm is considered as the slump required for a concrete to be classified as self-compacting concrete. A close look at the pattern of spread of concrete can also give a good indication of the characteristic of concrete such as tendency for segregation

B. Result of Compression Test

In this study concrete divided into four type of concrete, table below indicates data and result cube compacting test carried out at the age 1 day.

Data and result for cube compacting test (10mm size aggregates)

Mix Proportion	10mm															
	OPC + FA + CA + Water				OPC + FA + CA + Water + 50% CaC ₂ + 1.0% AAQ				OPC + FA + CA + Water + 50% CaC ₂ + 1.5% SVC				OPC + FA + CA + Water + 50% CaC ₂ + 1.5% SVC + 0.5% PET			
Sample	1	2	3	Ave	1	2	3	Ave	1	2	3	Ave	1	2	3	Ave
Machine Reading	119.7	123	119	120.5	232.3	244.1	228.5	235.0	483.0	473.6	448.1	468.9	530.4	521.7	522.0	524.7
Comp. Strength (N/mm ²)	5.32	5.47	5.29	5.36	10.32	10.84	10.14	10.43	21.5	21.03	19.89	20.81	23.58	23.16	23.18	23.31
Weight (kg)	6.70	6.89	6.66	6.75	6.50	6.83	6.40	6.58	6.79	6.63	6.27	6.56	6.90	6.78	6.79	6.82

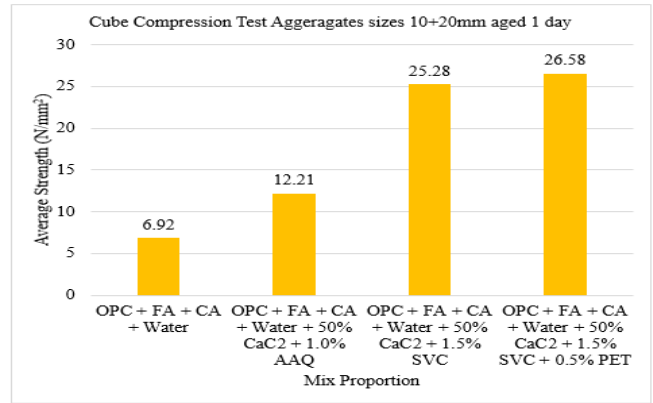


Graph Cube Compacting Test Aggeragates sizes 10mm aged 1 day

Based on the graph, the higher strength is from mix proportion OPC + FA + CA + Water + 50% CaC₂ + 1.5% SVC + 0.5% PET that's means waste PET serves as a reinforced in the concrete. For mix proportion OPC + FA + CA + Water only can achieved 5.36 N/mm². There are differences of high strength between mixes OPC + FA + CA + Water + 50% CaC₂ + 1.0% AAQ and OPC + FA + CA + Water + 50% CaC₂ + 1.5% SVC that is 10.43 N/mm² and 20.81 N/mm².

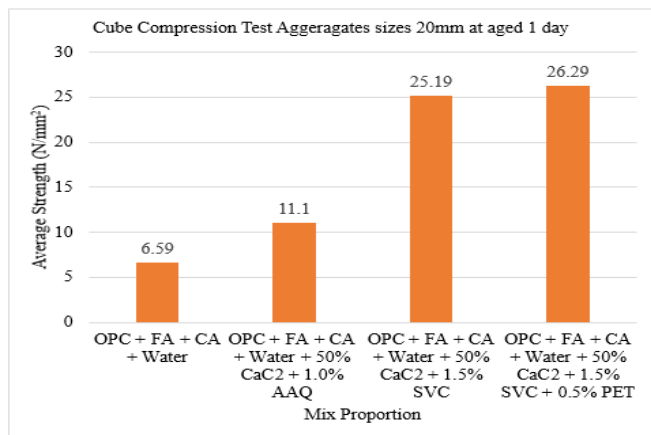
Data and result for cube compacting test (20mm size aggregates)

Mix Proportion	20mm															
	OPC + FA + CA + Water				OPC + FA + CA + Water + 50% CaC ₂ + 1.0% AAQ				OPC + FA + CA + Water + 50% CaC ₂ + 1.5% SVC				OPC + FA + CA + Water + 50% CaC ₂ + 1.5% SVC + 0.5% PET			
Sample	1	2	3	Ave	1	2	3	Ave	1	2	3	Ave	1	2	3	Ave
Machine Reading (kN)	148.3	151.2	145.9	148.4	250.5	251.3	247.2	249.6	578.0	563.2	566.1	569.1	595.3	593.1	585.9	591.4
Comp. Strength (N/mm ²)	6.58	6.71	6.48	6.59	11.13	11.17	10.98	11.1	25.66	25.01	24.91	25.19	26.46	26.36	26.04	26.29
Weight (kg)	7.18	7.32	7.06	7.19	7.52	7.54	7.42	7.49	7.23	7.04	7.08	7.12	7.44	7.41	7.32	7.39



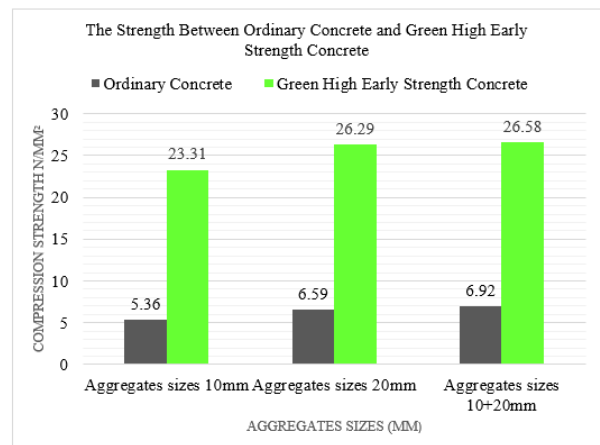
Graph Cube Compacting Test Aggregates sizes 10 + 20 mm at day 1

Graph shows that green high early strength self-consolidation sustainable concrete can achieve high strength within one day that is 26.58 N/mm². For mix proportion OPC + FA + CA + Water only can achieved 6.92 N/mm². There are differences of high strength between mixes OPC + FA + CA + Water + 50% CaC₂ + 1.0% AAQ and OPC + FA + CA + Water + 50% CaC₂ + 1.5% SVC that is 12.21 N/mm² and 25.28 N/mm².



Graph Cube Compacting Test Aggregates sizes 20mm aged 1 day

Based on the graph, the higher strength is from mix proportion OPC + FA + CA + Water + 50% CaC₂ + 1.5% SVC + 0.5% PET that is 26.29 N/mm² and only slightly different with mix proportion OPC + FA + CA + Water + 50% CaC₂ + 1.5% SVC that is 25.19 N/mm². For mix proportion OPC + FA + CA + Water only can achieved 6.59 N/mm². There are differences of high strength between mixes OPC + FA + CA + Water + 50% CaC₂ + 1.0% PL and OPC + FA + CA + Water + 50% CaC₂ + 1.5% SVC that is 11.1 N/mm² and 25.19 N/mm².

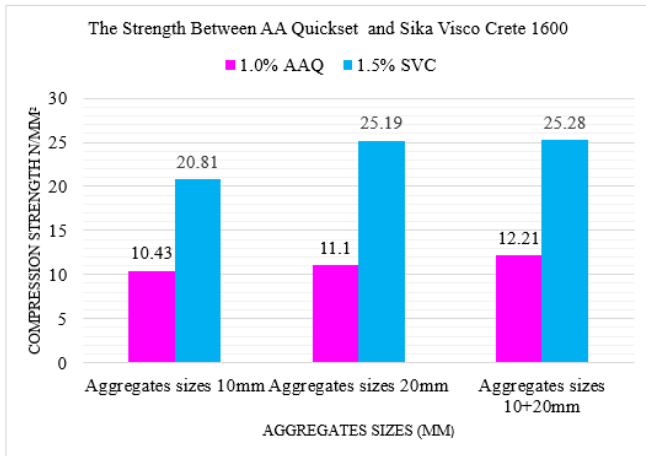


The Strength between Ordinary Concrete and Green High Early Strength Concrete

The graph shows the strength between ordinary concrete and green high early strength concrete, based on the graph above showing the strength of concrete using aggregates sizes 10mm for ordinary concrete is 5.36 N/mm² for Green High Early Strength Concrete (GHESC) is 23.31 N/mm². Next for mix proportion using aggregates sizes 20mm the strength for ordinary concrete is 6.59 N/mm² for GHESC the strength is 26.29 N/mm². Lastly for mix proportion using aggregates sizes 10+20mm, for ordinary concrete the strength is 6.92N/mm² and for GHESC the strength is 26.58 N/mm².

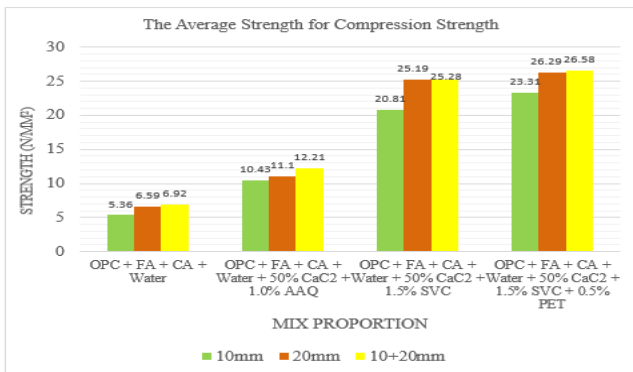
Data and result for cube compacting test (10+20mm sized aggregates)

Mix Proportion	10+20mm															
	OPC + FA + CA + Water				OPC + FA + CA + Water + 50% CaC ₂ + 1.0% AAQ				OPC + FA + CA + Water + 50% CaC ₂ + 1.5% SVC				OPC + FA + CA + Water + 50% CaC ₂ + 1.5% SVC + 0.5% PET			
Sample	1	2	3	Ave	1	2	3	Ave	1	2	3	Ave	1	2	3	Ave
Machine Reading (kN)	152.5	157.1	157.8	155.8	279.5	268.4	276.4	274.7	576.5	574.8	568.5	573.3	599	596.8	597.5	597.8
Comp. Strength (N/mm ²)	6.77	6.98	7.01	6.92	12.42	11.93	12.28	12.21	25.64	25.64	25.56	25.28	26.64	26.54	26.57	26.58
Weight (kg)	7.38	7.61	7.64	7.54	7.27	6.98	7.19	7.15	7.21	7.19	7.12	7.17	7.39	7.46	7.47	7.44



Graph The Strength Between AA Quickset and Sika ViscoCrete 1600

The graph show the strength between AA Quickset and superplasticizer, based on the graph show that mix proportion using superplasticizer more effective than using AA Quickset, and proportion mix using aggregates sizes 10+20mm slightly increase the strength of concrete. The value for proportion using AA Quickset and aggregates sizes 10+20mm is 12.21 N/mm², while the value for proportion using superplasticizer and aggregates sizes 10+20mm is 25.28 N/mm². For mix proportion using aggregates sizes 20mm and AA Quickset the value is 11.1 N/mm², while using superplasticizer the value is 25.19 N/mm². Lastly the value for proportion using AA Quickset and aggregates sizes 10mm is 10.43 N/mm², while the value for proportion using superplasticizer and aggregates sizes 10mm is 20.81 N/mm².



The Average Strength for Compression Strength

Based on the graph obtained, the mix proportion OPC + FA + CA + Water + 50% CaC₂ + 1.5 SVC + 0.5% PET concrete for 10 + 20mm size aggregate is the best mix proportion and successfully to achieve the green high early strength of the concrete value on grades 20 that is 26.58 N/mm² at the age one day. Differences in strength green high early concrete and ordinary concrete is about 75%. The increasing of the percentage show that the mix concrete proportion achieves high early strength concrete. According to David Darwin (2010), concrete grade 20 is suitable for

reinforced concrete, works involving the construction of the concrete foundation, slab and column.

V. CONCLUSION AND RECOMMENDATION

In detail, the objectives of this study are achieved and the findings of this study are as follows:

- (a) The ratio of aggregate/cementcarbide suitable for producing green high early strength concrete are 3:1 (volume size).
- (b) Water/cementcarbide ratio is ideal for producing green high early strength concrete is 1:2 (volume size)
- (c) Flowability green high early strength concrete is considered excellent due to water/superplasticizer content.
- (d) The mix proportion OPC + FA + CA + Water + 50% CaC₂ + 1.5 SVC + 0.5% PET concrete for 10 + 20mm size aggregate is successfully to achieve the green high early strength of the concrete value on grades 20 that is 26.58 N/mm² at the age one day.
- (e) Differences in strength green high early concrete and ordinary concrete is about 74%.

Recommendation

Quality control is very important in the design of green high early strength concrete mixture, starting from the purchase of materials to the final mix of test samples. Because of that, those who are experts in this field must be assigned to conduct this study because every little mistake made in this study state has a significant influence on the results obtained.

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Kajian Penentuan Keperluan Oksigen Biokimia (BOD) di Sungai Merlimau

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Abstrak— Keperluan oksigen biokimia ditakrifkan sebagai jumlah oksigen yang diperlukan oleh mikroorganisma untuk mengoksidakan atau menstabilkan organik dalam keadaan aerobik. Kajian ini telah dilakukan keatas 3 stesen yang dipilih di Sungai Merlimau. Kesemua stesen ini terletak di kampung Kilang Berapi yang mana sungai tersebut berada dikawasan perindustrian Industri Kecil Sederhana (IKS). Persampelan dilakukan sebanyak 3 kali sehari sepanjang satu bulan Oktober, 2017 pada semua stesen. Tujuan kajian ini adalah untuk menganalisis keputusan keperluan oksigen biokimia (BOD) yang diperolehi dalam aspek kesannya terhadap sungai tersebut. Data yang diperolehi kemudian dibandingkan dengan Indeks Kualiti Air Sungai (IKA) dan dikelaskan melalui *Piawai Interim Kualiti Air Kebangsaan (INWQS)*, dimana paras cadangan interim piawai keperluan oksigen biokimia untuk air mentah di sungai iaitu 3mg/l. Stesen A dan B mencatat purata bacaan yang tertinggi iaitu 7.82 mg/L manakala stesen C adalah 6.64mg/L. Kesimpulannya dari kajian ini mendapati ketiga-tiga stesen tersebut mempunyai bacaan BOD melepasi piawai yang mana tahap sungai tersebut telah tercemar dan kategori sebagai Kelas III iaitu memerlukan rawatan yang intensif. Kesan daripada bacaan ini akan menyebabkan hidupan didalam sungai tersebut akan terjejas dan memerlukan kos yang tinggi untuk dirawat. Efluen daripada industri yang tidak terkawal atau dipantau ini boleh menyebabkan berlakunya penurunan kualiti air sungai yang teruk pada masa akan datang.

Katakunci—Keperluan Oksigen Biokimia (BOD); Indeks Kualiti Air (IKA); *Piawai Interim Kualiti Air Kebangsaan (INWQS)*; *Sungai Merlimau*

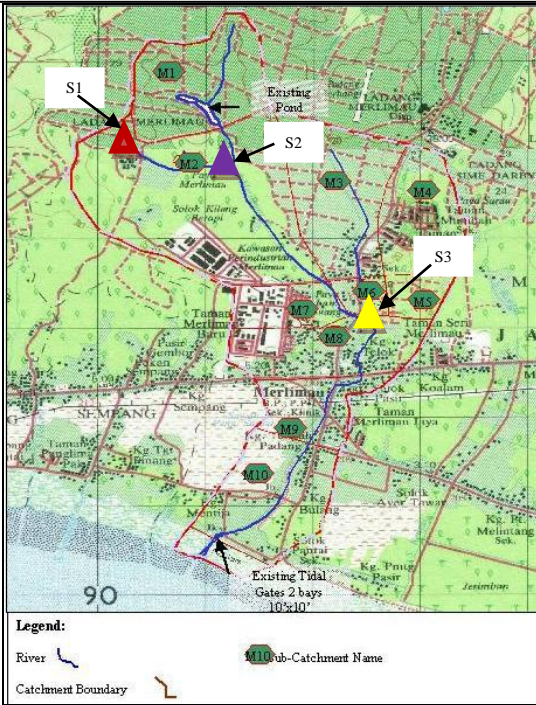
I. PENGENALAN

Malaysia adalah sebuah negara membangun dan mempunyai matlamat untuk menuju sebuah negara maju yang berteraskan perindustrian. Namun dalam keghairahan manusia untuk mengaut keuntungan yang tinggi dari proses pembangunan ini, secara sengaja atau tidak sengaja telah menyebabkan kebersihan alam sekitar tergugat. Akibat daripada ketidakseimbangan pelaksanaan pembangunan dalam pengurusan alam sekitar yang sewajarnya maka, pelbagai masalah persekitaran telah wujud. Di Malaysia, sungai merupakan punca utama yang membekalkan sumber air kepada segala aktiviti manusia. Terdapat lebih kurang 49 lembangan sungai utama yang menjadi punca kepada bekalan tersebut.

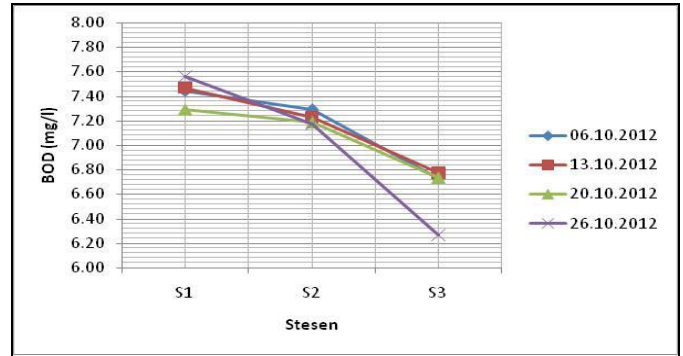
Panjang sungai Merlimau adalah 6km dari hulu di Estet IOI di kampung Kilang Berapi hingga ke muara sungai. Ia merupakan saluran utama bagi system saluran pekan Merlimau dan merupakan sumber utama bagi kawasan pengaliran Merlimau. Aktiviti manusia di sepanjang sungai Merlimau di kampung Kilang Berapi adalah perindustrian dan agrikultur. Rujukan [5] telah melaporkan bahawa terdapat pencemaran di sungai tersebut. Ia dikuatkan lagi dengan aduan orang ramai yang menyatakan bau busuk terhasil dari sungai tersebut. Keadaan ini adalah berpunca daripada sikap tidak bertanggungjawab segelintir manusia yang membuang sampah sarap termasuk najis serta bangkai ternakan dan buangan toksik dari kilang ke dalam sungai tersebut. Rujukan [2] pula menjelaskan konsep kualiti air ini akan ditentukan berdasarkan jumlah peratusan sampel yang ada dalam "cut of concentration" iaitu sebanyak 3 mg/l bagi Keperluan Oksigen Biokimia (BOD). Air sungai yang tercemar ini boleh menjadi ancaman kepada hidupan akuatik. Kandungan Keperluan Oksigen Biokimia yang tinggi dalam sungai, menjadi ancaman kepada ikan. Jika keadaan ini berlarutan, ikan akan mati.

II. METODOLOGI DAN ANALISIS

Dalam kajian ini, pensampelan telah dilakukan sebanyak Empat kali iaitu pada 6/10/2012, 13/10/2012, 20/10/2012 dan 26/10/2012 di tiga stesen pensampelan (S1, S2 dan S3) seperti dalam Rajah 1. Sampel air sungai telah diambil pada kedalaman 1 meter di bawah paras permukaan air dan disimpan di dalam botol polietilena yang telah dibasuh dengan 10 % asid hidroklorik [1]. Botol berisi sampel tersebut kemudiannya disimpan di dalam bekas yang mengandungi ais dan dibawa ke makmal untuk dianalisa selanjutnya. Penentuan nilai BOD ditentukan berdasarkan kaedah piawai [6]. Umumnya, nilai BOD ditentukan berdasarkan nilai DO sebelum dan selepas sampel diinkubasikan dalam inkubator pada suhu 20 °C.



Rajah 1 . Kedudukan stesen-stesen persampelan dikawasan kajian. (JPS Melaka, 2011)



Rajah 2. Keputusan nilai BOD di 3 stesen Sungai Merlimau

Umumnya, tren yang ditunjukkan oleh BOD adalah tinggi pada bahagian hulu lembangan sungai berbanding dengan hilir lembangan sungai. Kepekatan BOD yang tinggi dicatatkan di bahagian di hulu sungai iaitu stesen S1 manakala dihilir sungai iaitu S3 mempunyai BOD yang rendah. Kepekatan BOD yang tinggi di S1 mungkin disebabkan oleh kesan input sisa-sisa kumbahan domestik dan aktiviti perindustrian. Sisa-sisa ini biasanya mengandungi banyak bahan organik. Merujuk [3], bahan-bahan organik tersebut akan diuraikan secara pengoksidaan oleh mikroorganisma (BOD) dan kuantiti bahan organik yang banyak akan menyebabkan tingginya kepekatan BOD yang diperhatikan. Kepekatan BOD yang tinggi ini berkorelasi pula dengan nilai DO yang rendah di stesen tersebut menunjukkan berlakunya penguraian bahan-bahan organik.

JADUAL 1. FORMULA UNTUK PENGIRAAN NILAI IKA [2]

Subindeks BOD (mg/L)	Formula
$x \leq 5$	$SICOD = -1.33x + 99.1$
$x > 5$	$SICOD = 103e^{-0.0157x} - 0.04x$

JADUAL 2 : PENGELASAN KUALITI AIR INWQS [2]

Paramet er	Unit	Kelas					
		I	IIA	IIB	III	IV	V
BOD	mg/L	1	3	3	6	12	> 12

Rujukan [4], kelas kualiti air ialah:

Kelas I - Pemeliharaan untuk persekitaran semulajadi

Bekalan air I – secara pratiknya tidak memerlukan rawatan

Perikanan I – untuk spesies akuatik yang sangat sensitif

Kelas IIA

Bekalan air II – memerlukan rawatan konvensional

Perikanan II – untuk spesies yang sensitif

Kelas IIB - Sesuai untuk aktiviti rekreasi yang melibatkan sentuhan badan

Kelas III

Bekalan air III – memerlukan rawatan yang intensif

Perikanan III – untuk minuman binatang ternakan

Kelas IV Pengairan

Rajah 2 menunjukkan nilai bacaan untuk parameter BOD yang dikaji di tiga stesen pensampelan di Sungai Merlimau, kampung Kilang Berapi. Julat purata nilai BOD yang diperolehi dalam kajian ini adalah diantara 6.64 mg/L hingga 7.82 mg/L.

III. KESIMPULAN

Kajian di sepanjang Sungai Merlimau Kampung Kilang Berapi telah menunjukkan bahawa nilai Keperluan Oksigen Biokimia (BOD) ialah 7.09 mg/L iaitu dalam kelas IV dengan status agak tercemar. Kualiti air yang lebih baik direkodkan di bahagian hilir sungai berbanding dengan bahagian hulunya aktiviti utama yang menyumbang kepada kemerosotan kualiti air ialah input sisa kumbahan domestik daripada penempatan penduduk dan input daripada sisa – sisa perindustrian.

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Keberkesanan `Justify Table` dalam Penentuan Topik Kajian bagi Subjek DCW 5022 – Research Methodology

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Abstrak— Tujuan kajian ini dilaksanakan adalah untuk menilai keberkesanan penggunaan borang `Justify Table` dalam menentukan topik kajian dan penyediaan proposal pada akhir sesi pembelajaran bagi subjek DCW 5022 – Research Methodology. Hasil dapatan kajian menunjukkan bahawa hampir 100 % pelajar telah bersetuju bahawa instrumen berkenaan telah berjaya membantu mereka dalam mencari topik kajian sebelum menggunakan hasil maklumat berkenaan di dalam proposal akhir mereka. Walaubagaimanapun, ia masih lagi memerlukan kaedah-kaedah lain atau instrument serta perisian komputer yang disesuaikan untuk membantu subjek ini pada masa hadapan.

Kata Kunci: `Justify Table`, `Research Methodology`, Kertas cadangan kajian

Abstract— The purpose of this study is to evaluate the effectiveness of using `Justify Table` form in determining the research topic that suit with a preparation of proposal at the end of the class session for subject DCW 5022 – Research Methodology. The findings were revealed that almost 100 % of students agreed that this instrument was successfully assisted them in searching of the topic research study before applying it's in their final proposal. However, there is still need others instrument, method or suitable software in order to assist this subject in the future.

Key words: *Justify Table, Research Methodology, Proposal*

I. PENGENALAN

Subjek DCW 5022 – Research Methodology merupakan subjek yang ditawarkan kepada pelajar-pelajar Semester 4 bagi Program Diploma Teknologi Berasaskan Kayu, Politeknik Malaysia. Subjek ini lebih menumpukan kepada penyediaan kertas cadangan kajian penyelidikan yang akan dilaksanakan pada projek akhir pelajar di Semester 5.

Best, 1977, menyatakan bahawa penyelidikan merupakan satu perkara yang rasmi, sistematik dan melibatkan satu proses yang intensif yang mungkin melibatkan prinsip atau teori. Hasil daripada proses penyelidikan kebiasaannya akan dapat menghasilkan satu jangkaan dapatan dan kawalan kepada proses berkenaan.

Penyediaan kertas cadangan atau proposal mungkin berbeza dari institusi ke institusi yang lain dan juga bergantung kepada jenis atau kaedah penyelidikan yang akan dilaksanakan. Proposal biasanya akan menyediakan penyelidik dengan prosedur yang sistematik dan pelan perancangan yang baik (Ibrahim, 2015).

Penyelidik yang baru hendak memulakan kajian biasanya menghadapi masalah di dalam menentukan permasalahan kajian yang bersesuaian yang akhirnya menyebabkan penentuan topik kajian sukar dilaksanakan. Inovasi dan perkembangan teknologi semasa proses pembelajaran di dalam kelas haruslah dilaksanakan sepanjang proses penyelidikan tersebut. Peranan penyelia projek dalam membantu pelajar mencari permasalahan ini adalah sangat diperlukan (Ibrahim, 2015) sepanjang proses penyelidikan berkenaan berlangsung. Oleh itu, satu kaedah pemudah-cara bagi subjek DCW 5022 – Research Methodology perlu diperkenalkan kepada pelajar-pelajar yang mengambil subjek ini agar objektif pengajaran dan pembelajaran dapat dicapai dengan jayanya.

A. Refleksi masalah pengajaran dan pembelajaran yang lepas.

Melalui pemerhatian penulis terhadap kualiti persembahan dokumen cadangan kertas kajian yang dikemukakan pada penyelia projek akhir Semester 5, ia masih jelas menunjukkan bahawa pelajar-pelajar berkenaan masih kurang keyakinan untuk melaksanakan projek sepertimana yang telah dibentangkan pada penilaian cadangan kertas kajian mereka di akhir pembelajaran subjek DCW 5022 tersebut. Tingkah laku ini timbul kerana mereka sendiri kurang jelas dengan tajuk kajian yang telah dicadangkan disebabkan oleh kaedah pelaksanaan projek yang kurang jelas serta kurangnya sorotan kajian-kajian yang lepas yang boleh menyokong pelaksanaan projek kajian mereka. Kesan daripada itu, penukaran topik kajian masih berlaku pada semester 5 sedangkan pada semester berkenaan pelajar sudah perlu melengkapkan kajian mereka sepenuhnya.

Oleh itu, penulis telah membuat satu refleksi terhadap cara pengajaran dan pembelajaran bagi subjek DCW 5022 dengan memperkenalkan penggunaan borang `Justify Table` bagi

menentukan topik kajian dan pengumpulan maklumat bagi sorotan kajian-kajian yang lepas dalam membantu pelajar menyediakan proposal kertas kajian yang baik di akhir sesi pembelajaran.

B. Fokus kajian dan Limitasi

Fokus kajian ini adalah berkaitan dengan kefahaman pelajar dalam menentukan topik kajian serta mencari rujukan-rujukan yang berkaitan dengan kaedah mengisi `Justify Table` sewaktu perbincangan di dalam kelas dan juga pembelajaran sendiri di luar waktu kuliah. Data kajian ini hanya diambil bagi Sesi pengajian Disember 2017 sahaja.

C. Objektif kajian

Kajian ini bertujuan untuk meninjau: (1) Kefahaman pelajar terhadap proses mencari permasalahan kajian dan sorotan kajian yang bersesuaian dengan mengisi maklumat di dalam `Justify Table`. (2) Keberkesanan kaedah `Justify Table` di dalam penentuan topik kajian di akhir sesi pembelajaran subjek DCW 5022.

D. Kumpulan Sasaran

Soal selidik kajian ini telah dilaksanakan di Jabatan Kejuruteraan Awam, Politeknik Kota Kinabalu, Sabah, Malaysia. Ia hanya melibatkan tiga belas (13) orang pelajar di Semester 4 bagi program Diploma Teknologi Berasaskan Kayu (DBK) yang telah memilih projek kajian sebagai projek akhir mereka bagi melengkapkan penganugerahan Diploma Teknologi Berasaskan Kayu.

II. METODOLOGI KAJIAN

A. Instrumen kajian

Instrumen kajian ini adalah menggunakan borang `Justify Table` seperti tercatat di dalam Jadual 1. Pelajar-pelajar diminta untuk mengisi jadual tersebut berdasarkan kepada bahan rujukan yang digunakan untuk sorotan kajian mereka. Berdasarkan artikel jurnal yang berkaitan dengan tajuk kajian mereka, pelajar-pelajar secara berkumpulan berbincang dan mengisi maklumat ke dalam jadual 1 berkenaan.

Jadual 1: `Justify Table` yang telah digunakan di dalam penilaian kajian ini.

Vol	Raw materials used	Product/ Where its applied?	Methodology used?	Findings/ Suggestions	Author & Year
1.					
2.					

Setelah pelajar mengisi jadual tersebut, pensyarah dan pelajar akan berbincang bagi menapis maklumat yang paling hampir dengan topik kajian yang hendak dibuat sahaja. Kelompongan atau penambakan pada projek-projek yang telah dibuat di dalam kajian-kajian yang lepas boleh dilihat jika maklumat di dalam Jadual 1 di atas diisi dengan betul dan tepat. Selain daripada itu, parameter kajian juga boleh dikenalpasti daripada dapatan `Justify Table` ini.

B. Soal selidik kajian

Soal selidik keberkesanan penggunaan `Justify Table` merupakan kajian kuantitatif menggunakan kajian atas talian iaitu melalui google form yang boleh diakses melalui link berikut:

https://docs.google.com/forms/d/e/1FAIpQLSfckMJB1z15vtK6dbJk1ScSuLRPNenMY4Flzz5EF0jndb-sA/viewform?usp=sf_link

Gambarajah 1: Sampel `google form` yang digunakan dalam kajian ini.

Setiap pelajar diminta mengisi soal-selidik berkenaan apabila ia telah dikongsikan di dalam kumpulan `whatsapp` yang telah ditubuhkan bagi kemudahan perkongsian maklumat pengajaran dan pembelajaran di antara pensyarah subjek dengan kumpulan pelajar berkenaan.

III. DAPATAN KAJIAN SOAL SELIDIK

Demographi nisbah responden pelajar lelaki kepada pelajar perempuan dalam soal selidik ini adalah 53.85 % (7 orang pelajar perempuan) dan 46.15 % (6 orang pelajar lelaki). Jumlah keseluruhan kumpulan sasaran yang telah ditetapkan adalah seramai 13 orang pelajar. Sebanyak 10 soalan telah

digunakan di dalam soal selidik ini terdiri daripada 9 soalan berbentuk pilihan jawapan dan satu soalan memerlukan jawapan terbuka. Empat pilihan skala telah disediakan iaitu: Tidak Setuju; Kurang Setuju; Setuju dan Sangat Setuju. Bagi kesemua sembilan soalan berbentuk pilihan jawapan sebanyak 13 maklumbalas telah diterima. Manakala bagi soalan berbentuk jawapan terbuka hanya tiga (3) maklumbalas yang telah dihantar. Jadual 2 di bawah merupakan item-item soalan yang telah dikemukakan di dalam penilaian soal-selidik tersebut.

Jadual 2: Item soalan soal-selidik yang digunakan di dalam kajian ini.

No Item	Soalan
1	Adakah subjek `Research Methodology` berjaya menimbulkan minat anda terhadap kajian penyelidikan?
2	Mengikut fahaman anda, perkara utama yang harus dilaksanakan sebelum melaksanakan kajian adalah penyediaan proposal atau kertas cadangan penyelidikan
3	Adakah anda bersetuju bahawa penentuan tajuk bagi proposal kajian penyelidikan adalah sukar?
4	Instrumen seperti `Justify Table` berjaya membantu saya menentukan tajuk/topik kajian yang akan dilaksanakan
5	Adakah saya tahu mengisi `Justify Table` bagi membantu saya menentukan tajuk/topik kajian yang akan dilaksanakan
6	Instrumen seperti `Justify Table` berjaya membantu saya mengumpulkan kajian literatur (Literature review) berkenaan dengan tajuk/topik kajian yang akan dilaksanakan
7	`Justify Table` berjaya membantu saya mengumpulkan maklumat berkenaan dengan kaedah metodologi secara terperinci berkaitan dengan tajuk/topik kajian yang akan dilaksanakan
8	`Justify Table` telah berjaya membantu saya menentukan parameter/rekabentuk kajian yang bersesuaian untuk dilaksanakan
9	`Justify Table` telah berjaya membantu saya membuat kesimpulan tentang apa yang akan dibuat dalam kajian penyelidikan akan datang
10	Cadangan penambaan pada `Justify Table` bagi membantu kefahaman pelajar terhadap penentuan topik/tajuk di dalam penyediaan proposal penyelidikan

A. Dapatan respon kajian bagi item soalan nombor 1 - 9

Berdasarkan Jadual 3, item soalan nombor 1, telah menunjukkan bahawa tidak ada maklumbalas yang menyatakan tidak setuju dan kurang setuju. Manakala sebanyak 61.54 % dan 38.46 % menyatakan subjek DCW 5022 telah berjaya menarik minat mereka terhadap penerokaan kajian penyelidikan.

Merujuk kepada item soalan nombor 2 pula didapati kecenderungan pelajar menjawab soalan sama seperti dapatan soalan item nombor 1. Bagi item soalan nombor 3, terdapat 2 orang pelajar atau 15.38 % menyatakan kurang setuju bahawa penentuan topik kajian adalah sukar, manakala 84.62 %

menyatakan bahawa penentuan topik kajian merupakan perkara yang paling sukar bagi mereka.

Sebanyak 84.62 % dan 15.38 % bagi item soalan nombor 4, hampir kesemua pelajar bersetuju bahawa instrumen seperti `Justify Table` telah berjaya membantu mereka dalam menentukan topik kajian proposal. Manakala bagi item soalan nombor 5, hanya 7.69 % atau seorang pelajar kurang bersetuju yang menyatakan bahawa beliau tahu mengisi jadual `Justify Table` berkenaan. Walaubagaimanapun 92.31 % menyatakan bahawa pelajar tahu untuk mengisi jadual berkenaan.

Item soalan nombor 6 pula menunjukkan 30.77 % pelajar sangat setuju bahawa `Justify Table` telah berjaya menghimpunkan koleksi sorotan kajian-kajian yang lepas yang akan membantu mereka menyediakan kertas proposal pada akhir sesi pembelajaran subjek DCW 5022.

Jadual 3: Dapatan analisa item soalan yang digunakan di dalam soal-selidik mengikut kekerapan dan Peratusan

No.Item	Kekerapan dan Peratusan			
	Tidak Setuju	Kurang Setuju	Setuju	Sangat Setuju
1			8 (61.54%)	5 (38.46%)
2			8 (61.54%)	3 (23.08%)
3		2 (15.38%)	8 (61.54%)	3 (23.08%)
4			11 (84.62%)	2 (15.38%)
5		1 (7.69%)	11 (84.62%)	1 (7.69%)
6		1 (7.69%)	8 (61.54%)	4 (30.77%)
7			11 (84.62%)	2 (15.38%)
8		1 (7.69%)	11 (84.62%)	1 (7.69%)
9			11 (84.62%)	2 (15.38%)
10	Jawapan soalan terbuka			

Merujuk kepada item soalan nombor 7, hampir keseluruhan pelajar (100 %) bersetuju bahawa mereka dapat mengetahui kaedah metodologi secara terperinci berkaitan dengan tajuk kajian yang akan dilaksanakan pada Semester 5. Analisa soalan item nombor 8, menunjukkan bahawa hanya seorang pelajar (7.69 %) kurang bersetuju bahawa instrumen `Justify Table` telah berjaya membantu beliau dalam mencari atau menentukan parameter yang bersesuaian dengan topik kajian yang akan dilaksanakan Walaubagaimanapun seramai

12 orang pelajar telah menyatakan pendirian yang sebaliknya. Item soalan nombor 9, telah menunjukkan bahawa hampir kesemua pelajar bersetuju bahawa instrumen `Justify Table` telah berjaya membuat kesimpulan tentang topik kajian yang akan dilaksanakan pada semester berikutnya.

B. Dapatan respon kajian bagi item soalan nombor 10

Item soalan nombor 10, merupakan soalan yang memerlukan cadangan penambakan terhadap instrumen `Justify Table` pada masa akan datang. Hanya 3 maklumbalas sahaja yang telah diterima iaitu 1 orang pelajar berpendapat, tanpa instrumen berkenaan pun, beliau masih dapat menentukan topik kajiannya sendiri. Manakala 2 orang pelajar lagi menyatakan bahawa untuk menentukan topik kajian memerlukan mereka mencari sebanyak mungkin sorotan kajian-kajian yang lepas bagi mengisi instrumen `Justify Table` dalam menentukan topik kajian mereka. Pelajar juga berpandangan bahawa perlunya kaedah-kaedah sokongan lain selain `Justify Table` agar lebih mudah membantu mereka menyediakan cadangan kertas proposal di akhir sesi pembelajaran bagi subjek DCW 5022 – Research Methodology.

IV. KESIMPULAN DAN CADANGAN

1. Pada keseluruhannya pelajar bersetuju bahawa instrumen `Justify Table` telah dapat membantu dalam penentuan topik kajian dan seterusnya membantu mereka di dalam penyediaan kertas proposal.
2. Pelajar juga berpandangan bahawa perlunya ada kaedah-kaedah lain diperkenalkan supaya penyediaan topik kajian

dan proposal menjadi lebih mudah pada masa akan datang.

3. Selain daripada instrumen seperti `Justify Table`, pelajar masih perlu dibantu dalam kaedah mencari bahan rujukan dengan penggunaan kata kunci dan laman web yang bersesuaian. Ketepatan pencarian artikel yang betul akan membantu pelajar mengisi instrumen `Justify Table` dengan lebih tepat dan bersesuaian dengan cadangan topik kajian yang akan dilaksanakan.
4. Pengenalan kepada perisian komputer dalam pencarian maklumat dan pembinaan proposal masih perlu diperkenalkan kepada pelajar semasa sesi pembelajaran subjek ini pada masa hadapan.
5. Pembinaan item soalan soal-selidik perlu diperhalusi supaya ia memenuhi objektif kajian yang telah ditetapkan.

PENGHARGAAN

Kajian ini telah membabitkan 13 orang pelajar Semester 4, Diploma Teknologi Berasaskan Kayu (DBK), Jabatan Kejuruteraan Awam, Politeknik Kota Kinabalu. Terima kasih atas komitmen yang diberikan sepanjang menjalankan kajian ini.

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The Relationship between Mathematics and Mechanics of Structure Exam Performance

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Abstract—This is a descriptive survey study, 477 diplomas in civil engineering students from Politeknik Kota Kinabalu participated in the study. Final exam results for mathematic and mechanics in structure of these students were analyzed using frequency counts, percentages and Pearson and Spearman Correlation Coefficient to find out correlation between both courses. Results indicated that there was a weak correlation between mathematic and mechanics in structure scores in final examination. It was concluded that mathematics result merely influenced students' performance in mechanics structure score. It was recommended that in further study data should not be based on scores but should be include other indicator such as attitude or mastery in subject-matter domain.

Keywords—Final exam results, mathematic, mechanics in structure, correlation

I. INTRODUCTION

Science and math are interrelated as it is used in most branches of science to derive answers that cannot be measured directly or in other word engineering education rests on a solid base in mathematics. So mathematics is a compulsory requirement to get diploma in any engineering course.

Civil engineers do require specialized mathematical skills thus student of diploma civil engineering (DKA) are taking mathematics course. In second semester student learn mechanic of structure, one of civil engineering common core subject and at the time they also taken Engineering mathematics 2 BA201. In BA201 course student is exposure to complex numbers which explains real and imaginary numbers (JMSK syllabus). While Mechanics of structures CC205 is a course students learn basic principles of types of forces, strength of materials and behavior of loaded structures (DKA syllabus).

Mathematics courses suppose has the advantage of preparing students with all the mathematics knowledge needed in engineering education. In Politeknik Kota Kinabalu most engineering students lack adequate mathematics skills for engineering studies [1].

II. PROBLEM STATEMENT

Based on the random final result and Course Learning Outcomes (CLO) analysis in the course of CC205-Mechanic of Structure and BA201-Engineering Mathematics 2, the percentage of students fail in both courses is higher compared with the other course offered by the same semester. Student

master in math will have no problem in learning mechanic of structures or the opposite student weak in math will likely to fail the CC205. So this briefly sketches the alternative views of relationship between BA201 and CC205.

The objective for this study is to identify the significant relationship between the both courses.

Hypothesis;

Ho: There is no significant relationship between BA201 and CC201.

Ha: There is no significant relationship between BA201 and CC201.

III. LITERATURE REVIEW

Mathematics as an essential tool that helps student understands and solve more complicated engineering problem [2]. There is high correlation 0.74 between mathematics and science achievement in their research among middle-school students.

There is study suggested that teach better and more useful mathematics to improve student engineering education rather than be taught more mathematics [1]. This is because they found that one of the biggest challenges in engineering education is freshmen's have low proficiency in mathematics.

IV. METHODOLOGY

Correlation is used to determine whether a linear relationship between variables exists [3]. In this study, correlation coefficient is used to determine the strength of the linear relationship between final exam score for both courses. Both Pearson and spearman product moment correlation coefficient were used in this study depend on the distribution of the data. The range of the correlation coefficient is between -1 and +1.

The participants in this study are the students of Department of Civil Engineering, Polytechnic Kota Kinabalu. Total students of 477 are selected. Sample need to fulfill the basic requirement like be able to sit for final exam for both course. Descriptive analysis is carried out for the sample.

Raw data collected from examination department. Raw data sorted using MS Excel. SPSS software is used to select specific cases only. For student who repeat the course only the most recent data is taken from them who repeat paper for several semesters. The range of duration of data collection for

the student result is 5 semesters that are from session December 2010 until December 2012.

Student are divided into three difference group which is excellent, moderate and poor according to grade of final exam. For each group correlation coefficient is used to determine the strength of each group the linear relationship between final exam score for both courses.

V. RESULT AND DATA INTERPRETATION

Descriptive statistics in table one is used to describe the scores for both course. There are typically three categories of descriptive statistics; central tendency, dispersion and distribution.

Table 1. Descriptive analysis

	BA201	CC205
Mean	59.9925%	52.7969%
Standard deviation	14.61	12.19
Skewness	0.003	0.235

The mean describe the center of a distribution of scores or central tendency. The arithmetic average score for BA201 is 60% and CC205 is 53%. Standard deviation is measure the dispersion to compare distributions of both courses. In this study standard deviation is respectively high for both courses; BA201 is 14.61 and CC205 is 12.19. Mean that data have a big rage in minimum and maximum value and is spread away from mean.

All measures of dispersion provide an idea of data spread in histogram. For BA201 is show in Figure 1 and for CC205 is in Figure 2 and there is a normal curve show. In general, a skewness value greater than one indicates a distribution that differs significantly from a normal, symmetric distribution. From table 1 skewness for BA201 and CC201 is 0.003 and 0.235 respectively. Data is normally distributed as skewness is less than 1.

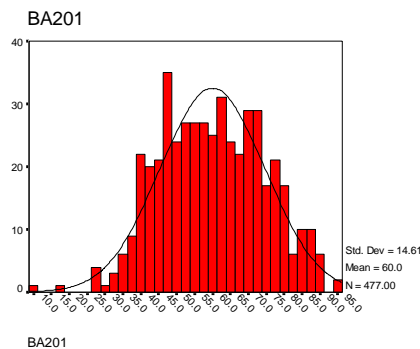


Figure 1: Histogram for BA201 score

Skewness measures the asymmetry of a distribution. A positive skewness value indicates a positively skewed distribution.

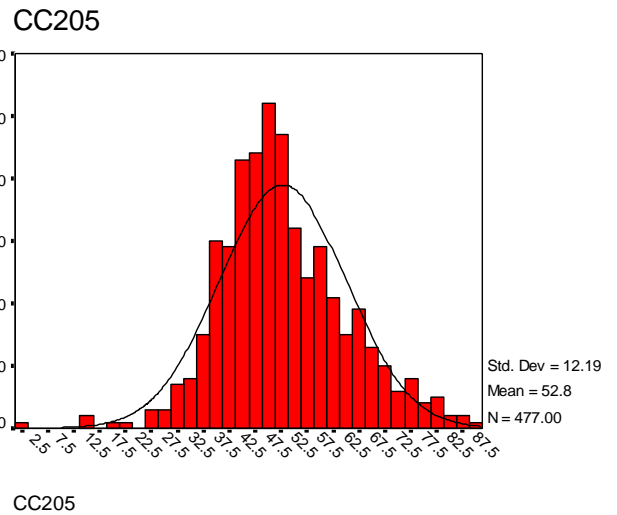


Figure 2: Histogram for BA201 score

Table 2 is the Pearson Correlations analysis for total sample 477 students, table displays Pearson correlation coefficients, significance values, and the number of cases with non-missing values.

Table 2: Pearson Correlations analysis

		BA201	CC205
BA201	Pearson Correlation	1	.614**
	Sig. (2-tailed)	.	.000
	N	477	477
CC205	Pearson Correlation	.614**	1
	Sig. (2-tailed)	.000	.
	N	477	477

** . Correlation is significant at the 0.01 level

Pearson correlation coefficient is used because the data are normally distributed. The absolute value of the correlation coefficient indicates the strength, with larger absolute values indicating stronger relationships. The interpretation of correlation coefficient is based on [4].

Refer to Table 3 Pearson correlation coefficient 0.614 is interpretation there is a linear associations between both BA201 and CC205 course. BA201 and CC205 have moderate strong relationship.

Table 3: Correlation Coefficient Interpretation

Range	Correlation Coefficient Interpretation
± 0.75 to ± 1.0	Very strong relationship
± 0.50 to ± 0.75	Moderate strong relationship
± 0.25 to ± 0.50	Weak relationship
± 0.00 to ± 0.25	Low to no relationship

The scatter plots presented in Figure 3 illustrate the linear association's correlation coefficient between BA201 and CC205. When $r=0.0$ the points scatter widely about the plot, the majority falling roughly in the shape of a circle [4]. Because linear relationship is moderate strong the circle becomes more and more elliptical in and all the points fall on likely a straight line.

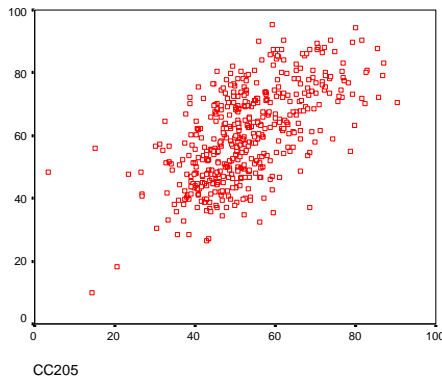


Figure 3: Scatterplots for correlation coefficient between BA201 and CC205

Students are divided into three different group, according to grade of final exam as shown in Table 4. Students with excellent score for grade which is more than 75% is categories as Grade A, Student with grade B and C is categories as moderate score which is between 74% and 50% and student with poor score which is less than 50% is Grade D. For each group the same testing will be carried out same as the total sample.

Table 4. Descriptive analysis

Group	N	BA201 %	N	CC205 %
Grade A	80	16.8	24	5.0
Grade B, C	259	54.3	246	51.6
Grade D	138	28.9	207	43.4
Total	477	100	477	100

Descriptive statistics analysis for group BA201 as shown in the following Table 5, group Grade D is not normally distributed. Skewness for not normal distributed is -1.920, so correlation relationship is conducted using spearman correlation coefficient. For group Grade A and Grade B, C can analyze using Pearson correlation coefficient.

Table 5: Descriptive data for Group: Course BA201

Group	N	Mean	Standard deviation	Skewness
Grade A	80	82%	5.00	0.663
Grade B, C	259	63%	7.14	0.030
Grade D	138	43%	6.27	-1.920
Total	477			

Refer to interpretation of correlation coefficient is based on Jack R. Fraenkel and Norman E. Wallen [4]. Table 6 show that correlation coefficient 0.108 which means low to no relationship for group of student receive Grade A for course BA201.

Table 6: Pearson Correlations analysis Group: Course BA201 Grade A

		BA201	CC205
BA201	Pearson Correlation	1	.108
	Sig. (2-tailed)	.	.617
	N	24	24
CC205	Pearson Correlation	.108	1
	Sig. (2-tailed)	.617	.
	N	24	24

Table 7, 8 have correlation coefficient relatively is 0.448 and 0.354 interpretation of correlation coefficient is weak relationship. Even though there is a linear associations between both BA201 and CC205 course.

Table 7: Pearson Correlations analysis Group: Course BA201 Grade B,C

		BA201	CC205
BA201	Pearson Correlation	1	.448**
	Sig. (2-tailed)	.	.000
	N	246	246
CC205	Pearson Correlation	.448**	1
	Sig. (2-tailed)	.000	.
	N	246	246

** . Correlation is significant at the 0.01 level

Table 8: Spearman Correlations analysis Group: Course BA201 Grade D

		BA201	CC205
Spearman's rho BA201	Correlation Coefficient	1.000	.345**
	Sig. (2-tailed)	.	.000
	N	207	207
CC205	Correlation Coefficient	.345**	1.000
	Sig. (2-tailed)	.000	.
	N	207	207

** . Correlation is significant at the 0.01 level (2-tailed).

After descriptive statistics analysis for group CC205 the result shown as the following Table 9. From the data show that group Grade D is not normally distributed because skewness is -2.217, so correlation relationship is analyze using Spearman correlation coefficient. For group Grade A and Grade B, C can analyze using Pearson correlation coefficient.

Table 9: Descriptive data for Group: Course CC205

Group	N	Mean	Standard deviation	Skewness
Grade A	24	81%	4.116	0.776
Grade B, C	246	59%	6.814	0.573
Grade D	207	42%	6.652	-2.217
Total	477			

Table 10,11,12 show that correlation coefficient for group that achieve Grade A, Grade B, C and Grade D in final exam course CC205.

Table 10 shown correlation coefficient for group that achieve Grade A, Grade B, C and Grade D in final exam course between CC205 and BA201 which is 0.279. Interpretation of correlation coefficient is weak linear relationship between both BA201 and CC205 course.

Table 10: Pearson Correlations analysis Group: Course CC205 Grade A

		BA201	CC205
BA201	Pearson Correlation	1	.297**
	Sig. (2-tailed)	.	.007
	N	80	80
CC205	Pearson Correlation	.297**	1
	Sig. (2-tailed)	.007	.
	N	80	80

** . Correlation is significant at the 0.01 level

Table 11 shown correlation coefficient for group that achieve Grade A, Grade B, C and Grade D in final exam course between CC205 and BA201 which is 0.397. Interpretation of correlation coefficient is weak linear relationship between both BA201 and CC205 course.

Table 11: Pearson Correlations analysis Group: Course CC205 Grade B,C

		BA201	CC205
BA201	Pearson Correlation	1	.397**
	Sig. (2-tailed)	.	.000
	N	259	259
CC205	Pearson Correlation	.397**	1
	Sig. (2-tailed)	.000	.
	N	259	259

** . Correlation is significant at the 0.01 level

Table 12 shown correlation coefficient for group that achieve Grade A, Grade B, C and Grade D in final exam course between CC205 and BA201 which is 0.251.

Interpretation of correlation coefficient is weak linear relationship between both BA201 and CC205 course.

Table 12: Spearman Correlations analysis Group: Course CC205 Grade D

		BA201	CC205
Spearman's rho	BA201	Correlation Coefficient	1.000
		Sig. (2-tailed)	.
		N	138
CC205	Correlation Coefficient	.251**	1.000
		Sig. (2-tailed)	.003
		N	138

** . Correlation is significant at the 0.01 level (2-tailed).

VI. CONCLUSION

Result showed that there is a linear relationship between BA201 and CC205. With the results correlation coefficient 0.614, allows rejection of null hypothesis. This indicated that if the score of BA201 increase the score of the CC205 increase; as one decrease the other decrease. In other words, student with good score in math BA201 will score better in CC205. But result is different after split the sample into small group. Only a group of 80 student with excellent result in BA201 math may fail CC205, because correlation coefficient for the group is 0.108 mean low to no relationship. While others groups show there are weak relationship and linear association's correlation coefficient between BA201 and CC205. So in future study other indicator need to include in study to determine conflict show in this study.

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The Innovative Design of Adjustable Coffee Table

PABLO

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Abstract — In this era of globalization, adjustable furniture is growing, expanding and gaining more attention from the modern society today. Different types of coffee table are produced in accordance with the flexible needs of the consumer. This innovative design of adjustable coffee table has been produced to be used in three ways of top opening. This product is very attractive due to its adjustable function that suitable most in a hybrid apartment or small-sized room. The main materials used in the construction of the product are plywood, PVC pipe, steel pipe, and plate. The coffee table has been designed to provide comfort and convenience to all user. This lightweight feature meets consumers at a reasonable price.

Keywords: *Adjustable; Coffee table; Hybrid apartment; Small-sized room*

I. INTRODUCTION

Adjustable furniture is a furniture that can be transformed, resized and redesigned according to consumer needs. The design of this furniture created is derived from the design of existing furniture created in the today's industry. The addition of its main functions brings more flexibility and style to form a new and so-called innovative design featuring a coffee table.

Furniture pieces are designed and fabricated to assist in the many ways people sit and rest, work and play, organize or display items, and partition space. This view suggests a broad utilitarian framework, in which function is perceived to be the primary intended purpose of furniture. Although function, utility, and social use are important aspects of the performance of furniture, rarely does function alone inspire great design [2].

II. PURPOSE OF INNOVATION

The main purpose of this project is to produce a furniture with the function that fits consumer style, space and can be modified according to needs.

As today's furniture mostly focus on one function only, this innovative design offers a new way of style due to the concept itself that is adjustable to form another shape and size that can be fit into a small-sized room. The elements of art are used to create the furniture [1].

Just lay it wide open as a traditional coffee table at the centre of the room or by simply fold it into half or quarter shape then snug it into nooks and corners of the room for displaying decorative items as well as a modern living idea.

III. SCOPE OF PROJECT

The product consists of several components that form a single piece. This 450 mm tall and 600 mm wide furniture requires 4x4-inch breadboard and 2 mm thickness plywood and steel plate to form the top. Wood as the basic construction material in furniture is used in designed elements [3]. A 3-inch diameter PVC pipe is used as a support for table legs. A 2 mm thickness steel pipe is used as a pillar at the centre to hold the base for a stronger and more stable when put in an upright position. Adhesive glue is also used to attach each layer of plywood for the top and then finally the furniture is coated with varnish for finishing.



Fig 1. AutoCAD 3D Design

IV. METHODOLOGY

The approach of innovative ways as the methodology applied in this project in order to suit a hybrid apartment or small-sized room. In order to get the idea, a rough sketch of the various design of adjustable coffee table are made. Then the chosen design finely sketch with AutoCAD software to the following specs and sizes.

After the main material is ready, it then measured and cut to actual size using a proper machine at the polytechnic workshop. The process follows with the assembling the components using adhesive glue, dowel, and nails. The final step includes scrubbing the top surface with sandpaper,

layering shellac and clear varnish for an attractive finish. Clear varnish is used for a natural wood finish [4].

V. RESULT OF PROJECT

First, in order to achieve the result of this project, the selection of material is also taken into consideration. Wood-base materials are used as the main materials as well as PVC pipe for its lightweight formula. Steel is also used in accordance with the design and strength of this product.

Next, once the finished product components are assembled, these components are incorporated and installed to form a ready-to-use product. Finally, as a result, three types of an adjustable coffee table has been designed.

A. Type 1 (360 Degrees Top Opening)

The wide open top of 360 degrees opening allows the consumer to use the product as traditional coffee table and fit in the middle of the room.



Fig. 2. Wide open top

B. Type 2 (180 Degrees Top Opening)

The half-folding 180 degrees top opening allows the consumer to place the product at the edge of the room wall for decoration use, as well as putting small things like keys and other small necessities like a mobile phone.



Fig. 3. Half-folding top opening

C. Type 3 (90 Degrees Top Opening)

This product can be converted into quarter shape, a 90 degrees top opening and placed in the nook or corner of the room for display purposes. Accessories and ornaments such as table clock, calendar, and flower vase are among the type of decorating ideas.



Fig 4: Quarter shape top opening

VI. ADVANTAGES OF PROJECT

In a modern home with a very limited space especially hybrid apartment building like SOHO (Small Office, Home Office), SOFO (Small Office, Flexible Office) or SOVO (Small Office, Virtual Office) is now on the rise [5]. Ideas of furniture must consider of having a functional yet practical as well as stylish to the design. To begin with, this new innovative design of the adjustable coffee table is a cost-effective and interior-wise option and as well as a smart move into a more minimalist touch.

This adjustable function brings a different look each time. 3 types of design derived from a conventional coffee table make 3 different ways of styling a simple room. It is used in the middle of the living room with a full opening of the top of the table. The top of the table can be aligned from 180 degrees openings and placed to the edge of the wall of the house, to 90 degrees openings and be placed in the corner of the room.

Due to its stylish design and lightweight which only weight around 8 kilograms making it so mobile and easy to move from one place to another. It also very affordable as the cost is below RM80. The product will be highly competitive with other products in the market based on the pull and push innovation factors in the modern furniture industry [6].

VII. PRODUCT IMPROVEMENTS

Some improvements are needed to make sure the product can be used widely in any room. Proposed for the improvements:

1. Steel and aluminium are common materials can be used in the furniture industry. Each has attributes, own physical and mechanical properties that make it the

right choice for this product. However, to make the components more lightweight, aluminium is better suited to the coffee table. An aluminium weights one-third less than a steel of the same dimensions. Therefore, it is better to use aluminium than steel in reducing the weight of the coffee table.

2. LED tape light is highly versatile and very popular. It is flexible and can be cut to size. It is also very easy to install pretty much anywhere [7]. A lot of furniture designs these days use them as safety features. By adding this LED tape light to the product, the consumer can enjoy the soft glow of the LED strips. In addition to LED tape light, photoluminescent (glowing) powder also can be used for lighting on this coffee table.

ACKNOWLEDGMENT

I express special thanks to the builders of this product, Damian Raymond, Bonaventure Jacob and Lenrebert Kolimin from Civil Engineering Department for their wonderful work.

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