PBU eDIGEST 2019

KEMENTERIAN PENDIDIKAN MALAYSIA

POLITEKNIK MALAYSIA BALIK PULAU

THE PROCEEDING OF

RECOVET19

1ST RESEARCH COLLOQUIUM ON DIGITAL TECHNOLOGY & TVET

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PREFACE

Firstly, praise be to Allah s.w.t. for the completion “PBU eDigest 2019: The Proceeding of the ReCoVET 2019”. Secondly, I am pleased to congratulate the Research, Innovation and Commercialization Unit of Politeknik Balik Pulau for their effort in making this happen.

This eDigest is a compendium of the research studies in Politeknik Balik Pulau. It contains information on the effort as well as the innovative and exciting researches related to Digital Technology, Social Science and TVET (Technical and Vocational Education & Training). We are now experiencing the business and economic impact as well as challenges brought about the Fourth Industrial Revolution (IR 4.0). I believe that this e-Digest is timely and will help encourage the research environment in Politeknik Balik Pulau.

I am confident that this e-digest will be beneficial in spurring the development of our Polytechnics’ research capacity and potential. I am certain we will see many more exceptional products from our Polytechnics and Community College in years to come.

Ts. Syamsiah Binti Hussin
Head of Unit
Research,Innovation and Commersialization Unit
Politeknik Balik Pulau

SYNOPSIS

Research Colloquium on Digital Technology & TVET **(ReCoVET 2019)** is held on 13th November 2019 at Politeknik Balik Pulau, Penang.

As technologies continue to emerge at a rapid pace, ReCoVET 2019 focuses on Digital Technology, Education, Technical/Vocational Education and Training (TVET), Industrial Revolution 4.0, Internet of Thing, System Integration, Big Data, Cybersecurity and Virtual Learning. We expect that the colloquium and its publications will be a trigger for further related research and technology improvements in these important subjects. All papers submitted for this colloquium were evaluated by the reviewers.

ReCoVET 2019 was both stimulating and informative with an interesting array of presenters from all over the polytechnics and community colleges. The programme consists of presentation sessions and discussions with panels covering a wide range of topics. This rich program provided all participants with the opportunity to meet and interact with one another.

We would like to thank the organization staffs, the committees and reviewers for their excellent work in reviewing the papers as well as their invaluable input advice to the colloquium. We hope that ReCoVET 2019 will be successful and bring meaningful experience to all participants. We look forward to seeing all of you next year at the ReCoVET.

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TABLE OF CONTENT

Proceeding ot the 1st Research Colloquium on Digital Technology and TVET (RECOVET19), 13 November 2019

eISBN

PENDEKATAN ETNOMATEMATIK DALAM KALANGAN PENSYARAH MATEMATIK DI POLITEKNIK MALAYSIA

Erna Ruhaily bt Rusli
Politeknik Balik Pulau, Pulau Pinang

Abstrak

Falsafah Pendidikan Kebangsaan menggariskan bahawa pendidikan di Malaysia adalah satu usaha berterusan kearah memperkembangkan lagi potensi individu secara menyeluruh dan bersepadu untuk mewujudkan insan yang seimbang dan harmoni dari segi intelek, rohani, emosi dan jasmani berdasarkan kepercayaan dan kepatuhan kepada Tuhan (Kementerian Pendidikan Malaysia). Menurut Affizal (2013) peranan pendidikan dalam konteks kualiti hidup sejahtera meliputi kondisi kerja, ekonomi, perkahwinan dan pengurusan keluarga, kawalan diri dan sokongan sosial serta kefungsian sosial. Selain itu, bidang pendidikan merupakan teras terpenting bagi membina negara Malaysia yang inklusif, sederhana dan gemilang di persada dunia (Menteri Pendidikan Malaysia, 2018). Oleh yang demikian, Agensi Kelayakan Malaysia dibawah Kementerian Pengajian Tinggi diperkenalkan bagi memastikan bahawa program pengajian yang ditawarkan di semua institusi pendidikan mendapat pengiktirafan kerajaan sekaligus menjamin kualiti pengajian tinggi di Malaysia. Pendidikan yang berkualiti sudah tentu merupakan salah satu penyumbang kepada pencapaian akademik pelajar yang cemerlang. Hal ini pastinya mempunyai hubungan rapat dengan sistem penyampaian pengajaran dan pembelajaran di dalam kelas. Objektif utama kajian ini meninjau sama ada pendekatan etnomatematik digunapakai oleh pensyarah matematik atau tidak dalam proses pengajaran matematik serta mengkaji sama ada wujud perbezaan signifikan antara jantina pensyarah matematik terhadap penggunaan pendekatan etnomatematik. Kajian secara soal selidik deskriptif akan digunapkai terhadap sekumpulan pensyarah matematik daripada 36 buah politeknik di Malaysia.

Kata Kunci: etnomatematik, matematik, pendidikan

PENGENALAN

Matematik merupakan salah satu mata pelajaran teras di seluruh politeknik di bawah Kementerian Pengajian Tinggi Malaysia. Dalam merealisasikan hasrat kerajaan untuk melahirkan kebolehpasaran graduan yang tinggi, para pensyarah merupakan pihak yang memainkan peranan yang sangat penting. Semua ini bermula daripada kaedah pengajaran yang digunapakai oleh para pensyarah dalam memastikan keberkesanan ilmu yang disampaikan kepada para pelajar. Kajian oleh Profesor Madya Dr. Ishak (2009) menyatakan bahawa antara faktor penyumbang peningkatan prestasi pelajar ialah diri pelajar, pengajar serta bahan/kaedah yang digunakan oleh pengajar

Konsep ‘chalk and talk’ tidak lagi relevan dalam sistem pengajaran di politeknik. Secara umumnya, politeknik merupakan institusi pendidikan yang menawarkan pendidikan aliran teknikal dan sememangnya memerlukan konsep pengajaran yang berunsurkan teori dan praktikal. Namun, sejauh mana kefahaman serta pengamalan konsep ini diterapkan dalam sistem pengajian politeknik khususnya dalam matapelajaran matematik.

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D'Ambrosio (2001) percaya bahawa amat mustahil untuk seseorang pelajar itu memahami konsep matematik jika kurikulum matematik yang dipelajari dalam kelas tidak dihubungkaitkan dengan kehidupan realiti pelajar tersebut. Beliau juga percaya bahawa ada kalangan guru yang tidak faham bagaimana budaya hidup berhubungkait dangan pelajar serta pembelajaran mereka.

PENYATAAN MASALAH

Aktiviti pengajaran dan pembelajaran yang berkesan meliputi kesediaan pensyarah menggalakkan pembelajaran yang menarik dan membentuk minat para pelajar. Pendekatan etnomatematik merupakan salah satu cara para pendidik menjadikan suasana belajar ceria dan tidak bosan sekaligus dapat mencuri tumpuan para pelajar. Hal ini juga membantu para pelajar mempelajari dan memahami isu dan masalah masyarakat yang pelbagai. Pendekatan ini membolehkan pelajar membuat hubungkait tentang perkembangan sejarah matematik berdasarkan sumbangan serta kajian yang dibuat oleh pelbagai kumpulan dan individu. Pelajar boleh meningkatkan daya fikir mereka dalam permasalahan berkaitan matematik dan meningkatkan keupayaan mereka dalam memahami konsep matematik . Oleh itu, menjadi persoalan pengkaji kepada pensyarah matematik di politeknik, apakah pendekatan etnomatematik merupakan salah satu strategi pengajaran mereka? Adakah jantina pensyarah matematik mempunyai pengaruh terhadap pengamalan pendekatan etnomatematik?

OBJEKTIF

1. Mengkaji sama ada pensyarah metematik menggunakan pendekatan etnomatematik dalam pengajaran matematik atau tidak

2. Mengkaji sama ada wujud hubungan signifikan antara jantina pensyarah matematik dalam penggunaan pendekatan etnomatematik dalam pengajaran matematik

KAJIAN LITERATUR

Kajian – kajian lepas dalam pengamalan etnomatematik telah membuktikan bahawa konsep ini mampu serta berkesan dalam meningkatkan tahap pencapaian pelajar dalam matapelajaran matematik. Kajian oleh Kurumeh (2009) mendapati pendekatan etnomatematik dapat meningkatkan kefahaman dan membantu pelajar matematik mencatatkan keputusan yang lebih baik. Dapatan beliau bertepatan dengan hasil kajian yang dilakukan oleh Mogari pada tahun 2002.Kajian Mogari melaporkan bahawa pendekatan etnomatematik adalah pendekatan yang efisin dalam pengajaran dan pembelajaran matematik. Menurut Faizal (2004) dalam kajiannya menyatakan bahawa seorang pengkaji akademik percaya perubahan dalam konsep pengajaran menampakkan perubahan yang positif dalam pencapaian pelajar. Kajian Magallanes (2003) mendapati wujudnya perbezaan yang signifikan terhadap tahap pencapaian pelajar melalui perbezaan kaedah pengajaran etnomatematik dan kaedah pengajaran tradisional dalam topik satah unit. Walau bagaimanapun, Kubiszyn dan Borich (2000) percaya bahawa etnomatematik bukanlah cara pengajaran terbaik untuk diserapkan dalam proses pembelajaran semasa usia kanak-kanak. Dalam penulisannya, beliau menyatakan bahawa Sokal, seorang professor di Universiti New York percaya bahawa pengamalan konsep etnomatematik ini memberi tekanan serta kerisauan kepada para guru dan sekaligus menyebabkan pengajaran matematik menyimpang daripada konsep asal.

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Frasa kata etnomatematik mula digunapakai semenjak tahun 1960 an oleh seorang ahli matematik Brazil iaitu Ubiratan Dambrosio. Etnomatematik adalah proses menghubungkaitkan budaya serta cara hidup dengan konsep matematik (D'ambrosio,2001). Dalam erti kata lain ialah proses aplikasi matematik yang dikaitkan dengan kehidupan sehari-harian kita. Oleh yang demikian, para pensyarah memainkan peranan yang penting dalam usaha menerapkan matematik dalam budaya serta cara hidup pelajar. Perubahan harus berlaku dalam proses pengajaran matematik supaya selari dengan perubahan demografi pelajar.

Kekurangan keupayaan komunikasi dalam bahasa asing juga menjadikan pelajar sukar untuk mengembangkan idea matematik. Di Amerika, kaum asli terutamanya, mereka menggunakan bahasa dan budaya mereka sepenuhnya sebagai isyarat komunikasi dan tidak menjadikan Bahasa Inggeris sebagai bahasa penghantaran. Oleh yang demikian, kaedah pembelajaran matematik di dalam bilik darjah secara tradisional bagi anak-anak kaum asli adalah tidak relevan lagi. Oleh yang demikian, etnomatematik merupakan cara terbaik dalam proses memastikan penyampaian serta pembelajaran matematik difahami oleh mereka. (David M. Davidson 1990). Menurut Harbor dan Peter (2001), bagi negara Nigeria pula, mereka terdiri daripada masyarakat berbilang budaya dan setiap daripada pelajar-pelajar mereka adalah produk daripada pelbagai budaya. Beliau percaya bahawa dapatn kajian terhadap pengembangan matematik dalam budaya yang berbeza adalah positif serta mampu meningkatkan kefahaman dan prestasi pelajar dalam pembelajaran matematik.

Aktiviti pengajaran dan pembelajaran yang berkesan meliputi kesediaan pensyarah menggalakkan pembelajaran yang menarik dan membentuk minat para pelajar. Pendekatan etnomatematik merupakan salah satu cara para pendidik menjadikan suasana belajar ceria dan tidak bosan sekaligus dapat mencuri tumpuan para pelajar.

KERANGKA KAJIAN

METODOLOGI KAJIAN

Kajian ini akan mengamalkan kaedah penyelidikan kualitatif. Satu soal selidik yang diadaptasi daripada kajian Aikipitanyi dan Eraikhuemen (2017) akan diedarkan kepada responden yang dipilih secara rawak berlapis.

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CADANGAN

Bagi memastikan, pendekatan etnomatematik digunapakai secara meluas dalam sistem pengajaran khususnya matematik, pensyarah matematik perlulah diberi latihan dan pendedahan yang cukup. Program seperti seminar dan bengkel berkaitan etnomatematik kepada mereka yang terlibat perlu dirancang bagi merealisasikan cadangan ini. Seterusnya, pengkaji juga mencadangkan supaya kajian keberkesanan pendekatan etnomatematik ini dijalankan terhadap kumpulan pelajar bagi mengetahui sejauh mana keberkesanan proses pengamalan etnomatematik ini dan pengkaji yakin hasil analisis data nanti akan memberikan persepsi yang positif terhadap perlaksanaan etnomatematik. Dapatan kajian itu juga akan dapat membantu pensyarah menilai sejauh mana keberkesanan pendekatan etnomatematik dan memberi peluang kepada pensyarah untuk mencari kaedah yang paling sesuai untuk menarik minat pelajar dalam mengendali sesebuah kelas matematik. Akhir sekali, kerajaan perlulah memainkan peranan yang penting dengan menyediakan dana dan insentif kepada pensyarah matematik untuk menggalakkan mereka menggunakan kaedah inovatif dan cekap dalam penyampaian ilmu matematik.

KESIMPULAN

Sebagai seorang pendidik yang berjiwa besar, mereka haruslah menjadi seorang yang bertanggungjawab atas apa yang telah mereka ajar kepada anak-anak didik mereka. Seorang pendidik yang baik mampu menghasilkan produk-produk yang berkualiti dan mampu menjadi aset terbaik negara. Pendidik yang baik disini membawa makna bahawa mereka bukan sahaja mengajar berdasarkan buku teks atau nota semata-mata malah mereka berusaha menerapkan konsep matematik itu dalam kehidupan serta rutin pelajar-pelajar mereka.

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eISBN

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eISBN

APLIKASI KAEDAH JIGSAW DALAM PENGAJARAN MATEMATIK PENGKOMPUTERAN BAGI TOPIK KALKULUS

Fatin Hamimah Mohd Salleh, Erna Ruhaily Rusli
Politeknik Balik Pulau, Pulau Pinang

Abstrak

Pepatah Melayu berbunyi ‘bersatu kita teguh, bercerai kita roboh’ yang membawa maksud bahawa semangat kerjasama dalam berpasukan mampu menjadikan kita lebih kuat dan berdaya saing. Dalam bidang pendidikan, semangat kerja berpasukan ini dapat diterap melalui kaedah pembelajaran koperatif menggunakan teknik Jigsaw. Teknik ini merupakan salah satu subset pembelajaran koperatif yang telah menunjukkan keupayaan memupuk kemahiran interaksi berkumpulan, berfikiran kritis serta sifat positif, selaras dengan paradigma masa kini yang berlandas keperluan hasil pembelajaran. Dalam kajian ini, teknik Jigsaw akan digunapakai dalam proses pengajaran dan pembelajaran bagi topik kalkulus. Sehubungan dengan itu, kertas kerja ini akan membincangkan kedua-dua metodologi pembelajaran yang akan dilaksanakan dalam subjek Matematik Pengkomputeran dan mengupas keberkesanannya secara kuantitatif dan kualitatif. Perbandingan struktur pembelajaran secara koperatif dan kompetitif adalah menggunakan rekabentuk kuasi eksperimental. Analisis kuantitatif dilakukan ke atas dua set data markah ujian pasca dan ujian pos pelajar untuk melihat kesan ke atas pencapaian akademik manakala analisis kualitatif dilakukan secara analisis sebab-akibat menggunakan set soal selidik yang diadaptasi daripada kajian Instructional Material Motivations Survey (IMMS) (Keller, 1987) untuk mengkaji kesannya terhadap motivasi pelajar.

Kata Kunci: Jigsaw, Koperatif, Pembelajaran

PENGENALAN

Pendidikan memainkan peranan penting dalam perkembangan ekonomi dan pembangunan sesebuah negara. Untuk itu, proses pengajaran dan pembelajaran yang berlaku dalam bilik darjah merupakan penentu utama kejayaan masa depan sesebuah negara. Peranan guru sangat penting untuk merancang pengajaran yang lebih sistematik dengan kaedah dan teknik mengikut tahap kebolehan pelajar. Kebanyakkan kaedah pembelajaran yang diamalkan di bilik darjah adalah pembelajaran secara kompetitif di mana pelajar belajar secara sendirian atau berpusatkan pensyarah semata-mata. Namun begitu, pembelajaran secara koperatif. memberi peluang dan ruang untuk pelajar memberikan idea, berbincang dan berinteraksi satu sama lain dan belajar melalui pengalaman mereka sendiri (Ahmad, 2013).

PENYATAAN MASALAH

Matematik Pengkomputeran (DBM10063) merupakan subjek teras yang perlu diambil oleh semua pelajar yang mengikuti pengajian Diploma Teknologi dan Maklumat di Politeknik Balik Pulau khususnya. Penguasaan konsep asas matematik yang lemah menyebabkan pelajar tidak dapat memperkembangkan konsep baru yang diperolehi menjadi lebih bermakna. Keputusan ujian akhir sesi Jun 2019 bagi kursus DBM10063 mencatatkan peratusan pelajar yang gagal adalah sebanyak 73.3% dalam topik kalkulus.

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Kaedah pembelajaran secara kooperatif merupakan salah satu cadangan Peningkatan Kualiti Berterusan bagi meningkatkan peratusan pelajar lulus dalam topik kalkulus bagi sesi Disember 2019. Kajian oleh Jamaludin dan Affendi (2018) terhadap skor pencapaian pelajar Politeknik Sultan Abdul Halim Muadzam Shah (POLIMAS) bagi subjek Matematik Pengkomputeran mendapati skor pencapaian terendah adalah dalam topik geometri serta pembezaan dan pengamiran. Topik-topik ini merupakan salah satu cabang matematik di bawah tajuk kalkulus.

Kaedah pembelajaran secara koperatif merupakan salah satu strategi pengajaran dan pembelajaran yang berpusatkan pelajar. Menurut Wahidah (2011), strategi pembelajaran berpusatkan pelajar adalah lebih praktikal pada masa kini berbanding pengajaran berpusatkan pensyarah semata-mata. Hal ini juga bertepatan dengan strategi penyampaian kuliah berpusatkan pelajar yang telah digariskan oleh Kementerian Pendidikan Tinggi Malaysia. Terdapat pelbagai teknik pembelajaran koperatif telah dibangunkan menerusi penekanan yang berbeza-beza. Teknik Jigsaw merupakan salah satu kaedah pembelajaran secara koperatif. Pada bahagian sorotan literatur akan dibincangkan kajian- kajian keberkesanan perlaksanaan kaedah Jigsaw dalam pengajaran dan pembelajaran. Justeru itu, kajian ini bertujuan mengenalpasti keberkesanan pembelajaran Jigsaw bagi topik kalkulus dalam meningkatkan pencapaian pelajar dan mengkaji tahap motivasi pelajar terhadap pembelajaran menggunakan kaedah Jigsaw.

OBJEKTIF

Objektif yang ingin dicapai melalui kajian ini adalah:

1. Mengenalpasti sama ada terdapat perbezaan pencapaian min ujian kumpulan eksperimen dan kumpulan kawalan bagi menunjukkan wujudnya keberkesanan pembelajaran koperatif teknik Jigsaw dalam topik kalkulus

2. Mengenalpasti tahap motivasi pelajar terhadap kaedah pembelajaran koperatif teknik Jigsaw dalam topik kalkulus.

SOROTAN KAJIAN

Pendidikan Berasaskan Hasil (Outcome Based Education) yang diperkenalkan di politeknik membolehkan para pelajar memperolehi pencapaian dan menguasai pembelajaran tahap tertinggi setiap semester tanpa menunggu sehingga memenuhi kredit program dan tamat pengajian. Salah satu elemen yang diberi penekanan dalam Pendidikan Berasaskan Hasil (OBE) adalah menyediakan aktiviti pembelajaran tertentu dengan tujuan untuk membolehkan para pelajar mencapai semua hasil yang dirancangkan. Selaras dengan itu, Pendidikan Berasaskan Hasil (OBE) memfokuskan kepada pembelajaran berpusatkan pelajar. Oleh itu, pembelajaran koperatif dilihat sebagai salah satu kaedah efektif yang dapat digunakan dalam meningkatkan penguasaan pelajar terhadap kursus yang diambil seterusnya dapat melahirkan generasi muda yang berkaliber serta bersedia menghadapi cabaran baru dalam era globalisasi.

Definisi Pembelajaran Koperatif

Pembelajaran koperatif merupakan satu strategi pengajaran dan pembelajaran yang menggunakan kumpulan kecil pelajar untuk memberikan peluang kepada pelajar berinteraksi sesama mereka dalam proses pembelajaran. Kaedah pembelajaran koperatif berdasarkan Felder dan Brent (2004),

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menitikberatkan pembelajaran berstruktur dalam kumpulan kecil dalam memenuhi lima kriteria, iaitu; saling bergantungan positif, kebertanggung- jawapan, interaksi bersemuka, penggunaan kemahiran interpersonal yang bersesuaian dan penilaian kendiri ke atas matlamat kumpulan yang berterusan. Kriteria-kriteria ini merupakan asas kepada pengurusan dan perancangan kepada kaedah pembelajaran koperatif yang telah dikenalpasti mempunyai kesan positif terhadap pembelajaran pelajar. Berdasarkan kajian Noraini Idris (2005), menyatakan bahawa pembelajaran koperatif adalah satu kaedah pembelajaran kerjasama yang memerlukan pelajar bekerjasama untuk belajar dan bertanggungjawab ke atas pembelajaran rakan sepasukan mereka. Pembelajaran secara berkumpulan ini merupakan langkah terbaik bagi memantapkan pemahaman pelajar terhadap sesuatu isi pelajaran yang diajar.

Menurut Amira (2008), menyatakan bahawa pembelajaran koperatif membantu pelajar menyiapkan tugasan dengan lebih mudah dan dapat mendengar serta menerima pendapat masing-masing. Kemahiran bekerja dalam kumpulan ini turut meningkatkan kemahiran berkomunikasi melalui aktiviti perbincangan dalam kumpulan. Ini dibuktikan melalui kajian- kajian berikut (Johnson & Johnson, 2000; Felder & Brent , 2003; Slavin & Karweit, 1985), yang menyatakan bahawa kaedah ini telah berjaya meningkatkan pencapaian pelajar disamping menggalakkan perkembangan generik seperti motivasi untuk belajar, interaksi dan sikap saling bergantungan yang positif, menerapkan kemahiran asas seperti kepimpinan, keupayaan membuat keputusan, memupuk kerjasama, sifat toleransi antara kaum dan kepercayaan di antara pelajar serta keupayaan berfikir secara kritikal.

Seterusnya Sahin (2010), mengemukakan bahawa pembelajaran koperatif merupakan satu cara pendekatan atau serangkaian strategi yang khusus dirancang bagi memberi dorongan kepada pelajar agar bekerjasama selama proses pengajaran dan pembelajaran berlangsung. Student teams Achievement Divisions (STAD), Learning Together (LT), Jigsaw dan sebagainya merupakan antara jenis strategi yang digunakan dalam pembelajaran koperatif.

Strategi Pembelajaran Jigsaw

Strategi pembelajaran Jigsaw merupakan satu kaedah berpusatkan pelajar yang diperkenalkan pada tahun 1978 oleh Aronson. Strategi pembelajaran ini adalah salah satu strategi yang digunakan dalam pembelajaran koperatif. Ia memberi penekanan kepada penglibatan pelajar secara aktif dalam proses pengajaran dan pembelajaran, meningkatkan minat pelajar terhadap pelajaran dan bekerjasama untuk menjadikan proses pembelajaran lebih bermakna. Rajah 1 menunjukkan struktur pembelajaran Jigsaw yang mengandungi dua jenis kumpulan iaitu kumpulan pembelajaran dan kumpulan pakar. Seterusnya dalam kumpulan pembelajaran, pelajar dibahagikan kepada beberapa kumpulan kecil di mana setiap ahli kumpulan perlu menguasai subtopik yang berbeza antara satu sama lain.

Setelah itu, pelajar akan berkumpul bersama ahli kumpulan lain yang menguasai topik yang sama di dalam kumpulan pakar. Manakala dalam kumpulan pakar pula, semua pelajar akan belajar bersama-sama untuk menguasai sesuatu topik. Kemudian setiap ahli kumpulan tersebut akan kembali semula kepada kumpulan pembelajaran masing-masing untuk mengajar ahli kumpulan yang lain. Selain itu, strategi atau kaedah Jigsaw ini juga dilihat seperti Jigsaw Puzzle di mana setiap ahli kumpulan akan menyumbangkan sekeping puzzle berupa maklumat untuk dikongsikan bersama pelajar yang lain.

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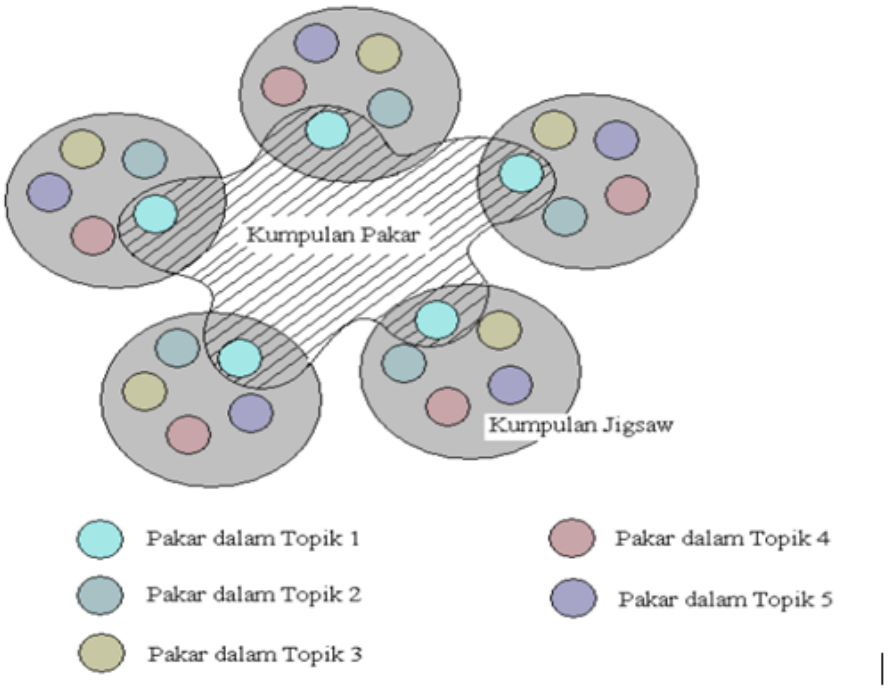

Rajah 1: Struktur Pembelajaran Jigsaw Dipetik daripada: Hafizah et.al, (2008)

Slavin (1990) telah melakukan pengubahsuaian terhadap format Jigsaw dengan memasukkan elemen kuiz dan ganjaran yang dikenali sebagai Jigsaw II. Secara tidak langsung kaedah ini dapat mengajar pelajar yang lemah menjadi pengajar yang baik di samping meningkatkan kemahiran sosial dan keyakinan diri. Menurut Felder & Brent (2004), strategi Jigsaw II ini dilihat lebih kompleks kerana memerlukan komitmen daripada para pelajar dan juga pensyarah serta memerlukan perancangan yang rapi. Setiap kumpulan pelajar perlu memenuhi ciri berikut: (i) Kepelbagaian dalam kumpulan, (ii) Sasaran kumpulan atau kesalingbergantungan yang positif, (iii) Interaksi sokongan, (iv)Tanggungjawab individu, (v) Kemahiran interpersonal, (vi) Peluang kejayaan yang sama rata, dan (vii) Persaingan antara kumpulan.

Menurut Esah (2004), menyatakan bahawa perancangan pengajaran yang menarik melalui pelaksanaan pembelajaran Jigsaw II menjadikan pembelajaran lebih berbentuk hands-on, minds-on dan bersifat autentik. Hands-on bermaksud perancangan pengajaran yang melibatkan pelajar melaksanakan aktiviti atau praktikal disamping membina makna bagi mendapatkan kefahaman. Minds-on pula bermaksud perancangan aktiviti yang memungkinkan pelajar membina proses kognitif serta menggalakkan perasaan ingin tahu di dalam diri mereka. Proses pembelajaran ini akan memberikan kesan yang positif apabila setiap pelajar mampu menyelesaikan persoalan yang dihadapi khususnya semasa perbincangan berlangsung dalam kumpulan Jigsaw atau kumpulan pakar.

Perlaksanaan strategi pembelajaran Jigsaw II ini telah menunjukkan keberkesanannya melalui hasil kajian yang dibuat. Hasil kajian yang dilaksanakan menunjukkan peningkatan yang positif dalam pencapaian pelajar. Menurut Yusfaiza dan Mohd (2012), perlaksanaan strategi Pembelajaran Jigsaw II dalam pengajaran Penulisan Bahasa Melayu telah meningkatkan tahap pencapaian pelajar dalam penulisan karangan.

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Selain itu, Hafizah et. al (2008) juga membuktikan bahawa penggunaan strategi Pembelajaran Jigsaw II memberi impak yang positif dalam pencapaian kursus Isyarat dan Sistem.

METODOLOGI KAJIAN

Kajian ini dilaksanakan bertujuan untuk melihat kesan kaedah pembelajaran koperatif dan kompetitif ke atas pencapaian akademik pelajar dalam topik kalkulus. Bagi mengukur objektif pertama, pengkaji akan menggunakan kaedah kuasi eksperimental. Dua kumpulan pelajar yang terlibat dalam kajian ini iaitu kumpulan eksperimen dan kumpulan kawalan. Kumpulan eksperimen akan didedahkan kepada pengajaran dan pembelajaran koperatif dalam menguasaikemahiran penyelesaian masalah dalam topik kalkulus. Manakala kumpulan kawalan tidak diberikan rawatan. Kaedah pengajaran dan pembelajaran kumpulan kawalan dilaksanakan mengikut kaedah pembelajaran kompetitif, iaitu guru mengajar secara kuliah. Kajian ini akandijalankan selama lapan minggu untuk mencapai kemahiran penyelesaian masalah dalam topik kalkulus. Tempoh masa kajian berdasarkan kepada beberapa penyelidikan kuantitatif menggunakan kaedah kajian eksperimen yang pernah dijalankan di negara ini mengambil masa dua bulan (Suhaida Abdul Kadir et al. 2006). Ujian pra dan ujian pos akan dijalankan bagi kedua-kedua kumpulan sebelum dan selepas rawatan.

Bagi mengukur objektif kedua, kaedah soal selidik yang diubah suai berdasarkan Instructional Material Motivations Survey (IMMS) (Keller, 1987). Instrumen ini mengukur motivasi responden dalam 4 dimensi: Aspek Tumpuan, Aspek Relevansi, Aspek Keyakinan Diri dan Aspek Kepuasan Diri. Responden dikehendaki memberi respon dengan menandakan (/) pada petak pilihan berdasarkan skala 1 (sangat tidak bersetuju) sehingga skala 5 (sangat bersetuju). Item-item soal selidik direkabentuk menggunakan skala likert lima mata. Keputusan analisis skor min akan ditentukan menggunakan tafsiran skor min yang dicadangkan dalam kajian Huang dan Hew, 2016.

Jadual 1 : Tafsiran Skor Min (Huang dan Hew,2016)

Tahap Motivasi	Min Skor
Tinggi	4.00 --- 5.00
Sederhana Tinggi	3.50 --- 3.99
Sederhana	3.00 --- 3.49
Rendah	< 3.00

CADANGAN

Pengkaji mencadangkan bahawa semua topik dalam subjek Matematik Pengkomputeran (DBM10063) menggunakan pendekatan pembelajaran secara koperatif. Pengkaji juga

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mencadangkan bahawa para pensyarah diberi kursus dan bengkel berkaitan pemahaman serta pengamalan pendekatan pembelajaran secara koperatif. Pengkaji juga mencadangkan bahawa masa pertemuan bersama pelajar iaitu 2 jam ditambah kepada 3 jam bagi membolehkan pendekatan koperatif ini dijalankan dengan lebih tersusun dan terancang. Pengkaji juga mencadangkan bahawa teknik-teknik lain dikaji keberkesanaannya sebagai kaedah pembelajaran koperatif. Akhir sekali, pengkaji juga mencadangkan bahawa pendekatan pembelajaran koperatif ini digunapakai bagi subjek-subjek lain bagi melihat keberkesannya terhadap peningkatan akademik pelajar politeknik amnya.

KESIMPULAN

Secara rumusannya, kejayaan serta pencapaian akademik seorang pelajar bukanlah semata-mata bergantung kepada diri pelajar itu sendiri. Para pensyarah juga merupakan insan yang bertanggungjawab secara langsung membantu kejayaan pelajar mereka dengan menerapkan teknik serta kaedah pengajaran dan pembelajaran yang berkesan serta berkualiti. Oleh yang demikian, kombinasi pengajaran yang berkualiti, susunan kurikulum yang baik serta sikap pelajar yang ingin berjaya merupakan ramuan penting dalam memastikan kebolehpasaran graduan politeknik berada pada tahap yang tinggi.

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FAKTOR-FAKTOR YANG MEMPENGARUHI KEPUTUSAN PEPERIKSAAN AKHIR PELAJAR BAGI SUBJEK MATEMATIK PENGKOMPUTERAN

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Politeknik Balik Pulau, Pulau Pinang

Abstract

This study was conducted with the aim to find the factors that influence final exam results of the Computer Science subject. Respondents consisted of 217 semesters one students who registered the subject of Computing Mathematics in Polytechnic of Balik Pulau. Data collection was conducted using a set of questionnaires containing 40 items with 5-point likert scale. To ensure the reliability of the items constructed, a pilot study of 30 respondents was conducted. Cronbach's Alpha of 0.853 was obtained and this indicates that the mean value of the constructed item is high. The actual data collected were processed descriptively using Statistical Packages for Social Sciences (SPSS version 23). The findings from the study show that the main factor influencing the result of the final examination of the students for the subject of Computing Mathematics is the lecturer's intracellular delivery factor with the highest mean of 4.331.

Keyword: Factor, Mathematics.

PENDAHULUAN

Matematik adalah subjek yang memerlukan penerapan kefahaman dan kebolehan memanipulasikan pengetahuan yang diperolehi, serta kemahiran mengaplikasikannya. Ia telah difahamkan sebagai "satu cara berfikir, kajian pola, kajian perhubungan, satu seni dan bahasa yang tersendiri", yang berasal daripada sistem logik hasil rumusan bahasa matematik seperti simbol-simbol, hukum-hukum dan operasi-operasinya (Ahmad et al., 2006, 2). Usaha mempertingkatkan kualiti pengajaran dan pembelajaran matematik di negara ini perlu diambil kira pelbagai aspek termasuk sosioekonomi, budaya & kehendak masyarakat. Walau bagaimanapun, kemerosotan pencapaian pelajar dalam mata pelajaran matematik sering dibincangkan dari semasa ke semasa, terutamanya di kalangan pendidik subjek matematik, akhbar, mahupun media massa.

KAJIAN LITERATUR

Dewasa ini, pengajaran & pembelajaran (PdP) ditakrifkan sebagai suatu proses yang saling berkaitan serta berpautan antara satu dengan yang lain (Ahmad et al., 2006, 2). Penyediaan pengajaran yang sistematik akan mewujudkan hasil pembelajaran yang berjaya dan berkesan. Kesannya, PdP secara "Chalk and Talk" yang diamalkan pada masa dahulu tidak lagi menjadi kaedah yang berkesan. Hubungan gaya pembelajaran mengikut tempat tinggal dan kemahiran belajar mempengaruhi pencapaian seseorang pelajar tersebut (Abd. Rahman, 2009).

Sistem pendidikan pada hari ini lebih berorientasikan kepada peperiksaan. Ini menyebabkan para pendidik perlu menghabiskan silibus dan terikat dengan takwim peperiksaan yang telah ditetapkan oleh pihak atasan. Kaedah penyampaian subjek matematik mungkin dicepatkan untuk menghabiskan silibus dan kemungkinan besar persoalan dalam matematik diselesaikan oleh guru itu sendiri jika pelajar kurang kemahiran tinggi (Sabran, 2013).

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Guru hanya membincangkan penyelesaiannya di papan tulis dan pelajar akan menyalin jawapan yang diberikan. Kesannya, kekurangan kemahiran pemikiran aras tinggi akan mendorong kepada pencapaian pelajar yang lemah di dalam Matematik. Hal ini terbukti di mana pelajar kurang kemahiran dan lemah dalam menjawab soalan peperiksaan yang melibatkan penyelesaian masalah (Sabran, 2013).

Hasil kajian literatur yang dijalankan oleh Ahmad et al. (2006) menunjukkan isu-isu kesukaran pencapaian pelajar dalam bidang matematik adalah disebabkan oleh (i) perbezaan gaya pembelajaran; (ii) personaliti; (ii) tanggapan negatif terhadap matematik; (iv) sikap; (v) pengaruh persekitaran dalam pembelajaran; (vi) latar belakang keluarga; (vii) kurang minat. Sikap dan minat pelajar boleh diubah sekiranya matematik dapat diajar dengan berkesan, mengatasi kelemahan yang dihadapi oleh pelajar (Ahmad et al., 2006). Walau bagaimanapun, pendekatan pengajaran matematik yang lemah dan tidak matang juga boleh menyebabkan kemahiran asas matematik yang mudah menjadi sukar dikuasai oleh pelajar (Ruhaiza, 2016; Ahmad et al., 2006; Yuzi, 2003).

Kehidupan seorang pelajar, terutamanya mereka yang menyambung pengajian di institusi pengajian tinggi (IPT) sebenarnya adalah sangat mencabar disebabkan pelbagai masalah perlu dihadapi setiap hari dan hal ini termasuklah masalah pembelajaran, masalah persekitaran, masalah sosial, masalah kewangan, dan masalah emosi pada mereka yang tinggal berjauhan dengan keluarga (Noor Syaheeda et al., 2014; Titik dan Bibi, 2000). Pelajar tidak dapat mencari jalan penyelesaian atau tempat luahan perasaan yang boleh mengurangkan bebanan dalam diri mereka. Sesetengah pelajar juga menghadapi masalah tidur yang tidak mengcukupi dan memberikan kesan yang negatif terhadap tubuh badan sekaligus mengakibatkan gangguan emosi atau minda untuk berfikir secara cergas (Hajah Farhana Tarnudi, 2013).

Kajian yang dijalankan di Politeknik Ibrahim Sultan untuk mengkaji faktor pelajar gagal dalam subjek Matematik; di mana ramai pelajar mengulang subjek matematik dan tidak dapat menamatkan pengajian mereka mengikut masa yang ditetapkan. Didapati faktor pelajar atau masalah individu itu tersendiri merupakan faktor utama yang menyumbang kepada kegagalan pelajar dalam subjek Matematik; dan ia termasuklah faktor-faktor seperti (i) kaedah belajar; (ii) masalah peribadi; (iii) sikap dan motivasi (Noor Syaheeda et al., 2014). Kajian yang dilakukan di Politeknik Mukah pula mendapati faktor persekitaran (Min=3.76), faktor pensyarah (Min=3.56), faktor minat (3.51), dan faktor sikap (Min=3.11) merupakan faktor yang mempengaruhi pencapaian pelajar dalam kursus Matematik Kejuruteraan 2 (Suhana dan Intan, 2016).

Sebenarnya, subjek matematik di politeknik adalah lanjutan kepada matematik yang dipelajari di sekolah menengah. Pelajar telah dipersiapkan dengan asas Matematik dan hanya perlu mengulangkaji nota dan membuat latih tubi untuk mengingat semula dan menguasai asas-asas matematik seperti pecahan, persamaan linear, pembezaan dan pengamiran (Noor Syaheeda et al., 2014). Subjek Matematik turut dipraktikan sebagai salah satu syarat utama (kredit) untuk memasuki IPT dalam bidang kejuruteraan (Titik dan Bibi, 2000). Pencapaian matematik pelajar di peringkat SPM dipengaruhi oleh sikap pelajar itu sendiri. Akan tetapi, kebanyakan pelajar mempunyai sikap malas, tidak minat belajar dan bosan dengan matematik (Asniza, 2010; Ahmad et al., 2006), serta kurang persediaan (Yuzi, 2003) boleh mengakibatkan mereka gagal dalam subjek matematik.

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Pelajar tidak berjumpa dengan pensyarah apabila berhadapan dengan masalah dalam subjek matemati. Mereka juga tidak bertanya kepada pensyarah atau kawan sekiranya tidak faham, kurang motivasi dan mudah berputus asa tanpa mencari kaedah penyelesaian (Noor Syaheeda et al., 2014; Sabran, 2013; Asniza, 2010). Pada masa yang sama, pelajar juga tidak mempunyai asas yang kukuh dalam matematik sewaktu di sekolah (Ruhaiza, 2016; Yuzi, 2003). Hakikatnya, tiada perbezaan antara pelajar aliran Sains (teknik pembelajaran saintifik) dan pelajar bukan aliran sains (teknik pembelajaran bukan saintifik) sebaliknya tabiat pembelajaran matematik yang positif akan meningkatkan pencapaian dalam subjek Matematik itu tersendiri (Adibah et al., 2000).

PENYATAAN MASALAH

Prestasi akademik seseorang pelajar dinilai melalui prestasi dalam peperiksaan, samada ianya gagal atau lulus di Institusi Pengajian Tinggi (IPT). Kecemerlangan di dalam bidang akademik dapat memberikan gambaran mengenai tahap kefahaman dan penguasaan terhadap ilmu yang dipelajari di dalam sesuatu bidang. Walau bagaimanapun, jika sebahagian besar pelajar memperoleh prestasi yang rendah dalam peperiksaan berkaitan, ianya akan menjadi isu dan perhatian utama terutamanya pihak atasan mahupun ibu bapa pelajar berkenaan.

Berdasarkan kepada keputusan peperiksaan Semester 1 pelajar Program Diploma Teknologi Maklumat (Jadual 1) di Politeknik Balik Pulau (PBU), dapat dirumuskan prestasi subjek Matematik Pengkomputeran pelajar tidak begitu membanggakan khususnya bilangan pelajar yang gagal. Jika keadaan ini berterusan, ia mungkin akan menyebabkan pelajar tidak berminat dan mempunyai sikap yang negatif terhadap matematik.

Jadual 1: Keputusan peperiksaan mata pelajaran Matematik pelajar Semester 1

Sesi PdP	3.68 – 4.00 (80-100%) Cemerlang	3.00 – 3.67 (65-79%) Kepujian	1.00 – 2.99 (40-64%) Lulus	0 – 0.99 (0 – 39%) Gagal	Jumlah Pelajar
Jun 2018	5	66	37	109	217

Sumber: Jabatan Matematik, Sains dan Komputer PBU, 2019.

Untuk itu, objektif utama kajian ini adalah mengkaji faktor utama yang mempengaruhi keputusan peperiksaan akhir pelajar bagi mata pelajaran Matematik Pengkomputeran di PBU.

METODOLOGI

Kajian ini dijalankan secara deskriptif, iaitu bagi menerangkan sesuatu fenomena yang sedang berlaku. Sampel kajian ini melibatkan semua pelajar semester 1 (Jun 2018) yang mendaftar subjek Matematik Pengkomputeran di PBU. Kajian rintis telah dijalankan terhadap soalan yang dibina dan ianya menunjukkan tahap kepercayaan yang tinggi, iaitu sebanyak 0.853 Alpha Cronbach. Untuk kajian ini, semua item dalam soal selidik, iaitu data demografi (Bahagian I) dan soalan kajian (Bahagian II) dianalisa dengan menggunakan perisian SPSS (Statistical Packages for Social Sciences) versi 23. Bilangan item soal selidik berdasarkan faktor adalah seperti Jadual 2 berikut.

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Jadual 2: Bilangan item berdasarkan faktor-faktor

Faktor-aktor	Bilangan Soalan
soalan peperiksaan akhir	10
kecenderungan	11
bahan rujukan	6
penyampaian instruksional pensyarah	13
Jumlah	40

DAPATAN KAJIAN

Hasil daripada dapatan seramai 217 orang pelajar, 111 orang (51.2%) adalah pelajar lelaki, dan 106 orang (48.8%) adalah pelajar perempuan. Berdasarkan umur pelajar, 202 orang (93.1%) berumur 18-20 tahun, 13 orang (6%) berumur 21-23 tahun, dan 2 orang (0.9%) berumur lebih daripada 24 tahun. Hasil dapatan juga menunjukkan keputusan Matematik untuk Sijil Pelajaran Malaysia (SPM) adalah tahap memuaskan, iaitu 205 orang (94.5%) skor Gred A – C, manakala 12 orang (5.5%) skor Gred D – E.

Jadual 3 merupakan hasil analisa min yang menunjukkan faktor penyampaian intruksional pensyarah merupakan faktor utama yang mempengaruhi keputusan peperiksaan akhir pelajar bagi subjek Matematik Pengkomputeran di PBU

Jadual 3: Analisa dapatan berdasarkan faktor-faktor

Faktor	Min	Sisihan Piawai
soalan peperiksaan akhir	3.838	0.532
kecenderungan	3.782	0.715
bahan rujukan	3.701	0.703
penyampaian instruksional pensyarah	**4.331**	0.749

(i) Faktor Soalan Peperiksaan Akhir

Dapatan analisa menunjukkan catatan min bagi faktor ini adalah sebanyak 3.838. Item ke-5 iaitu “Saya memahami setiap item peperiksaan akhir dengan mudah” mendapat skor min paling rendah dengan catatan sebanyak 3.424. Ini menunjukkan bahawa sebilangan besar responden, iaitu sebanyak 52.5% tidak memahami soalan semasa menduduki peperiksaan akhir semester.

(ii) Faktor Kecenderungan Minat

Dapatan analisa menunjukkan catatan min bagi faktor ini adalah sebanyak 3.782. Item ke-9 iaitu “Saya akan meminta soalan tambahan dari pensyarah untuk mengulangkaji pelajaran” mendapat skor min paling rendah dengan catatan sebanyak 3.060. Ini menunjukkan bahawa sebilangan besar responden iaitu sebanyak 66 % responden tidak menunjukkan kecenderungan minat terhadap subjek Matematik Pengkomputeran dengan mengambil alternatif meningkatkan kefahaman dan penguasaan subjek ini.

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(iii) Faktor Bahan Rujukan

Dapatan analisa menunjukkan catatan min bagi faktor ini adalah sebanyak 3.701. Item ke-4 iaitu "Saya ambil maklum kedudukan rak buku rujukan matematik di perpustakaan PBU" mendapat skor min paling rendah dengan catatan sebanyak 2.750. Ini menunjukkan bahawa sebilangan besar responden iaitu sebanyak 75 % responden tidak maklum atau tidak pernah menggunakan buku rujukan matematik di perpustakaan PBU.

(iv) Faktor Penyampaian Instruksional Pensyarah

Dapatan analisa menunjukkan catatan min bagi faktor ini adalah sebanyak 4.331. Item ke-5 iaitu "Pensyarah menggunakan alat bantu mengajar yang sesuai" mendapat skor min paling tinggi dengan catatan sebanyak 4.070. Ini bermaksud kebanyakan pelajar tidak bersetuju dengan kaedah yang digunakan untuk mengajar subjek ini.

PERBINCANGAN

ICT merupakan salah satu usaha saintifik yang dapat memantapkan tahap penguasaan matematik pelajar, terutamanya dari segi penguasaan, kefahaman, penghayatan dan aplikasi Matematik (Noorzeliana et al., 2015); di samping menjimatkan kos, masa dan tenaga (Hafiza, 2016). Peranan multimedia bukan sahaja boleh memotivasikan para pendidik terutamanya dalam pengajaran sains dan matematik, tetapi juga mengurangkan jurang antara penguasaan Bahasa Inggeris yang telah diamalkan dalam subjek berkenaan (Jailani et al., 2008). Malah, multimedia interaktif berbantuan komputer juga boleh meningkatkan motivasi belajar para pelajar (Siti Salwa, 2013; Md. Nor dan Rashita, 2011).

Untuk itu, para pendidik di PBU boleh memuatnaik bahan rujukan yang lebih banyak ke aplikasi CIDOS (Curriculum Information Document Online System) yang diwujudkan di politeknik sebagai medium pembelajaran secara bukan bersemuka. Di samping itu, para pendidik juga boleh menunjukkan kaedah pencarian maklumat melalui Internet seperti YouTube. Kaedah e-learning terbukti berkesan dengan kajian yang telah dijalankan di Politeknik Mukah, di mana kesediaan pelajar terhadap penggunaan e-learning berada pada tahap yang tinggi (Min=3.95) dan e-learning sesuai digunakan untuk subjek Matematik Kejuruteraan (Min=3.86); seterusnya meningkatkan pembelajaran "Self Learning Time (Intan dan Suhana, 2016).

Laporan oleh Utusan Malaysia (3 Oktober 1996), satu bentuk kesepakatan telah dicapai oleh golongan pendidik, khasnya dalam pengajaran dan pembelajaran matematik yang mencadangkan supaya pelajar perlu aktif di dalam kelas ditambah lagi melalui kaedah belajar secara berkumpulan dan sentiasa berhubung dengan guru. Kajian yang dijalankan oleh Norazlina dan Azman (2015) mendapati pelaksanaan aktiviti yang berpusatkan pelajar seperti pembelajaran interaktif, pra-ujian sebelum ujian berlangsung, bengkel dan klinik Matematik yang boleh meningkatkan prestasi pelajar. Oleh yang demikian, melalui kajian ini, pensyarah boleh melakukan penambahbaikan dari segi teknik pengajaran seperti menambahkan elemen multimedia dalam PdP atau Klinik Matematik sebelum peperiksaan akhir berlangsung untuk meningkatkan keputusan akhir Matematik Pengkomputeran.

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KESIMPULAN, IMPLIKASI, DAN BATASAN KAJIAN

Dalam kehidupan seharian, matematik digunakan untuk menyelesaikan tugas yang diamanahkan; dan memainkan peranan yang penting dalam perkembangan sains dan teknologi yang semakin canggih. Kekuatan asas Matematik adalah penting agar pelajar tidak menghadapi masalah untuk mendalami ilmu Matematik pada peringkat yang lebih tinggi. Berdasarkan faktor-faktor yang dikenalpasti, pelajar dan pensyarah boleh melakukan perubahan dengan mengatur strategi-strategi yang lebih berkesan untuk meningkatkan lagi peratusan pelajar yang lulus dalam subjek Matematik Pengkomputeran. Segala tindakan yang diambil boleh melahirkan insan yang berkebolehan dan berketerampilan.

Kajian ini juga boleh dijadikan sumber rujukan oleh mana-mana pihak yang berusaha meningkatkan prestasi akademik pelajar terutamanya subjek matematik. Walau bagaimanapun, kajian ini dijalankan di PBU ke atas pelajar program Diploma Teknologi Maklumat. Saiz sampel yang dikaji adalah terhad kepada pelajar semester 1 yang mengambil subjek Matematik Pengkomputeran di institusi ini sahaja dan tidak dapat mengambarkan keseluruhan pelajar di politeknik Malaysia.

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A REVIEW ON MARKET SEGMENTATION IN MALAYSIA POPULATION

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Abstract

Market segmentation is the process of dividing a market into subsets of consumers with common needs or characteristics. In order to have an effective targeting, a market segment should be identifiable, sizeable, stable or growing, accessible and congruent with the marketer's objective and resources. Currently in Malaysia, the lack of research to analyse the market segmentation and consumer behaviour is not being addressed. Therefore, a systematically literature review is proposed to enhance the level of understanding of the concepts on market segmentation and consumer behaviour among consumers and marketers. The main objective of this paper is to provide an overview on the bases for market segmentations and consumer behaviour that have been practiced in Malaysia. We could actually improve market targeting and success more effectively in an efficient way using the most appropriate market segment which could bring competition in the marketplace.

Key words: Market segmentation; Consumer Behaviour; Practiced in Malaysia

INTRODUCTION

Marketing is the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society (Schiffman et al., 2015). There are two common marketing strategies which are mass marketing and marketing segmentation. Mass marketing is a strategy to promote a single product or service to as many people as possible without differentiating how various segments of the market might respond. It is only works if all consumers have the same needs, wants, desires, background, education and experience. Before the widespread adoption of the marketing concept, most companies practiced the mass marketing by offering the same product and marketing mix to all consumers (Philip et al., 2013). Today, mass marketing is largely replaced by market matching strategy i.e. a three step strategy containing market segmentation, targeting and positioning (Simona et al., 2008). The marketing concept states that a company must determine the needs and wants of specific market segments and satisfy them better than competition (Schiffman et al., 2015). Thus, companies who adopt the marketing concept must segment their markets and develop products or services targeting different consumer groups. Market segmentation groups consumers according to their similarity related to a particular product category. It is a process of dividing a market into subset of consumers with common characteristics and selecting one or more to target with a distinct marketing mix. In other words, it is a process used to divide large heterogeneous markets into small markets that can be reached more efficiently and effectively with products and services that match consumer unique needs (Schiffman et al., 2015) (Philip et al., 2013).). In order to have profitability growth, companies not only have to focus on developing products and services to satisfy their customers, in the same time they should track customer purchase behavior and present distinct products and services for each segment. In other words, customer segmentation based on buying behavior is essential for developing successful marketing strategies, which in turn creating and maintaining competitive advantage.

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Thus, consumer behavior must be take into consideration together with the effective segmentation in marketing (Simona et al., 2008). Consumer behavior is the study of consumer actions when searching for, purchasing, using, evaluating, and disposing of products and services that they expect will satisfy their needs. Its plays an important role in discovering how consumer make consumption related decisions. In point of fact, there is a relationship between consumer behavior and marketing concept. To comply with the marketing concept, companies must always alert with customer needs and consumption related behavior (Schiffman et al., 2015). This paper will generally describe the bases of market segmentation in section 2. Then, general description of consumer behavior is discussed in section 3. A discussion on effective segmentation that have been practiced in Malaysia will be describe in Section 4. Lastly, the conclusion and overall findings are outlined in Section 5.

BASES OF MARKET SEGMENTATION

This section will intensively discuss the market segmentation which is consists of eight categories i.e. demographic, geodemographic, personality traits, psychographics, benefit segmentation, usage rate segmentation and usage situation segmentation. For most product and services, one variable is not enough to tell about target group. Thus, companies tend to use multivariable segmentation by simply combining segmentation into three categories which is shown as below (Philip et al., 2013). In general, multivariable segmentation leads to better customer insights. The simple multivariable segmentation which uses two or more bases from one category. For example, age and gender from demographic variables. While for advanced multivariable segmentation which uses two or more bases from two or more categories. For example, lifestyle, age, family life cycle and attitude to the product. The multistage segmentation which uses different variables at different times for example region, lifestyle and age.

A. Demographics

Demographic qualities include personal statistics, such as age, gender, ethnicity, income and wealth, occupation, marital status, household type and size, and geographic location (Lawson et al., 1988). Demographic segmentation is one of the most clearly identifiable. Using demographic is the easiest and most logical way to classify people and can be measured more precisely than other segmentation bases (Schiffman et al., 2015). Besides, it is also the most cost-effective way to locate and reach specific segments because most of the secondary data (e.g. U.S. Census Bureau, audience profiles of various media) compiled about any population stems from demographics (Schiffman et al., 2015). Demographic enable marketers to identify business opportunities in the form of shifts in age, income distribution, and populations of various regions (Schiffman et al., 2015). It is also the most consumption behaviours, attitudes, and media exposure patterns are directly related to demographics (Schiffman et al., 2015). In general, the most prominent demographics used in segmenting markets and targeting consumers are age, gender, family and households, social class and ethnicity. From the advantages that can be obtained from demographics, this demographics segmentation has become one of the most commonly used segments.

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B. Geodemographic

Geodemographic is segmentation based on the theory that people who live close to one another are likely to have similar financial means, tastes, preferences, lifestyles, and consumption habits, in strategic targeting (Schiffman et al., 2015). Consumers can be segmented geographically by region, climate or population density. This segment can also include the distance at which a consumer will travel to obtain a product or service.

C. Green Consumer

Environmental issue is fast becoming important business issue in Malaysia. Many corporations are beginning to incorporate green value into their marketing strategies. Malaysia consumer have been slow in responding to the environmental issues in the past but with increased per capita income and higher educational levels, the tide is now changing rapidly (Lee et al., 2018). More and more consumers have started to assess the environmental impact of product and services choices and to change their behaviour in purchasing, consuming and dispensing of the product (Ting et al., 2016). Green consumer is defines generally as ecologically minded consumers and have been segmented in several ways (Schiffman et al., 2015) i.e. Environmental activists, Organic eaters, and Economizers (Pelsmacker et al., 2011). Secondly, True Greens, Donor Greens, Learning Greens, and Non-Greens (Smint et al., 2003). Finally, Darkest greens where this type of consumer willing to pay a premium for eco-friendly products to reduce global warming, while the lightest greens were mostly concerned about saving money on energy bills, not saving the planet (Morales et al., 2012).

D. Personality Traits

By using the personality tests which consist in the form of questions or statements presented to the respondent, it helps marketers to determine consumer's personality and use it in segmentation. Consumers who are open-minded and perceive less risk than others in trying new things are likely to be innovators. Overall, personality traits shape attitudes and consumption behaviour (Schiffman et al., 2015).

E. Psychographic

Lifestyles is known as psychographics which consist of activities, interests, and opinions. As mention in previous discussion, the interests and opinions are categorized as cognitive factors which can be measured using surveys. Thus, usually for psychographic research, it will indicate respondent's level of agreement or disagreement by using the sample statements that refer to psychographic factors. Because of their versatility, psychographics is widely used together with demographic in segmentation and are part of almost all segmentation framework (Schiffman et al., 2015). Value and lifestyles (VALS) is the most popular segmentation system combining lifestyles and values to explain consumer purchasing behaviour. There are three primary motivations in VALS segment i.e. ideals motivated, achievement motivated and self-expression motivated. It will reflect a continuum in terms of resources and innovativeness and many business plan have used VALS (Schiffman et al., 2015).

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F. Benefit Segmentation

Benefit segmentation is based on the benefits consumers seek from products and services. The benefits that consumers look for represent unfilled needs, whereas buyers' perceptions that a given brand delivers a unique and prominent benefit result in loyalty to that brand (Schiffman et al., 2015).

G. Media-based Segmentation

Media-based segmentation considers the benefits consumers seek from adopting communication tools (Schiffman et al., 2015).

H. Usage Rate Segmentation

Usage rate segmentation stems from differences among heavy, medium and light users, and nonusers of a specific product, service, or brand. Marketers have found that within some product categories that a relatively small group of heavy users account for a disproportionately large percentage of total product usage. Targeting heavy users is a common marketing strategy and it can be more profitable than targeting other user categories. Since all competitors are likely to target the same heavy users, trying to attract these buyers requires a lot of expensive advertising. Some marketers prefer to target light and medium users with products that are distinct from those preferred by heavy users. A sophisticated approach to usage rate involves identifying the factors that directly impact the usage behaviour. Besides, understanding nonusers is essential. Thus, consumers are segmented in terms of their awareness status and also level of involvement. Besides, product involvement is also a segmentation factor too (Schiffman et al., 2015).

I. Usage Situation Segmentation

The occasion or situation often determines what consumers will purchase or consume. The marketers sometimes use usage situation segmentation. Many products are promoted for special usage occasions.

CONSUMMER BEHAVIOR ANALYSIS

Consumer behavior is a dynamic interaction of affect, cognition, behavior, and the environment by which human beings conduct the exchange aspects of their lives (Bennett et al., 1995). It involves thoughts and feelings people experience and the actions they perform in consumption processes. Including all things from the environment which influence those thoughts, feelings and actions. In order to develop effective marketing strategies, marketers have to research, analyze and understand consumers through education, sufficient information, product availability and price that affect products and services purchasing decisions (Bennett et al., 1995). In other word, consumer behavior focuses on the way consumer make decisions to spend their valuable resources i.e. time, money and effort on consumption related items. Besides, consumer behavior helps marketers to make decision on the way to deliver products and services effectively to consumers (Schiffman et al., 2015). There are four disciplines that helps shaping

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understanding of consumer behavior. Firstly, psychology where it is the study of the human mind and mental factors that affect behavior. Secondly, sociology is study of development, structure, functioning and problems of human society. Anthropology is to compare human societies' culture and development. Finally, communication is the process of imparting or exchanging information.

MARKET SEGMENTATION PRACTICES IN MALAYSIA

This section will discuss on effective segmentation and consumer behaviour that have been practiced in Malaysia. A successful segmentation will probably impact many different areas of the company i.e. product development, sales, information technology and market research. There are seven cases will be discussed in this section.

A. Psychographic Identifying Market Segment and Targets for Marketing Strategy Plan of Coca-Cola Company in Malaysia (Kanesan et al., 2018).

This paper aims to identify market segments and targets for marketing strategy plan of Coca-Cola Company in Malaysia. The first market segmentation is geodemographic where the market is divided into different geographical units such as regions, cities, or neighbourhood. Coca-Cola has a countrywide network of product distribution but the company segments more in urban and suburban areas as compared to rural areas. The second market segmentation is demographic where it is the main sector in which Coca-Cola Company targets is the youth because there is a much need of refreshment and energizers to cope up with their daily activities. Gender is also an issue needed to be given prior by Coca-Cola. Men and women tend to have different attitudinal and behavioural orientations, based partly on genetic makeup and partly on socialization practices. Coca-Cola targets both genders with its wide variety of drinks. This market is relatively large and is open to both genders, thereby allowing greater product diversification. The third market segmentation is psychographic where the Coca-Cola buyers are divided into different groups on the basis of lifestyle or personality or values. People within the same demographic group can exhibit very different psychographic profiles, for that reason Coca-Cola Company designed and made product which are suitable for their personality. In lifestyle, people differ in attitudes, interest, activities, and these affect the goods and services they consume. Coca-Cola Company presented products which are suitable for modern, busy life style and mobile generation. The fourth market segmentation is personality traits where the Coca-Cola Company award Coca-Cola products with a brand personality that corresponds to a target consumer personality.

The fifth market segmentation is benefit Segmentation where in promotion strategy of Coke, Coca-Cola Company introduces prizes in the top cover. The last market segmentation is usage situation segmentation where the Coca Cola consumers can be distinguished according to the occasions when they develop a need, purchase a product, or use a product. This segmentation can help firms expand product usage. In general, demographic variables are the most popular base of Coca-Cola Company for distinguishing their customer groups. The reason is that consumer wants, preferences, and usage rates are often associated with demographic variables. Another is that demographic variables are easier for Coca-Cola to measure because they can evaluate or conduct surveys for the demographic segmentation.

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B. Marketing Environment, Segmentation and Targets in Peninsular Malaysia: The Case of Gardenia Bakeries SDN.BHD (Hasri et al., 2016).

This paper focus about the strategies of Gardenia Bakeries SDN. BHD. in the consumer markets which market segmentation and targets implemented by Gardenia Bakeries in Peninsular Malaysia. Segmentation, targeting and positioning helps Gardenia Bakeries to find out which area or segment should the company focus in. The first market segmentation is psychographic. Based on lifestyle, Gardenia focuses on customer who demands for freshness, convenience, variety and uncompromising taste. To fulfil the consumer demands of bread with low heath risk and can easily get, Gardenia had done its very best to provide daily baked bread to their customers and have more delivery channel such as supermarket, grocery shop or even hawker along the road. Second market segmentation is demographic. Based on the age variable, Gardenia segments consumer into teenager, adults and senior citizen. Teenager are more likely to consume products with sweet taste e.g. waffle products is introduced to meet their demands. Gardenia also focusing on adults and senior citizens that demand for healthy diet. They have launched whole wheat fiber bread and also the latest Gardenia Breakthru which is full of vitamins and fiber. Gardenia have come out with a wide range of choices to make their bread as a popular food and is affordable for people of all ages and incomes. The capability of the catch up and cope with the consumer ever changing demands has helped the bread industry to expand. Dominating the market with a wide range of specialty breads, buns and rolls that cater to every taste bud, Gardenia has risen to become Malaysia's preferred brand, and has already captured a 70% market share. Its consumers span the entire spectrum of socio-economic segments, and market studies clearly indicate that Malaysians prefer the soft, American-style bread produced by Gardenia, to the drier European varieties.

C. The Lifestyle Segmentation of House Buyers' in Malaysian New Residential Market (Suan et al., 2008).

The Malaysian housing market is highly competitive. The success of a housing developer would depend very much on obtaining up to date information on consumer preferences. Prior knowledge of consumer needs and wants is important for the formulation of appropriate marketing strategies to ensure buyers satisfaction. Here, the property developer must apply different sets of marketing strategies for different group of house buyers to ensure that they could successfully communicate with each specific segment separately. This paper is using lifestyle segmentation to differentiate the segments of house buyers in Malaysia. In lifestyle, this psychographic segmentation research could shed some light into the different segments of house buyers in the country. Each of these segments can then be profiled and characterized to give a more accurate picture of the behaviour and purchasing decisions of house buyers. This paper had concluded that by using lifestyle market segmentations on consumer, it will enable the development of purposeful advertising strategies and the design of new products will meet the future demands.

D. Segmentation of Fresh Vegetable Shoppers by Product and Store Attributes Consedered for Fresh Vegetable Purchase in Klang Valley, Malaysia (Gindi et al., 2015).

This study examined and segmented the fresh vegetable consumers based on the product attributes and store attributes considered by the consumers in their fresh vegetable purchases.

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Segmentation process was based on different factors which include demographic and psychographic characteristics of the consumers as well as product and choice of the place to purchase the product. This process of segmentation of the consumers have started for long period of time. Result of the study shows that majority of the respondents considered fresh looking of vegetables, colour of the products and size and shape of the fresh vegetables as the important attributes considered by the respondents while purchasing the products. From the result also, majority of the respondents considered convenient of the store location, accessibility of the store, easy entry and exit and enough parking space as the important attributes for fresh vegetable purchases. The three segments of the consumers obtained are convenience seekers, health conscious concerned consumers and segment of the consumers who concerned for both products and store attributes while purchasing fresh vegetables.

E. The Challenger of Market Segments for Private Higher Education in Malaysia: Behavioural Segmentation (Haron et al., 2017).

The number of Higher Education institution in Malaysia keep continue to grow and develop from year by year especially private institution. In order to maintain the number of high intake in the private institution, it is important to figure out the market segmentation i.e. student who select the Private Higher Education to continue their study. Obviously market segmentation can be revealed by observing the attributes of certain student groups. This paper exactly using behavioural variable as key factor to market segmentation. From the behavioural segmentation perspective, customer or student satisfaction can be achieved using two dimensions. Firstly, is the benefits sought by the consumer and secondly is the underlying motivation of that consumption. Situation in Private Higher Education of Malaysia was responsive and sensitive with the sought of student. For example, the desire and element of want from undergraduate students can be distinguish from those of the postgraduate students either master or doctorate level. While postgraduate students may concern and more specifically on the providing of research facilities such as full functional laboratories, enough workshops room, complete equipment , supportive and responsibility with supervisors as feedback factors for satisfaction to postgraduate student, meanwhile the undergraduate students may emphasis to see availability of facilities in universities like classrooms with complete of latest technology such as LCD projector, Virtual Desktop Infrastructure (VDI) in classroom , not cramp and compact lecture hours, technique of teaching methodology in class , financial aids, lecturers expertise in faculty as important behavioral tools for customer factor satisfaction.

F. The Psychographic Analysis of Malaysian Domestic Travelers (Badearuddin et al., 2005).

This paper focus on clustering Malaysian domestic travellers into several groups along the psychographic line. It is important in order for better understanding towards promoting better strategies to prepare better products that suit the demands and traveller behaviours. In psychographic, it is one of the several generic methods to segment the market. The types of products and brands an individual purchase will reflect that person's characteristics and patterns of living. This approach is better to understand and predict how travellers will behave and choose their destination. This information is often useful in developing a destination positioning and in the execution of creative strategies to capture the exact traveller group. Psychographics also is one of the approaches to the study of understanding the motivation of traveller behaviour. Psychographics can explain the underlying motivations for travel and answers several important questions about the how, what, and why of travel.

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Psychographic research analyse consumers according to their psychological traits such as values, attitudes, perceptions, interests, motivations, opinions, needs, beliefs, activities and daily life routine which attempts to identify the characteristics of consumers that may affect their response to the place they would like to travel. While in demographic, the primary segmentation analysis in this project is typically performed using demographic data.

G. Market Segmentation and Shariah Compliancy Process in Islamic Banking Institutions (Bennett et al., 1995).

One of the objective of this paper is to find out market segmentation and positioning of Islamic banking services and products. The findings of this study reveal that there are three distinct consumer segments from the perspective of key market players, namely the religious conviction group, the religious conviction & economic rationality group and the ethical observance & economic rationality group. Theoretically, the current study identifies that the closest possible market segmentation basis for these groups are value and benefit sought. Values are from psychographic segmentation which emphasizes values, opinions and attitudes, activities and lifestyles while benefit sought is from product or product attributes. Benefit sought or benefit segmentation is based on the benefits that consumers seek from products and services. The benefits that consumers look for represent unfilled needs, whereas consumer perceptions that a given brand delivers a unique and prominent benefit result in loyalty to that brand. Overall, the findings provide an interesting theoretical insight into consumer segmentation for IBIs as compared to the segmentation in conventional banking.

CONCLUSION

Market segmentation consists of subdividing the market into homogeneous clusters, and it is the first step in a three-phase market strategy. After segmenting the market, the marketer must select one or more segments to target with a specific marketing mix. The third step is to position the product so that it is perceived by the target market to satisfy its needs better than other competitive offerings. Form the overview of the market segmentation that have been practice in Malaysia, the demographic information is the most accessible and cost effective way to identify a target market. Besides, demographics are easier to measure than other segmentation variables. Most secondary data are expressed in demographic terms and most media develop demographic profiles of their audiences. Moreover, demographic trends reveal shifts in age and income that signal business opportunities for marketers. However, demographic tend to be one dimensional because it provides information on the potential for usage but not on why a particular brand is used or exactly who uses it. Thus, demographics help locate a target market, although psychological and sociocultural characteristics help describe who its members are, how they think, feel, and behave. Unlike demographic variables, the benefits sought variable is difficult to measure, so it is not as identifiable. Benefit segmentation is built upon the premise that consumers are basically purchasing needs, wants, and satisfactions. Thus, it is entirely consistent with the marketing concept. In behavioral segmentation, variables that affect behavioral segmentation are usage rate, buying status and brand loyalty. For psychographic segmentation, everyone has different values, beliefs and attitudes. Consumers can be segmented based on how they feel and think about a product or service. Surveys are very useful when grouping consumers based on psychographics segmentation. For most product and services, one variable is not enough to tell about target group. Thus, companies tend to use multivariable segmentation by simply combining segmentation. In general, multivariable segmentation leads to better customer insights.

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KAJIAN KEBERKESANAN MODUL 'MATHEMATICAL COMPUTING FOR POLYTECHNIC'S STUDENT' DALAM PEMBELAJARAN KURSUS MATHEMATICAL COMPUTING (DBM1033) DI POLITEKNIK BALIK PULAU, PBU.

Mohd Dinil Haq bin Sahbudin
Politeknik Balik Pulau

Abstrak

Kajian ini bertujuan mengenal pasti kesan pembelajaran menggunakan modul 'Mathematical Computing for Polytechnic's Student' terhadap pencapaian pelajar. Modul ini adalah bahan bercetak yang disediakan merangkumi kesemua lima topik untuk membantu proses pembelajaran kursus Mathematical Computing (DBM1033). Sampel kajian terdiri daripada dua kumpulan iaitu kumpulan eksperimen yang merupakan 20 orang pelajar semester 1 sesi Jun 2018 dan kumpulan kawalan yang terdiri daripada 20 orang pelajar semester 1 sesi Dis 2018. Kumpulan eksperimen adalah kumpulan pelajar yang menggunakan modul 'Mathematical Computing for Polytechnic's Student' dalam sesi pembelajaran kursus DBM1033, manakala kumpulan kawalan adalah kumpulan pelajar yang tidak menggunakan modul tersebut dalam pembelajaran mereka. Berdasarkan dapatan yang diperolehi dari ujian-t sampel berulangan yang dilakukan, terdapat perbezaan pencapaian min yang tinggi bagi ujian pra (Min = 49.9, S.P.= 22.06) dan pasca (Min = 72.90, S.P.= 19.99) bagi pelajar yang menggunakan modul 'Mathematical Computing for Polytechnic's Student' berbanding dengan pencapaian min ujian pra (Min = 40.20, S.P.= 21.43) dan pasca (Min = 51.20 , S.P.= 19.64) pelajar yang tidak menggunakan modul tersebut bagi kursus DBM1033. Set soal selidik telah diedarkan kepada 20 orang pelajar dalam kumpulan eksperimen bagi mengkaji persepsi mereka terhadap kesesuaian modul tersebut terhadap pembelajaran kursus DBM1033. Dapatan kajian menunjukan menunjukan persepsi yang positif terhadap kesesuaian modul terhadap proses pembelajaran kursus DBM1033.

PENGENALAN

Mathematical Computing merupakan ilmu asas Matematik yang semestinya dikuasai oleh semua pelajar Jabatan Teknologi Maklumat & Komunikasi (JTMK) di seluruh Politeknik Malaysia. Kegagalan pelajar menguasai konsep asas Matematik, adalah sukar bagi mereka untuk menyelesaikan permasalahan pengiraan yang melibatkan aplikasi Matematik pada semester berikutnya. Bersesuaian dengan itu satu modul telah dihasilkan bagi membantu proses pembelajaran kursus DBM1033 di Politeknik Balik Pulau. Ini didorong lagi apabila modul dikatakan sebagai suatu yang mampu menjadi bahan perantara kepada pelajar khususnya dalam proses pengajaran dan pembelajaran yang terancang (Norijah, 1997). Menurut Saedah Siraj (2000) walaupun ledakan teknologi maklumat menyaksikan kewujudan pelbagai bahan bantu mengajar yang hebat dalam bentuk elektronik, namun buku teks (bahan bercetak) masih menjadi bahan pendidikan yang terpenting digunakan dalam bilik darjah. Tambahan lagi, memetik kenyataan Rosnizammuddin (2010) menyatakan modul pembelajaran kendiri adalah satu cara untuk membantu pelajar dalam memahami sesuatu subjek dengan lebih baik. Jesteru pengkaji ingin mengkaji keberkesanan modul 'Mathematical Computing for Polytechnic's Student' dalam meningkatkan prestasi pencapaian pelajar dalam kursus DBM1033.

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PENYATAAN MASALAH

Memetik kata-kata Tun Dr. Mahathir dalam ucapanya di Universiti Teknikal Melaka pada 19 May 2014, ilmu matematik disamping ilmu sains dan teknologi adalah tulang belakang yang penting dalam pembangunan negara Malaysia. Oleh itu, usaha untuk meningkatkan penguasaan pelajar PBU terhadap ilmu Matematik perlu dilakukan. Menurut Thamby Subahan (1999) yang dipetik oleh Zulkepli (2010), pencapaian pelajar dipengaruhi oleh beberapa faktor antaranya ialah kesediaan guru untuk membimbing pelajar atau cara mengajar. Di PBU, penghasilan modul 'Mathematical Computing for Polytechnic's Student' adalah satu usaha tenaga pengajar di Jabatan Matematik, Sains & Komputer (JMSK) untuk membantu pelajar-pelajar JTMK agar dapat menguasai ilmu Matematik. Jesteru itu, satu kajian perlu dibuat bagi mengenal pasti sejauh mana tahap keberkesanan modul tersebut dalam meningkatkan pencapaian pelajar bagi kursus DBM1033.

TUJUAN KAJIAN

Terdapat kajian yang telah dibuat tentang keberkesanan penggunaan modul dalam pembelajaran dan kesanya dilaporkan positif. Antaranya ialah kajian yang dibuat oleh Maimon @ Mohmood, Ainor Izmira (2004) terhadap penggunaan modul pembelajaran bagi mata pelajaran Sistem Elektronik 2 (EE2002) bagi pelajar Kejuruteraan Elektrik di politeknik. Jesteru itu, pengkaji ingin mengenalpasti samada penggunaan modul 'Mathematical Computing for Polytechnic's Student' turut memberi kesan positif terhadap pencapaian pelajar dalam kursus DBM1033 atau sebaliknya. Bagi mencapai matlamat di atas, kajian ini dilaksanakan berdasarkan tujuan-tujuan berikut:

1. Mengenal pasti sama ada terdapat perbezaan pencapaian min bagi pelajar yang menggunakan modul 'Mathematical Computing for Polytechnic's Student' dengan pencapaian min bagi yang tidak menggunakan modul ''Mathematical Computing for Polytechnic's Student''.

2. Menentukan persepsi pelajar terhadap penggunaan modul ''Mathematical Computing for Polytechnic's Student'' dalam proses pembelajaran Mathematical Computing.

PERSOALAN KAJIAN

Bagi menjawab tujuan kajian yang dijalankan, kajian ini cuba mencari jawapan bagi soalan-soalan kajianberikut:

i. Adakah terdapat perbezaan pencapaian min bagi pelajar yang menggunakan modul ' Mathematical Computing for Polytechnic's Student' berbanding dengan pelajar yang tidak menggunakan modul 'Mathematical Computing for Polytechnic's Student' dalam proses pembelajaran mereka.

ii. Apakah persepsi pelajar terhadap penggunaan modul 'Mathematical Computing for Polytechnic's Student' dalam proses pembelajaran kursus Mathematical Computing.

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KEPENTINGAN KAJIAN

Diharap dapatan kajian ini akan menjadi satu dorongan kepada pensyarah-pensyarah DBM1033 yang lain dalam menggalakan pelajar-pelajar lain menggunakan modul 'Mathematical Computing for Polytechnic's Student' dalam proses pembelajaran mereka sebagai usaha meningkatkan kefahaman pelajar bagi subjek matematik. Seterusnya, subjek matematik menjadi subjek yang mudah dan diminati oleh pelajar PBU khususnya dan Politeknik Malaysia amnya. Selain itu juga, dapatan kajian ini diharap menjadi pemangkin kepada pensyarah jabatan lain untuk menghasilkan modul seumpama ini yang boleh digunakan sebagai Alat Bantu Mengajar (ABM) bagi kursus-kursus yang lain kelak.

TINJAUAN LITERATUR

Kajian-kajian berkaitan

Kajian yang dilakukan oleh Zulkepli Mohamad (2010) berkaitan keberkesanan modul Pengajaran Mengikut Perspektif Konstruktivisme (PMPK) menunjukan pencapaian pelajar tidak dipengaruhi oleh modul tersebut dan dapatan kajian beliau terhadap persepsi dan minat pelajar terhadap modul PMPK adalah tidak positif.

Kajian keberkesanan yang dilakukan oleh Maimun @Mohmood, Ainor Izmira (2004) terhadap penggunaan modul pembelajaran bagi mata pelajaran Sistem Elektronik 2 (EE2002) bagi pelajar Kejuruteraan Elektrik di politeknik menunjukan tahap penerimaan pelajar adalah sangat baik.

Satu kajian berkaitan persepsi penggunaan modul yang dilakukan oleh Sabdani Batang (1999) bertajuk 'Persepsi pelajar terhadap penggunaan ABM dalam mata pelajaran Fizik tingkatan empat, satu tinjauan di Sekolah Menengah Taun Gusi di Kota Belud, Sabah' menunjukan pelajar mempunyai persepsi yang baik terhadap ABM yang guru gunakan.

TEORI MODUL PEMBELAJARAN

Modul ialah sesuatu yang mampu menjadi bahan perantara kepada pelajar khususnya dalam proses pengajaran dan pembelajaran yang terancang (Norijah, 1997). Terdapat dua modul iaitu satu modul pengajaran dan satu lagi ialah modul pembelajaran. Modul pembelajaran adalah panduan pembelajaran kendiri yang mana penggunanya merasakan ada peluang untuk maju dengan belajar sendiri (Shaharom, 1994). Modul mempunyai bahagian-bahagian kecil tersendiri tetapi lengkap dan berkait rapat antara satu sama lain. Struktur pengolahan yang berperingkat ini boleh membina keyakinan diri kepada pelajar (Musalmah, 1987) dipetik daripada Norijah (1997). Contoh modul pembelajaran kendiri untuk Fizik telah dibina oleh Shaharom (1994) dalam tesis yang bertajuk. Penghasilan Dan Penilaian Keberkesanan Modul Kendiri Fizik Dalam Kalangan Pelajar Yang Berbeza Kebolehan Dan Jantina Tingkatan 4 dan didapati ia berkesan untuk meningkatkan pencapaian pelajar. Modul pengajaran pula adalah modul yang direka khas untuk guru yang membolehkan guru mengajar dengan lebih berkesan. Modul pengajaran guru merupakan bahan pengajaran yang dilengkapkan dengan isi kandungan mata pelajaran khusus kepada sesuatu topik. Modul mengandungi strategi-strategi, tindakan-tindakan dan gerak kerja yang boleh diselenggarakan oleh guru bersama-sama penilaian isi kandungan mata pelajaran tersebut (Norijah Mohamad, 1997). Mengikut Abdul Rahim (1996) modul adalah teks yang mengajar.

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Teks pengajaran ini boleh memberi penerangan. membuat rujukan dan membimbing seseorang pembaca. Modul juga adalah sebagai reka bentuk pengajaran yang sistematik dan menyeluruh bagi merancang, memperkembangkan, melaksanakan serta menilai pengajaran dan bahan yang digunakan.

METODOLOGI KAJIAN

Reka Bentuk Kajian

Kajian ini merupakan reka bentuk kuasi eksperimental kawalan ujian pra – ujian pasca digunakan untuk menguji keberkesanan modul 'Mathematical Computing for Polytechnic's Student' dalam proses pembelajaran di Politeknik Balik Pulau. Kumpulan eksperimen dan kumpulan kawalan adalah dipilih berasaskan dua kelas yang sedia ada sepertimana yang telah ditetapkan oleh pihak PBU. Reka bentuk ini disimpulkan dalam Jadual 1. X mewakili rawatan (treatment) yang diberi kepada kumpulan eksperimen yang mana proses pembelajaran yang menggunakan 'Mathematical Computing for Polytechnic's Student'. "sempang" mewakili rawatan (treatment) yang diberi kepada kumpulan kawalan yang mana proses pembelajaran yang tidak menggunakan modul 'Mathematical Computing for Polytechnic's Student'. Manakala perwakilan O1 dan O2 adalah pengukuran yang dilaksanakan sebelum dan selepas rawatan (treatment) diberikan.

Jadual 1. Reka bentuk kajian

Kumpulan	Ujian Pra	Rawatan	Ujian Pasca
Eksperimen	O_1	X	O_2
Kawalan	O_1	-	O_2

Soal selidik pula digunakan untuk mengetahui persepsi pelajar terhadap penggunaan modul 'Mathematical Computing for Polytechnic's Student' dalam proses pembelajaran mereka.

Sampel

Seramai 40 orang pelajar Politeknik Balik Pulau yang telah mengambil kursus Mathematical Computing (DBM1033) pada sesi Jun dan Disember 2018 dijadikan sampel bagi kumpulan eksperimen dan kumpulan kawalan, masing-masing terdiri daripada 20 orang pelajar bagi setiap kumpulan. Manakala seramai 20 orang pelajar semester 1 sesi Disember 2018 yang juga juga dari kumpulan eksperimen dijadikan sampel untuk menjawab objektif kedua kajian ini, iaitu mengkaji persepsi pelajar terhadap penggunaan modul 'Mathematical Computing for Polytechnic's Student' dalam proses pembelajaran DBM1033.

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Instrumen

Instrument kajian terdiri daipada modul 'Mathematical Computing for Polytechnic's Student', set soalan ujian pra dan set soalan pasca serta set soalan soal selidik. Modul 'Mathematical Computing for Polytechnic's Student' telah dibina berdasarkan silibus yang telah ditetapkan oleh Jabatan Pengajian Politeknik, Putrajaya.

Set soalan untuk menguji pencapaian dalam ujian dibina berdasarkan aras kesukaran dan bentuk yang sama. Ujian pencapain ini dibina untuk menentukan sejauh mana kefahaman pelajar dalam kursus DBM1033 sebelum dan selepas rawatan dilakukan.

Soal selidik persepsi pelajar terhadap kesesuain modul merupakan soalan berbentuk tinjauan dengan menggunakan skala Likert dengan pemberat 1 hingga 4. Nilai 1 mewakili penyataan 'Sangat tidak setuju', nilai 2 mewakili penyataan 'Tidak setuju', nilai 3 mewakili penyataan "setuju" dan nilai 4 mewakili penyataan 'Sangat setuju'. Soal selidik ini terdiri daripada dua bahagian iaitu bahagian A dan bahagian B. Bahagian A adalah maklumat asas responden. Manakala, bahagian B terdiri daripada 11 soalan berkaitan persepsi pelajar terhadap kesesuaian modul tersebut digunakan sebagai modul pembelajaran mereka.

Prosedur Kajian

Bagi mengkaji keberkesanan modul ini, kumpulan eksperimen dan kumpulan kawalan telah diberi soalan ujian pra sebelum rawatan dijalankan. Selepas ujian pra dilakukan, kumpulan eksperimen diwajibkan memiliki modul 'Mathematical Computing for Polytechnic's Student' bagi membolehkan mereka menggunakan modul tersebut dalam proses pembelajaran mereka. Manakala, kumpulan kawalan tidak menggunakan modul tersebut dalam proses pembelajaran mereka sebaliknya pembelajaran yang hanya menggunakan nota kuliah dan rujukan dari perpustakaan sahaja, dalam erti kata lain mereka tidak menggunakan modul 'Mathematical Computing for Polytechnic's Student' proses pembelajaran mereka. Untuk memastikan hanya kumpulan eksperimen sahaja memiliki modul tersebut, modul dicetak selepas tamatnya sesi Jun 2018 dan hanya boleh didapati pada sesi Disember 2018. Di hujung semester iaitu selepas rawatan dilakukan, ujian pasca dilakukan pula untuk menguji keberkesanan modul terhadap pencapaian pelajar. Peningkatan pencapaian akademik diukur berdasarkan perbezaan pencapaian dalam ujian pra dan ujian pasca.

Untuk mendapatakan data tentang persepsi pelajar terhadap kesesuaian modul terhadap pembelajaran kursus DBM1033, soal selidik telah diedarkan kepada pelajar yang memiliki modul 'Mathematical Computing for Polytechnic's Student' sahaja. Ini memastikan dapatan adalah benar dan sah.

Prosedur analisis data

Statistik inferinsi iaitu ujian-t digunakan untuk membandingkan min skor pencapaian pelajar bagi kumpulan kawalan dan kumpulan eksperimen. Paras signifiken untuk membuat keputusan ditetapkan pada aras 0.05. Hipotesis nol yang mengatakan tidak terdapat perbezaan pencapaian min bagi pelajar yang menggunakan modul 'Mathematical Computing for Polytechnic's Student' berbanding dengan pelajar yang tidak menggunakan modul tersebut dalam proses pembelajaran mereka akan ditolak sekiranya nilai p yang diperolehi adalah kurang dari pada 0.05.

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Bagi menentukan persepsi pelajar, dapatan dari soal selidik dikelaskan kepada persepsi positif dan persepsi negative melalui pengiraan peratus secara statistik deskriptif. Jadual 2 merumuskan pengkelasan tahap persepsi pelajar terhadap modul 'Mathematical Computing for Polytechnic's Student'.

Jadual 2. Tahap persepsi

Peratus	Persepsi
"Setuju" dan ' Sangat setuju' >50%	Positif
'Tidak setuju' dan 'Sangat tidak setuju' >50%	Negatif

DAPATAN KAJIAN

Jadual 3. Ujian-t perbandingan ujian pra dan pasca antara dua kumpulan

Kumpulan	Min (S.P)		Nilai-t	p
Kawalan	Ujian pra	Ujian pasca		
	40.20	51.20		
	(21.43)	(19.64)	3.715	0.001
Eksperimen	Ujian pra	Ujian pasca		
	49.90	72.90		0.000
	(22.06)	(19.99)	9.043	

Daripada jadual 3 di atas, terdapat peningkatan pencapaian min pelajar dalam ujian pasca jika dibandingkan dengan min pencapaian pelajar dalam ujian pra bagi kedua-dua kumpulan kawalan dan kumpulan eksperimen. Bagi kumpulan kawalan, peningkatan pencapaian min dalam ujian pasca sebanyak 11.00. Manakala, bagi kumpulan eksperimen peningkatan pencapaian min dalam ujian pasca sebanyak 23.00 iaitu peningkatan pencapain min yang lebih tinggi dibandingkan dengan kumpulan kawalan iaitu sebanyak 12. Ujian-t menunjukan terdapat perbezaan yang signifiken dalam peningkatan pencapaian min di antara kedua-dua kumpulan, $p<0.005$.

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Jadual 4. Persepsi pelajar terhadap kesesuaian modul terhadap pembelajaran

Bil.	Soalan	Peratus			
		STS	TS	S	SS
1.	Modul ini membantu saya memahami kursus DBM1033 dengan lebih jelas	-	-	40	60
2.	Modul ini membantu proses pembelajaran saya	-	-	35	65
3.	Susunan kandungan modul ini mudah diikuti	-	-	40	60
4.	Isi kandungan modul ini mudah diikuti	-	-	40	60
5.	Isi kandungan modul ini menarik minat saya untuk memahami matematik	-	5	45	50
6.	Saya memahami maklumat yang disampaikan dalam modul ini	-	-	50	50
7.	Struktur ayat yang digunakan dalam modul ini mudah difahami	-	5	45	50
8.	Saya berasa seronok mempelajari matematik melalui modul ini	-	5	45	50
9.	Contoh penyelesaian masalah yang disediakan mudah difahami	-	10	35	55
10.	Modul ini menyatakan objektif pembelajaran dengan jelas	-	-	45	55
11.	Saya akan mencadangkan kepada individu lain untuk menggunakan modul ini dalam pembelajaran DBM1033	-	5	30	65

Nota: Sangat Tidak Setuju (STS), Tidak Setuju (TS), Setuju (S), Sangat Setuju (SS)

Berdasarkan analisis yang ditunjukan dalam jadual 4, hampir kesemua item soalan menunjukan persepsi yang positif terhadap penggunaan modul 'Mathematical Computing for Polytechnic's Student' dalam proses pembelajaran DBM1033 oleh responden. Hanya seorang hingga dua orang pelajar sahaja yang tidak setuju dengan item 5, 7, 8, 9 dan 11. Ini mungkin disebabkan oleh bahasa Inggeris digunakan sepenuhnya dalam modul ini, seterusnya menyukarkan pelajar tersebut untuk mengikutinya.

Menurut kajian yang dilakukan oleh Strain dan Pearce (2001) yang dipetik dari Saripah Salbiah Syed Abdul Aziz et al. (2013), aktiviti-aktiviti yang seronok dan mudah dalam proses pembelajaran lebih digemari oleh pelajar untuk mengikuti proses pembelajaran tersebut. Dengan itu, penggunaan modul ini di dalam kelas mampu memudahkan pelajar memahami kursus DBM1033.

KESIMPULAN

Hasil kajian menunjukan penggunaan modul 'Mathematical Computing for Polytechnic's Student' mampu meningkatkan pemahaman pelajar dalam proses pembelajaran kursus DBM1033 khususnya dan ilmu Matematik amnya. Didapati responden daripada kumpulan eksperimen iaitu pelajar yang menggunakan modul 'Mathematical Computing for Polytechnic's Student' memperolehi markah jauh lebih baik dari kumpulan yang tidak menngunakan modul tersebut dalam ujian pasca. Daripada soal selidik yang dijalankan juga menunjukan persepsi yang positif terhadap kesesuaian modul terhadap proses pembelajaran kursus DBM1033. Penggunaan modul ini dapat memudahkan pelajar mengikuti pembelajaran DBM1033 di dalam kelas dan membuat rujukan di luar kelas, seterusnya ia dapat meningkatkan pemahaman dan prestasi pelajar dalam Matematik amnya dan kursus DBM1033 khususnya.

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Diharap dapatan ini dapat memberi galakan kepada warga pendidik dalam menghasilkan modul untuk subjek-subjek yang lain dalam usaha meningkatkan kefahaman pelajar.

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IMPLEMENTASI REVOLUSI INDUSTRI KE-4 MELALUI KECERDASAN BUATAN INDUSTRI

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Abstrak

Kecerdasan buatan merupakan elemen tenaga baharu yang akan menjadi teras terhadap implementasi teknologi dalam era revolusi industri ke-4. Sektor pembuatan khususnya akan bergantung harap terhadap kecerdasan buatan industri memandangkan ianya boleh dipercai, berkesan, selamat dan memanjangkan jangka hayat mesin. Hasil dari perlaksanaan ini, membolehkan pengeluaran dioptimakan selari dengan sumber yang digunakan. Perjalanan kehidupan seharian dengan implementasi kecerdasan buatan industri turut membantu mengoptimakan tugasan manusia dengan cara mengurangkan kesalahan, memberi ramalan dan kawalan terhadap masa. Konsep asas kecerdasan buatan masih diaplikasikan dengan kombinasi input menggunakan model teras-pembuktian yang dikomputasikan dengan pembelajaran mendalam berpacukan data. Hasil komputasi data yang lebih besar menjadikan pengeluaran yang lebih optimum. Cabaran dalam perlaksanaan ini merupakan data yang salah, rosak mahupun tidak betul. Kepantasan waktu turut merupakan cabaran selain dari jaminan terhadap kepercayaan serta keyakinan manusia itu sendiri.

Keywords: Kecerdasan Buatan Industri, Revolusi Industri Ke-4, AI

PENDAHULUAN

Perkembangan pesat teknologi mewujudkan satu revolusi baharu yang dinamakan revolusi industri ke-4. Revolusi ini akan merubah gaya hidup manusia dan cara manusia bekerja sekaligus ia mengoptimakan fungsi otak. Kewujudan resolusi ini bukan sahaja merubah persekitaran sektor pembuatan dan pengeluaran, tetapi turut melibatkan hampir kesemua sektor termasuk perkhidmatan dan juga governan.

Pada masa kini, berbiliun peranti berhubung diantara satu sama lain bukan sahaja terhad kepada peranti mobil, tetapi turut melibatkan perkakasan lain. Dalam masa yang sama, kuasa komputasi meningkat dengan mendadak dan jumlah kapasiti peranti storan turut berganda serta capaian kepada pengetahuan sudah tidak terbatas. Elemen kecerdasan buatan (AI), automasi, robotik dan data besar menjadikan gabungan teknologi ini satu revolusi yang memanfaatkan semua pihak. Revolusi industri ke-4 ini akan mempengaruhi keseluruhan perjalanan hidup manusia (Schwab. 2016). Revolusi ini menandakan kemunculan sistem fizikal siber melibatkan keupayaan baharu sepenuhnya bagi manusia mesin dan kaedah baharu teknologi. Dengan kata lain, teknologi automasi itu dilihat sebagai keupayaan teknologi yang tidak perlu melibatkan manusia secara langsung. Ia juga dapat mengatasi masalah kebergantungan terhadap sumber tenaga yang secara signifikan akan mengubah masa depan dunia pekerjaan. Sekiranya cabaran teknologi baharu yang kompleks itu tidak diberi penekanan sewajarnya, ia boleh menyebabkan Malaysia jauh ketinggalan dalam persaingan di peringkat global.

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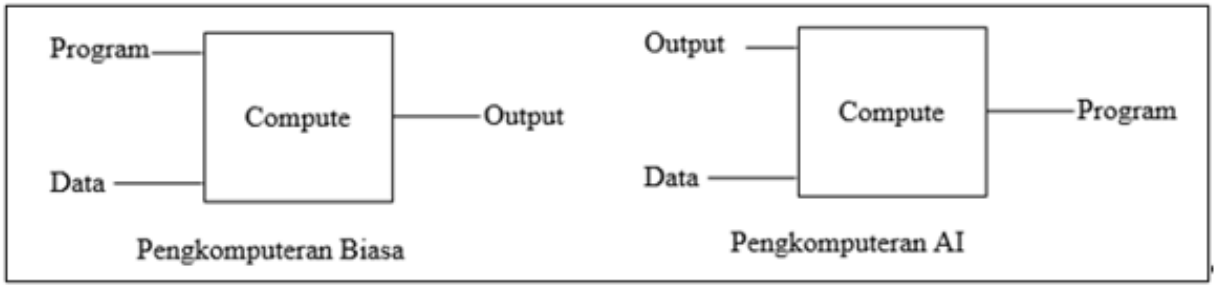
Sistem pendidikan tinggi di seluruh negara juga akan mengalami perubahan hasil revolusi industri ke-4 (F. Marmolejo, 2017). Justeru itu, institusi pendidikan tinggi juga perlu memainkan peranan yang lebih aktif dalam pembangunan program pengajian dan kursus yang ditawarkan. Teras dalam revolusi itu sendiri telah berubah bermula dengan 9 teras pada permulaan perlaksanaannya di tahun 2016, pada tahun 2018 teras tersebut telah ditingkatkan kepada 11 teras. Manakala pada Oktober 2019, 3 lagi teras ditambah menjadikan 14 teras keseluruhnya setakat hari ini (Cheng, 2019).

KAJIAN ILMIAH

AI bakal membuka peluang yang besar untuk dilaburkan dalam revolusi ini (Lee, 2016). AI sebelum ini diketahui beroperasi secara maya, akan diimplemestasikan dalam bentuk fizikal, merubah persekitaran industri (Hossein, 2018). Konsep asas AI masih dikekalkan, dengan menjadikan output sebagai input dalam satu proses komputasi. Rajah 1 menunjukkan perbezaan komputasi biasa dengan komputasi AI (Cheng, 2019).

Rajah 1: Perbezaan Komputasi



Konsep AI Industri ini memerlukan data yang besar untuk mendapatkan hasil yang lebih optimis. Data diperolehi dari pelbagai penderia yang secara asasnya diletakkan pada mesin dan ruang kerja. Menggunakan konsep Big Data Analytic (BDA), data akan dikumpul, diurus, diproses, dianalisa dan divisualisasikan secara berterusan berdasarkan bilangan, kecepatan, nilai, kepelbagaian dan kebolehpercayaan (M. Habib, 2019)

AI Industri terdiri daripada 5 kunci elemen asas iaitu teknologi analitik, teknologi data besar, teknologi cloud, teknik knowhow dan bukti. Analitik merupakan teras utama AI Industri ini manakala gandingan data besar dan teknologi cloud memperkemaskan lagi perlaksanaannya dengan membekalkan ruang data dan pangkalannya. Teknik knowhow pula merupakan pengetahuan terhadap masalah dan bagaimana cara ia diselesaikan dengan menggunakan AI. Pembuktian merekod segala corak output untuk ia diprogramkan bagi mencapai tahap optimum (Hossein, 2018). Rajah 2 menunjukkan ekosistem AI Industri.

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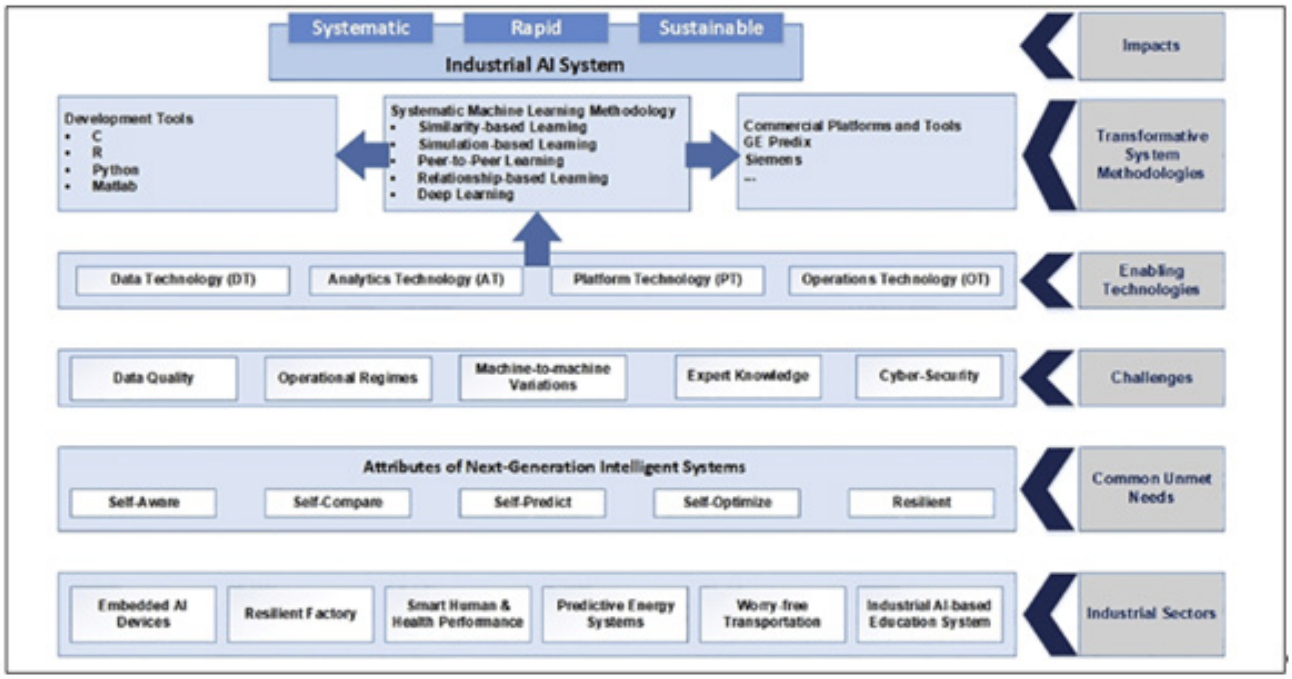
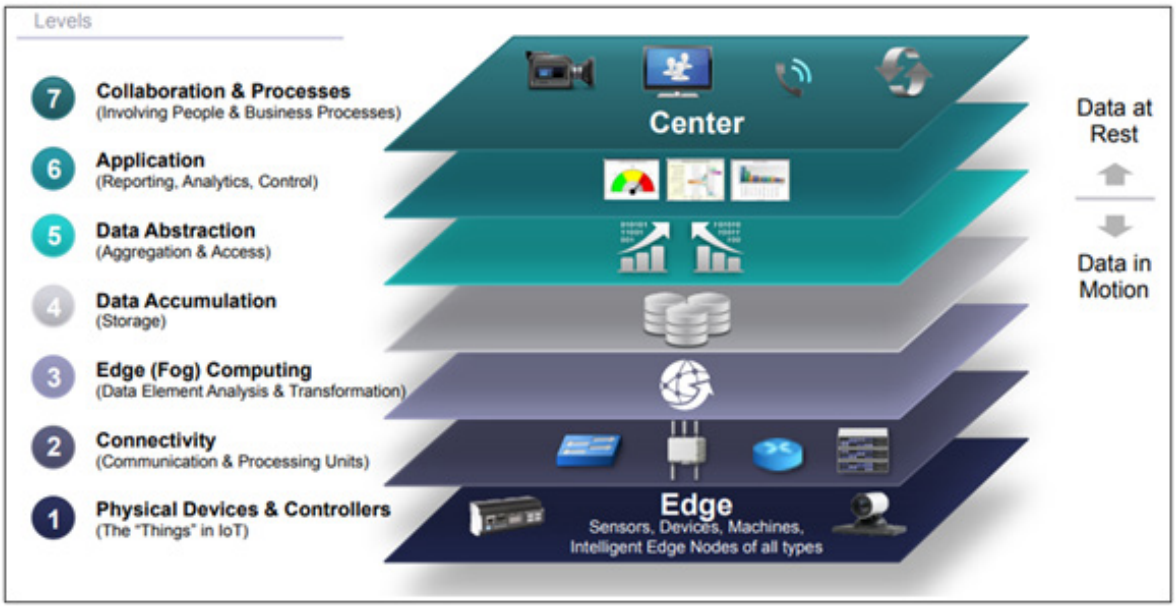
Rajah 2: Ekosistem AI Industri



Kecekapan peranti tidak dapat dinafikan dimana melalui Internet of Things (IoT), peranti-peranti ini berkongsi data secara automatik tanpa penglibatan manusia. IoT telah berjaya mentrasformasikan produk pengeluaran seperti kenderaan, bangunan dan mesin kepada yang lebih bijak. Kesemua ini berpandukan kepada data yang diperoleh dan diprogram kemudian disesuaikan untuk dintegrasi pada setiap peringkat (A.E Hakim, 2018). Peneraju peranti sistem rangkaian terkemuka, CISCO telah mengeluarkan model rujukan bagi IoT seawal tahun 2014 seperti Rajah 3. Manakala pada tahun 2018, selepas dua tahun revolusi industri ke-4 dimumkan, Gartner telah memperkenalkan model baharu yang menjadi rujukan kepada organisasi yang menawarkan perkhidmatan IoT seperti yang boleh dilihat pada Rajah 4.

Rajah 3: Model Rujukan IoT CISCO



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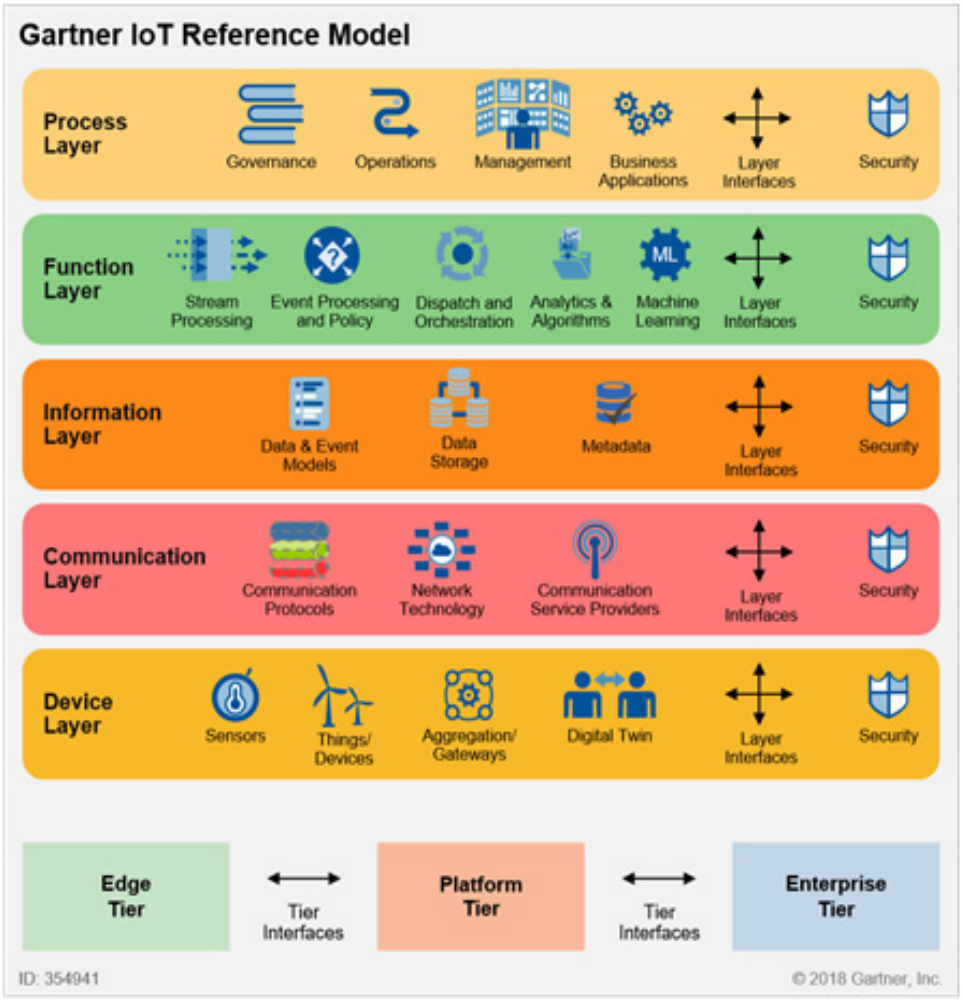
Rajah 4: Model Rujukan IoT Gartner



PERBINCANGAN

Perlaksanaan AI Industri dalam persekitaran industri pengeluaran terutamanya mempunyai beberapa kelebihan. Pertama, kebergantungan kepada tenaga manusia dapat diminimakan (Miller, 2018). Dalam masa yang sama, kesalahan manusia dapat dicegah dari berlaku. Selain dari itu, penjimatan sumber turut dapat direalisasikan, bukan sahaja terhadap penjimatan bahan mentah, tetapi penggunaan fasiliti turut boleh dijimatkan. Penjimatan lain termasuklah kos baikpulih dan juga masa yang digunakan untuk baikpulih. AI Industri bermatlamat untuk mengoptimumkan kos terhadap pengeluaran. Oleh itu, secara keseluruhan, pendapatan dijana dengan lebih bijak. Sektor perkhidmatan mengaplikasi AI Industri untuk menjadikan perkhidmatan lebih menjimatkan, ringkas dan juga selamat. Cabaran dalam melaksanakan AI Industri ini pertama sekali adalah kebolehpercayaan terhadapnya. Sejak revolusi industri ke-4 diperkenalkan, sehingga Oktober 2019 masih tidak ada satu industri pun menggunakan AI Industri dalam firmanya (Cheng, 2019). Selain itu, ia perlu dimulakan dengan IoT terlebih dahulu untuk mendapatkan data yang cukup besar. Tempoh masa sehingga dua tahun mungkin diperlukan sebelum ia boleh dilaksanakan.

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Cabaran lain adalah terhadap data yang dikumpul. Data tersebut mestilah data asli yang benar serta tidak rosak. Keselamatan data turut menjadi cabaran disamping ruang penimpanan serta media perhubungan yang menjadi sistem rangkaian terhadap AI Industri ini.

KESIMPULAN

AI Industri disepakati oleh ramai pakar industri sebagai tenaga baharu yang menjadi tunjang revolusi industri ke-4. Objektif utama adalah untuk menjadikan perkhidmatan, pengeluaran dan governan beroperasi seoptima mungkin. Secara tidak langsung, ia berkemungkinan dalam mengurangkan nilai produk dan perkhidmatan sekaligus memanfaatkan pengguna masa akan datang

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KESEDIAAN PELAJAR DIPLOMA TEKNOLOGI MAKLUMAT (TEKNOLOGI DIGITAL) POLITEKNIK BALIK PULAU DALAM PENGGUNAAN RASPBERRY PI BAGI PROJEK INTERNET OF THINGS UNTUK KURSUS DFT6014 INTEGRATED PROJECT

Nur Fairuz Afni Binti Ahmad Faizal, Nor Farihah Binti Razak
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Abstrak

Trend pemilihan tajuk projek akhir yang dipilih oleh pelajar Diploma Teknologi Maklumat (Teknologi Digital) telah berubah dengan begitu mendadak apabila Internet of Things (IoT) menjengah masuk menjadi sebahagian daripada industri pendidikan. Buktinya di Politeknik Balik Pulau, berdasarkan keputusan dari ujian pra yang dikutip bagi kedua-dua sesi pengajian iaitu Sesi Disember 2018 dan Sesi Jun 2019 menunjukkan majoriti pelajar tahun akhir yang mengambil kursus DFT6014 Integrated Project memilih kategori projek IoT sebagai tajuk projek tahun akhir mereka. Namun begitu, daripada jumlah majoriti yang memilih kategori IoT sebagai tajuk projek, hanya sebilangan kecil pelajar yang memilih menggunakan peranti Raspberry Pi sebagai papan mikro pengawal (board microcontroller). Reka bentuk kajian yang digunakan ialah kajian deskriptif menggunakan kaedah tinjauan bagi mengenalpasti kesediaan pelajar Diploma Teknologi Maklumat (Teknologi Digital) dalam penggunaan Raspberry Pi 3 bagi projek Internet of Things. Dua aspek utama yang dinilai ialah pengetahuan dan kemahiran. Sasaran kajian difokuskan kepada kumpulan pelajar tahun akhir Diploma Teknologi Maklumat (Teknologi Digital) PBU yang mengambil kursus DFT6014 Integrated Project bagi Sesi Jun 2019. Data kajian sebenar akan dianalisis dengan menggunakan perisian IBM SPSS Statistics v22 untuk mendapatkan keputusan akhir.

KATA KUNCI: Internet of Things (IoT), Raspberry Pi, projek akhir, pelajar Diploma Teknologi Maklumat.

PENGENALAN

Politeknik Balik Pulau menawarkan program Diploma Teknologi Maklumat (Teknologi Digital) yang dikendalikan dibawah satu jabatan induk iaitu Jabatan Teknologi Maklumat dan Komunikasi (JTMK). Pelajar Diploma Teknologi Maklumat (Teknologi Digital) Politeknik Balik Pulau (PBU) terdiri daripada dua trek kursus iaitu trek Pembangunan Aplikasi dan Perisian dan trek Sistem Rangkaian. Bagi melengkapkan pengajian diploma, kedua-dua trek kumpulan pelajar ini perlu mengambil kursus-kursus yang terdiri daripada beberapa komponen subjek asas, wajib, pengkhususan dan elektif. Subjek DFT6014 Integrated Project adalah subjek pengkhususan yang perlu diambil oleh pelajar-pelajar Semester 6 Diploma Teknologi Maklumat (Teknologi Digital) sebelum melangkah meninggalkan politeknik untuk menjalani latihan industri pada semester berikutnya.

Mengikut Buku Panduan Projek Pelajar Politeknik Malaysia (Program Diploma) Edisi 2016, pelaksanaan kursus DFT6014 Integrated Project berfungsi sebagai platform bagi pelajar untuk mengembangkan potensi, mempamerkan keupayaan dan mempraktikkan segala ilmu yang telah dikuasai sepanjang pengajian dengan mengeluarkan hasil kerja berinovasi dan bermutu tinggi. Bertepatan dengan kehendak ini, pelajar tahun akhir Diploma Teknologi Maklumat (Teknologi Digital) PBU menyahut cabaran tersebut dengan menghasilkan pelbagai projek tahun akhir yang terdiri daripada pelbagai kategori projek seperti projek Internet of Things (IoT), Mobile Apps, Web-based System, Augmented Reality, Virtual Reality, Multimedia Interactive CD, Networking Project dan lain-lain.

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Menurut kajian yang ditulis oleh Mastura et al, (2018), trend pemilihan tajuk projek akhir yang dipilih oleh pelajar Diploma Teknologi Maklumat (Pengaturcaraan) di politeknik boleh dibahagikan kepada empat kategori utama iaitu website, information system, courseware, dan mobile apps. Di Politeknik Sultan Mizan Zainal Abidin (PSMZA) pelajar Diploma Teknologi Maklumat (Pengaturcaraan) lebih cenderung memilih untuk membangunkan kategori projek information system kerana pelajar telah mempunyai pengetahuan sedia ada dan telah mempelajari pengaturcaraan web melalui penguasaan kandungan silibus sepanjang tempoh pengajian.

Namun begitu, trend ini telah berubah dengan begitu mendadak apabila IoT menjengah masuk menjadi sebahagian daripada industri pendidikan. Di Politeknik Balik Pulau, tinjauan awal yang dibuat oleh penyelidik mendapati majoriti kumpulan projek akhir pelajar kini telah beralih kepada projek IoT bagi menyempurnakan kursus DFT6014 Integrated Project. Berdasarkan tinjauan awal ini, penyelidik merasakan penting untuk mengetahui sejauh mana tahap kesediaan pelajar Diploma Teknologi Maklumat (Teknologi Digital) di PBU dalam menggunakan satu peranti IoT iaitu papan mikro pengawal (board micro controller) Raspberry Pi untuk menghasilkan projek IoT mereka. Ini kerana, untuk membangunkan projek akhir yang berkualiti, berimpak tinggi dan menepati keperluan industri masa kini, kesediaan dari segi pengetahuan dan kemahiran amat penting bagi menggambarkan kebolehan pelajar menguasai tiga aspek utama pembelajaran iaitu kognitif, psikomotor dan afektif. Tambahan pula, bagi pelajar-pelajar ini subjek IoT atau subjek berkaitan papan pengawal tidak pernah diajar di dalam kelas dan tidak terkandung dalam silibus pembelajaran pelajar sepanjang pengajian.

LATAR BELAKANG KAJIAN

IoT adalah 3 perkara berikut. Manusia kepada manusia. Manusia kepada mesin atau benda dan mesin kepada mesin. Ketiga-tiga perkara ini akan berhubung melalui internet. (Keyur et al, 2019). Trend pemilihan IoT sebagai kategori projek akhir adalah kesan daripada fenomena ini. Bagi Sesi Jun 2019 yang lepas, di PBU, antara tajuk-tajuk projek IoT yang dihasilkan pelajar tahun akhir adalah seperti Security Triggering System (Sistem pengesan keselamatan), Secure Pro-Tech Handbag (Sistem keselamatan tas tangan), Fire-Extinguisher Monitoring (Kawalan Pemadam Api), The Intruder Preventer (Penghalang penceroboh), Smart Price Checker (Penyemak harga pintar), Automated Recycling Application (Aplikasi kitar-semula berautomasi) dan pelbagai projek IoT pintar yang lain. Peranti IoT yang digunakan oleh pelajar untuk menghasilkan projek-projek berikut antaranya ialah Arduino, Raspberry Pi 3, RFID, Ultrasonic Sensor, ESP8266 dan lain-lain.

Raspberry Pi 3 adalah sebahagian daripada siri keluaran model Raspberry Pi yang diperkenalkan kepada dunia oleh Yayasan Raspberry Pi (Raspberry Pi Foundation) sejak tahun 2012. Menurut Philips Colligan iaitu Pengarah Urusan Yayasan Raspberry Pi, pada bulan Februari 2016, mereka telah menjual hampir 8 juta model Raspberry Pi untuk membantu memenuhi permintaan global oleh generasi baru yang meminati pembuatan digital (digital making). Raspberry Pi adalah pakej lengkap sebuah komputer kecil yang berkuasa tinggi dan mampu milik. Dengan Raspberry Pi pelajar boleh mencipta apa-apa peranti fizikal berasaskan litar dan mengawal peranti tersebut dengan menulis program pengaturcaraan sendiri menggunakan bahasa pengaturcaraan Python atau blok pengaturcaaraan Scratch. (Gareth Halfacree, 2018).

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Dengan permintaan yang semakin meningkat Raspberry Pi telah berkembang dari tahun ke tahun hinggalah pada bulan Julai tahun 2019, Yayasan Raspberry Pi telah mencipta model Raspberry Pi yang terbaru iaitu Raspberry Pi 4 Model B dengan saiz RAM sehingga 4GB, mengatasi model-model sebelumnya yang hanya bersaiz 1GB RAM. Walaubagaimanapun, kajian ini memfokuskan kepada penggunaan model Raspberry Pi 3 (Model B dan Model B+) yang masih relevan dan sesuai digunakan untuk projek pelajar tahun akhir bertepatan dengan kemampuan pelajar kerana harganya yang lebih murah berbanding Raspberry Pi 4 Model B.

Tinjauan awal mendapati daripada 34 kumpulan pelajar tahun akhir Diploma Teknologi Maklumat (Teknologi Digital) yang mengambil kursus DFT6014 Integrated Project bagi Sesi Jun 2019, sebanyak 24 kumpulan projek yang telah memilih kategori projek IoT sebagai tajuk projek akhir masing-masing. Hanya baki 10 kumpulan yang memilih kategori projek Networking, Mobile Apps dan Web-based System. Daripada 24 kumpulan yang menghasilkan projek IoT, hanya 3 kumpulan pelajar yang menggunakan Raspberry Pi 3 sebagai papan mikro pengawal (board micro controller) utama projek, manakala selebihnya menggunakan papan mikro pengawal Arduino.

Kutipan awal data yang dikutip secara rawak daripada pensyarah penyelia projek akhir di 6 politeknik Malaysia yang menawarkan program Diploma Teknologi Maklumat (Teknologi Digital) juga menunjukkan jumlah peratusan tertinggi iaitu sebanyak 71.4% kategori projek IoT dipilih oleh kumpulan pelajar masing-masing bagi sesi pengajian yang lepas iaitu Sesi Disember 2018. Daripada jumlah 71.4% kumpulan yang menghasilkan projek akhir kategori IoT, 28.6 % daripadanya menggunakan papan mikro pengawal Raspberry Pi 3 bagi menyempurnakan projek akhir mereka. Bagi Sesi Jun 2019 pula, sebanyak 68.6% pelajar Diploma Teknologi Maklumat (Teknologi Digital) menggunakan papan mikro pengawal Arduino untuk menghasilkan projek akhir mereka.

PENYATAAN MASALAH

Jika dilihat pada struktur penawaran kursus Diploma Teknologi Maklumat (Teknologi Digital), bermula daripada kursus-kursus di Semester 1 sehinggalah kursus-kursus di Semester 6, tiada sebarang penawaran kursus subjek IoT atau pun subjek yang berkaitan dengan IoT khususnya seperti subjek berkaitan mikro pengawal atau peranti IoT.

Kebanyakan pelajar menjelaskan pengetahuan dan kemahiran mereka mengenai peranti IoT yang digunakan diperolehi daripada sumber internet semata-mata. Tiada sebarang pembelajaran formal didalam kelas yang diterima. Temubual secara rawak dengan pelajar projek akhir juga mendapati Arduino menjadi pilihan dominan di kalangan mereka kerana terdapat banyak bahan dan contoh projek daripada internet serta kos papan pengawal yang sedikit murah berbanding Raspberry Pi.

Profesor Eben Upton, di University of Cambridge pada awalnya iaitu sekitar tahun 2006 mencipta Raspberry Pi untuk digunakan oleh pelajar bidang Sains Komputer bagi menambah baik kemahiran pengaturcaraan (Sean et al., 2017). Tetapi bagi pelajar bidang komputer di Malaysia, khususnya di Politeknik Balik Pulau, penggunaan Raspberry Pi dikalangan pelajar amatlah sedikit. Malahan sehingga akhir tahun 2019, subjek IoT atau khususnya subjek Raspberry Pi tidak pernah ditawarkan kepada pelajar bidang Diploma Teknologi Maklumat, Politeknik. Para pelajar juga tidak mempelajari bahasa pengaturcaraan Python sepanjang tempoh pengajian diploma.

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Walaubagaimanapun ada segelintir pelajar yang mengambil inisiatif sendiri untuk mengenali dan menggunakan Raspberrry Pi serta mempelajari bahasa pengaturcaraan Python. Pelajar-pelajar ini akhirnya dapat menghasilkan projek akhir untuk kursus DFT6014 Integrated Project menggunakan Raspberry Pi.

Selain itu, turut menjadi kebimbangan apabila pelajar Diploma Teknologi Maklumat (Teknologi Digital) cenderung memilih peranti IoT Arduino bagi projek akhir mereka. Dengan Arduino pelajar bidang komputer dikhuatiri kurang mendapat manfaat atau nilai tambah kemahiran kerana sumber kod pengaturcaraan Arduino yang menggunakan bahasa pengaturcaraan C boleh diperolehi dengan mudah seperti hanya menyalin dari internet. Konsep terbuka perkakasan Arduino juga menjadikan sesiapa sahaja mudah mempelajarinya (Isikdag, 2015) kerana bahan-bahan yang telah tersedia atas talian. Berbeza dengan Raspberry Pi yang boleh diprogram dengan menggunakan bahasa pengaturcaraan Python yang bersifat Object-oriented Programming (OOP).

Dapatan awal kajian ini menunjukkan jurang ketara di antara penggunaan peranti IoT Raspberry Pi dengan peranti lain terutamanya Arduino. Oleh itu, penyelidik berharap dengan adanya kajian ini dapat membantu meningkatkan kesedaran tentang penggunaan Raspberry Pi di kalangan pelajar sekaligus dapat mengurangkan jurang perbezaan penggunaan antara papan mikro pengawal Raspberry Pi dan papan mikro pengawal yang lain serta memberi lebih banyak peluang kepada pelajar bidang komputer untuk meneroka IoT dan Raspberry Pi.

OBJEKTIF KAJIAN

1. Mengenalpasti tahap pengetahuan pelajar mengenai kesediaan menggunakan Raspberry Pi untuk kursus DFT6014 Integrated Project
2. Mengenalpasti tahap kemahiran pelajar dalam penggunaan Raspberry Pi untuk kursus DFT6014 Integrated Project

KAJIAN LITERATUR

Pada masa kini, projek IoT untuk pelajar bukanlah sesuatu yang baru. Penerapan IoT dalam pembelajaran dapat meningkatkan hasil pembelajaran mahasiswa (Harry Dhika et al., 2017). Gelombang baru teknologi internet dan dunia pembuatan digital memerlukan mahasiswa pengajian tinggi menjadi serba boleh dan berdaya cipta. Dengan IoT pelajar mengaplikasikan teori kepada praktikal iaitu dengan menghasilkan satu projek dunia nyata (real-world project) yang dapat digunakan dalam situasi sebenar. Projek yang sebenar memerlukan perkakasan yang sebenar. Contohnya dengan penggunaan peranti kecil dan mudah alih yang menyokong internet tanpa wayar amat sesuai digunakan untuk penciptaan serta eksperimen sesebuah projek IoT. Bagi contoh ini Raspberry Pi adalah antara peranti yang sangat sesuai dan menepati kesemua ciri-ciri (Zhong & Liang, 2016).

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Secara umumnya, kedua-dua Arduino dan Raspberry Pi adalah papan mikro pengawal. Tetapi sebenarnya kedua peranti ini berbeza pada operasi dan prestasi. Raspberry Pi mempunyai fungsi lengkap sebagai sebuah mini komputer kerana mempunyai mikro pemproses, memori serta memerlukan papan kekunci, skrin paparan dan bekalan kuasa untuk beroperasi. Selain itu Raspberry Pi menggunakan Raspbian iaitu salah satu sistem pengoperasian berasaskan Linux, (Maksimović et al., 2015) menyokong penghasilan projek IoT yang kompleks dan boleh menyimpan dan memproses maklumat daripada pangkalan data. Kebiasaannya projek Raspberry Pi juga boleh diprogram melalui antara muka pengguna atau Graphical User Interface (GUI). Dalam kajian yang dibuat oleh Maksimović et al., (2015) juga, terdapat banyak perbezaan yang mendorong penggunaan Raspberry Pi berbanding Arduino dalam menghasilkan projek mengikut citarasa pengguna. Jadual 1 menunjukkan perbezaan prestasi mengikut kriteria.

Jadual 1: Perbezaan antara platform Raspberry Pi dan Arduino Sumber: Maksimović et al., (2015)

Name	RAM	Power	LAN	Wifi	USB ports	Board Operating System	Programming Language
Raspberry Pi	256 MB – 4GB	5V/ USB	10/100/ 1000mbps	802.11 b/g/n/ac (2.4Ghz+ 5Ghz)	1 -2	Raspbian/ Ubuntu/ Android/Archlinux and etc	C, C++, Java, Python
Arduino	16-32 KB	7-12V/USB	-	-	1	-	C/Arduino IDE

Melihat kepada perbezaan di atas, pelajar projek tahun akhir program Diploma Teknologi Maklumat (Teknologi Digital) harus mengambil kira setiap kriteria semasa memilih peranti IoT atau papan mikro pengawal bagi menyempurnakan projek akhir mereka. Namun begitu tanpa pengetahuan dan kemahiran mengenai peranti tersebut pelajar tidak akan dapat memilih dengan tepat. Oleh itu, kajian ini dibuat bagi mengetahui sejauh mana tahap kesediaan pelajar Diploma Teknologi Maklumat (Teknologi Digital) dari segi kemahiran dan pengetahuan tentang Raspberry Pi kerana ia akan membantu mempengaruhi pemilihan peranti IoT untuk penghasilan projek.

KERANGKA KONSEP KAJIAN

Pengkaji menggunakan Model Penerimaan Teknologi (Technology Acceptance Model) oleh Davis et al. (1985) sebagai kerangka kajian ini. Kerangka ini dibina dengan menganggap bahawa apabila pelajar mempunyai pengetahuan dan kemahiran yang baik tentang papan mikro pengawal Raspberry Pi, pelajar akan dapat menggunakan peranti IoT ini serta lebih bersedia untuk menggantikan peranti IoT lain seperti papan pengawal mikro Arduino dalam menghasilkan projek akhir bagi kursus DFT6014 Integrated Project. Rajah 1 menunjukkan kerangka kajian.

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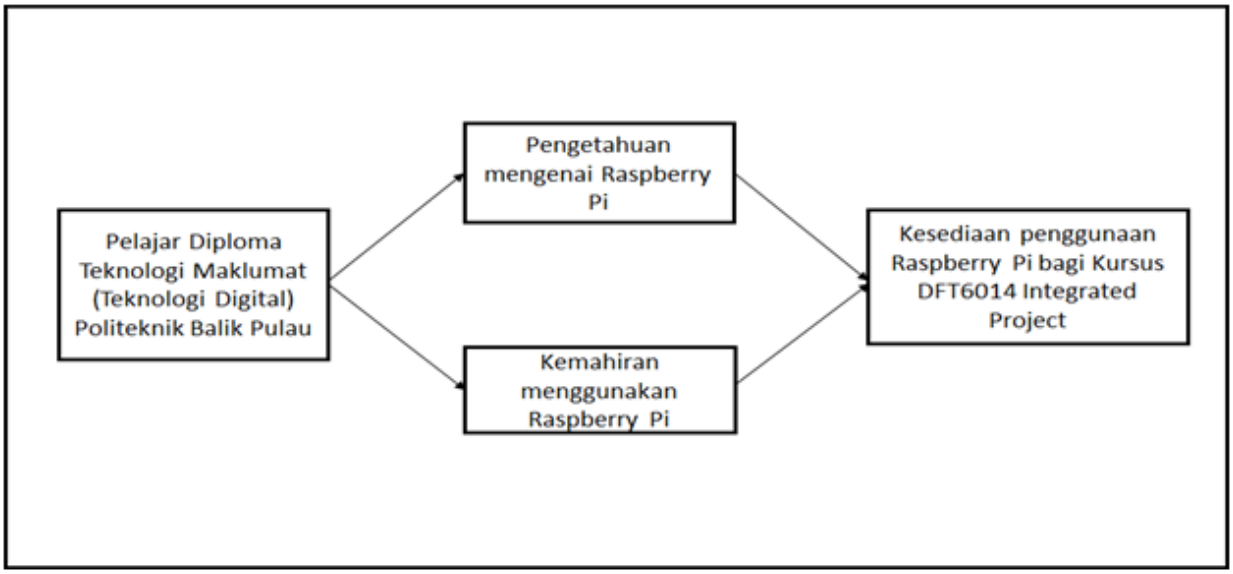

Rajah 1 Kerangka Kajian

METODOLOGI KAJIAN

Pada bab ini akan menerangkan tentang kaedah penyelidikan yang dijalankan untuk pengumpulan data dan maklumat daripada responden yang terlibat. Kajian yang dijalankan adalah berbentuk deskriptif menggunakan kaedah tinjauan dan dilakukan menggunakan soal selidik sebagai instrumen kajian. Responden bagi kajian ini adalah terdiri daripada dua (2) kumpulan. Kumpulan pertama adalah responden untuk ujian pra manakala kumpulan kedua adalah responden ujian pos. Bagi ujian pra sebanyak 34 kumpulan pelajar tahun akhir Diploma Teknologi Maklumat (Teknologi Digital) PBU yang mengambil kursus DFT6014 Integrated Project mengambil bahagian serta turut mengambil kira input yang diberikan oleh penyelia projek akhir dari enam (6) buah politeknik Malaysia. Manakala ujian pos akan melibatkan sebanyak 46 kumpulan pelajar dengan jumlah seramai 138 orang pelajar bagi Sesi Jun 2019 sahaja. Memandangkan jumlah responden yang agak tinggi, kajian tinjauan amat sesuai digunakan. Data kajian sebenar akan dianalisis dengan menggunakan perisian IBM SPSS Statistics v22 untuk mendapatkan keputusan akhir.

ANALISIS DATA

Instrumen utama dalam kajian ini ialah soalan soal selidik awal yang diberikan kepada responden yang bertujuan untuk mendapatkan maklumat berkaitan tajuk kajian. Set soal selidik ini dibahagikan kepada dua bahagian iaitu Bahagian 1 dan Bahagian 2. Dalam bahagian ini terdapat dua (2) item merangkumi maklumat latar belakang responden iaitu semester semasa dan sesi semester. Dalam bahagian ini pula, responden dikehendaki menjawab soal selidik berkaitan dengan projek akhir pelajar. Sebanyak empat (4) item soalan telah disediakan iaitu jumlah ahli kumpulan projek akhir, pemilihan kategori projek yang dipilih, tajuk projek setiap kumpulan dan pilihan peranti IoT yang digunakan untuk menyiapkan projek akhir. Soal selidik yang digunakan berbentuk positif serta terbuka dengan pilihan jawapan yang disediakan. Selain itu, untuk melengkapkan kajian ini, data sokongan diperolehi daripada pelbagai sudut rujukan seperti pembacaan jurnal artikel, internet dan melalui buku.

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JANGKAAN DAPATAN KAJIAN

Projek akhir pelajar dan kreativiti saling berkait. Salah satu asas penting bagi kreativiti adalah pengetahuan. Ada pendapat daripada ahli psikologi menyatakan bahawa terdapat hubungan positif di antara ilmu pengetahuan dan kreativiti. Kemampuan seseorang individu untuk menghasilkan idea-idea kreatif adalah bergantung kepada kedalaman dan keluasan yang dimiliki dalam sesuatu bidang (Mohsin & Nasruddin, 2006). Menurut Mohd Taib et al., (2015) projek akhir pelajar yang dinilai dalam pertandingan projek adalah untuk menghargai kesungguhan dan idea kreatif pelajar dalam menghasilkan ciptaan baru dan berinovasi. Oleh kerana pentingnya faktor ini, pengkaji berharap sekiranya responden lebih berpengetahuan dan berkemahiran menggunakan Raspberry Pi, maka mereka akan lebih bersedia untuk meneroka Raspberry Pi dan menggantikan papan mikro pengawal yang lain seperti Arduino semasa menghasilkan projek akhir. Bagi pelajar bidang teknologi maklumat dan sains komputer, Raspberry Pi sesuai digunakan sebagai papan mikro pengawal untuk projek IoT kerana dapat menghasilkan pelbagai objek yang menarik melalui pengaturcaraan. Selain itu, penggunaan versi Linux iaitu Raspbian sebagai sistem pengoperasian menjadi nilai tambah kepada Raspberry Pi kerana ciri-ciri open source yang terdapat pada Linux. Penggunaan Raspbian juga akan membantu generasi muda mempelajari dan menguasai bahasa pengaturcaraan Python yang lebih mudah berbanding bahasa OOP yang lain (Pankaj Naganath, 2016).

PENUTUP

Raspberry Pi mampu berfungsi sebagai server web, kotak muzik, kamera pintar, hub media dan banyak lagi jika diteroka. Kebanyakan projek memerlukan perkakasan elektronik tambahan dan ada juga yang tidak memerlukan perkakasan tambahan. Jika pelajar bidang Teknologi Maklumat berminat mempelajari dan mengawal robot, mereka juga boleh menghubungkan Arduino kepada Raspberry Pi untuk tujuan ini tetapi memerlukan pengetahuan lanjutan. Untuk menghasilkan projek DFT6014 Integrated Project yang mempunyai ciri-ciri inovasi dan berkualiti, bimbingan yang menyeluruh serta bantuan berbentuk ilmu pengetahuan dan kemahiran harus diberikan kepada pelajar. Keupayaan mengenali serta mengguna peranti IoT seharusnya tidak tertumpu kepada keupayaan pelajar semata-mata tetapi perlu mendapat perhatian para pensyarah khususnya pensyarah penyelia projek akhir. Dengan bantuan dan panduan yang menyeluruh, para pelajar akan lebih bersedia menyahut cabaran menghasilkan projek akhir bermutu tinggi.

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KEBERKESANAN PENGGUNAAN WEB 2.0 DI KALANGAN PELAJAR POLITEKNIK BALIK PULAU UNTUK KURSUS BASIC ROUTING TECHNOLOGIES

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Abstrak

Bidang rangkaian adalah satu bidang yang penting sekarang. Penghubung Internet dengan kehidupan dan bisnes adalah rangkaian (C-IoT.John Wiley & Sons, 23 April 2015). Kebanyakan pelajar tidak dapat menguasai kursus yang ada di dalam trek rangkaian. Ini mungkin disebabkan oleh cara penyampaian serta kekangan masa untuk pelajar menguasai pembelajaran kursus tersebut. Seramai 25 orang pelajar telah menjadi responden. Mereka dipilih kerana telah mengambil kursus DFN5013- Basic Routing Technology (BRT) lebih satu semester (mengulang kursus) yang terdiri daripada lelaki dan perempuan dari pelajar yang telah melepasi semester 3, iaitu semester pemilihan trek. Kebanyakakan pelajar kurang memberi tumpuan dan fokus kepada kursus rangkaian disebabkan oleh cara penyampaian di dalam kelas. Kajian ini, bertujuan untuk mengkaji perspektif dan pengalaman pelajar di dalam penggunaan web 2.0 di dalam kelas. Ia dibuat melalui kajian soal selidik dan juga ujian-pra dan juga ujian-pos. Satu set soalan soal selidik digunapakai sebagai instrumen kajian yang mengandungi 15 item. Nilai kebolehpercayaan instrumen adalah: 0.956. Satu set soalan digunapakai untuk ujian-pra dan ujian-pos. Set soalan untuk ujian ini adalah soalan peperiksaan akhir untuk tahun yang lepas. Secara keseluruhan kajian dapatan mendapati bahawa pelajar lebih gemar dan berminat terhadap penyampaian pengajaran menggunakan web 2.0. Ini dibuktikan oleh kajian lepas yang mendapati penggunaan web 2.0 boleh meningkatkan engagement (Martin et al, 2018). Mereka juga termotivasi dan mampu memberi penglibatan secara maksima jika menggunakan medium tersebut. Ujian-pra serta ujian-pos juga menunjukkan peningkatan terhadap markah pelajar. Ujian-pra dilakukan menggunakan kaedah tradisional manakala ujian-pos dilakukan menggunakan medium web 2.0. Kesimpulannya, walaupun kursus Basic Routing Technology sukar diajar menggunakan medium web 2.0, tetapi apabila diaplikasi walau hanya digunapakai ketika ujian, kuiz atau kerja kumpulan, mereka lebih bermotivasi dan berminat untuk menjawab dengan lebih tekun dan fokus. Limitasi kajian adalah berkaitan dengan masa, serta bilangan responden yang menjawab kaji selidik yang disediakan.

Kata Kunci: **web 2.0, trek rangkaian, gamifikasi, ujian-pra, ujian-pos, engagement, pespektif dan** pengalaman.

PENDAHULUAN

Aplikasi web 2.0 ataupun penggunaan gamifikasi di dalam pengajaran dan pembelajaran adalah suatu alternatif kepada cara penyampaian terkini, ini telah dikaji oleh (Arnab et al, 2016). Dalam beberapa tahun kebelakangan, platform digital atau penggunaan web 2.0 berkaitan dengan e-learning dan simulasi platform. Aplikasi mobil juga menjadi pengabung antara etika pembelajaran dan teknologi di dalam perkembangan teknologi baharu. Ia bersesuaian dengan arus pembangunan semasa.

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Sebagai titik permulaan kepada penggabungan teknologi dalam beberapa abad terkini, ia berkembang menjadi suatu suasana pembelajaran tanpa sempadan yang akan memberikan pengalaman pembelajaran yang sempurna. (E-Learning Guild, 2014). Pendekatan web 2.0 adalah suatu medium yang amat berguna yang mudah dan sangat membantu pensyarah.

LATAR BELAKANG MASALAH

Selari dengan kehendak National Blue Ocean Strategy (NBOS) (INFRA,2013), Politeknik Malaysia menawarkan diploma fast trek yang boleh diselesaikan di dalam masa 2.5 tahun berbanding 3 tahun untuk pelajar dahulu. Lima Politeknik yang menawarkan diploma fast trek ini adalah, Politeknik Balik Pulau (PBU), Politeknik Sultan Idris Shah (PSIS), Politeknik Seberang Perai, Politeknik Ungku Omar (PUO) dan Politeknik Metro Kuala Lumpur (PMKL). Daripada lima politeknik yang menawarkan fast trek, empat daripadanya menawarkan trek rangkaian iaitu, PBU, PSIS, PUO dan PSP. Ini membuktikan bahawa pengkhususan rangkaian adalah penting. Selepas berlangsung beberapa semester sehingga pengkhususan trek, pelajar didapati agak lemah di dalam kursus-kursus rangkaian. Fast trek menyebabkan segelintir pelajar ketinggalan. Ini dibuktikan dengan jumlah pelajar yang gagal (mengulang kursus) meningkat dengan jumlah yang ramai. Disebabkan peningkatan pelajar gagal di kalangan pelajar fast trek, kajian ini dibuat. Ini adalah untuk membantu pelajar dan pensyarah membuat pembaharuan di dalam proses pdp.

PENYATAAN MASALAH

Pelajar sering gagal kursus rangkaian. DFN5013 BRT menjadi salah satu penyumbang terbesar kegagalan pelajar rangkaian. Ini dibuktikan dengan jumlah pelajar yang masuk ke kelas Mengulang Kursus (MK) adalah lebih 20 orang. Pelajar yang gagal juga mungkin masuk ke kelas yang bukan MK disebabkan pertindihan jadual. Justeru, pelajar yang gagal BRT adalah ramai dan telah dibuktikan daripada pencapaian yang telah dikeluarkan oleh unit peperiksaan PBU. Sebanyak tiga semester berturut-turut BRT menjadi penyumbang besar kegagalan kursus rangkaian. Pada sesi Disember 2017 dan sesi Jun 2018, didapati keputusan penilaian akhir pelajar kurang memberangsangkan iaitu, 48 dari 115 orang pelajar telah gagal kursus DFN5013 iaitu 41.74% kegagalan untuk sesi Disember 2017. Manakala untuk sesi Jun 2018 pula, seramai 112 daripada 224 oarang pelajar gagal kursus DFN5013, peratus kegagalan adalah 54.10% (Unit peperiksaan PBU). Sebanyak 60 hingga 70 peratus kandungan soalan yang diuji di dalam peperiksaan akhir adalah soalan berbentuk konfigurasi yang memerlukan kefahaman kandungan amali.

OBJEKTIF KAJIAN

1. Mengkaji pesepsi pelajar terhadap penggunaan web 2.0
2. Mengkaji pandangan pelajar terhadap antara muka web 2.0
3. Mengkaji keberkesanan web 2.0 dari sudut faktor kemahiran insaniah

SOALAN PENYELIDIKAN

Bagi memenuhi keperluan kajian serta mencapai obejektif yang perlu dilaksanakan, beberapa persoalan kajian telah diwujudkan hasil daripada setiap objektif yang telah dijangka untuk membantu menyelesaikan masalah yang wujud. Soalan penyelidikan yang berkaitan adalah:

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1. Apakah persepsi pelajar terhadap penggunaan web 2.0?
2. Apakah perasan pelajar ketika penggunaan web 2.0 di dalam kelas?
3. Bagaimanakah web 2.0 memenuhi kehendak pelajar di dalam kelas?
4. Bagaimanakah web 2.0 memenuhi keperluan pelajar di dalam kelas?
5. Adakah penggunaan web 2.0 memudahkan pengajaran dan pembelajaran?
6. Bagaimanakah penggunaan web 2.0 memudahkan pengajaran dan pembelajaran?

KEPENTINGAN KAJIAN

Hasil kajian ini amat membantu pendidik memurnikan serta melestarikan sistem pembelajaran yang disarankan, medium perantara bagi menggalakkan pelajar untuk memberi fokus kepada pembelajaran menggunakan aplikasi web 2.0. Ini adalah kerana kaedah ini sangat sesuai menjadi medium perantara untuk digunapakai oleh pelajar serta pensyarah yang bagi kursus yang berkaitan. Selain itu, kajian ini dilakukan adalah untuk membuktikan bahawa penggunaan web 2.0 dapat menggalakkan pensyarah untuk menggunakan web 2.0 di dalam pdp. Kajian ini juga mahu membuktikan bahawa walaupun untuk kursus teknikal, medium web 2.0 boleh digunakan sebagai aplikasi tambahan untuk proses pdp.

SKOP KAJIAN

Kajian ini hanya melibatkan pelajar Politeknik Balik Pulau yang mengambil kursus DFN5013 BRT untuk kursus rangkaian 2.5 tahun, keputusan kajian hanya boleh digeneralisasikan kepada pelajar-pelajar yang mengambil kursus rangkaian 2.5 tahun. Untuk penyataan yang lebih tepat kajian dilakukan kepada kelas khusus yang kebanyakkan responden adalah pelajar yang pernah gagal subjek BRT. Diantara aplikasi yang digunakan adalah Quizizz, Kahoot, ClassDojo dan Cidos. Aplikasi ini dipilih adalah kerana faktor-faktor yang difikirkan sesuai dengan keadaan pelajar, bilangan mereka serta faktor yang ingin dikaji dan diperhatikan.

SOROTAN KAJIAN

Perkembangan teknologi masa kini mencetus amalan BYOD (Bring Your Own Device) yang memanfaatkan dari segi kemudahan akses kepada data, penjimatan kos, produktiviti dan kepuasan terhadap penggunaan teknologi maklumat (Pillay, Diaki, & Nham, 2013). Menurut Chou, Chang, & Lin (2017), amalan pembelajaran secara BYOD melangkau pengalaman pembelajaran terutamanya dari segi memotivasikan dan menarik minat pelajar untuk belajar. Kajian oleh Jian & Waugh (2018) turut mendapati persepsi pelajar terhadap penggunaan web 2.0 dalam pembelajaran adalah menjurus kepada ketersediaan format program pembelajaran di platform atas talian serta terdapat juga pendapat mengenai fleksibiliti sistem pembelajaran atas talian selain dapat mengisi masa yang terluang.

Penggunaan kuiz atas talian dapat meningkatkan penglibatan pelajar sehingga tekun menjawab di samping menarik minat pelajar untuk bersedia untuk menjawab kuiz, dan ianya adalah pengalaman yang menyeronokkan dalam pembelajaran (Cohen & Sasson, 2016; Harlina et al, 2017). Tomas et al., (2015) juga bersetuju bahawa penggunaan medium kerja penilaian yang dapat membina literasi pelajar, melatih imaginasi dan kreativiti mereka, serta memenuhi keperluan silibus dapat menggalakkan penglibatan intelektual dan menarik minat pelajar. Pembelajaran dalam web 2.0 mempunyai potensi untuk menarik penglibatan pelajar dan memberi keseronokan selain mudah digunakan berbanding mod pembelajaran bersemuka kerana kebolehan untuk digunapakai untuk semua jenis gaya pembelajaran (Fan & Le, 2019; Fang, 2019).

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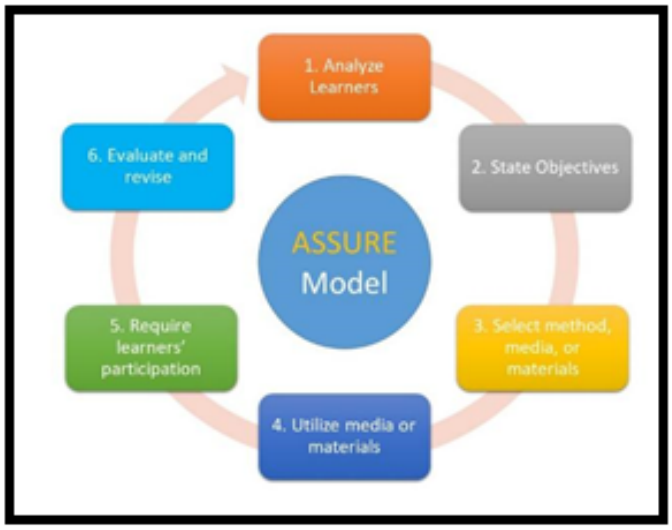
Web 2.0 dapat meningkatkan pengetahuan pelajar dan pendidik perlu mengubah cara pengajaran supaya menarik penglibatan pelajar di dalam kelas. Ini dapat dibuktikan dalam kajian (Suthgate, Budd, & Smith, 2017; Nurul et al, 2018) bahawa pendidik adalah digalakkan untuk menggunakan permainan pembelajaran yang dapat membantu amalan pedagogi sedia ada dan dapat meningkatkan keyakinan pendidik dalam menarik penglibatan pelajar dan mempertingkatkan hasil pembelajaran. Cohen & Sasson, (2016) juga mendapati pencapaian pelajar meningkat sepanjang proses pembelajaran atas talian, bermula dari cubaan pertama hingga kuiz tamat dan pelajar turut menunjukkan minat untuk terus menjawab kuiz atas talian dengan kebolehan menjawab beberapa kali. Owen & Dunmill (2014) berpendapat seorang pendidik seharusnya berfungsi sebagai fasilitator di dalam kelas tetapi terdapat kekangan seperti terdapatnya jurang di antara pengetahuan dan kebolehan yang mempengaruhi cara mendidik berteraskan teknologi atau masa hadapan. Sekiranya pihak universiti menyokong perpindahan pembelajaran tradisional kepada pembelajaran secara atas talian, maka akan dapat membantu mengatasi isu berkenaan penglibatan pelajar dalam akademik (Dyment, Downing & Budd, 2013).

METODOLOGI KAJIAN

Teori Asas Kajian/ Kerangka Konsep



Rajah 1.0 ASSURE Model Digunapakai Dalam Kajian

Rajah 1.0 menunjukkan gambar rajah kerangka ASSURE model yang digunapakai untuk melakukan proses penyelidikan ini. Setiap peringkat dibuat mengikut keperluan pdp dan kesesuaian kursus BRT. Proses yang pertama adalah Analyze Learners, proses ini dilakukan untuk mengenalpasti siapa target audience, mengetahui demografi mereka, tahap pendidikan, psikologi, afektif dan keperluan sosial mereka. Langkah kedua iaitu State Objective, dengan menyatakan tujuan modul atau kajian dibuat. Kenyataan ini mengandungi cara yang spesifik apa yang mampu pelajar lakukan seperti keputusan yang dibentuk. Untuk membuat objektif yang baik, bahagian ini perlu melibatkan ABCD objektif pembelajaran iaitu: Audience, Behaviour, Conditions dan Degree. Seterusnya bahagian ke tiga, adalah Select method, media or material, pada bahagian ini, web 2.0 dipilih sebagai media untuk menjadi alat bantuan pdp yang membantu melancarkan proses. Web 2.0 yang digunapakai adalah Quizizz, Kahoot, ClassDojo dan Cidos. Pemilihan aplikasi web 2.0 ini perlulah memenuhi keperluan untuk meningkatkan fokus, motivasi serta penglibatan pelajar di dalam kelas.

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Bahagian ke empat adalah utilize media or material. Untuk bahagian ini, aplikasi web 2.0 yang dipilih digunapakai sepenuhnya untuk mamastikan rancangan untuk merealisasikan objektif yang telah dinyatakan. Untuk bahagian ini 5P telah digunapakai. Proses yang ke lima adalah Require Learner Participation. Proses ini adalah proses yang sangat penting kerana dengan penglibatan pelajar sahaja Teori ASSURE mampu terlaksana. Sebagai melengkapkan proses, langkah yang terakhir adalah evaluate and revise. Ini adalah proses untuk mengetahui samada apa yang telah dilaksanakan berjaya atau pun tidak. Proses perlaksana ASSURE boleh diulang semula mengikut keperluan (Serhat Kurt, 2018).

RANGKA BENTUK KAJIAN

Di dalam bahagian rangka bentuk kajian menceritakan cara kajian dijalankan untuk mengumpulkan data dan maklumat daripada responden yang terlibat. Kaedah permilihan responden adalah menggunakan kaedah persampelan bertujuan. Kajian telah dibuat terhadap satu kelas MK DFN5013 Basic Routing Technology. Data yang diperolehi dianalisis dan disimpulkan menggunakan perisian SPSS 25.0. Pemboleh ubah yang digunakan di dalam kajian adalah; cara penyampaian pdp (pembolehubah dimanipulasi), perspektif dan pengalaman (pembolehubah bergerak balas), dan pelajar atau kursus (pembolehubah malar).

Kaedah soal selidik telah dijalankan dengan menggunakaan beberapa soalan yang telah dibuat. Soal selidik ini telah diagihkan kepada kesemua 25 orang responden, melalui pengedaran link di dalam WhatsApp. Mereka berhak mengeluarkan pendapat masing-masing berkenaan dengan menjawab soalan kajian tanpa ada gangguan dari pihak pengkaji. Soalan ini akan diedarkan melaui Google Form dan dipantau supaya tiada kehilangan data dan semua soalan berjawab. Penggunaan Google Form dapat memudahkan cara untuk membuat kajian (Iqbal, et al, 2018).

ANALISIS DATA

Analisis data akan dibuat menggunakan kaedah analisis diskriptif untuk kajian tinjauan, ujian-pra dan ujian-pos pula untuk melihat dapatan akhir. Ini kerana dapatan perlu dilihat melalui pendapat dan hasil ujian. Sebelum data diteruskan untuk dianalisis, satu ujian kesahan telah dibuat. Ujian kesahan telah dijalankan dan menunjukkan kadar kesahan soalan kajian tinjauan adalah baik dan boleh diguna pakai untuk meneruskan peringkat persampelan

Cronbach's Alpha	Bilangan item
0.956	17

Rajah 3.0: Cronbach's Alpha

Rajah 3.0 menunjukan bukti kesahan soalan kajian yang dihasilkan. Bukti ini diperolehi daripada Perisian SPSS 25.0.

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ANALISIS DAN KEPUTUSAN

Data Analisis Soalan Tinjauan

Berdasarkan jadual 4.1, item soalan di bahagian A, adalah berkaitan dengan demografi atau maklumat latar belakang responden daripada kursus rangkaian, seramai 25 pelajar telah diberi soalan soal selidik. Kajian ini dibuat adalah untuk mengkaji perspektif dan pengalaman pelajar di dalam penggunaan web 2.0 untuk kursus Basic Routing Technology.

Jadual 4.1: Jadual Demografi Responden

Latar belakang	Klasifikasi	Kekerapan	Peratusan (%)
Semester	3	1	4
	4	8	32
	5	9	36
	6	5	20
	7	3	12
	8	0	0
Mengulang kursus	Ya	22	88
	Tidak	3	12
Jika mengulang kali ke berapa	1	20	90.9
	2	1	4.5
	3	1	4.5

Daripada responden yang berjumlah 25 orang (100%), jumlah responden yang tertinggi daripada semester 5 (36%), manakala terdapat semester 4 (32%), yang selebihnya adalah semester 3, 6 dan 7. Mejoriti daripada responden adalah mengulang kursus iaitu 22 orang (88%), manakala hanya 3 orang (12%) adalah pelajar yang tidak mengulang kursus. Daripada 22 orang yang mengulang kursus, 20 orang mengulang kali pertama (90.9%) manakala seorang telah mengulang kali kedua dan kali ke tiga (4.5%).

DAPATAN HASIL SOALAN PENDAPAT MELALUI SOALAN KAJIAN

Berdasarkan borang selidik ini, setiap item akan dianalisiskan dalam bentuk min bagi setiap item. Analisa skor min bagi setiap item adalah berpandukan jadual skor berikut:

Jadual 4.2 Tafsiran Statistik Min

Skor Min	Petanda	Maklumbalas
0.00 -1.0	Sangat rendah	Sangat tidak setuju
1.01-2.00	Rendah	Tidak setuju
2.01-3.00	Sederhana	Setuju
3.01-4.00	Tinggi	Sangat bersetuju
4.01-5.00	Sangat tinggi	Sangat-sangat bersetuju.

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Jadual 4.3 Min Persepsi Penggunaan Web 2.0

PERSEPSI PENGGUNAAN WEB 2.0		MIN
1	Penggunaan web 2.0 membuatkan saya fokus di dalam kelas	4.16
2	Penggunaan web 2.0 menaikkan motivasi saya menjawab kuiz, dan ujian	4.24
3	Penggunaan web 2.0 menaikkan semangat kerja berpasukan saya	4.12
4	Penggunaan web 2.0 menaikkan keinginan untuk mendapat markah tertinggi di dalam kelas	4.20
5	Penggunaan web 2.0 menaikkan minat saya belajar BRT	4.32
6	Saya merasa gembira ketika menggunakan web 2.0 di dalam kelas	4.16
7	Saya merasa termotivasi ketika menjawab soalan di dalam aplikasi web 2.0	4.08
8	Saya rasa keinginan belajar BRT meningkat apabila menggunakan web 2.0 di dalam kelas	4.16
MOD KESELURUHAN		**4.18**

Analisis berkaitan persepsi penggunaan web 2.0 ini, menunjukkan skor keseluruhan yang diperolehi ialah 4.18 iaitu berada pada tahap yang paling tinggi. Berdasarkan nilai min yang ditunjukkan, ramai responden web 2.0 mampu membuatkan mereka fokus, bersemangat, bermotivasi serta germbira ketika menggunakan aplikasi ini.

Jadual 4.4 meunjukkan pandangan pelajar terhadap antara muka web 2.0. Skor min secara keseluruhan menunjukkan 4.14 iaitu pada tahap yang tinggi. Ini menunjukkan para pelajar dan pensyarah berpendapat bahawa web 2.0 sesuai dijadikan sebagai medium untuk mengajar dan ianya amat sesuai untuk mereka, mahupun untuk kursus teknikal.

Jadual 4.4 Min Pandangan Pelajar Terhadap Antara Muka Web 2.0

PANDANGAN PELAJAR TERHADAP ANTARA MUKA WEB 2.0		MIN
1	Penggunaan web 2.0 dalam BRT memberi impak positif kepada saya	4.16
2	Penggunaan web 2.0 dalam BRT memupuk nilai yang baik kepada saya	4.04
3	Penggunaan web 2.0 dalam BRT memupuk nilai yang baik kepada saya dan rakan-rakan	3.76
4	Penggunaan web 2.0 dalam BRT membentuk semangat kerjasama yang baik	4.16
5	Web 2.0 menarik	4.28
6	Web 2.0 mudah digunakan	4.36
7	Web 2.0 tersusun	4.28
8	Web 2.0 mempunyai tutorial penggunaan	4.04
MIN KESELURUHAN		**4.14**

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Dari sudut persoalan keberkesanan web 2.0 dari sudut faktor kemahiran insaniah pula, responden menyatakan keperluan untuk menggunakan web 2.0. Mereka memerlukan web 2.0 di kerana menjadi pemangkin semangat, menjadikan pdp lebih menarik, menambahkan fokus serta memenuhi kehendak serta keperluan pdp mereka. Skor keseluruhan yang diperolehi dari respon pelajar adalah 4.13. Ini jelas menunjukkan bahawa responden amat bersetuju untuk menjadikan web 2.0 sebagai aplikasi yang digunakan di dalam kelas walaupun kelas yang berbentuk teknikal.

Jadual 4.5 Min Mengkaji keberkesanan web 2.0 dari sudut faktor kemahiran insaniah

	MENGKAJI KEBERKESANAN WEB 2.0 DARI SUDUT FAKTOR KEMAHIRAN INSANIAH	MIN
1	Saya memerlukan medium web 2.0 untuk membuat saya fokus di dalam kelas	4.08
2	Saya memerlukan web 2.0 sebagai pemangkin semangat di dalam kelas	4.08
3	Saya memerlukan medium web 2.0 untuk memberi kerjasama di dalam kumpulan	4.08
4	Saya memerlukan medium web 2.0 untuk meningkatkan kefahaman kursus BRT	4.28
5	Saya memerlukan web 2.0 untuk menjadikan pengajaran dan pembelajaran lebih menarik	4.08
6	Saya memerlukan medium web 2.0 untuk menjadi pemangkin untuk hilang mengantuk dalam kelas	4.08
7	Saya memerlukan web 2.0 untuk memenuhi keperluan pdp saya di dalam kelas	4.20
8	Saya memerlukan web 2.0 untuk memenuhi kehendak pdp saya di dalam kelas	4.16
	MIN KESELURUHAN	**4.13**

KESIMPULAN

Kaitan Demografi dengan Dapatan Kajian

Jumlah keseluruhan responden adalah 25 orang. Jumlah responden yang tertinggi daripada semester 5 dengan bilangan 9 orang (36%), manakala semeter 4 seramai 8 orang responden (32%). Tiada responden kurang dari semester 1,2 dan 8. Responden mestilah terdiri daripada semester 3 dan ke atas. Manakala semester yang lebih daripada 8 akan diberhentikan. Kajian demografi ini dibuat untuk menguji kesahan jawapan responden dan juga mengetahui anggaran semester mereka. Demografi semester responden diperlukan untuk menunjukkan corak hasil dapatan kajian dengan semester menggikut tahap kematangan seseorang.

Seterusnya kajian demografi mengulang kursus kali ke berapa diperlukan untuk mengetahui tahap kefahaman mereka serta tahap menjanaan maklumat yang diberikan di dalam kelas. Pelajar yang pernah gagal BRT mungkin merjana input maklumat dengan agak lambat berbanding dengan pelajar yang tidak gagal. Selain itu, pelajar yang gagal dapat menilai keberkesanan penggunaan web 2.0 jika dibandingkan dengan semester lepas yang tidak menggunakan pendekatan web 2.0 di dalam pdp.

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RUMUSAN IMPLIKASI DAPATAN KAJIAN

Setelah kajian dilakukan secara keseluruhannya, didapati secara seluruhnya responden bersetuju bahawa web 2.0 ini wajar digunapakai serta amat membantu mereka untuk lebih fokus, dan bermotivasi di dalam proses pdp. Mereka juga amat bersetuju bahawa penggunaan web 2.0 mampu memberi impak yang baik kepada mereka. Setiap persoalan kajian didapati berjaya terjawab setelah dapatan terkumpul. Responden bersetuju, bahawa penggunaan web 2.0 membantu mereka memahami BRT dengan lebih baik serta mereka mampu mempelajari BRT dengan keadaan yang lebih menarik. Implikasi yang berkaitan dengan kajian dan yang paling bertepatan dengan kajian adalah di peringkat PBU. Pihak politeknik perlulah memastikan segala kemudahan komputer di makmal mempunyai capaian internet untuk memudahkan pensyarah menggunakan web 2.0 di setiap kelas dan makmal.

Selain itu, setiap pensyarah perlulah diberi pendedahan berkaitan dengan web 2.0 agar mereka mampu untuk memilih serta melaksanakan kelas yang menarik menggunakan aplikasi yang sesuai. Maka kursus yang berkaitan penggunaan penggunaan web 2.0 perlu diadakan untuk membantu pensyarah memilih aplikasi yang bersesuaian kepada pelajar mengikut keperluan pelajar itu sendiri. Seperti contoh, terdapat pelajar yang gemar bekerja secara berkumpulan, maka pensyarah boleh mencipta suatu kerja yang berkaiatn secara berkumpulan. Pensyarah perlu lebih kreatif dalam mencipta serta memvariasikan penggunaan web 2.0. Tidak dapat disangkal bahawa penggunaan alat bantuan mengajar seperti aplikasi web 2.0 amat membantu pelajar serta pensyarah, maka tidak perlu dikhuatiri bengkel berkaitan akan mendapat sambutan yang hebat.

LIMITASI KAJIAN DAN CADANGAN KAJIAN SUSULAN

Limitasi kajian ini adalah bilangan responden yang terhad, ini adalah kerana bilangan sampel bergantung kepada tujuan kajian. Jumlah responden adalah 25 orang iaitu bergantung kepada jumlah bilangan pelajar kelas yang mengambil BRT di dalam kelas MK. Selain itu, kajian ini terhad masa kerana hanya sesuai dilakukan untuk pelajar yang berkaitan dengan masa tertentu sahaja. Beberapa senarai cadangan kajian lanjutan disenaraikan untuk menjadi bahan rujuk. Antara cadangan tersebut ialah:

a) Kajian ini boleh dimajukan untuk diaplikasikan untuk lebih keseluruhan kelas yang berada di Politeknik Malaysia yang menawarkan BRT dan kepada semua pensyarah yang mengajar kursus rangkaian atau kursus teknikal.

b) Bagi tujuan penambahbaikan, kajian boleh diteruskan dengan mengkecilkan skop kepada persoalan kajian yang lebih sedikit dan terfokus sahaja, seperti contoh, satu aplikasi dan dijadikan modul utama. Ini boleh membuatkan kajian lebih tertumpu dan lebih mendalam.

c) Kajian juga boleh ditambah baik dengan menambah kajian berkaitan kualitatif. Kerana kualitatif adalah kajian yang lebih sempurna dan lebih tepat mengetahui kesan serta hasil yang terbaik. Apabila menggunakan sampel kualitatif kajian akan menjadi lebih jitu dan mendapat hasil yang lebih tepat berbanding kajian sekarang.

d) Selain itu, kajian juga boleh diperluaskan dengan menganalisis mengikut perbezaan antara jantina, umur, serta pengalaman.

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FAKTOR – FAKTOR KETIDAKHADIRAN PELAJAR KE KELAS: KAJIAN KES DI POLITEKNIK BALIK PULAU

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Politeknik Balik Pulau, Pulau Pinang

Abstrak

Gejala ketidakhadiran menyebabkan generasi hari ini akan hilang jati diri, tidak terdidik mental, gangguan emosi, lemah jasmani, lemah rohani dan ketandusan ilmu akan menyebabkan mereka mudah terjebak dalam kegiatan yang negatif. Peranan utama politeknik adalah untuk melatih pelajar supaya lebih berfikiran matang dalam menghadapi permasalahan, nilai budi dan jati diri yang unggul bagi melayari kehidupan sebagai bakal pekerja dan individu yang seimbang rohani, jasmani, intelek dan sahsiah. Kajian ini bertujuan untuk mengenalpasti faktor sikap pelajar, faktor keluarga, faktor pensyarah dan faktor rakan sekelas yang mempengaruhi ketidakhadiran di kalangan pelajar. Kajian yang dijalankan ini berbentuk kuantitatif dan menggunakan soal selidik sebagai instrumen kajian. Responden kajian terdiri daripada 155 orang pelajar Politeknik Balik Pulau yang dipilih secara rawak. Data yang diperolehi dalam kajian ini di analisis menggunakan perisian Statistical Packages for Social Sciences (SPSS) Version 20.0. Hasil kajian ini diharapkan dapat membantu mempertingkatkan peratus kehadiran pelajar-pelajar yang terlibat dan dapatan kajian ini boleh diaplikasikan bagi membantu mempertingkatkan kehadiran pelajar-pelajar lain yang menghadapi masalah untuk hadir ke sekolah.

PENGENALAN

Ponteng didefinisikan sebagai lari daripada tanggungjawab atau tugas tanpa kebenaran (Kamus Dewan: 979). Secara umum ponteng sekolah ialah tidak hadir ke sekolah tanpa sebab yang munasabah dan di luar pengetahuan ibu bapa atau penjaga. Masalah ponteng dalam kalangan pelajar politeknik merupakan isu yang tidak berkesudahan. Masalah ponteng ini sering dikaitkan dengan faktor ibu bapa, pengajaran guru, interaksi pensyarah dan pelajar yang kurang rapat, bilik kuliah yang tidak kondusif, pengaruh negatif dan persekitaran serta komposisi pelajar yang ramai dalam sesebuah bilik kuliah (Tin Len Siong dan Muhamad Sidek Said, 2007). Banyak pihak menyalahkan pensyarah apabila timbulnya masalah ponteng dalam kalangan pelajar. Menurut Mohd. Salleh Lebar (1998), kewibawaan seseorang pensyarah mulai diragui oleh masyarakat terutamanya para ibu bapa. Oleh itu ramai dalam kalangan masyarakat khususnya ibu bapa menyalahkan guru apabila isu ponteng diperkatakan.

Oleh itu, kajian ini dilaksanakan bagi melihat dan mengkaji secara lebih terperinci sama ada gejala ponteng dalam kalangan pelajar politeknik ini berlaku didominasi oleh faktor gaya pengajaran guru atau sebaliknya. Peningkatan jumlah pelajar yang ponteng secara berterusan menimbulkan pelbagai implikasi kepada diri pelajar, institusi keluarga, sekolah, masyarakat dan negara.

PERNYATAAN MASALAH

Daripada pemerhatian dan rekod fail surat amaran dan tunjuk sebab Politeknik Balik Pulau, didapati bilangan pelajar yang tidak hadir ke kelas tanpa bukti semakin meningkat setiap semester. Kegagalan pelajar untuk hadir ke kelas boleh menyebabkan pelajar tersebut ditahan dari menduduki peperiksaan.

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Jadual 1.0 menunjukkan bilangan pelajar yang telah mendapat surat amaran dan tunjuk sebab disebabkan kegagalan mengemukakan bukti atau alasan yang kukuh. Bilangan pelajar yang mendapat surat amaran dan surat tunjuk sebab semakin meningkat dari sesi ke sesi.

Jadual 1.0: Bilangan Pelajar mendapat surat amaran dan tunjuk sebab

Sesi	Bilangan Surat	
	Surat Tunjuk Sebab	Surat Amaran
Jun 2019	4	219
Dis 2018	1	206
Jun 2018	1	205

Kehadiran pelajar-pelajar ke kelas merupakan salah satu elemen penting kerana kegagalan pelajar hadir ke kelas boleh menyebabkan pelajar ditahan dari menduduki peperiksaan. Pelajar diwajibkan menghadiri setiap sesi Pengajaran dan Pembelajaran (PdP) tidak kurang dari 80% dari jumlah jam pertemuan bagi setiap arena pembelajaran. Pelajar yang tidak mencapai kehadiran 80% dari jumlah jam pertemuan untuk setiap kursus tidak dibenarkan menduduki penilaian akhir. Pelajar akan diberikan surat amaran (SA) sekiranya tidak hadir tanpa sebab-sebab tertentu yang dapat diterima oleh kolej melebihi 10% daripada jam pertemuan bagi kursus tersebut. Manakala surat tunjuk sebab (STS) sekiranya tidak hadir tanpa sebab-sebab tertentu yang dapat diterima oleh kolej melebihi 20% daripada jam pertemuan bagi kursus atau tersebut. Pelajar yang tidak mencapai kehadiran 80% dari jumlah jam pertemuan untuk setiap kursus tidak dibenarkan menduduki penilaian akhir. Justeru didapati setiap semester terdapat pelajar yang akan ditahan dari menduduki peperiksaan. Oleh itu kajian ini dijalankan bagi mengenalpasti apakah faktor-faktor utama yang menyebabkan pelajar gagal hadir ke kelas seperti yang telah ditetapkan dalam jadual waktu.

OBJEKTIF KAJIAN

Objektif kajian ini dijalankan adalah:
1. Mengenalpasti faktor sikap yang menyebabkan masalah ketidakhadiran
2. Mengenalpasti faktor keluarga yang menyebabkan masalah ketidakhadiran
3. Mengenalpasti faktor rakan sebaya yang menyebabkan masalah ketidakhadiran.
4. Mengenalpasti faktor pensyarah yang menyebabkan masalah ketidakhadiran.

KAJIAN LITERATUR

Masalah ketidakhadiran atau ponteng merupakan masalah yang sering berlaku disemua peringkat sama ada sekolah atau institusi pengajian tinggi. Justeru menurut Johari dan Nik Selma (2010), masalah ketidakhadiran pelajar ke kelas merupakan masalah yang sering melanda pelajar dipelbagai peringkat bermula dari sekolah rendah sehinggalah ke peringkat yang paling tinggi iaitu Institusi Pengajian Tinggi (IPT). Terdapat banyak faktor yang menyebabkan berlakunya masalah ketidakhadiran dikalangan pelajar seperti faktor sikap pelajar, rakan sebaya, sikap pensyarah, kemudahan infrastruktur sesebuah institusi, keluarga, media sosial dan juga media elektronik. Menurut Sharif Mustafa dan Suria Abd Jamil (2012), perlakuan ponteng kelas berkaitan dengan sikap pensyarah, aktiviti-aktiviti pembelajaran yang kurang menarik dan peraturan disiplin yang terlalu ketat. Justeru sikap pelajar yang tidak bermotivasi untuk belajar juga merupakan salah satu faktor ponteng dikalangan pelajar (Azizi Yahaya, Shahrin Hashim, Yusof Boon, How Lee Chan, 2007).

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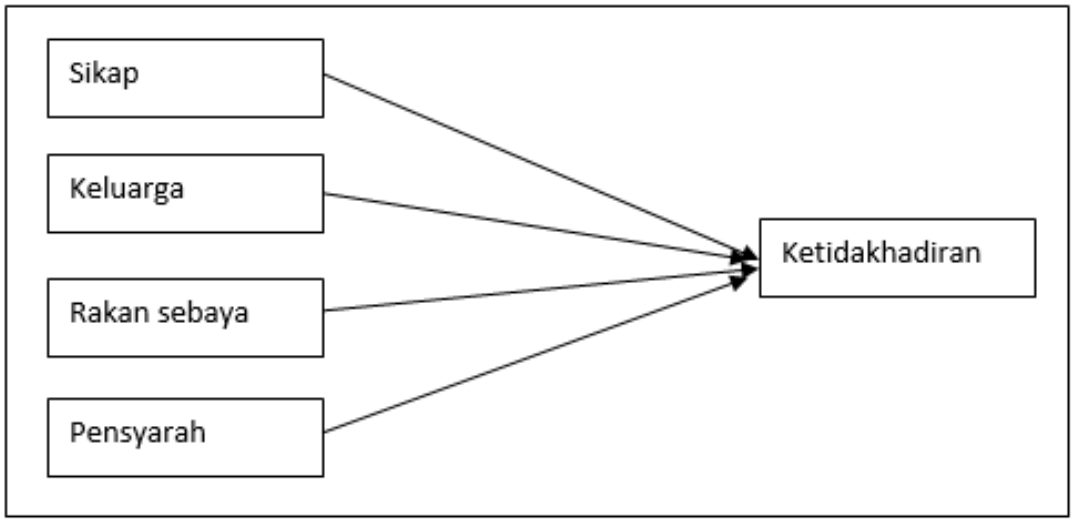
Menurut Azizi, Noordin dan Juriah (2010), gejala masalah ketidakhadiran merupakan faktor utama yang boleh menjerumuskan pelajar kepada pelbagai tingkah laku yang menjerumus ke arah jenayah kecil di kalangan remaja. Masalah ketidakhadiran di kalangan pelajar bukan sahaja mengundang masalah kepada pensyarah tetapi turut memberi impak negatif kepada masyarakat.

KERANGKA KAJIAN



Rajah 1.0: Model Kerangka Kajian

METODOLOGI KAJIAN

Instrumen kajian yang digunakan dalam kajian ini ialah borang soal selidik. Borang soal selidik terdiri daripada dua (2) bahagian iaitu bahagian A demografi responden dan bahagian B iaitu faktor-faktor yang mempengaruhi masalah ketidakhadiran pelajar di Politeknik Balik Pulau. Menurut Mohd Majid (1994), soal selidik dapat meningkatkan ketepatan dan kebenaran gerak balas yang diberikan oleh responden kerana ia tidak dipengaruhi oleh gerak laku penyelidik. Dalam kajian ini, soal selidik yang dibina berdasarkan skala likert. Kajian rintis telah dijalankan ke atas 25 orang pelajar dan nilai alpha yang diperolehi dalam kajian ini ialah melebihi 0.709.

DAPATAN KAJIAN

Dapatan kajian bagi penyelidikan ini di analisis menggunakan Jadual Tafsiran Min seperti dalam Jadual 2.0.

Jadual 2.0: Jadual Tafsiran Min (Landell, 1977)

SKOR MIN TAHAP	KECENDERUNGAN
1.00 – 2.33	Rendah
2.34 – 3.67	Sederhana
3.68 – 5.00	Tinggi

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Min Untuk Sikap

Jadual 2.1: Jadual Nilai Skor Min bagi Sikap

Item	Sub Item	Skor Min	Skor Min Keseluruhan
Sikap	Saya sentiasa bangun pada awal pagi	**2.55**	Min =2.71
	Saya sangat berminat dan bermotivasi untuk belajar	**3.01**	
	Saya melakukan kerja part time untuk mencari duit.	**2.13**	
	Saya suka berjalan, merokok dan melepak pada waktu lapang	**1.90**	
	Saya suka aktiviti sosial	**3.94**	

Min Untuk Keluarga

Jadual 2.2: Jadual Nilai Skor Min bagi Keluarga

Item	Sub Item	Skor Min	Skor Min Keseluruhan
Ibubapa / Keluarga	Ibubapa & keluarga sentiasa mengambil berat tentang saya	4.35	Min = 3.79
	Ibubapa/keluarga sentiasa sibuk bekerja	3.24	
	Keluarga kami sentiasa menghabiskan masa bersama-sama	3.78	

Min Untuk Rakan Sebaya

Jadual 2.3: Jadual Nilai Skor Min bagi Rakan Sebaya

Item	Sub Item	Skor Min	Skor Min Keseluruhan
Rakan Sebaya	Rakan-rakan sentiasa mengajak saya membuat perkara yang baik	2.98	Min = 2.47
	Rakan-rakan saya jarang melayari internet dan bermain video game	1.25	
	Rakan saya tidak menghabiskan waktu lapang melepak dan merokok	2.51	
	Rakan-rakan mempengaruhi saya untuk hadir ke kelas	3.27	
	Rakan-rakan saya sentiasa menjaga sembahyang.	2.34	

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Min untuk Pensyarah

Jadual 2.4: Jadual Nilai Skor Min bagi Pensyarah

Item	Sub Item	Skor Min	Skor Min Keseluruhan
Pensyarah	Pensyarah sentiasa memberi motivasi dan pujian kepada pelajar	3.44	Min =3.83
	Pensyarah mahir dalam modul yang di ajar	4.12	
	Pensyarah mampu mengawal kelas ketika PdP	4.35	
	Pensyarah tidak pilih kasih antara pelajar	3.98	
	Pengajaran pensyarah menarik dan menambah kefahaman	3.24	

KESIMPULAN

Kegiatan ponteng merupakan masalah serius yang wujud di politeknik. Kegiatan ponteng ini mempengaruhi pencapaian akademik para pelajar dalam pelajaran. Sekiranya ia tidak ditangani secara tuntas, ia boleh menjejaskan sumber manusia yang akhirnya membantutkan usaha pembangunan negara.

Jadual 3.0: Jadual Tafsiran Skor Min

Faktor Ketidakhadiran	Skor Min	Tahap
Sikap	2.71	Sederhana
Ibu bapa / Keluarga	3.79	Tinggi
Rakan sebaya	2.47	Sederhana
Pensyarah	3.83	Tinggi

Daripada kajian yang telah dijalankan didapati skor min yang rendah dengan tahap kecenderungan yang sederhana ialah faktor rakan sebaya dan sikap. Ini menunjukkan bahawa rakan sebaya merupakan faktor utama yang menyebabkan masalah ketidakhadiran di kalangan pelajar Politeknik Balik Pulau. Dapatan ini disokong oleh Norhasilah Mat Nor , Aspaniza Hamzah, Nurul Farhana Junus (2012) yang menyatakan bahawa remaja sering dan mudah terikut-ikut dengan perangai rakan mereka dan pemilihan rakan yang tepat akan membawa kejayaan. Oleh itu semua pihak seharusnya memandang serius akan gejala ini dan berkerjasama untuk membasminya.

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FAKTORYANG MEMPENGARUHI KEMAMPUAN PELAJAR DALAM MENGUASAI AMALI ASAS TEKNOLOGI ROUTING

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Politeknik Balik Pulau, Pulau Pinang

Abstrak

Kajian ini dihasilkan bagi mengenal pasti masalah keupayaan pelajar Diploma Teknologi Maklumat (Teknologi Digital) trek rangkaian, di Jabatan Teknologi Maklumat dan Komunikasi, Politeknik Balik Pulau dalam menguasai amali asas teknologi routing. Di politeknik, kursus DFN5013 Basic Routing Technology merupakan keperluan komponen asas dalam badan pengetahuan berkaitan teknologi rangkaian sebelum pelajar mempelajari ilmu rangkaian diperingkat yang lebih kompleks. Namun, pelajar dilihat menghadapi masalah dalam menguasai amali asas teknologi routing berdasarkan keputusan peperiksaan dan juga maklum balas daripada pensyarah yang mengajar kursus tersebut. Justeru itu, penghasilan kajian ini adalah untuk mengkaji faktor-faktor yang mempengaruhi masalah keupayaan pelajar dalam menguasai amali asas teknologi routing bagi membantu meningkatkan pencapaian pelajar dalam Peperiksaan Akhir dan penglibatan pelajar secara aktif di dalam kelas amali. Kajian ini berbentuk tinjauan dan data yang diperolehi dianalisis secara diskriptif. Sampel kajian ini terdiri daripada 150 orang pelajar semester empat sesi Jun 2018 bagi program Diploma Teknologi Maklumat (Teknologi Digital) trek rangkaian, Politeknik Balik Pulau yang dipilih menggunakan kaedah sampel rawak. Hasil dapatan kajian menunjukkan bahawa faktor yang paling mempengaruhi masalah keupayaan pelajar ialah faktor kurang penggunaan bahan pengajaran berbentuk interaktif dan visual yang dapat menarik minat pelajar dalam pembelajaran amali asas teknologi routing. Keputusan yang diperolehi menunjukkan penggunaan bahan berasaskan visual dan interaktif boleh dicadangkan dalam pembangunan pembelajaran asas teknologi routing. Ini dapat dibuktikan dengan skor min tertinggi sebanyak 4.21 terhadap faktor teknik dan bahan pengajaran.

Kata Kunci: Amali Asas Teknologi Routing, DFN5013 *Basic Routing Technology, packet tracer*

PENGENALAN

DFN5013 Basic Routing Technology (BRT) merupakan kursus specialisation yang perlu diambil oleh para pelajar semester empat bagi program Diploma Teknologi Maklumat (Teknologi Digital) trek rangkaian di Politeknik Balik Pulau. Kursus BRT merupakan asas routing kepada hubungan sistem rangkaian dan ianya memerlukan konsep pembelajaran secara praktikal dan juga pemahaman terhadap konsep abstrak. Namun, kursus BRT ini dilihat antara kursus dalam trek rangkaian yang menjadi kecenderungan pelajar untuk sukar mendapat keputusan yang memberangsangkan dalam Peperiksaan Akhir. Berdasarkan keputusan Peperiksaan Akhir untuk dua semester iaitu pada sesi Disember 2017 dan sesi Jun 2018, didapati keputusan pelajar kurang memberangsangkan iaitu sebanyak 48 dari 115 orang pelajar telah gagal kursus DFN5013 (BRT) pada sesi Disember 2017 (peratusan kegagalan = 41.74%). Manakala bagi sesi Jun 2018 pula, sebanyak 112 dari 244 orang pelajar telah gagal kursus DFN5013 (BRT) (peratusan kegagalan = 54.10%). Sehubungan dengan itu, satu kajian telah dilakukan terhadap pelajar semester empat sesi Jun 2018 di Politeknik Balik Pulau, Pulau Pinang bagi mengkaji faktor yang menjadi punca masalah keupayaan pelajar dalam menguasai amali kursus BRT.

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Ini adalah kerana 60-70% soalan yang diuji dalam Peperiksaan Akhir bagi kursus DFN5013 (BRT) merupakan soalan konfigurasi yang memerlukan pemahaman pelajar terhadap konsep praktikal. Keputusan kajian ini boleh digunakan sebagai rujukan asas untuk mengembangkan pendekatan pembelajaran bagi kursus DFN5013 Basic Routing Technology.

PERNYATAAN MASALAH

Kajian ini dijalankan bagi mengkaji faktor yang mempengaruhi masalah keupayaan pelajar dalam menguasai amali kursus DFN5013 Basic Routing Technology (BRT). Berdasarkan pemerhatian, antara masalah yang dihadapi oleh pelajar ialah kurangnya latihan praktikal akibat kekangan peralatan dan perkakasan rangkaian di sesetengah makmal rangkaian. Jumlah peralatan dan komponen rangkaian yang ada tidak dapat menampung kesemua kelas untuk satu minggu sesi praktikal pelajar. Pelajar sukar menerangkan konsep amali asas teknologi routing dengan baik disebabkan kebanyakan teori berkaitan berbentuk abstrak. Selain daripada itu, teknik pengajaran dan penggunaan bahan pembelajaran yang kurang menarik juga menjadi halangan kepada pelajar untuk mempelajari kursus BRT dengan efektif.

OBJEKTIF KAJIAN

Secara khususnya objektif kajian ini adalah seperti berikut:

1. Menentukan sama ada faktor kekangan peralatan dan latihan praktikal menyumbang kepada masalah pembelajaran pelajar terhadap amali asas teknologi routing.

2. Menentukan sama ada faktor isi kandungan kursus mempengaruhi pemahaman pelajar terhadap amali asas teknologi routing.

3. Menentukan sama ada faktor kaedah dan bahan pengajaran pensyarah mempengaruhi penguasaan pelajar dalam konsep amali asas teknologi routing.

SKOP KAJIAN

Kajian yang dijalankan oleh penyelidik merupakan satu kajian yang berbentuk tinjauan yang berdasarkan sampel. Sampel yang digunakan adalah tertumpu kepada pelajar dari program Diploma Teknologi Maklumat (Teknologi Digital) trek rangkaian di Jabatan Teknologi Maklumat & Komunikasi, Politeknik Balik Pulau. Responden kajian terdiri daripada pelajar semester empat sesi Jun 2018 seramai 150 orang yang telah mengambil kursus DFN5013 Basic Routing Technology.

TINJAUAN LITERATUR

Di Politeknik Balik Pulau, kursus DFN5013 Basic Routing Technology merupakan salah satu kursus asas routing yang perlu diambil oleh pelajar untuk memenuhi syarat dianugerahkan Diploma Teknologi Maklumat (Teknologi Digital). Kursus DFN5013 Basic Routing Technology merangkumi empat topik utama iaitu Dynamic RoutingProtocols, Access Control Lists (ACLs), Network Address Translation (NAT) dan Dynamic Host Configuration Protocol (DHCP). Pembelajaran terhadap asas routing adalah penting kerana ianya memberi pendedahan kepada pelajar untuk mengenali bagaimana hubungan antara rangkaian berfungsi dan menjadi asas yang kuat sebelum para pelajar boleh melangkah ke semester yang seterusnya yang lebih memerlukan penguasaan pelajar terhadap amali routing yang lebih menguji aras kesukaran.

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Menurut Ismail et. Al (2010), mendapati bahawa kaedah pembelajaran pelajar merupakan faktor utama yang menyebabkan pelajar kurang cemerlang dalam mata pelajaran yang mereka ambil. Selain itu faktor pembelajaran pelajar berkait rapat dengan teknik belajar seperti kajian yang dilaksanakan oleh Mohd Nihra & Nurul Azilah (2010) dimana mereka menyatakan faktor teknik belajar sebagai salah satu item bagi kajian terhadap mata pelajaran rangkaian.

Johdi Salleh et. Al. (2012) dalam kajiannya menyatakan peranan pendidik adalah merupakan salah satu faktor yang dapat mempengaruhi kecemerlangan pelajar. Menurut Pheng (2011), dalam kajiannya menyatakan kekurangan sumber atau bahan mengajar boleh menyumbang kepada peningkatan tekanan kerja kepada para pendidik. Royo & Fun (2010), menegaskan faktor kekangan masa juga menyumbang kepada kepada kemerosotan mutu dan minat terhadap proses pengajaran dan pembelajaran.

METODOLOGI

Rekabentuk kajian yang digunakan ialah kajian deskriptif dengan menggunakan kaedah tinjauan. Populasi kajian ini terdiri daripada pelajar semester empat Diploma Teknologi Maklumat (Teknologi Digital) trek rangkaian sesi Jun 2018 di Politeknik Balik Pulau. Sampel kajian adalah seramai 150 orang responden yang terpilih menggunakan teknik persampelan rawak. Segala pengukuran terhadap objektif kajian adalah dibuat berdasarkan maklumbalas responden terhadap pernyataan yang terkandung di dalam soal selidik yang diedarkan.

Instrumen Kajian

Instrumen kajian yang digunakan adalah soal selidik mengikut skala Likert. (Johdi Saleh et al, 2012). Menurut Tuckman (1988), kaedah soal selidik lebih mudah mendapatkan kerjasama daripada responden. Mereka bebas memilih, menyuarakan pandangan dan penilaian mengikut kehendak soal selidik serta tahu apa yang difikirkan. Selain itu, soal selidik merupakan satu instrumen yang lazim digunakan dalam kajian tinjauan. Kaedah soal selidik ini dijalankan untuk mendapatkan maklumat dengan lebih tepat dan betul. Faktor-faktor yang ditekankan di dalam instrumen ini adalah dari segi latar belakang pelajar, faktor kekangan peralatan dan latihan, faktor kesukaran isi kandungan kursus dan faktor teknik pembelajaran dan bahan pengajaran. Item-item soal selidik dalam kajian ini telah diubahsuai berdasarkan soal selidik oleh Abdul Aziz et. Al (2017).

Soal selidik ini terbahagi kepada 4 bahagian. Bahagian pertama soal selidik mengandungi maklumat demografi iaitu latar belakang umum responden. Bahagian kedua soal selidik ini dibuat adalah untuk mengenal pasti faktor kekangan peralatan dan latihan praktikal. Bahagian ketiga soal selidik adalah untuk mengenal pasti faktor kesukaran isi kandungan kursus. Manakala bahagian keempat soal selidik akan mengenal pasti faktor bahan dan teknik pengajaran pensyarah. Responden dikehendaki memberi maklum balas terhadap konsep asas teknologi routing berdasarkan nilai skala likert. Ringkasan bahagian soal selidik seperti yang ditunjukkan di dalam Jadual 1.

Jadual 1. ***Pembahagaian Soal Selidik***

Bahagian	Item
Bahagian 1	Terdiri daripada maklumat latar belakang pelajar
Bahagian 2	Item-item mengenai masalah kekangan peralatan dan latihan praktikal
Bahagian 3	Item-item mengenai pemahaman pelajar terhadap isi kandungan amali
Bahagian 4	Item-item mengenai teknik dan bahan pengajaran pensyarah

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Kajian rintis ke atas soal selidik telah dijalankan terhadap 10 orang pelajar secara rawak dan nilai skor Alpha Cronbach yang diperolehi adalah 0.91. Kajian ini dilakukan untuk mengetahui sejauh manakah responden memahami soalan yang dikemukakan, iaitu satu kaedah biasa untuk menilai kebolehpercayaan soalan yang dibina.

Kaedah Analisis data

Data yang diperolehi dari borang soal selidik akan dianalisis menggunakan kaedah statistik deskriptif menggunakan skor min dan sisihan piawai. Jadual tafsiran min yang digunakan oleh pengkaji adalah seperti Jadual 2 telah diubahsuai dan diadaptasi daripada Wiersma W. (2006).

Jadual 2. ***Interprestasi Tahap Julat Min***

Tahap Penggunaan	**Min**
Amat Tidak Setuju	1.0 - 1.4
Tidak Setuju	1.5 - 2.4
Sederhana	2.5 - 3.4
Setuju	3.5 - 4.4
Amat Setuju	4.5 - 5.0

KEPUTUSAN DAN PERBINCANGAN

Hasil kajian latar belakang responden dan peratus bilangan responden untuk kajian ini adalah seperti yang ditujukkan pada Rajah 3. Jadual 4, 5 dan 6 pula menunjukkan analisis terhadap faktor-faktor yang menyumbang kepada masalah keupayaan pelajar dalam menguasai amali asas teknologi routing berdasarkan nilai skor min dan sisihan piawai.

Jadual 3. ***Latar Belakang Responden***

	Latar Belakang	**Peratus (%)**
Jantina	Lelaki	65
	Perempuan	85
Umur	18 – 20 Tahun	100
Semester	Semester 4	100
Faktor Kekangan Peralatan & Latihan Praktikal		

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Jadual 4. ***Faktor Kekangan Peralatan dan Latihan Praktikal***

Item	Skor Min	Sisihan Piawai
Kelas *DFN5013 Basic Routing Technology* saya dilengkapi dengan peralatan rangkaian (router) dan digunakan sepenuhnya semasa kelas amali	3.62	1.05
Keadaan di makmal rangkaian adalah tidak kondusif bagi pelajar semasa proses amali dijalankan	3.71	0.98
Setiap kali tugasan amali di dalam makmal saya terpaksa berkongsi bersama rakan yang lain bagi menggunakan peralatan rangkaian (router) yang disediakan	4.24	0.87
Masa yang diperuntukan untuk saya menyelesaikan tugasan praktikal di dalam makmal tidak mencukupi	3.70	0.89
Kebanyakan perkakasan teknologi rangkaian yang disediakan di dalam makmal adalah tidak terkini serta tidak ikut peredaran teknologi	3.61	0.81
Perkakasan rangkaian (router) yang digunakan oleh saya bagi menyelesaikan tugasan amali sering berada dalam keadaan tidak berfungsi dengan baik	3.53	0.90
Nisbah ahli kumpulan latihan praktikal terlalu ramai menyebabkan saya tidak dapat memahami langkah-langkah konfigurasi dengan baik	4.01	1.00
Purata keseluruhan	**3.77**	**0.93**

Faktor Pemahaman Terhadap Isi Kandungan Amali

Jadual 5. ***Faktor Pemahaman Terhadap Isi Kandungan Amali***

Item	Skor Min	Sisihan Piawai
Saya berasa sukar untuk memahami implementasi *Dynamic Routing Protocols* dalam amali rangkaian	3.12	1.05
Saya berasa sukar untuk memahami konfigurasi *Open Shortest Path First (OSPF)* dalam amali rangkaian	3.45	1.00
Saya berasa sukar untuk memahami konsep *Access Control List (ACLs)* dalam amali rangkaian	3.56	0.78
Saya berasa sukar untuk memahami konfigurasi *Access Control List (ACLs)* dalam amali rangkaian	3.70	0.81
Saya berasa sukar untuk memahami konsep *Network Address Translation (NAT)* dalam amali rangkaian	3.66	0.89
Saya berasa sukar untuk memahami konfigurasi *Network Address Translation (NAT)* dalam amali rangkaian	3.53	0.97
Saya berasa sukar untuk memahami konfigurasi *Dynamic Host Configuration Protocol (DHCP)* dalam amali rangkaian	3.57	0.89
Purata keseluruhan	**3.51**	**0.91**

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Faktor Teknik & Bahan Pengajaran

Jadual 6. Faktor Teknik dan Bahan Pengajaran

Item	Skor Min	Sisihan Piawai
Saya suka belajar amali asas teknologi *routing* menggunakan bahan berasaskan visual interaktif	4.15	0.86
Saya suka belajar amali asas teknologi *routing* secara praktikal *hand on*	4.13	1.00
Saya suka amali asas teknologi *routing* jika pensyarah menerangkan konsep secara visual dan interaktif	4.21	0.81
Saya suka belajar amali asas teknologi *routing* menggunakan nota dan buku rujukan	3.62	1.10
Saya berasa lebih mudah faham untuk memahami amali asas teknologi *routing* jika pensyarah menggunakan pelbagai teknik pengajaran seperti perbincangan dalam kumpulan, forum, peta minda dan seumpamanya	3.71	0.81
Saya suka belajar amali asas teknologi *routing* sekiranya terdapat aplikasi atau simulasi rangkaian dimana saya boleh mengulangkaji pada bila-bila masa dan dimana sahaja	3.82	0.90
Saya suka belajar amali asas teknologi *routing* sekiranya keadah *online classroom* atau *blended learning* dilaksanakan, agar segala nota rujukan dapat dikongsi bersama	3.75	0.92
Purata keseluruhan	**3.91**	**0.91**

Faktor Teknik & Bahan Pengajaran

Hasil kajian berkenaan faktor-faktor yang mempengaruhi masalah keupayaan pelajar dalam menguasai amali asas teknologi routing, didapati faktor yang paling mempengaruhi pelajar ialah faktor kaedah dan bahan pengajaran pensyarah iaitu mendapat purata skor min yang tertinggi sebanyak 3.91. Berdasarkan Jadual 6, skor min tertinggi adalah 4.21 iaitu bagi pernyataan **Saya suka amali asas teknologi routing jika pensyarah menerangkan konsep secara visual dan interaktif.** Manakala skor min terendah adalah 3.62 iaitu bagi pernyataan **Saya suka belajar amali asas teknologi routing menggunakan nota dan buku rujukan.** Hasil kajian yang dilakukan oleh Akmal Rizal (2003), menunjukkan kurangnya penglibatan pelajar terhadap sesuatu kursus adalah berpunca daripada tahap motivasi mereka yang rendah akibat kurangnya daya penarik dalam kaedah penyampaian pengajaran pensyarah di dalam kelas serta bahan pengajaran pensyarah yang tidak menarik. Justeru itu dapat disimpulkan, pelajar memerlukan alat bantu mengajar (ABM) yang lebih dipelbagaikan oleh pensyarah seperti e-nota berbentuk visual dan video interaktif berbanding ABM berfokuskan ‘slide PowerPoint’ yang menjadi kebiasaan disediakan oleh kebanyakan pensyarah kerana ianya boleh membantu penguasaan pelajar terhadap konsep amali dengan baik terlebih dahulu dan impak seterusnya ianya akan lebih membantu memudahkan pelajar bagi menyelesaikan tugasan amali dengan lebih efektif pula selepas itu.

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Faktor Pemahaman Terhadap Isi Kandungan Amali

Faktor pemahaman terhadap isi kandungan kursus pula, didapati pelajar menghadapi kesukaran untuk memahami konfigurasi dan fungsi routing untuk menghubungkan rangkaian. Kesemua masalah ini sebenarnya telah secara langsung mempengaruhi prestasi dan pencapaian pelajar di dalam memahami dan menguasai kursus asas teknologi routing ini. Berdasarkan Jadual 5, skor min tertinggi adalah 3.70 iaitu bagi pernyataan item **Saya berasa sukar untuk memahami konfigurasi Access Control List (ACLs) dalam amali asas teknologi routing.** Manakala skor item terendah adalah 3.12 iaitu bagi pernyataan item **Saya berasa sukar untuk memahami implementasi Dynamic Routing Protocols dalam amali asas teknologi routing.** Kesimpulan yang boleh dibuat, pensyarah boleh memfokuskan lebih masa pengajaran terhadap isi kandungan kursus yang sukar difahami pelajar kerana impak kurangnya pemahaman pelajar terhadap sesuatu topik sedikit sebanyak akan mempengaruhi juga masalah keupayaan pelajar dalam menguasai amali asas teknologi routing dan seterusnya pelajar tidak mampu menjawab soalan peperiksaan akhir yang lebih berfokuskan kepada pemahaman praktikal dengan baik. Maka untuk cadangan penambahbaikan, pensyarah bukan sahaja boleh melaksanakan proses pengajaran dan pembelajaran bersama pelajar semasa di dalam waktu kuliah, malah di luar waktu kuliah juga dapat dilaksanakan dengan bantuan teknologi seperti online classroom, mobile learning dan aplikasi web 2.0 yang lain.

Faktor Kekangan Peralatan & Latihan Praktikal

Berdasarkan Jadual 4, skor min tertinggi adalah 4.24 iaitu bagi pernyataan **Setiap kali tugasan amali di dalam makmal saya terpaksa berkongsi bersama rakan yang lain bagi menggunakan peralatan rangkaian (router) yang disediakan.** Manakala skor item terendah adalah 3.53 iaitu bagi pernyataan **Perkakasan rangkaian (router) yang digunakan oleh saya bagi menyelesaikan tugasan amali sering berada dalam keadaan tidak berfungsi dengan baik.** Faktor kekurangan peralatan dan masa melaksanakan tugasan amali juga harus dipandang secara serius kerana ianya turut mempengaruhi pelajar untuk tidak menguasai amali DFN5013 Basic Routing Technology dengan baik. Kursus DFN5013 ini sememangnya melibatkan banyak topik berkaitan konfigurasi routing dan troubleshooting routing. Pembelajaran akan lebih berkesan sekiranya setiap pelajar mendapat gambaran yang lebih jelas setiap fungsi peralatan dan komponen rangkaian.

CADANGAN

Daripada dapatan kajian, beberapa cadangan juga dikemukakan. Antaranya terdapat responden yang mencadangkan supaya alat bantu mengajar seperti aplikasi augmented technology boleh dibangunkan untuk membantu pelajar dalam pembelajaran amali asas teknologi routing. Masalah kekangan peralatan di makmal yang menyebabkan pelajar sukar untuk melakukan latihan praktikal secara individu mungkin juga dapat diatasi dengan teknologi augmented reality yang membolehkan setiap komponen rangkaian dapat divisualkan secara maya dan tiga dimensi.

Secara umumnya, kesemua maklumbalas yang diperolehi hanya merupakan pandangan subjektif daripada pelajar yang dijadikan sebagai responden untuk kajian ini. Bukan kesemua masalah yang mempengaruhi keupayaan pelajar dalam pembelajaran amali kursus DFN5013 Basic Routing Technology dapat diterangkan oleh kumpulan responden ini. Walaubagaimanapun, kerana lebih 50 peratus daripada jumlah pelajar sesi Jun 2018 yang sedang mengambil kursus DFN5013

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Basic Routing Technology telibat dalam kajian ini, maka pandangan dan maklumbalas kumpulan pelajar ini boleh mewakili pelajar Diploma Teknologi Maklumat (Digital Teknologi) trek rangkaian di Politeknik Balik Pulau.

KESIMPULAN

Daripada hasil kajian yang diperolehi, beberapa perkara perlu dititik beratkan semasa mengajar kursus DFN5013 Basic Routing Technology oleh para pensyarah. Antaranya, pensyarah perlu memberi tumpuan yang lebih kepada topik-topik yang dianggap sukar oleh kebanyakan pelajar dan hendaklah sentiasa memastikan perancangan dan penyediaan kursus adalah baik. Sesi kelas praktikal seharusnya digunakan sebaik mungkin bagi memastikan setiap pelajar berpeluang untuk melakukan amali secara menyeluruh. Penglibatan pelajar secara aktif di dalam kelas juga harus dititik beratkan dengan melaksanakan kaedah pengajaran dan menyediakan bahan bantu mengajar yang menarik dan interaktif supaya dapat menarik minat pelajar untuk melibatkan diri secara aktif semasa sesi praktikal. Bantuan teknologi juga dapat membantu pensyarah dalam meningkatkan mutu pengajaran. Setakat ini, pembelajaran mengunakan perisian simulator Packet Tracer memberi kelebihan kepada pelajar sebagai pendedahan awal untuk menguasai amali asas teknologi routing. Selain itu, di laman sesawang Netacad Academy juga ada disediakan pelbagai pilihan video interaktif yang mampu membantu pensyarah untuk memperluaskan lagi kaedah pengajaran secara visual dan interaktif. Cadangan awal ini juga telah diutarakan di awal semester kepada pensyarah-pensyarah yang mengajar kursus DFN5013 Basic Routing Technology pada sesi Disember 2018. Setelah kajian ini dijalankan, akhirnya di akhir sesi Disember 2018 didapati hanya 9 dari 115 orang pelajar sahaja yang gagal dalam Peperiksaan Akhir kursus DFN5013 Basic Routing Technology iaitu menyumbang kepada peratusan kegagalan sebanyak 7.83% sahaja berbanding peratusan kegagalan yang lebih tinggi semasa sesi Disember 2017 dan Jun 2018 (rujuk Pengenalan).

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INFLUENCE OF PERCEIVED PLAYFULNESS TOWARDS STUDENTS ACCEPTANCE OF ARDUINO PLATFORM AS AN IoT DEVELOPMENT TOOLS

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Abstract

Nowadays, the use of internet devices is growing rapidly. Known as Internet of Things (IoT), these products and devices such as smart home appliances, smartphones, smart gadgets, smart watches and digital vehicles are widely used today. It has been current trends for students and hobbyists to develop their own IoT prototype using open source electronic platform such as Arduino. This research reviews the important determinants of Perceived Playfulness as an intrinsic motivator in the context of using Arduino platform as an IoT development tools for the final year polytechnic student. After a literature review on the title subject and data collection, descriptive statistical analyses for the determined factors were conducted with a sample of 59 final year students. The finding shows that Perceived Playfulness has a positive effect on student intrinsic motivation. Meanwhile, the overall findings from this study suggest that Moon and Kim's (2001) Perceived Playfulness theory could be valid in context to test the acceptance of Arduino among final year polytechnic student.

Keyword: arduino, IoT, perceived playfulness, embedded learning, polytechnics

INTRODUCTION

The Internet of Things (IoT) is a term used to describe technologies, systems, and design principles associated with the emerging wave of Internet-connected things that are based on the physical environment. (Pticek, Podobnik, & Jezic, 2016). This concept is associated with the next level of the internet manipulation describes where objects become part of the Internet which uniquely identified, accessible to the network, position and status detectable, and intelligence added (Coetzee & Eksteen, 2011).In Malaysia education sector mainly, Ministry of Education is committed to provide a channel for the younger generation to keep up with the times and emerging technologies, such as the Internet of Things (IoT) and artificial intelligence (AI) (The Star Online, 2019a). The improvement for the curriculum also will impact polytechnics and community college in Malaysia. According to Polytechnic and Community College Education Department, Prof Datuk Dr Mohd Ismail Abd Aziz, starting June 2019, the new curriculum will be adapted to match industry needs and to keep up with changes brought about by the Industry 4.0(The Star Online, 2019b).

Industry 4.0 uses an IoT in order to perform digital manufacturing. All devices, robots, simulations, and tools have sensors and provide data (Andrew C.Oliver, 2019). As such, Malaysian Polytechnic takes initiatives by encouraging students to develop their own IoT devices using Arduino platform for their final year project. Arduino is an open-source physical computing platform based on a simple microcontroller board and a development environment that implements the Processing language (Banzi, 2009). Therefore, this study is conducted to examine the extent of polytechnic student's acceptance towards Arduino as IoT development tools for their final year project.

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PROBLEM STATEMENT

Although Arduino board is cheap and easy to find, students should have an opportunity to select or buy their very own development kits to develop their own device right from the beginning. Thus, student must select their preferred embedded system platform consisting of hardware and software components that is able to fulfil the requirements of the targeted application (Ibrahim, Ali, Zulkefli, & Elfadil, 2015). Although Arduino has a clear promise as an educational platform in embedded technology, it cannot be stated with certainty that it is a suitable platform for embedded education. (El-Abd, 2017). For coding in student's level, the applications usually use non-complicated applications which can be given with a simple command system. (Kirikkaya, 2019). But, compared to other microcontrollers programmed with C or Assembly, Arduino obscures much more of the technical details in favour of a streamlined process that favours rapid prototyping over complete understanding (Toombs, 2013). Thus, a study needs to be done to identify the level of acceptance of Arduino and the significant factors that contribute to the acceptance of students in this technology.

RESEARCH OBJECTIVES

This study has conducted to examine student acceptance of Arduino microcontroller board as IoT development tools, using Perceived Playfulness concept as suggested by Moon and Kim's (2001) in final year polytechnic student.

RESEARCH FRAMEWORK

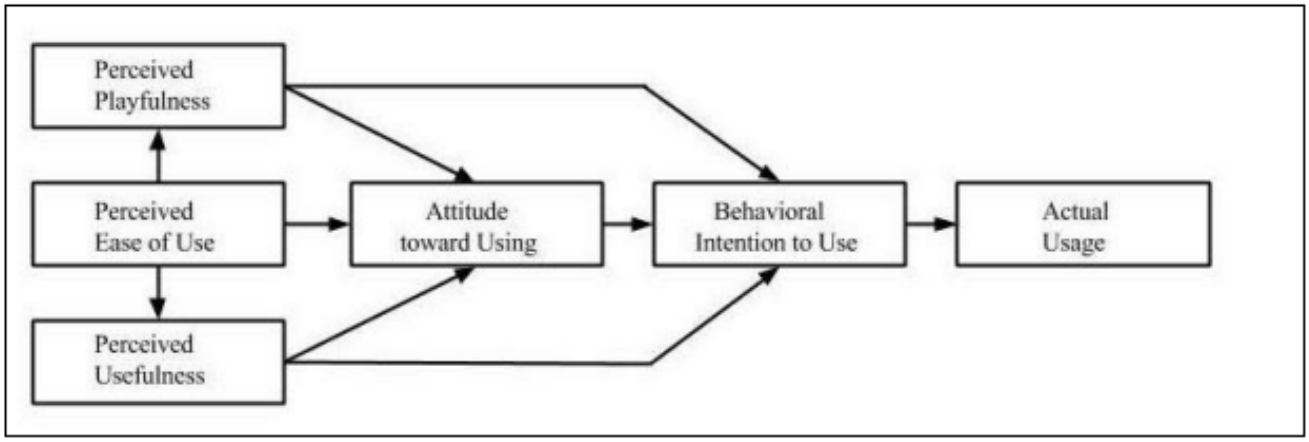

Figure 1. Perceived Playfulness by Moon & Kim (2001)

LITERATURE REVIEW

Perceived playfulness is a concept that has been widely used in studying user acceptance of new technology or innovations. Moon and Kim (2001) define it as an intrinsic motivation or the performance of an activity for no apparent reason other than the process of performing it (Moon & Kim, 2001). Moon and Kim (2001) split the concept into three components: concentration, enjoyment and curiosity.

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The first concept is concentration or put great focus on the interaction and shuts out eventual irrelevant perceptions. The second is security which implies that an individual could be affected by certain tools that can arouse sensory curiosity or cognitive curiosity. The third concept is enjoyment, it can be concluded that individuals are involved in the activity for pleasure and enjoyment rather than for extrinsic rewards. Playfulness is considered as an intrinsic belief or motivation (Lee, Cheung, & Chen, 2005) which is shaped from the individual's experiences with the environment. When individuals are in the playfulness condition, they will find the activity intrinsically interesting, so they are involved in the activity for pleasure and enjoyment rather than for extrinsic rewards. In the motivational context, perceived playfulness represents the intrinsic motivation associated when using any new system or innovations (Venkatesh & Bala, 2008). The intrinsic motivation often direct behavioural intention more strongly than the extrinsic one do (Thomas, 1990). The significance of perceived playfulness indicates that intrinsic motivation plays an important role in this context. The study by (Felix B Tan, 2001) provided evidence of the robustness of Moon and Kim's (2001) extended Technology Acceptance Model (TAM) by Davis (1989) and indicated the generalisability of the model.

METHODOLOGY

All of the samples were selected from final year student, Diploma in Digital Technology since they can be accessed easily. The convenience sampling procedure was conducted set up the meeting with all students for explanation and participate in the survey using paper-based survey questionnaire. Although paper-based questionnaire will take time to input in SPSS, it was faster to fill by respondents at the same time and promised a high response rate. It was suitable for a relatively small number of samples.

The data was collected by a questionnaire-based survey of 59 students in Politeknik Balik Pulau. The distributed questionnaire consisted of 5 constructs from the Perceived Playfulness extending Technology Acceptance Model (TAM). A five-point Likert Scale has been chosen, from 1 'Strongly Disagree' to 5 'Strongly Agree'. A session has been arranged and all students were then asked answer paper-based survey questionnaire to encourage full return feedback on the same time.

RESULTS

The demographic sections in this study analysed information involving gender, age and courses. The participant's demographic characteristics have some influence the acceptance of Arduino which were investigated in this study.

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Table 1. Demography Analysis for the Study

Respondents Characteristics	*n(59)*	Percentage (%)
Gender		
Male	36	61.0
Female	23	39.0
Age		
17 - 20 years	54	91.5
21 - 24 years	5	8.5
Programme		
DDT	32	54.2
DNS	27	45.8

Referring to descriptive analysis in Table 4.3, 61% of the sample were male and 39% female. Most of the respondents age is in range 17 – 20 years old (91.5%) and the rest are between 21 – 24 years old (8.5%). In terms of the number of students taking DDT and DNS courses, there is a balanced value where 54.2% takes DDT courses while 45.8% takes DNS courses.

Table 2. Descriptive Analysis for the Study

Questionnaire Item	Mean	Standard Deviation	Average Mean
Perceived Usefulness (PU)			
Using Arduino platform in my project enable me to accomplish tasks more quickly	4.08	.677	4.06
Using Arduino platform improve my project performance	4.03	.669	
Using Arduino platform increases my productivity	4.00	.643	
Using Arduino platform enhances my effectiveness in my final year project	4.12	.697	
Perceived Ease of Use (PEOU)			
Learning to operate Arduino platform is easy for me	3.66	.801	3.70
I find it easy to get the Arduino platform to do what I want to do	3.69	.876	
My interaction with Arduino does not require much effort	3.54	.877	
It is easy for me to become skilful at Arduino technology	3.76	.773	

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I find the Arduino platform is easy for me	3.85	.867	
Perceived Playfulness (PP)			
When interacting with my Arduino platform, I do not realize how time elapses	3.78	.811	3.81
When interacting with my Arduino platform, I am not aware of any noise	3.31	.725	
When interacting with my Arduino platform, I often forget the work I must do	3.66	.944	
Using Arduino platform gives me enjoyment	3.92	.677	
Using Arduino platform gives fun to me	3.93	.807	
Using Arduino platform keeps me happy	3.95	.753	
Using Arduino platform stimulates my curiosity	3.95	.680	
Using Arduino platform leads to my exploration	3.88	.646	
Using Arduino platform arouses my imagination	3.98	.629	
Attitude Towards Using (ATU)			
Once I start using Arduino platform, I find it hard to stop	3.56	.915	3.71
I look forward to those aspects of my project that require the use of Arduino technology	3.78	.721	
I like working with Arduino platform	3.80	.783	
Behavioural Intention to Use			
I intend to continue to use Arduino platform in the future	3.73	.691	3.78
I expect that I would use Arduino platform in the future	3.65	.673	
I plan to use Arduino platform in the future	3.97	.694	

Table 2 reports descriptive statistics analysis for each variable in terms of Means (M) and Standard Deviation (SD). All the questions were adapted from T.Teo (2011) and Moon & Kim (2001). Means were used to achieve the explorative objectives of this study, determine the sample characteristics and interpret the findings of the descriptive statistics analysis for research variables. Findings from the survey shows that in overall, participants gave consistent answers for every construct.

DISCUSSION

After finishing analysis for this study using Statistical Analysis by SPSS, it can be concluding that overall findings from this study suggest that Moon and Kim's (2001)

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extended Technology Acceptance Model could be suitable to test the acceptance of Arduino as development tools. Results from the respondents indicated that Perceived Usefulness (PU) is the most relevant factor in accepting Arduino as development tools in their Final Year Project with the highest mean score of 4.06. The next factor is Perceived Playfulness which scores 3.81. Meanwhile, the least important factor that contributed to the acceptance or Arduino are Perceived Ease of Use (PEOU) which have 3.70 mean score. By overall, the scores not have obvious differences between each factor. It can be concluding that student feel the usefulness of the technology is the main factor to accept it, followed by the motivational of playfulness and ease of use.

The significance of perceived playfulness indicates that intrinsic motivation plays an important role in this context. The previous study has provided evidence of the robustness of Moon & Kim (2001) extended TAM and indicated the generalisability of the model. This research also contributes to the literature providing evidence about the acceptance in Arduino microcontroller in the previous study.

CONCLUSIONS

During the past years the contents of many courses were extended by microcontroller and embedded system related topics. The fast developing area of embedded systems is especially affected by the lack of student knowledge, student attitude, curriculum flexibility, well trained instructors and many more. However, this was deal by individual teachers without a specific concept, and only within the approved curriculum structure.

Implement Arduino Microcontroller as a development tools is an area with a thematic identity and a functional legitimacy, which means that the technology are requesting students capable of conceiving, designing, implementing and operating embedded systems. In the context of Malaysian education sector, Arduino Microcontroller can be assumed as new technology at the polytechnic. Therefore, this study contributed to existing research by validating the importance of perceived playfulness as an intrinsic motivator for student to learn and use Arduino platform as their development tools in their final year project.

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KECENDERUNGAN PEMILIHAN KERJAYA KEUSAHAWANAN DALAM KALANGAN PELAJAR DI POLITEKNIK BALIK PULAU

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Abstrak

Kertas konsep ini adalah berkenaan kecenderungan pemilihan kerjaya keusahawanan dalam kalangan pelajar di Politeknik Balik Pulau (PBU). Penulisan di dalam kertas konsep ini memfokuskan kepada faktor-faktor sokongan dan faktor-faktor kekangan kepada kecenderungan pemilihan kerjaya keusahawanan dalam kalangan pelajar di PBU. Kertas konsep ini merupakan kajian ilmiah yang menggunakan data sekunder dari kajian-kajian lepas yang berkaitan dengan tajuk kajian. Latar belakang keluarga yang bekerja sebagai usahawan atau peniaga sangat mempengaruhi pelajar untuk menjadikan usahawan sebagai kerjaya pilihan. Program-program keusahawanan yang dijalankan di politeknik dapat memberi bantuan awal kepada bakal graduan dari aspek pemberian insentif untuk memulakan perniagaan, menulis pelan perniagaan, membuat pemasaran serta mewujudkan jaringan perniagaan di antara graduan dengan pihak industri. Selain itu faktor psikologi seperti bebas membuat pilihan, kepuasan hati, kejayaan diri, pembangunan diri dan pengiktirafan merupakan faktor penting yang menyokong kepada pemilihan kerjaya keusahawanan dalam kalangan pelajar. Mentaliti dan sikap pelajar yang lebih selesa makan gaji ditambah pula masalah kewangan dan kekurangan modal merupakan faktor kekangan utama yang menghalang pemilihan usahawan sebagai pilihan kerjaya dalam kalangan pelajar. Selain itu faktor pensyarah yang kurang berpengalaman sebagai usahawan tidak berjaya mencetuskan aspirasi keusahawanan dalam kalangan pelajar. Kerjaya dalam bidang keusahawanan semakin berkembang dan menjadi faktor penyumbang kepada pertumbuhan ekonomi negara. Bidang keusahawanan menyediakan peluang yang luas untuk diceburi sebagai satu bidang kerjaya.

Kata kunci: Kecenderungan Keusahawanan Pelajar, Pemilihan Kerjaya Keusahawanan

PENGENALAN

Keusahawanan merupakan satu proses membuat keputusan dan tindakan yang berterusan daripada memulakan hingga mengurus sesuatu perniagaan (Mahmood et al., 2008). Seorang usahawan bukan saja mempunyai keupayaan mereka cipta, mencetus atau memperoleh idea baru hasil daripada ilmu pengetahuan yang dikuasainya, tetapi sewajarnya juga berupaya menggunakan ilmu pengetahuan tersebut bagi tujuan mengaplikasikannya untuk peningkatan kualiti hidup (Eriniwati, 2014). Bidang keusahawanan adalah struktur yang penting dalam membantu generasi masa depan membina kerjaya masing-masing tanpa mengharapkan bantuan dari pelbagai pihak (Suhaila, 2015). Pihak kerajaan telah menyediakan pelbagai insentif kepada graduan untuk menceburkan diri dalam bidang keusahawanan dan bukan hanya berfikir untuk makan gaji selepas mereka tamat belajar nanti.

Galakan untuk menceburkan diri dalam bidang keusahawanan perlu diberikan kepada bakal graduan kerana golongan ini dilihat berpotensi menjadi usahawan yang berjaya. Selain itu, faktor kekangan yang menghalang golongan ini dari memilih kerjaya sebagai usahawan juga perlu dikenalpasti agar dapat terus diperbetul dan ditambahbaik agar keusahawanan dipilih sebagai salah satu peluang pekerjaan utama selepas mereka menamatkan pengajian.

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Memiliki pencapaian akademik yang cemerlang tidak menjamin seseorang graduan mendapat pekerjaan yang diidamkan akibat persaingan yang sengit di bidang industri pada masa kini. Oleh yang demikian, usahawan merupakan penyelesaian terbaik bagi menyelesaikan masalah pengangguran dimana mahasiswa tidak bergantung untuk makan gaji sahaja malahan sebagai usahawan mahasiswa dapat mewujudkan peluang pekerjaan kepada lebih ramai orang. Justeru penulisan ilmiah ini dijalankan untuk mengenalpasti faktor-faktor yang menggalakkan pelajar PBU menjadikan kerjaya usahawan sebagai pilihan kerjaya utama mereka selepas graduasi.

PERN**YATAAN MASALAH**

Di Malaysia, kesukaran graduan memperolehi pekerjaan bukanlah perkara yang asing lagi. Diploma atau Ijazah Sarjana Muda yang diperolehi tidak menjanjikan graduan akan mendapat kerja yang selari dengan program atau jurusan pengajian mereka. Rusli Ahmad (2007), menyatakan kebanyakan graduan memilih kursus yang menawarkan pekerjaan yang terhad. Kesilapan memilih bidang pengajian dengan tepat akan menyebabkan kesukaran memperoleh pekerjaan bahkan juga mengalami kesukaran untuk memperoleh pinjaman pelajaran atau biasiswa ketika belajar di peringkat pengajian tinggi.

Menurut Yusof (2003), beliau menyatakan bahawa keusahawanan merupakan suatu bentuk disiplin yang menjadi tonggak kepada pembangunan dan pertumbuhan ekonomi sesebuah negara. Ini disokong dengan penjelasan yang diberikan oleh M. Osman (2007), dimana keusahawanan yang sesuai dengan konteks Malaysia mempunyai kaitan rapat dengan usaha-usaha pembentukan dan pembangunan yang sejajar dengan perubahan teknologi, ini adalah bertujuan untuk mewujudkan kombinasi baru dalam melaksanakan aktiviti yang berkaitan dengannya. Keusahawanan adalah sangat signifikan dalam membantu untuk meningkatkan kebolehpasaran siswazah seterusnya memenuhi hasrat kerajaan melahirkan masyarakat yang progresif dan berpendapatan tinggi. Menurut Jaafar (2017), Malaysia sedang mengubah keadaan masyarakat bumiputera yang makan gaji kepada masyarakat yang berkerja sendiri yang mana secara tidak langsung telah menggalakan untuk berniaga dan menjadi usahawan.

Hasil kajian yang telah dijalankan oleh pihak Jabatan Perangkaan Negara pada tahun 2009 mendapati bilangan usahawan di Malaysia telah bertambah sejajar dengan peningkatan bilangan penduduk bekerja bagi tempoh tahun 1982 hingga tahun 2008 di mana pada tahun 1982 hingga 2003 sebanyak 1.2 hingga 1.9 orang usahawan direkodkan dan seterusnya meningkat kepada 2.0 hingga 2.2 orang usahawan mulai tahun 2004 hingga 2008. Namun demikian, peningkatan bilangan usahawan ini agak kecil jika dibandingkan dengan keseluruhan jumlah penduduk bekerja dalam tempoh 25 tahun. Peratusan ini juga menunjukkan trend penurunan bilangan usahawan daripada 25.1 peratus pada 1982 kepada 20.9 peratus pada tahun 2008. Permasalahan ini menimbulkan minat penyelidik untuk mencari kecenderungan kerjaya untuk menceburkan diri dalam bidang keusahawanan di kalangan pelajar di PBU ekoran daripada pelbagai kemudahan dan inisiatif yang telah disediakan oleh pihak kerajaan terutamanya kemudahan di peringkat pusat pengajian tinggi.

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OBJEKTIF KAJIAN

Antara objektif kajian adalah :

i. Mengenalpasti tahap persepsi pelajar PBU tentang bidang keusahawanan
ii. Mengenalpasti tahap minat pelajar PBU terhadap bidang keusahawanan
iii. Mengenalpasti faktor-faktor yang dapat menjadi pendorong dan menjadi kekangan kepada pelajar PBU untuk memilih kerjaya sebagai usahawan.

KAJIAN LITERATUR

a) Kecenderungan Keusahawanan Pelajar

Usahawan berupaya membina nilai yang baru lagi berbeza, menukar bahan kepada sumber atau menggabung sumber-sumber yang ada untuk membentuk hasilan yang lebih produktif (Eriniwati,2014). Seorang usahawan itu bukan saja mempunyai keupayaan mereka cipta, mencetus atau memperoleh idea baru hasil daripada ilmu pengetahuan yang dikuasainya, tetapi sewajarnya juga berupaya menggunakan ilmu pengetahuan tersebut bagi tujuan mengaplikasikannya untuk peningkatan kualiti hidup (Eriniwati,2014). Kecenderungan ialah minat seseorang individu untuk melakukan sesuatu perkara dan didorong oleh perasaan yang menggerakkannya untuk menjadi satu tindakan. Kajian yang telah dijalankan Krueger et al. (2000) mendapati ramalan tingkah laku yang dirancang melalui sikap tertentu merupakan kaedah terbaik untuk mengetahui tahap kecenderungan. Kajian Douglas dan Shepherd (2002) mendapati pemilihan untuk bekerja sendiri sebagai kerjaya pilihan mempunyai kaitan antara sikap dan tahap kecenderungan keusahawanan. Beberapa kajian telah dijalankan untuk mengenal pasti kecenderungan pelajar menjadi usahawan dengan melihat faktor seperti umur, jantina, pendidikan dan latar belakang keluarga, dan pengalaman perniagaan terdahulu (Kristiansen & Indarti,2004; Shay & Terjensen, 2005). Selain itu, kajian ke atas kecenderungan keusahawanan pelajar turut melihat penerapan kemahiran keusahawanan dalam kalangan pelajar politeknik menerusi proses pengajaran dan pembelajaran. Menurut Hisrich et al. (2008) keputusan untuk menceburi bidang keusahawanan merupakan suatu tempoh masa yang bermula daripada kecenderungan kemudian diikuti dengan proses pengenalpastian dan penilaian peluang.

Kajian oleh Daniela et al. (2016) berkaitan kesan pendidikan keusahawanan terhadap kecenderungan keusahawanan pelajar dalam bidang sains dan kejuruteraan berbanding pelajar dalam bidang pengajian perniagaan. Dapatan kajian menunjukkan pendidikan keusahawanan yang ditawarkan di universiti harus diubahsuai dengan mengikut sasaran kumpulan pelajar yang bersesuaian atau mengikut bidang pelajar. Selain daripada merasa bebas dan mendapat pendapatan yang lumayan, seseorang juga perlu memiliki kecenderungan terhadap keusahawanan. Mereka perlu memiliki sikap sebagai seorang usahawan (Douglas & Shepherd,2002). Dalam erti kata lain, kecenderungan seseorang terhadap sesuatu perkara boleh mendorong keinginan mereka untuk mendapatkan perkara tersebut. Hal ini turut diakui oleh Hisrich et al. (2008) yang percaya bahawa individu yang mempunyai kecenderungan yang kuat untuk melakukan sesuatu perkara, akan memperlihatkan kemungkinan yang positif ke atas tindakan yang dikehendaki.

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b) Pemilihan Kerjaya Keusahawanan

Kerjaya merupakan agenda penting kepada setiap individu kerana akan mempengaruhi dan mencorakkan kehidupan seseorang (Sidek, 2006). Kini, pemilihan kerjaya menjadi semakin rumit dan kompleks disebabkan perubahan persekitaran yang tidak menentu dan tidak dijangka (Norasmah, 2012). Keadaan pemilihan ini bertambah rumit apabila seseorang sentiasa memilih kerjaya yang hanya diminati dan sesuai bagi membolehkan mereka mencapai kepuasan bekerja dan kekal lebih lama dalam kerjaya yang dipilih (Sidek, 2006). Kajian Norasmah dan Nor Hafiza (2012) adalah berkaitan dengan impak globalisasi tingkah laku pemilihan kerjaya keusahawanan dalam kalangan pelajar universiti mendapati bahawa wujudnya hubungan positif dan signifikan di antara impak globalisasi terhadap kerjaya keusahawanan dengan tingkah laku pemilihan kerjaya keusahawanan. Persepsi yang positif terhadap kerjaya keusahawanan akan membuatkan seseorang itu lebih cenderung untuk melibatkan diri dalam aktiviti keusahawanan. Kajian Fadhilah &Halimah (2010) mendapati seramai 58.8% pelajar Universiti Awam yang masih belum menunjukkan minat untuk menjadi usahawan. Walaupun pelbagai program keusahawanan telah dijalankan tetapi peratusan pelajar Universiti Awam yang ingin menceburi bidang keusahawanan masih berada pada peratusan yang masih kecil (Fadhilah dan Halimah 2010). Pelajar mempunyai kesedaran terhadap kerjaya keusahawanan walau bagaimanapun ianya tidak dapat mempengaruhi mereka untuk menceburi bidang keusahawanan dan ini turut memberi kesan minat pelajar di Universiti Awam terhadap kerjaya keusahawanan apabila dapatan kajian mendapati hanya 33% pelajar yang pernah menghadiri kursus keusahawanan (Fadhilah & Halimah 2010). Kajian-kajian lepas mendapati hanya individu-individu tertentu sahaja yang akan memilih bidang keusahawanan sebagai kerjaya pilihan. Apabila diselidiki, golongan ini selalunya mempunyai persepsi positif terhadap bidang keusahawanan. Malah berpendapat bahawa hanya bidang keusahawanan dapat memberi mereka kepuasan sama ada daripada segi material (pendapatan yang lumayan) ataupun pengiktirafan (Norasmah, 2011).

METODOLOGI KAJIAN

Rekabentuk Kajian

Menurut Marican (2005), rekabentuk kajian ialah pelan tindakan yang memperlihatkan secara terperinci bagaimana sesuatu kajian ini dijalankan. Melalui rekabentuk kajian ini ia berperanan sebagai panduan dalam membantu pengkaji dalam proses mengumpul, menganalisa dan membuat pentafsiran hasil daripada penyelidikan yang dijalankan. Kajian tinjauan ini dijalankan dengan menggunakan borang soal selidik yang bertujuan untuk mendapatkan maklumat yang berkaitan kajian ini. Rekabentuk kajian ini seperti yang ditunjukkan dalam jadual dibawah

Rekabentuk Kajian	Kaedah Pengumpulan	Responden Sampel	Jenis Data
Kajian Deskriptif	Soal Selidik	Pelajar	Kuantitatif

Jadual 1: Rekabentuk Kajian

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Populasi dan Sampel Kajian

Populasi dan pensampelan dibuat menggunakan statistik deskriptif di mana menghurai dan membuat ringkasan tentang data yang diperolehi daripada populasi dan pensampelan bagi pelajar semester 1 Sesi Jun 2019 di PBU. Pemilihan sampel pelajar 1 Sesi Jun 2019 dibuat adalah kerana pelajar semester 1 merupakan pelajar baharu di politeknik. Ini selari dengan matlamat kajian yang cuba meninjau tentang kecenderungan pelajar terhadap pemilihan kerjaya keusahawanan. Populasi pelajar semester 1 Sesi Jun 2019 di PBU adalah berjumlah 210 orang. Berdasarkan jadual penentuan saiz sampel Krejcie dan Morgan (1970), jika populasi sebanyak 210 orang, maka bilangan responden yang diperlukan adalah 136 orang pelajar.

Instrumen Kajian

Borang soal selidik akan digunakan sebagai instrumen kajian untuk mengumpulkan data-data yang akan dianalisis untuk mencapai objektif kajian ini. Soal selidik yang digunakan dalam kajian ini terdiri daripada empat (4) bahagian iaitu (A) Aspek demografi, (B) Persepsi dan Minat Pelajar Terhadap Bidang Keusahawanan (C) Latar Belakang Keluarga, Sikap dan Peluang Kerjaya (D) Cadangan dan Pandangan. Justeru, pengukuran yang dibuat dalam bahagian B dan C bagi menilai tahap sesuatu pembolehubah adalah dengan menggunakan skala jenis Likert. Berdasarkan pernyataan-pernyataan yang dikemukakan, responden perlu menandakan tahap persetujuan berdasarkan pandangan mereka, skala jenis Likert ini dikelaskan dengan skor 1 hingga skor 5 iaitu sangat tidak setuju, tidak setuju, tidak pasti, setuju dan sangat setuju.

KESIMPULAN

Program-program keusahawanan yang dilaksanakan di institusi pengajian tinggi dapat memberi bantuan awal kepada bakal graduan dalam memulakan kerjaya sebagai usahawan samada dari segi pemberian insentif untuk memulakan perniagaan, bantuan menulis pelan perniagaan, bantuan membuat pemasaran serta bantuan untuk menghubungkan bakal graduan dengan pihak luar untuk mewujudkan jaringan perniagaan. Selain itu faktor psikologi seperti bebas membuat pilihan, kepuasan hati, kejayaan diri, pembangunan diri dan pengiktirafan merupakan faktor penting yang menyumbang kepada pemilihan kerjaya keusahawanan di kalangan pelajar. Kerjaya usahawan dilihat dapat meningkatkan taraf hidup dan status sosial seseorang itu. Sikap personal adalah faktor penting yang mempengaruhi kecenderungan seseorang itu menentukan samada positif atau negatif untuk menceburkan diri sebagai usahawan. Sikap graduan yang takut melakukan kesilapan dan tidak mahu menanggung risiko kegagalan merupakan faktor kekangan utama yang menghalang mereka untuk menjadi usahawan.

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A SYSTEMATIC LITERATURE REVIEW OF USABILITY EVALUATION MODELS OF SKILL-BASED LEARNING SYSTEM OR SOFTWARE

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Abstract

Usability Evaluation of a system or software can be defined as one way of measuring a system or software that can be customized to the user. Various methods have been developed to carry out usability evaluations of systems or software over the past few decades. A systematic literature review report on the usability assessment training model was conducted to give different views on the usability aspects of the proposed approach. This study provides a current systematic review of usability evaluation on skill-based system or software. The particular purpose of the review is to explore the research as preliminary step that leads to choose the right type of usability evaluation model for training skill learning system or software. There is lacking of appropriate models available through the specific gaps in literature and finding especially for skill-based learning system usability evaluation.

Keyword: Usability evaluation, skill-based, model, system and software.

INTRODUCTION

Technology is rapidly changing the way students learn and how-to instructor teach. Technology plays a big role in many aspects of everyday life, and its importance to education is no different. There are various reasons why the e-learning education industry is growing. Online learning is an e-learning application where learning is done using internet access[1]. The adoption of online or web-based learning system or software is not limited to learning institution such as universities and schools. Government and private sectors also have been implementing such platforms to train the employees [4]. Usability is known as a quality attribute that can assess how easy the user interfaces are using [2]. In addition, usability is also known as an important index for evaluating system quality or software [3]. The word “usability” also refers to the method used to enhance the ease of use during the design process[5]. Based on the above statement, it is proved that usability testing is very important in evaluating a system and software. Currently, more researchers are focusing on knowing how to test usability evaluation for skill-based e-learning or learning systems or software. Thus, there is need on adequate techniques to evaluate these platforms to improve their quality. Skill-based system or software are very popular among learning institution such as schools and universities. Corporations and government teams have been implementing such platforms to train their employees in certain skills programs [6].

Systematic review is a comprehensive examination of systematic ways to critically identify, select, analyse relevant past research and to collect, and analyse data from past studies. Through systematic reviews, researchers can gather enough and relevant information to support their research as well as identify gaps and future research proposals in specific fields. Despite the abundance of studies on usability evaluation, efforts to systematically review studies on usability evaluation on skill-based learning systems are lacking. This article attempts to fill in the gaps in understanding and identify appropriate model for application in usability evaluation, especially in skill-based systems or software. This report focuses on the usability evaluation learning system where the previous study more focused on training skills program in corporation sector for

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education and training employees targeting on productivity development. This scenario needs for further studies and research on the importance of usability evaluation skill-based learning system or software to determine type of suitable models applied or modified for usability evaluation on skill-based learning system or software. The aim of this review is to describe systematic review of studies related to usability evaluation models in the context of skill-based learning system or software.

The remainder of this paper is organized as follows: Section 2 summarizes the literature review, section 3 describes the methodology used in the preparation of this systematic review, section 4 discussion and finally section 5 concludes the paper.

RELATED WORKS

This section presents the literature review related topic such as usability evaluation models on skill-based learning system or software. From the review paper[7], four level models approach declared as most successful and popular that can help to measure the effectiveness of customized corporate training program. The researchers had presented a review usability evaluation on training programs only. The available proposed model is basically linked to corporation improvements only. Each level focuses on increasing the productivity and employee's education of the industry. Analysis result showed the identified suitable models to evaluate training program for employees. Based on the paper, the usage of existing method is suggested to make usability evaluation easier. There are several proposed models such as Kirkpatrick Model, Kaufman Model, CIPP Model and CIRO Model. Kirkpatrick model is an appropriate model for conducting usability evaluation in terms of effectiveness training programs implemented in the industrial sector. Some of the methods used in conducting the usability evaluation process for training programs. Figure 1.1 shows the comparison of the methods used by each model to perform the usability evaluation Kirkpatrick Model is the most popular model used to perform the usability evaluation in terms of effectiveness since effectiveness is the main factor leading to conduct usability evaluation in order to decide the continuity of a training program and also the way to improvise the program in future. However, most of the researcher only focusing on this type of evaluation only which is for training programs while there are still other type of program that also had the urge to be evaluated such as skill-based learning system.

From the papers [8] [9] [10], the origin of the brief description on usability evaluation on training program was identified. Majority had discussed the importance of usability evaluation on training programs on workers and industrial sector development only. The results showed that most of the respondents were happy with the content of the module, the ease of speaking, the overall effectiveness and knowledge gained. They are also satisfied and confident in the learning activities provided in this exercise. The findings also show some evidence that respondents have increased their knowledge level and are able to apply knowledge and skills learned in training for their tasks. Given that there is positive empirical evidence for reaction, learning and transfer of training. Therefore, by using the Kirkpatrick's four levels of evaluation model, the paper specifically examines: (i) the reactions of the employees to the training programs; (ii) the level of employee's learning; and (iii) the employee's transfer of training. According to Lingham [9] four phases in this clinical model and the findings will add value to academics, practitioners and human resource professionals involved in designing training programs for organizations when focused. Training is learning management and career development. The discussion in this previous paper has shown that usability evaluation is very important in assessing the quality of a system and the result of implementation program or training towards achieving the organizational motives.

eISBN

The author intended to explain the benefit usability evaluation on training program on certain corporation sector only. This category of evaluation mostly referred to develop employee's knowledge, interest, training and quality of productivity only. By the end of discussion of this paper, the research gap identified is that no suggestion on evaluating usability evaluation for skill-based learning system or software available until current studies.

In summary, we did not find any systematic review regarding the usability evaluation on skill-based learning system or software. Therefore, our contribution with this systematic review, is to report, descript and classify the appropriate model to used or match to suggest for usability evaluation on skill-based learning system.

USABILITY EVALUATION MODELS

Kirkpatrick Model

Kirkpatrick Evaluation Model developed by University of Wisconsin Professor Donald Kirkpatrick on 1950s. This model has four level approach which is most successful and popular models than can help to measure the effectiveness of customized corporate training program [7]. This model can be as one of guidelines to outline design framework for evaluate training skill system/software for education sector. Frago.el,2004[12] stated that Kirkpatrick model is the simplest method and the most commonly used technology in usability evaluation. The four levels of measurement and key indicators to look for at each level. The table 1.1 below shows the methods used for each level in the Kirkpatrick model. Among the methods used in level 1 are questionnaires and discussion. This method can provide feedback from the user for discussion. Second level, results of training will be used as method to evaluate learning level. For level 3, method is used is self- assessment form, observation, feedback form to evaluate behaviour of users. Finally, level 4, results evaluate by percentage of increment of business income, improved productivity and quality.

Level	Methods
Level 1 **Reaction**	Questionnaire or a discussion
Level 2 **Learning**	Result of training such as Post-Test, analysis of reports, performance
Leve 3 **Behaviour**	Self-assessment questionnaire form, feedback from, observation, key performance indicators (KPIs)
Level 4 **Results**	Increase business results, Improved productivity and quality, Customer satisfaction index and Higher spirit

Table 1.1 Comparison methods by models

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Kaufman's Model

Kaufman model is one of the models of learning evaluation developed in response to Kirkpatrick's model [11]. There are two significant changes to Kirkpatrick's model [7] . The Kaufman model has been modified so that it is a two section input and process operation. At the input level, the Kaufman Model identifies the learning resources and resources available to students while the process level is related to the actual learning experience. Motive level five in Model Kaufman is for the benefit of an organization is to look at the community as a whole or to business customers. The Kaufman's model has six levels (i.e., input, process, acquisition, application, organization result, societal/customer consequence) [13].

Anderson's Value of Learning Model

Anderson's model argues that it is important to evaluate the coordination between organizational learning goals and organizational goals. According to [17] it has been proven that it can evaluate the success of a learning program in meeting organizational goals using Anderson's method of evaluation.

Brinkerhoff's Success Case Method (SCM)

This model discusses that a training program results in success or failure. This model involves identifying unsuccessful cases in the learning program and reviewing them in detail. Thus, according to [18] it is said that a comparison between success and failure can provide suggestions for improving or improving the training system's skills in the future.

CIRO Model

This CIRO model was introduced in 1970 by Warr, Bird and Rackham. Through the publication of the Management Training Assessment book, CIRO stands for input, reaction and output contexts. The difference between Kirkpatrick and CIRO is that CIRO will focus on measurements taken before and after training has been practiced [19]. Context evaluation focuses on correct identification of training needs, input evaluation is concerned with the design and delivery of training activity, reaction evaluation focus on gaining and using information about quality of training experience and finally the outcomes focuses achievement gained from the activity and assessed by three level such as immediate, intermediate and ultimate.

CIPP Model

CIPP model was developed by Daniel Stufflebeam and colleagues at 1960. This model are requires context assessment, inputs, processes and products in assessing program value. It aims to provide analytical and rational basis for program decision-making, based on planning cycles, restructuring, implementation and reviewing and reviewing decisions, each being examined through different aspects of assessment-context, input, process and product evaluation. It is a systematic framework guiding the concept, design, implementation and evaluation of service-learning projects and providing feedback and judgment of project effectiveness for continuous improvement. There are four aspects of the CIPP assessment such as context, input, process and products.

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SUMMARY

Based on theory of the previous researchers, we are also able to look for the weaknesses in the system that being developed, understanding the reestablishment processes of the test and also the implementation of the training skill system or software. In the usability test in term of effectiveness, talented learners and groups of students who are less well-aware of the content model can be detected. Additionally, the strengths and weaknesses of the system can be traced to provide opportunities for future improvements. This research is carried out by designing framework from the modification of Kirkpatrick model. Based on literature review, only four level approach reach the most successful and popular models than can help to measure the effectiveness of customized corporate training program. For this kind of training skill system or software, an improvement required from Kirkpatrick model which is expanding another sub level under behaviour level such as transfer of skill and knowledge.

RESEARCH METHODOLOGY

Systematic review is one of the most suitable methods for every researcher to identify, evaluate and interpret all relevant publications on specific research questions. This would have avoided the results of one-sided studies and more information on the other hand, more effort from the researcher (Kitchenham and Charters, 2007). Next subtopic shows the plan and mapping stage flow to be defined in the protocol of our study. In this section, the method used to retrieve articles related to usability evaluation on skill-based learning system or software were discussed. The search string is presented in Table 1.2 and the search engine was used to obtain relevant literature review: Google Scholar, Scopus and Web of Science. The search term was divided in two different groups such as skill-based system or software and another group is usability evaluation. Selected articles based on predefined terms make it easier for researchers to identify articles that are relevant to conducting this research. It was decided to restrict the review's focus to the past decade.

Table 1.2 Search String used in the systematic mapping

TITLE-ABS-KEY ("usability" OR" evaluate*" OR" usability test*" OR" usability assessment*" OR" usability inspection*" OR" usability model*" OR" usability guideline*")
AND
("skill-based system*" OR "skill-based software" OR "training system*" OR "training software" OR "e-learning system*" OR "web-based learning system*" OR "skill training system*" OR "skill training software" OR "skill training learning system*" OR "skill training learning software" OR "e-learning platform*")

Research Question

The aim of this research was to explore of the research as preliminary step that leads to choose the right type of model for usability evaluation for skill-based learning system or software. Our main research question was: “Which usability evaluation Model is suitable or closest for evaluate skill-based learning system or software”?

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Publication Selection Process

Researcher has selected two methods in the selection of related articles. Initially the researcher had to select the article by reading the title and content in the abstract. Usability evaluation in the context of training program and skill-based learning system or software. As Table 2.2 shows the inclusion and exclusion criteria in the selection of articles. The second method is to read the selected article in full. Selected articles based on the same criteria were used in the first filter. Table 2.2 shows Inclusion and exclusion criteria used during the article search processing. Regarding exclusion criteria, some consideration must be focus. Certain criteria have to ignore such as Massive Open Online Courses(MOOC), Learning Management System LMS), publication related to the evaluation non-learning system and software were also unconsidered.

Table 2.2: Inclusion and exclusion set of criteria

Inclusion Criteria	Exclusion Criteria
The study investigated usability evaluation of a learning system	Studies without abstracts.
Publication that describe usability evaluation training skill program	Publication related to the evaluation MOOCs
Publication that describe usability evaluation skill-based learning system or software	Publication related to the evaluation non learning system or software
Article includes in the area of usability evaluation models	Duplicated publications

Data Extraction

This section present details the data extraction process. The following information was extracted from each of selected article. From the review paper [14],[15][16] , the approaches described in the paper reviewed are quite different in terms of goals, approach design philosophy, techniques for usability modelling, process support and so on. As this paper focuses on the type of usability evaluation model that can be matched to the usability evaluation model on a skill-based learning system or software, it is possible to focus on addressing model suitability for the process-based usability evaluation on skill-based learning system or software. Among of the available models, Kirkpatrick model had been chosen as the most suitable one but with an improvement in assessing method to achieve the purpose of assessing usability for a skill-based learning system or software.

DISCUSSION

The particular purpose of the review is to explore on the usability evaluation studies in order to look for the most suitable type of model to be implemented usability evaluation for training skill learning system or software other than providing experience in searching and reviewing the past studies in order to assist in developing this research. The results show there are several studies regarding the models used to usability evaluation in online learning system or software. However, there are still gaps in the literature and findings that can be explored by further studies:

eISBN

- Among the evaluation models, none of them considered the Human Computer Interface(HCI) evaluation during usability evaluation on skill-based learning system
- There were lack of studies relating the influence of the usability improvement in the skill-based learning system or software
- There are no studies to identified experts during evaluation progress or after evaluation
- Most models focus only for corporate improvement apart focus on learning system.

CONCLUSION

In this systematic review, finding of the research is an initial step leading to choose which usability evaluation models is more suitable for usability testing on skill-based learning system. The finding mostly focuses on usability evaluation on training program and not in learning system or software. Although several studies had been conducted regarding the usability evaluation on training program, but still a need more focus in learning system or software. Among the identified models for usability evaluation on training program, there is no sufficient evidence of which models is best suited for this skill-based learning system evaluation. For future research will focus on the strength and weakness of usability evaluation approaches which can be apply to skill-based learning system. I hope that findings may contribute to the development and improvement of the usability evaluation and skill-based learning system or software and improvement of the usability evaluation models.

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MOBILE LEARNING IN ESL CLASSROOMS: AN OVERVIEW

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Abstract

Mobile learning is a technology that has been integrated in many ESL classrooms in many countries. Over the years, with the advent of mobile technology such as smartphones and tablets, mobile technologies can be an important learning and networking method for various learners as it encourages teachers to better understand the interests, desires and abilities of students. Besides, the concept of mobile learning itself is varied, as the depths of involvement over what constitutes mobile learning required are varied among researchers. This paper attempts to discuss about mobile learning and its effect on ESL language development, as well as highlighting challenges, considerations and suggestions in implementing successful ESL classrooms using this technology. It is hoped to add knowledge and ideas for educators to create a successful learning environment in classroom.

INTRODUCTION

Computer technology has been used at widespread by all layers in society and it has influenced educational sectors as well (McGrail, 2005). The integration of technology in language learning, in particular, is considered to be of profound effect as it changes the dynamic of classroom interaction and the perspectives of language learning (Kessler & Hubbard, 2017). The implementation of educational technology is very important as it is seen as an attempt to promote academic development of students to meet the demands of 21st century, which involves students being able to communicate skillfully, possess creativity and critical thinking skills, and being able to collaborate with others (Stanley, 2013).

Mobile learning is an example of a technology that has been integrated in many ESL classrooms in many countries. Over the years, with the rise of mobile technology such as smartphones and tablets, mobile technologies can be an efficient tool for learning and communication for various learners as it challenges educators to consider students' backgrounds, needs, and abilities better (Kukulska-Hume, 2010). Granted, the idea of mobile learning of M-learning itself is varied, as the depths of involvement needed over what constitutes a mobile learning differ among researchers (Alrasheedi & Capretz, 2013). This paper attempts to discuss about mobile learning and its effect on ESL language development, as well as highlighting challenges, considerations and suggestions in implementing successful ESL classrooms using this technology.

Mobile Learning

Mobile learning has been called with several names, Mobile-Assisted Language Learning (MALL) or M-learning (Liu, Scordino, Geurtz, Navarrete, Ko & Lim, 2014). There has not been any consensus on what constitutes mobile learning or m-learning (Ferreira, Klein, Freitas & Schelmmer, 2013). It can simply mean the use of mobile handhelds to scaffold learning (Hwang & Tsai, 2011). Traxler (2005) defines mobile learning where any learning is done dominantly using handheld or palmtop gadgets, which involves the use of mobile phones with internet connection, tablets PCs like iPads or could even extend to the use of games consoles where learning may take place using games.

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Mobile learning can also be seen as an extension of e-learning (Internet-based education), where learning is done and scaffolded through the use of mobile devices (Traxler, 2009).

Learning through mobile use has been categories into several factors , as explained by Traxler (2009): (i) mobile e-learning where learning management software such as Moodle, iTunes U, Blackboard are used as a repository of learning content and instructions, (ii) use of such technology in a physical classrooms where lessons are conducted using mobile gadgets as a resource, (iii) using mobile technology to provide instruction and training for on-site training, and (iv) using mobile technologies in order to facilitate learning and provide instructions in rural communities where unequal physical learning resources are accessible.

Mobile learning should not just be restricted to the idea of using mobile gadgets to do e-learning, but should be seen as a way to allow students to have access to educational resources all the time as well as putting learning inside and outside classroom at any time or place (Wagner, 2005). Attewell (2005) outlines five areas to consider where any types of mobile learning could be used to facilitate learning and provide educational instruction: transport, delivery, media technologies, and development languages.

Mobile learning is increasingly rationalised as the generation of young learners are already attuned to the use of technology in their daily lives (Biden & Ziden, 2013). Called as ‘digital natives’ (Prensky, 2001), this generation have not much difficulty using technology in their everyday lives, and become very accustomed at using digital idea for any purposes (Bidin & Ziden, 2013). As education sectors adopted this technology, there are considerable changes that happen, such as adoption of new technique and strategies of teaching, and the creation of applications that may assist students in their learning. Factors such as cost, suitability and adaptability have encouraged the increased use of mobile technologies in learning (Patten, Sanchez & Tangney, 2006), but there needs to be a pedagogical consideration in order to make mobile learning effective (Ozdamli, 2012).

Mobile Learning and Language Development

Mobile learning in language learning, or Mobile Assisted Language Learning (MALL) are seen as potential resources and medium to scaffold language learning, particularly in L2 learning (Zaki & Yunus, 2015). Valk, Rashid & Elder (2010) argues that mobile devices are suitable to be used for learning as they allow greater engagement as students use the mobile devices or gadgets throughout the day. In terms of its advantages, Zaki and Yunus (2015) outline several advantages of mobile devices: mobility, ubiquity, wireless network, interactivity, accessibility and privacy. Their mobility allow student to access the resources at any place, which supports learning outside the classroom. Their ubiquitous nature normalizes the use of the gadgets everywhere, compared to earlier forms of MALL where the use of gadgets may be alienating and attracts unwanted attention. The wireless networking technology inherent in most mobile devices also allows greater engagement with learning and it allows students to use the features of the smartphones effectively for language learning. Mobile devices are also interactive, enabling students to communicate with each other and collaborate. Their accessibility and privacy also ensure that students are comfortable using the technology without much of a hassle.

In terms of language learning pedagogy, Kukulska-Hulme, Agnes, Norris, Lucy and Donohue (2015) has outlined several considerations that educators need to consider for English language

eISBN

teaching. The researchers argue that current mobile devices allow students to create and share multimodal texts and communicative synchronously and asynchronously with other people around the world. Mobile devices also afford students to self-analyse their own language use and needs. This calls for teachers to think about lessons that actively use these devices that they have in order to maximise learning.

There are several researches that have been done to assess the effectiveness of mobile learning in language skills development. In terms of ESL writing, a quasi-experimental study by Alsaleem (2013) on the use of WhatsApp by a group of Saudi Arabian university students to improve their writing through the practice of electronic journal has shown that students vocabulary and idea elaboration has improved, based on the analysis of pre-test and post-test results. It also allows students to provide written feedback on students' own piece of writing. Jai Shree et al (2014) have embarked on a needs-analysis study of trainee teachers from teacher training institutes in Malaysia over the use of Go-Argue mobile application that allow students to write argumentative piece of writing. Using stratified random sampling, questionnaires were distributed and the respondents show that they are ready for learning using mobile devices and the trainee teachers believe that the use of mobile application which allow them to write and receive and give feedback would allow them to learn further, especially when further enrichment materials are provided to enhance their writing skills.

The use of mobile applications can also improve grammar in writing. Li & Hegelheimer (2013), in their study of the effectiveness of web-based mobile application to improve editing in writing, has found that from the 19 ESL university students studied, there is a positive correlation between their advancement in Grammar Clinic application used to the improvement of their writing, as students have minimised their errors that have negatively impacted the quality of their writing. Most students have also remarked positively about the use of the application in their writing course, and this shows the potential of using mobile devices to support writing skills development.

Besides grammar, mobile learning also possesses huge potential for vocabulary uptake for ESL learners. With mobile learning, students can acquire vocabulary through the use of online and digital dictionaries, messages that send vocabulary items or access to the Internet to seek the meaning and functions of the words (Nisbet & Austin, 2013). Song and Fox (2005) have embarked on a study of integrating mobile technology into web-based ESL vocabulary learning for adult ESL learners. Ten adult participants in the study were interacting using Short Message Service (SMS) which provide them with vocabularies that will be featured in their lessons. Song and Fox (2005) have found that there is a considerable improvement over students' writing performance during the post-test stage, and students like the easy nature of receiving useful English words using the SMS alert.

A more recent technology such as tablets and smartphone may also offer a more immersive mobile learning experience. Rahimi and Miri (2014) has studied the use of mobile dictionary on language learning. Using quasi-experimental method, 34 intermediate-level students were separated into two groups where the treatment group uses mobile dictionary while the other uses a printed version of these dictionaries. Using pre-test and post-test measures, students who use mobile dictionaries showed that there is a significant difference between the two groups in the post-test and students with mobile dictionaries perform better in the test conducted. This is attributed to easy access to these dictionaries that allow students to check vocabulary items and verb conjugations quickly.

eISBN

The rise of smartphone applications also allows students to learn using apps that support language learning. Wu (2015) has designed a smartphone app that contains 3,400 English words for Chinese college students to learn English as a foreign language. The app contains these English words along with its spelling, pronunciation, and Chinese definitions. Using quasi-experimental design, pre-test and post-test were conducted and it has shown that students in experimental group who use the smartphone app significantly outperformed the students in the control group, attributed to the greater exposure of the words provided using mobile learning.

In terms of listening skill, mobile learning can help to provide greater engagement time with learning materials due to mobile devices' ubiquitous nature and portability. Azar and Nasiri (2014) show that collaborative speaking and listening skills can be enhanced when students are provided with materials through mobile devices compared to another ICT medium such as computer. In their research, students in the treatment group who read audiobooks using mobile devices performed better than students who just read the audiobook using a computer. This shows that mobile devices can help students in learning better as the frequency of their listening practice increased by using the mobile devices. Furthermore, Rahimi and Soleymani (2015) has also studied the impact of mobile learning on students' listening anxiety and listening comprehension. Students from intermediate English course were separated into two groups and the treatment group was using podcast using mobile phones or tablet while the treatment group uses computer to access the podcast. The results show that students in the treatment group performed better in the post-test language test and have reduced listening anxiety compared to the treatment group.

These researches are not exhaustive, and there are many others over the years who show that mobile learning have potentials in scaffolding students' language development (Burston, 2015). However, it should be noted that mobile learning in itself, due to its varying dimensions, may pose certain challenges and we should consider some aspects before embracing this relatively new approach.

Challenges, Considerations and Suggestions on Mobile Learning

While some meta-analysis researches do show that many studies done on mobile learning show that it has a considerable positive effect on language learning (Burston, 2015; Sung, Chang & Yang, 2015), there are certain challenges that mobile learning pose and some considerations that need to be undertaken to ensure that successful language learning takes place (Kukulska-Hulme, 2016).

There are various factors that may influence the implementation and outcome of mobile learning in language classrooms. While Jones et al (2006) argue that mobile learning, especially when it is used outside classrooms can be motivating, due to factors such as students' control over learning goals, holding ownership over learning, fun and communicative lessons, and learning continuously between contexts, it does not mean that the learning itself is devoid of challenges. Naismith and Corlette (2006) have suggested five factors that may critically affect the success rate of mobile learning: availability of technology, institutional support, connectivity, integration and ownership. Mobile learning can be advantageous in a language class, but it depends on whether the technology is available to everyone because students come from different backgrounds and socioeconomic status.

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Educators also need to be trained properly in terms of using such technology because most times, when using these devices, software or applications, there are the immediate technical support person that the students would refer to, and the inability of educators in coping with these technical difficulties may affect the academic learning time for students. Institutional support is thus essential in order to allow educators to effectively use these mobile devices to be put to good use (Kukulska-Hume & Traxler, 2007).

Furthermore, in current learning environment where online learning using mobile devices are trending, mobile learning needs to ensure that the devices' Internet connectivity is good enough because slow connection will hinder students' learning and psychologically affect students' interest in learning. The curriculum must also integrate the mobile devices, they should not stand out because devices' novelty will wean over time, but a well-integrated curriculum will ensure that students can maximise the use of these devices and put them to good use.

Sharples (2013) has also suggested three issues that educators need to strongly consider in order to enhance learning within a mobile learning environment: improving usability, designing mobile learning, and creating novel methods of evaluation for mobile learning. Mobile learning has embraced the use of smartphones, tablets and other gadgets that mostly are not constructed expressly for language learning. A learning institution or the teachers themselves need to seriously consider the pros and cons of using any kind of mobile devices. The cost, ease of use and needs of the students need to be properly analyses to ensure that students can actually use the technology without much difficulty, or whether the school or students themselves are able to afford these technologies.

Mobile learning design should also consider that mobile devices used by students are ubiquitous and at the same time, personal and used beyond the classroom (Kukulska-Hulme & Traxler, 2007). A successful mobile learning use would be able to incorporate these situations that will allow students to maximise their exposure to the target language while at the same time pointing students to their suitable levels of language that they are currently at and are able to assess their learning outcomes (Sharples, 2013).

While mobile learning can be assessed using typical language tests in order to check students' development or progress over time and after the implementation, it's fairly important to consider that the new types of assessment can be created which reflects the nature of mobile learning – that learning can happen outside the classroom, and students can create multimodal products that reflect their language learning such as video recording or presentation (Kukulska-Hulme et al, 2015; Sharples, 2009). All these three factors, when critically assessed, allow teachers to develop curriculum that fully maximise the potentials of mobile learning.

At the same time, we must also consider the best pedagogy in using mobile learning. The success of a lesson using mobile devices also relies on educators' effectiveness at using these technologies (Wu, 2015). While the devices themselves are tangible items that may help scaffold learning, we should not forget that the educators' intangible principles such as pedagogy, psychology and instructional methodology that help orient the classroom to learn effectively (Serdyukov, 2017). While mobile learning in language learning can be conducted in a fairly traditional, straightforward way, with students interacting with the resources (e.g. applications) directly, we should also consider that mobile learning offers so much opportunities for collaboration (Rodriguez, Riaza, Gomez, 2017).

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The use of mobile devices and technologies allow teachers to promote collaboration between students to develop ideas, collaborate in a group project, and communicate and provide feedback to each other (Cobcroft et al, 2006). These new technologies allow students to engage and collaborate with each other inside and outside the classroom (Bryant, 2006)

CONCLUSION

It is important to for us to realise that our current language education, teacher training curriculum, curriculum materials and examination structure have yet to reflect the prevalence of mobile technology in our education system (Walsh, 2010). A pedagogical framework for teachers in using mobile learning effectively would have to consider teacher wisdom, device features, learner mobilities and language dynamics (Kukultska-Hume et al, 2015). This will ensure that the lessons constructed in a mobile learning environment would be relevant to students' needs and lives, as they tried to make connections between the places where the language is studied, used and the people who are learning the language.

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TWO-STAGE SPARSE COMPONENT ANALYSIS (SCA) TO UNDERDETERMINED BLIND SOURCE SEPARATION FOR BIOACOUSTIC SIGNALS

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Abstract

Bioacoustic signals have been used as modality in environmental monitoring and also for biodiversity researches. As bioacoustical data also carry species or even individual information, this allows recognition of the species and individual based on their vocals. Nevertheless, vocal communication in a crowded social environment is a challenging problem for automated sound recognizer system due to interference problem in concurrent signals from multiple individuals. To address this issue, Blind Source Separation (BSS) based on Sparse Component Analysis (SCA) approach is used to separate the bioacoustic sources from the mixture of multiple individual signals. In this paper, the problem of an underdetermined mixture was explored based on two-stage SCA approach which consists of: 1) Mixing matrix estimation and 2) Source estimation. The underdetermined mixture is defined when the number of observed mixtures are less than the sources. This two-stage SCA technique is applied to 100 instantaneous underdetermined mixtures, each is formed by a pair of random mixing matrix and different selection of source vector of bio-acoustic signals. The performance of the estimated mixing matrix and estimated source are evaluated and discussed under a different number of sources and sensors.

Keywords: Bioacoustic signals; Underdetermined mixtures, Blind Source Separation (BSS); Sparse Component Analysis (SCA)

INTRODUCTION

Bioacoustics can be defined as a study of animal sound communication and it can be considered as one of the most effective methods in environmental monitoring application and biodiversity researches (Huang et al., 2009). In particular, vocalized animals such as frog primarily rely on sound to interact with the con-species or other species by making a range of different calls for different purposes. Such sounds can be used by human to extract more detail information about the species and to identify them (Stevenson et al., 2015). Most of the research works on animal calls recognition focuses on animal species identification. However, to identify different species of an animal according to the recorded calls which frequently contain the vocalization from more than one individual is a difficult process (Hassan et al., 2018). This creates a challenging problem of identifying the source data from the given mixture data. Post-processing approaches are needed to separate the individual bioacoustic source from the sound mixtures to further enhance the process. Among post-processing approaches, the Blind Source Separation (BSS) is used to address the problem.

Blind Source Separation (BSS) has been widely used in audio, biomedical, digital communication and signal processing where it can separate the source signals based on the mixed signals (Santamaria, 2010) . BSS can be classified into determined (N=M), overdetermined (N<M) and underdetermined (N>M) cases where N is the number of sources and M is the number of sensors. Among the three cases, underdetermined is most popular due to its best fits the practical application. In determined case, the mixing matrix, A is a square matrix and can be invertible.

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So, by finding the mixing matrix, the source can be recovered easily by multiplying the mixture by the inverse of A. The well-known method used for the determined problem is Independent Component Analysis (ICA) (Hyvarinen, 2012). For overdetermined, the mixing matrix can be transformed into a square by using Principle Component Analysis (PCA) (Winter, 2006). In the case of underdetermined mixtures, the mixing matrix is not square, therefore it is not sufficient for reconstructing the sources as the mixing matrix is not invertible. When dealing with the underdetermined mixtures, the algorithms used in the for the determined and overdetermined cases may not work. So, it requires important prior information of the sources like 'sparsity' to resolve the underdetermined problem. Some algorithms for achieving the 'sparsity' in the transform domain, such as short-time Fourier Transform (STFT) (Linh-Trung et al.,2018) and wavelet packet transform (Li, Y. et al., 2003) have been proposed so far. The two-stage Sparse Component Analysis (SCA) which exploits the sparse representation of the sources to estimate the mixing matrix before estimating the sources.

Approach in estimating the mixing matrix can further be classified into two categories i.e. Single Source Points (SSPs) detection and clustering. Recently, many researches focus on underdetermined problems based on the SCA framework. The works in (Reju et al., 2010) identifies the SSPs by the fact that the absolute directions of real and imaginary parts of the Fourier transform coefficients vectors of the mixed signals are the same. The detected SSPs are then used to estimate the mixing matrix via hierarchical clustering. Degenerate Unmixing Estimation Technique (DUET) algorithm proposed by Jourjine et al., 2000 recovers the source signals based on the ratio of the time-frequency (TF) transforms of the observed mixing signals. The performances of work by Reju et al. (2010) and Jourjine et al. (2000) depend on this ratio to detect the SSPs. In (Li, Y. et al., 2016) an effective algorithm was also proposed to identify SSPs by utilizing TF coefficients of the mixed signals and complex conjugates of the coefficient. However, most of the SSPs-based on underdetermined mixtures focus merely on the nature of single SSP ignoring the relationship between SSPs, which results in low identification accuracy of SSPs, especially in noisy cases. The work in Zhen, Peng and Yi (2017) introduced a blind source separation for underdetermined mixtures based on STFT in which SSPs are identified by sparse coding. Since the sparse coding strategy considers the linear relations between SSPs, the method can obtain excellent estimation performance even in low signal to noise ratio (SNR) cases.

The interest of this paper is to investigate the performance of blind source separation for underdetermined mixtures using the method proposed by Zhen, Peng and Yi (2017) for our bioacoustic signals. The underdetermined mixtures are formed by a pair of random mixing matrix with a different selection of source vectors as in real life, the mixture of sources is dynamic since the position of sources and the sensors subject to change in times.

METHODOLOGY

Linear instantaneous mixed model of the underdetermined mixtures can be expressed as

$$X(t) = AS(t)$$

where $X(t) = [X_1(t), X_2(t), \ldots . X_M(t)]^T$ and $S(t) = [S_1(t), S_2(t), \ldots \ldots S_N(t)]^T$ are the vectors of mixtures and sources respectively in time domain of transpose operation. *M* and *N* are the number of mixed signals and source signals where $M < N$. $A = [a_1, a_2, \ldots \ldots a_N$ is the mixing matrix. The BSS of underdetermined mixtures aims to estimate the source signals when *A* and *B* are unknown.

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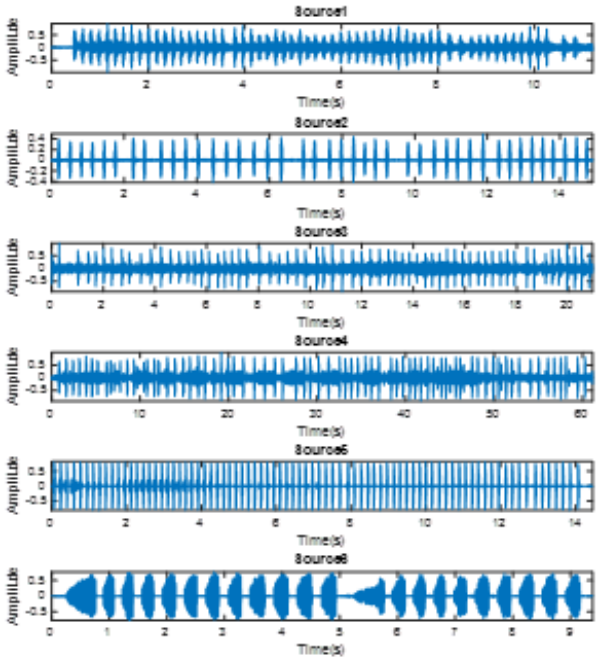
1. Data Preparation

Table 1 presents the dataset of the bioacoustic signals, $S_N(t)$ employed in this study. The signals were recorded in mono channel, 16 bit, 16kHz, and wav format.

Table 1. Bioacoustic Signal dataset

Sources	Name of species
	Source 1: Ameerega trivittata Source 2: Adenomera Andre Source 3: Leptodactylus hylaedactylus Source 4: Leptodactylus fuscus Source 5: Geocrinia Victoriana Source 6: Geocrinia Victoriana

Notes: Taken IBG Group, USM

2. Mixed Signal Generation

In real life environment, the nature of mixtures variates according to the position of the animals and sensors. To mimic the behavior of the real-life system, the mixed signals are generated using equation (1) with a random selection of sources from 1:*N* and with random mixing matrix. Each generated mixed signal, *X(t)* will have a different entry of sources as well as the mixing matrix.

3. Domain Transformation

In practice, natural signals like bioacoustics signals are not very sparse in the time domain. To increase the sparsity of source signals, the STFT transformation is applied to (1) and the transformed model is obtained as follows:

$$X(t,f) = AS(t,f) \tag{2}$$

where $X(t,f) = [X_1(t,f), X_2(t,f), \dots \dots X_M(t,f)]^T$ and $S(t,f) = [S_1(t,f), S_2(t,f), \dots \dots S_N(t,f)]^T$ represent the STFT complex coefficients of $X(t)$ and $S(t)$ at time-frequency (TF) point (t,f), respectively.

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4. Mixing Matrix Estimation

The mixing model in the time-frequency (TF) domain is used to estimate the mixing matrix. The mixing matrix estimation is an important procedure in SCA and it can be improved in two ways: Single source point (SSP) detection and clustering.

The steps of mixing matrix estimation can be summarized as follows:

- Generate the underdetermined mixtures
- Transform the underdetermined mixtures from the time domain, *X(t)* into the time-frequency domain, $\bar{X}(t, f)$.
- Detect the Single source point (SSP): To detect the single source point (SSP), for each of the time-frequency (TF) vector, compute the sparse coding coefficients by l_1-norm optimization.
- Apply hierarchical clustering technique on the detected single source mixture TF vectors to obtain clustering centers which is used to calculate the estimated mixing matrix, $\tilde{A}$.

5. Source Recovery Estimation

After the estimated mixing matrix is obtained, the next stage is to estimate the bioacoustic sources, $\tilde{S}$. Even when $\tilde{A}$ is known, since the solution in Equation (1) is underdetermined, its solution is not unique. A least square problems is needed in order to achieve the source recovery and the time domain of the estimated bioacoustic signals, $\tilde{S}(t)$ can be easily obtained via inverse STFT.

RESULTS AND DISCUSSIONS

For experiment setup, the STFT size is set to 1024 with time step equals to 512 and Hamming window is used as the weighting function. The noisy condition ranging from 5 to 45 dB and 100 simulations of Monte Carlo tests are conducted on the dataset to evaluate the performance of the SCA method versus signal-noise-to-ratio (SNR). First, we illustrate the effectiveness of the SCA algorithm over ICA algorithm in the condition of determined (4x4) and underdetermined mixtures (3x4). Then, we compare the results of the SCA algorithm by using different mixing matrixs: 3x4, 3x5, 4x5 and 4x6.

1. The first stage: Mixing Matrix Estimation

To evaluate the performance of mixing matrix estimation, the following performance index is used:

$$Error = \frac{1}{n}\sum_{i=1}^{n}\left(1 - \frac{a_i{}^T \hat{a}_i}{\|a_i\|\|\hat{a}_i\|}\right) \quad (8)$$

The accuracy of mixing matrix estimation will increase as the error decreases. Fig.3 a) and b) shows the averaged error obtained by 100 Monte Carlo test. From Fig. 3. a), we observed that SCA outperforms ICA in determined and underdetermined problems. This indicates that the 'sparseness' of sources does give a big impact on the performances. Fig. 3. b) shows that when SNR value increases, the error of mixing matrix decreases. This demonstrate that the accuracy improves. Here, we also observed that the performances of mixing matrix of 3x4 gives the best performances compared to others. This reveals that the mixing matrix estimation depends on the difference between the number of sources and the number of sensors.

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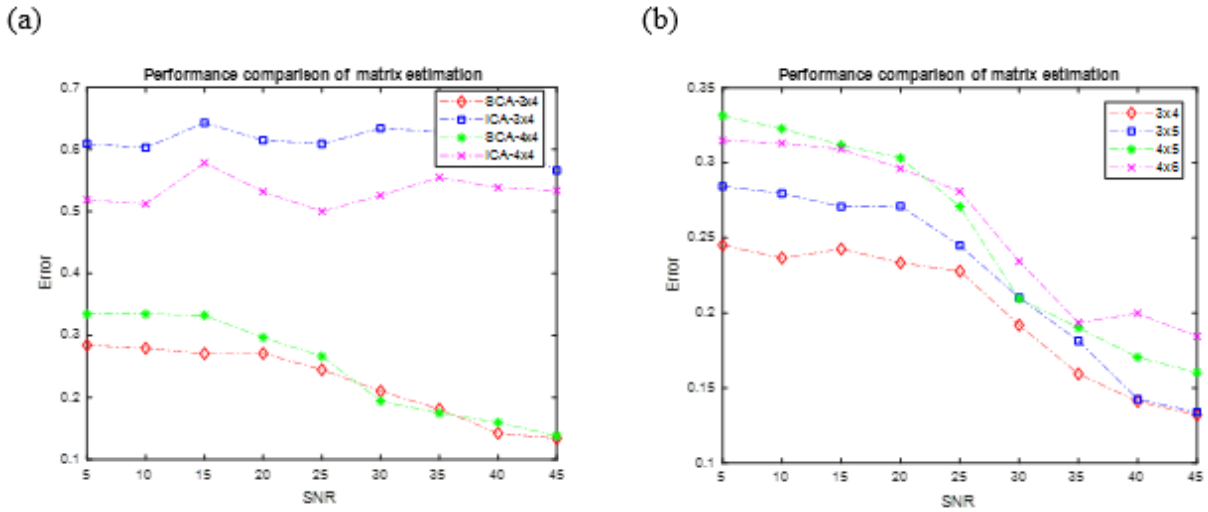

Fig.3. a) Performance comparison of matrix estimation using SCA and ICA b) Performance comparison of mixing matrix using SCA with different number of sources and sensors.

2. The second stage: Source Recovery Estimation

To achieve the bioacoustic source recovery, the quality of the separation was tested using the following measures:

$$MSE = 10log_{10}(\frac{1}{n}\sum_{i=1}^{n}\min_{\delta}\frac{\|s'_i - \delta\hat{s'}_i\|_2^2}{\|s'_i\|_2^2})$$

After the mixing matrix is estimated, source recovery can be quantitatively estimated. To accurately recover the source signal, the performance depends on the mixing matrix estimation accuracy. From Fig. 4. a), we find that SCA can recover the bioacoustic sources better than ICA. Fig. 4. b) shows that performance of 3x4 matrix outperforms in term of averaged MSE compared to other mixing matrixs as shown in Fig. 3. b). The performance degradation of using more sources may be due to it is hard to satisfy the restriction where at any TF point, only one source is active.

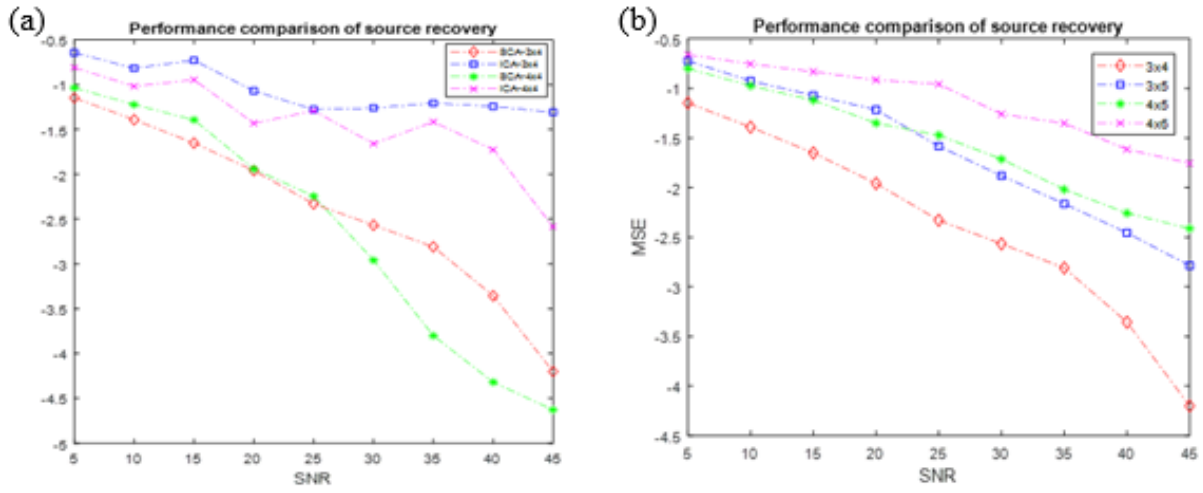

Fig.3. a) Performance comparison of source recovery using SCA and ICA b) Performance comparison of source recovery using SCA with different number of sources and sensors.

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We also evaluate the quality of the reconstructed signal using SCA by three measures, namely SDR (signal to distortion ratio), SIR (signal to interferences ratio), and SAR (signal to artifacts ratio)(Vincent et al., 2010). The higher value of the metric shows a better quality of separation. From Table. 2, note that mixing matrix 3x4 leads to better performance than the others as it gives high values in SDR, SIR and SAR. Both mixing matrix 3x5 and 4x5 result in low SDR and SIR for source 4 indicate that source 4 are not fully separated. The mixing matrix 4x6 can only separate source 1. The difference between the number of sources and the number of sources does influence the separation performance of our bioacoustics underdetermined mixtures.

Table 1. Performance evaluation of source recovery of different number of sensor and sources

Mixing matrix	Sources	SDR	SIR	SAR
3x4	1	13.47	24.68	13.83
	2	11.46	19.82	12.20
	3	10.72	15.10	12.84
	4	12.98	17.67	14.83
3x5	1	7.89	11.02	11.70
	2	4.51	7.33	2.25
	3	6.47	15.16	7.23
	4	-3.50	-1.85	5.53
	5	0.42	0.94	4.89
4x5	1	10.03	15.25	13.46
	2	11.24	18.29	12.26
	3	11.89	20.17	12.64
	4	-0.432	-0.075	13.64
	5	0.54	7.66	2.17
4x6	1	2.269	5.81	12.24
	2	-10.32	-5.37	-2.16
	3	-3.81	0.09	1.41
	4	-2.67	1.21	2.10
	5	-6.50	-5.91	9.37
	6	-2.21	-1.54	10.08

CONCLUSION

In this study, the SCA algorithm was exploited for underdetermined mixtures for bioacoustic signals using a different number of sources and sensors. The underdetermined mixtures presented here are where the sources exhibit a sparse behavior after transformed into the time-frequency domain using STFT. To estimate the mixing matrix, the detection of SSPs was exploited using sparse coding. The estimate sources are recovered by a series of least square problems. The result shows that SCA can estimate the mixing matrix and source better than ICA. The importance of SCA is that it can work both for determined and underdetermined cases.

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HISTOGRAM PROJECTION BASED ON UNOCCUPIED SPACE OF DOCUMENT IMAGE FOR DOCUMENT RECOGNITION

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Abstract

Document recognition is used to extract data from document images such as Al-Quran. It is crucial to identify whether the document is genuine or not through digital documents on the internet. Existing work is being carried out on document recognition. Nonetheless, the problem arises when character recognition only performed for specific language and when the image dataset size is small, it is challenging to recognize the character. The aim of this research is therefore to make use of the similarities of each language of character that is unoccupied space. As for this study, the aim is to obtain a list of point selection from the generated histogram that will use for further work. This work using the selected experimental design and dataset is a database of its own, which is a document image to manage the dataset of small size. Although Otsu's design and histogram projection were involved in the techniques. Experiments performed on the Al-Quran image's dataset. The results obtained a list of selected points for both vertical and horizontal histograms.

Keywords: Document recognition; Unoccupied space; Otsu's Model; Histogram projection

INTRODUCTION

Document Recognition is still ongoing research since there are too many documents that exist in hardcopy or softcopy. The purpose of document recognition is used to classify specifics of the origin of the text, such as its originality, date of writing, authors, etc. Almarimi et al. (2015) state that, document recognition is the particular case where one document examined if the same unidentified (or identified) author wrote all parts of it. While Norzaidah et al. (2009) define that, document recognition is a job that deals with digitalization and collection of information, which determines the categories to represent specific types of documents such as digital documents. Document recognition is a process of distinguishing the object in a document to extract more information from it, such as authors, date, and originality.

Research on document recognition gradually continues to grow utilizing current, enhanced or new image processing techniques and type of recognition such as character recognition (Chaudari & Gulati, 2016), handwriting recognition (Azeem & Ahmed, 2013), word recognition (Barathi Ganesh, Reshma, & Anand Kumar, 2015) and also digit recognition (Arbain, Azmi, Melhem, Muda, & Rashaideh, 2016). As an example, Almarimi et al. (2015) are using two techniques, which are n-gram and histogram of words for English and Arabic documents. Arbain et al. (2016) using triangle model techniques to perform digit recognition.

Histogram projection is vital in this research in order to perform document recognition. It makes use of the distinction between text and unoccupied space in a document. From this histogram, a list of coordinates will produce, which will take the peak value of coordinate that distinguishes between a character from unoccupied space.

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This paper will discuss on the projection of histogram based on the unoccupied space of document image. Since unoccupied space is a character that has similarities in all languages, it will be used as the point to process a document and extracting its features.

The paper has the following structure: In the second section, it provides some related works of the recent developments that focuses on document recognition, thresholding, and vertical histogram projection. The third section contains the preprocessing phase and results for this research will discuss in the fourth section. The fifth section concludes the paper.

RELATED WORK

Image processing has become popular in today's technology and is overgrowing. It is a method of processing an image into a digital form such as text typed or handwritten, documents, photo and video, and operating to extract any useful information from the image.

Document recognition is used to define, check, and authenticate the documents ' originality and make the author known. Work on the identification of documents using existing, enhanced or new techniques such as centroid detection(Low et al., 1998), triangle model(Arbain et al., 2016), watermarking(García-soto et al., 2013), n-grams and word histograms(Almarimi et al., 2015), statistical and Gabor characteristics(Chaudari & Gulati, 2016) and also geometric distortion(Joost van Beusekom, 2011).

There is existence research on document recognition, however, some of it get an accurate result, and others have a limitation of resource such as size of dataset (Norzaidah et al., 2009), depend on dataset training available and the research only applicable to specific character which cannot be used to other character. Therefore, it is a need to find a similarity in each character of each language that can define as space or unoccupied space.

The unoccupied space is a space between two words and space that is not occupied by characters or graphics. Figure 1 shows the example of unoccupied space in an Al-Quran.

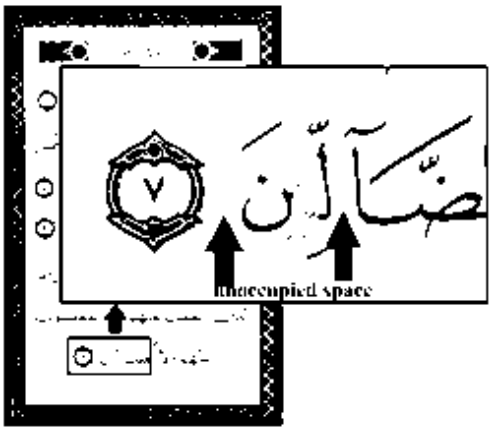

Figure 1: Unoccupied space in an Al-Quran.

Most of the research based on characters, digits, language, and segmentation of words so, there still a few research using unoccupied space in document recognition.

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The first step in image processing is the preprocessing phase, and image thresholding is a method that chooses. Thresholding is an image processing method that produces a binary image based on setting a threshold value on the pixel intensity of the original image and can be applied to grayscale and color images. Other than that, Image thresholding is a simple yet effective way to divide an image into the foreground and background. This technique of image analysis is a kind of image segmentation that isolates objects by transforming images of grayscale into binary images. Image thresholding in high contrast images is most effective.

Figure 2: Original image

Figure 3: Thresholding in a grayscale image

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The thresholding method replaces each pixel in an image with a black pixel if the image intensity $L_{x,y}$ is less than some fixed constant T or a white pixel if the image intensity is greater than that constant as shown in the formula below:

$$L_{x,y} < T$$

Image thresholding can automate with the use of the histogram. The histogram may have the information needed for image analysis. Therefore, the projection of histograms the peaks, valleys, and curvatures of the smoothed histogram are analyzed.

PRE-PROCESSING

In the pre-processing phase, the proposed method based on finding from the previous research. There are three steps involved in this phase data collection, binarization, and histogram projection. Data collection is a method of obtaining data and information. Lack of standard datasets available makes this research using a local dataset. This local dataset mainly uses Al-Quran images as the document image.

While for converting image to grayscale and binary, Otsu's method selected. Otsu's method is a popular technique use for optimal thresholding. The purpose of this technique is to distinguish the image between background and object. In (Azmi & Omar, 2011), Otsu's approach is used to binarize the document image which is used to minimize the color image to grayscale and then to a binary image. The binary image is a digital image conversion with only two values ' 1 ' and ' 0. ' In representing information, a binary representation is a base-2 number that refers to a particular state in which it has only two states of 1 and 0.

Histogram projection is the next level of thresholding that takes part after the binarization process. It is generally used for further image analysis in thresholding. The vertical and horizontal histogram will be created in two types of histogram. By measuring the frequency of ' 0 ' per column of each pixel in the binary image, the vertical histogram gets the value. The vertical and horizontal histogram will be created in two types of histogram. By measuring the frequency of ' 0 ' per column of each pixel in the binary image, the vertical histogram gets the value. Differ in the horizontal histogram. It will calculate the value of ' 0 ' by row.

EXPERIMENT AND RESULTS

The prototype is developed using JAVA as its programming language and a folder of document image as the database. In this research, the actual experimental design applied which there are one experiment will be executed. The experiment will describe as in Table 1.

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Table 1: Experimental Setup

Experiment	
Objective	To obtain a coordinate list of unoccupied space.
Significance	To produced histograms from the binary image and obtained the unoccupied space coordinates.
Input	Own dataset
Algorithm	Otsu's model and histogram projection
Output	The coordinates list of unoccupied space obtained from the histogram.

The experiments used its own dataset image to produce the result. The results obtained are stored in a text file for later review. Figure 4 shows the original dataset and its binary image after the binarization process using Otsu's model.

Figure 4: Original dataset and its Binary Image

Figure 5 shows the vertical histogram based on the binary image. While Figure 6 is a list of coordinates obtained from the maximum point of each column in a vertical histogram.

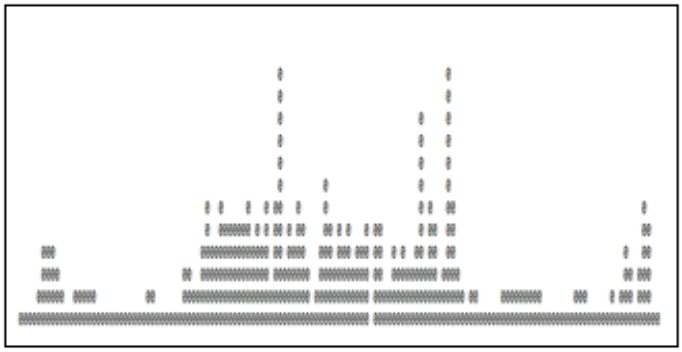

Figure 5: Vertical Histogram

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1 0	32 2	63 4	94 5	125 2
2 0	33 1	64 6	95 2	126 2
3 1	34 1	65 5	96 3	127 2
4 1	35 1	66 3	97 12	128 1
5 1	36 1	67 1	98 6	129 1
6 1	37 1	68 2	99 3	130 1
7 2	38 1	69 4	100 2	131 1
8 4	39 3	70 7	101 1	132 1
9 4	40 3	71 5	102 2	133 2
10 4	41 2	72 3	103 2	134 1
11 3	42 2	73 5	104 1	135 2
12 2	43 4	74 4	105 1	136 4
13 1	44 6	75 5	106 1	137 3
14 1	45 4	76 3	107 1	138 1
15 2	46 4	77 4	108 1	139 3
16 2	47 6	78 4	109 2	140 6
17 2	48 5	79 5	110 2	141 5
18 2	49 5	80 0	111 2	142 1
19 2	50 5	81 5	112 2	143 1
20 1	51 5	82 5	113 2	144 0
21 1	52 5	83 2	114 2	145 0
22 1	53 6	84 2	115 2	146 0
23 1	54 4	85 4	116 2	
24 1	55 5	86 3	117 2	
25 1	56 4	87 4	118 1	

Figure 6: List of Coordinates from Vertical Histogram

Figure 7 shows the horizontal histogram based on the binary image and Figure 8 is a list of coordinates obtained from the maximum point of each row horizontal histogram.

Figure 7: Horizontal Histogram

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0 1	15 20
0 2	23 21
0 3	26 22
0 4	40 23
0 5	57 24
0 6	59 25
0 7	27 26
0 8	16 27
3 9	29 28
9 10	8 29
14 11	6 30
11 12	1 31
2 13	0 32
10 14	0 33
12 15	0 34
10 16	0 35
3 17	0 36
8 18	0 37
11 19	

Figure 8: List of Coordinates from Horizontal Histogram

Based on the output in Figure 6 and 8, the objective to obtain a coordinate list for both histograms are successfully retrieved and ready to be used for the triangle model.

CONCLUSION

A histogram projection based on unoccupied space for document recognition was proposed in this paper. Not much researches on unoccupied space for recognition has been conducted so far. This research has shown that it is possible to use unoccupied space to produce histograms and obtain the coordinate list for each histogram. The result obtained indicates the usefulness of the proposed techniques and preparation for further research.

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TRACEABILITY ENABLING IN MATERIAL INVENTORY SYSTEM FOR MATERIAL WASTE REDUCTION EFFORT IN ASSEMBLY MANUFACTURING OPERATION

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Abstract

This research is about a case study conducted in a semiconductor factory namely as Factory A located in Kulim, Kedah. The factory performs assembly and test manufacturing at it shop floor. The main focus of this research is factory inventory specific to material inventory and how to address the risk of material wastage due to unnecessary scrapped which resulted to unnecessary spending to the overall factory operational cost. The analysis is performed from risk assessment and material selected in this research is Printed Circuit Board (PCB). Main gap analysis is identified and proposed solutions are suggested for PCB Vendor Expiry Date (VED) risk traceability between warehouse system and factory system. Process to enable traceability between two different systems is explored. Before and after of PCB VED wastage result are discussed after the system traceability process is enabled. Additional significant benefits related to PCB wastage reduction effort are gained after PCB VED traceability is enabled are discussed such as PCB yield trend, number of PCB losses, cost of avoidance from purchasing additional PCB to compensate yield trend as well as cost of poor quality avoidance. In conclusion, this research project met its objective with a total 99.84% improvement from PCB expiry loses, 99.85% PCB yield achieved within 6 quarters of implementation equivalence to USD 0.5 million saved, 87% cost of poor quality avoidance obtained which equivalence to 1539 man hours saved and USD 10.8 thousand cost avoidance.

Keywords: technology management, inventory management, semiconductor industry

INTRODUCTION

The main goal for a business company is to increase its overall profit margin year over year. To achieve this goal, companies are looking into every possible solution to ensure the product cost, functionality and quality are remain relevance as well as competitive in the market. To maximize overall product profit, company must find a way to reduce it overall spending especially unnecessary spending. Unnecessary spending in manufacturing field costing can vary from direct material cost, direct labor cost and manufacturing overhead cost.

For this study, the main objective is to identify potential problem in direct material cost for semiconductor. All direct materials potential wastage are explored and Printed Circuit Board (PCB) is selected as it contributed to the highest cost of all direct material in the factory. In the first year of awareness of this wastage existed, there were 261 thousands unit are scrapped which costed USD 0.9 million and equivalence to MYR 3.7 million. to Based on the factory PCB yield, every potential category of PCB are being scrapped are analyzed. One of the highest scraped numbers contributed by PCB scrapped due to exceeded it vendor expiry date (VED). The main organization goal for Factory A to achieve PCB yield 99.85% and above as well as zero PCB shelf life expiry triggering due to exceeding VED.

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All 30 types of PCB losscode are analysed and tabulated to identify it losses category. 75% of PCB lossed are contributed to human factor induced followed by equipment factor induced which is recorded as 18%, engineering related induced factor contributed to 3% and others factor induced contributed to 4%. From this assessment, the main focus of this research to reduce PCB wastage effort is focused to human induced related.

There are gap identified specific to different inventory system are used between factory warehouse versus production system of record. And whenever there is inventory movement from warehouse system to factory system of record system, some of the information including VED are loss. Thus, there is no traceability of the PCB lots specific to VED whenever it reach to factory system. This situation has risk on inventory discrepancy between system versus physical which impacting finance report as well as product quality if factory mistakenly load expired PCB to be assemble as microprocessor.

LITERITURE REVIEW

Market demand nowadays require product with combination of high quality and reliability, cost competitive and delivery in speed. To achieve this demand, all possible wastage in product process flow, manual handling, inventory, equipment, planning need to reduced and eliminated. According to Taiichi Ohno, (1988) perfection can be obtained from Seven Deadly Waste which was introduced by him for Toyota Production System (TPS) which are transportation, inventory, motion, waiting, over production, over processing and defects (TIM WOOD). According to Womack et all (1990), Shingo Shingeo (1997) and Dillon (2019) there are seven category of basic wastes which are correction which referring to rework or repairs task; motion which require any wasted motion action to perform task; over production which is producing more than demand or product it earlier than actual demand; conveyance which require additional process to transport and handling raw material, inventory, semi-finished good or finished good into storage or out of specific location; inventory which require additional task to manage excess of inventory from raw materials, semi-finished good parts or finished good product; processing which require additional rework or need to go to additional steps from normal process; waiting which require queuing time, static lot waiting to be process because of awaiting parts, awaiting material, awaiting machine to be repaired, awaiting headcount to operate the machine

Plan-Do-Check-Act (PDCA) cycle which also known as Deming Wheel is one of the tools to to drive for continuous improvement as stated by Slack and Brandon-Jones (2019) and Slack et alls,(1995) . According to Saier (2017) PDCA cycle has been revolutionized to a new PDCA cycle which starting with “Check” phase. It is discussed that project or improvement area that need to be improve need to be checked first, then followed by “Plan” phase before entering to “Act” cycle to ensure obtaining perfect result. Saier also stated this revolutionized PDCA cycle to Check-Plan-Do (CPD) derived from the “Lean Management method of Hoshin Kanri which is another level of further evolution of PDCA cycle”. Regardless how the PDCA cycle is revolutionized, the back to basic of driving Lean Manufacturing improvement is still based on PDCA cycle.

In operations Management, Lean Manufacturing concepts and tools have been introduced, developed and continued to innovate into new lean technique to drive for improvement. According to Asano Takashi, (2004) majority of Lean Manufacturing tools available nowdays been originated from industrial engineering field and developed by Toyota for example Kaizen and Quality Control. Asano divided Lean Manufacturing Tools into three areas.

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The first group of tools tackled for operational solutions such as Kanban and Poka-yoke. Next, the second group of tools covered for analysis and improvements such as Value Stream Mapping for current mapping assessment to be used to suggest the future mapping situation. The third Lean Manufacturing Tools group is being used for management measurement purpose such as PDCA cycle.

According to Lambersky (2016), manufacturing field costing can vary from direct material cost, direct labour cost and manufacturing overhead cost. Direct material cost is the overall cost needed to purchase ingredients to manufacture a product. Direct labour cost is the cost for the immediate worker directly handling the product to be manufactured. Where by manufacturing overhead cost is the other that other than direct material cost and direct labour cost. If taken Chicken Noodle Soup as a terminology example, the direct material cost are the cost of ingredients needed to produce Chicken Noodle Soup which are dried noodles, water, chicken broth, salt, sugar and it condiments ingredients. In addition, the direct labour cost is the the cook who directly involve in the Chicken Noodle cooking process. Manufacturing overhead cost are the pot, the bowl, the spoon, the stove to cook the Chicken Noodle.

There are 5 types of traceability techniques as stated by Souali Kamal et all, (2017) to assist user to manage traceable items which are information retrieval, ontology, graphs, models and others. In information retrieval as stated by Shahid et all, (2011) is focused in automate traceability link generation by comparing similarity between two type of search item. Ontology techniques in information science focusing into requirement modeling techniques and developed specific traceability taxonomy for continues improvement as well as increase efficiency in retrieving and monitoring manufacturing activities information according to Martin and Machado, (2012)

For traceability techniques number 3 which is the graph techniques is it normally used by software engineer in software system development to define artefacts type, capture traceability links between defined artefacts categories and manage traceability information throught XML files.. Then this trace links then is displayed by populated graphs. Other usage of traceability in graph- based techniques is “to create trace link of test scenarios which help to enhance test coverage measurement and analysis” as discussed by Shahid et all, (2011). The same authors also discussed that the forth techniques which is model techniques “in software development, requirement traceability can be described as a feature model to define a product” which consists of a graph with features and features relations as a node and edges accordingly. In addition, in others techniques used combination of XML as the main tools to represent models and trace link as stated by Souali Kamal et all, (2017). There are others techniques such as Rule-based, Event-Based, Value-Based and Scenario-based also categorized under others technique.

Traceability management consist of planning, organization and arrangement of tasks or activities such as creation, sustaining, maintenance and linkage use for traceability as stated by Wohlrab et all, (2016). It is use in human daily life such as reminder in memorizing events, activities, tasks and others. There is no single and exact definition of traceability. In fact, it has broad meanings which depends on field of studies, industry sector, supply chain related as well as situation which require suppliers and customers or user’s requirement for information needed as stated by Bollen and Emond, (2014).

From Supply Chain Management (SCM) perspective, traceability able to provide answers of what, where, why, when and how respective product information are travelling or processing along a supply chain process based on Pant et all (2015). In IT field according to Clayton, (2000) traceability

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is used to track and provide information of all activities of a system execution for example all the transaction, editing, adding and deleting activities are recorded in event log file based on time, date and action executor based on log in id. In supply chain field, traceability approach is used for decision making tools to optimize routes and improve planning and management. Besides, it has capability to assess current inventory versus the future customer demand in supply and demand tools to control, evaluate inventory or identify process inefficiencies stated by Martin and Machado, (2012)

From electronic point of view, traceability is normally used to keep track and record all information related to changes and transformation of PCB or other electronic components. According to Maro et all, (2016) traceability enable factory to track from beginning of raw material starting from the original lot incoming from supplier, product Bill of Material (BOM) when first reach to factory as well as to the list of operations begin until completed process. According to Souali Kamal et all, (2017) conclude that traceability able to “ensure quality, safety, reliability and accuracy”. At the same time it help organization and company to improve it productivity, reduce unnecessary cost spending as well as increase customer trust and satisfaction towards it brand and product.

METHODOLOGY

Qualitative research method is used for this research which included observation in shop floor as well as data derived from factory System of Record (SOR) for PCB yield analysis. Plan-Do-Check-Act (PDCA) cycle is used as a tools for this research to drive for continuous improvement. Traceability techniques used in this research is combination of information retrieval and ontology. FMEA analysis specific to Human-Human FMEA are applied into identifying potential gap that caused PCB expiry vendor shelf life at 589 location. Figure 1 shows the gap analysis are perform along PCB process. Warehouse system has capability to prioritize PCB issuance to factory based on VED. VED are traceable in warehouse system of record. However, when warehouse system Passover PCB information to factory SOR, VED data not successfully transferred. Then it will not alert factory to prioritize the lot to run first. When it detected, lot already expired need to scrap.

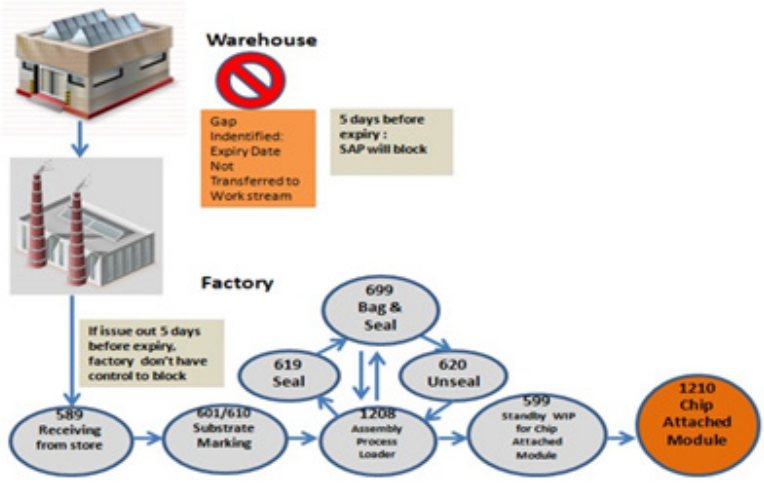

Figure 1: PCB Shelf Life Expiry Control Gap Detection

Poka yoke solution is implemented based on addressing VED shelf life by enabled VED information from warehouse SOR into factory SOR by add on new attribute 5024 to hold VED date. Then whenever PCB triggering script detected PCB lot met, an email will be sent via vigilance triggering system. Then the lot will be automatically auto non hold at 589 operation as shows in Figure 2.

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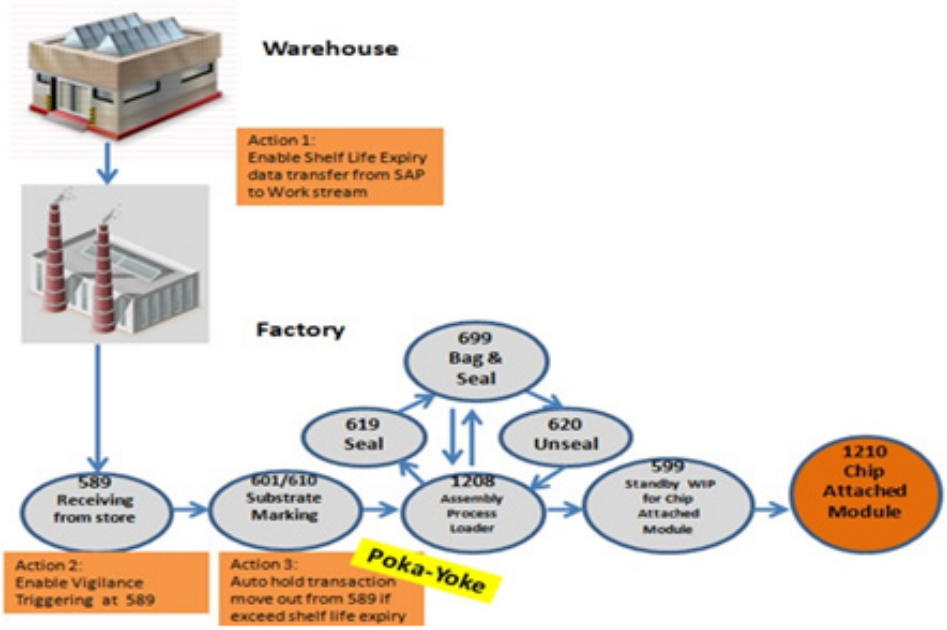

Figure 2: PCB Shelf Life Expiry Detection Control Plan

Figure 3 shows the setting up of new attribute 5024 representing PCB expiry date and it current value. Once the specific lot attribute is done set up, SOR analyst will update and VED lot are traceable in factory SOR.

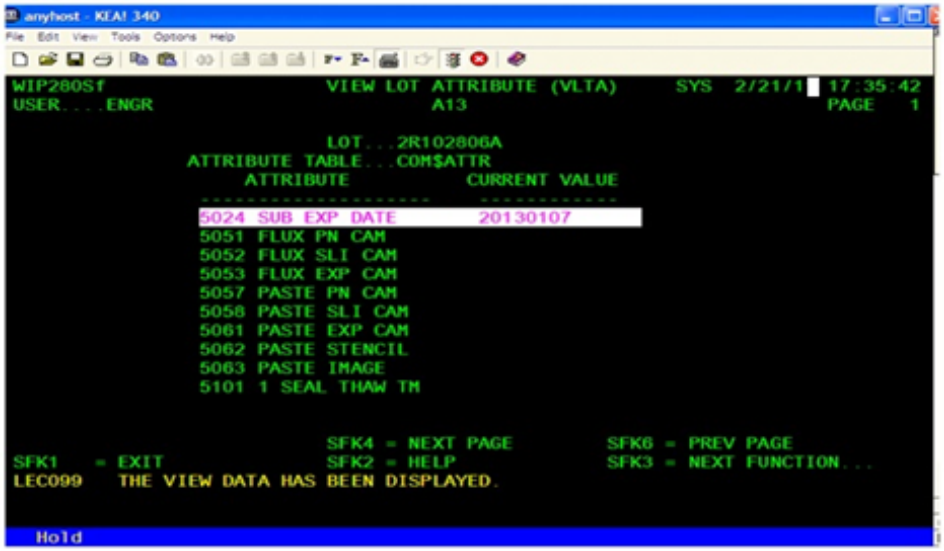

Figure 3: PCB Expiry Date Attribute 5024 Set Up in SOR

After the VED attribute is successfully enabled, additional triggering method are applied to monitor nearly expired VED PCB and already exceeded VED PCB are implement. There are 2 vigilance triggering are set up to alert shop floor team to take action and preventing expiry PCB located at factory as shows in Table 1.

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Table 1: Auto Triggering Vigilance Setting to Address VED Risk Factor

No	Purpose	Condition	Triggering Frequency	PCB Location
1	To salvage near to expiry PCB VED	<14 days than VED	Every 12 hours	589
2	To remove PCB with VED from production and system	VED == Today date	Every 24 hours	589

Vigilance 1 setting is set up to have proactive triggering capability to alert 15 days ahead before actual VED. This is to enable shop floor team opportunity to salvage the near to expiry VED by planning the loading if necessary or there is demand available based on production supply and demand planning rather than let the PCB expired just like that. Another proactive action is enable by turn on Vigilance 2 every 24 hours triggering to shop floor team whenever expired VED date equal to today date

RESULT AND DISCUSSION

Improving Factory PCB Yield Trend and Losses Quantity

Based on traceability implementation, PCB yield trend is improving from 99.37% before the implementation and improved to 99.88% in year 2 and 99.97% in first quarter of yield 3 as shows in Figure 4.

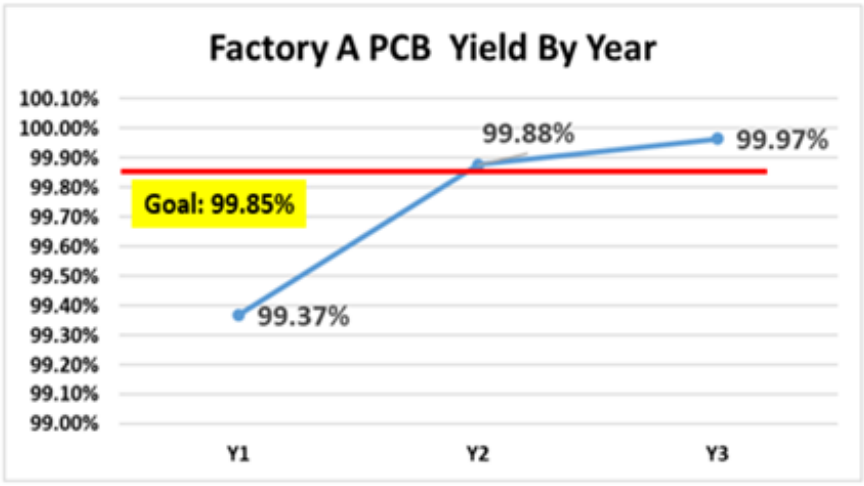

Figure 4: Factory A PCB Yield By Year Performance

There is significant reduction trend of PCB losses quantity up to 90% reduction observed in Year 3 based on Figure 5.

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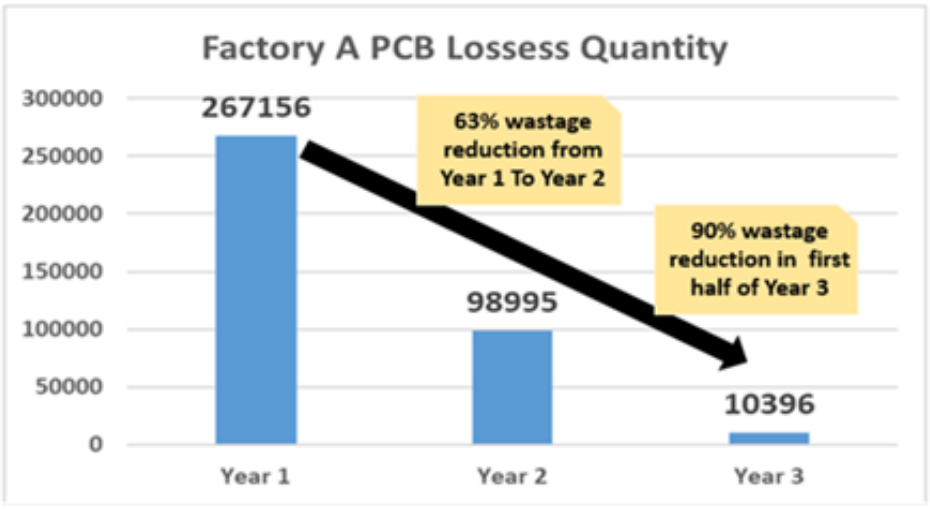

Figure 5: Factory A PCB Physical Waste Quantity Reduction Trend

PCB Expiry (GN203) Losses Trend

Upon traceability capability enabling implementation, PCB losses due to VED expiry as well as MET expiry trend shows 99.84% improvement. From 122, 231 units of PCB scrapped reduce to 190 units upon first half of year 3 as shows in Figure 6. There was 71920 unit scrapped due to incoming material packaging damage which is induced by other factors which is not related to human factors.

Figure 6: GN203 Losses from Year 1 to First Half of Year 3

Cost of Poor Quality Reduction Trend

Based on figure 7, it shows the significant reduction trend in terms of man hours spent to address cost of poor quality as well as the dollar value that able to avoid. A total of 87% improvement on cost of poor quality reduction which equal to 1539 man hours decreased leading to USD 10.8 thousand cost reduction avoidance are saved.

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Figure 7: Cost of Poor-Quality Reduction Trend

PCB Losses Cost Avoidance

PCB unit cost are vary based on it product type. Different product type has different PCB thickness and form factors. Figure 8 shows total PCB losses price by products. There are 3 PCB products and it production name is identify in alphabetical naming due to confidentiality concern.

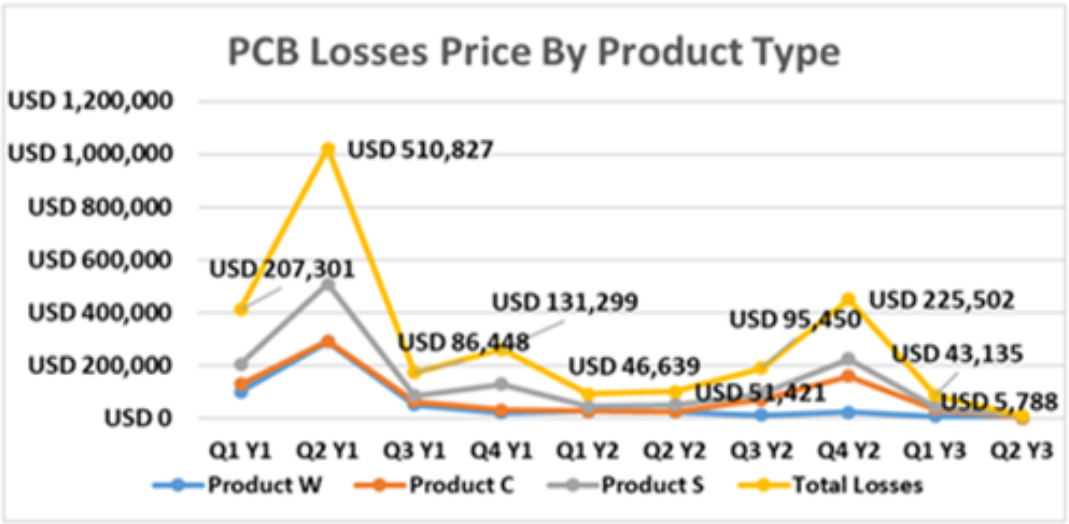

Figure 8: PCB Losses Price by Product Type

Overall PCB wastage reduction year over year too shows outstanding reduction trend. In Year 1, before PCB wastage effort has been implemented, total 267 156 units PCB have been scrapped with value USD 0.936 Million as show in Figure 9. There is reduction trend which is 98 995 units of PCB with value USD 0.419 Million are then scrapped. However, in first half of year 3, scrapped number down to 10 396 units which is equal to USD 0.05 Million.

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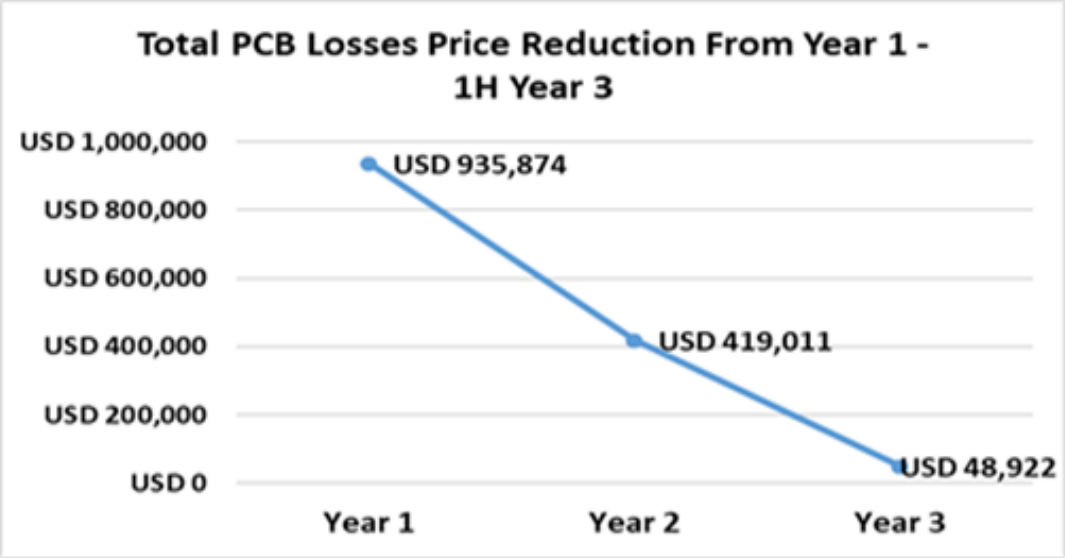

Figure 9: PCB Losses Price for Factory A

PCB with Vendor Expiry Date Proactive Triggering

With this traceability enabling, it contributed for deployment of auto vigilance triggering capability to factory SOR to manage PCB wastage. Factory team are given 14 days ahead notice that the PCB is going to be vendor shelf life expiry and it need to be prioritize to be consumed before it expired with condition there is production loading to this particular PCB product. In addition, production supervisor able to collaborate with loading planner and product planner to plan ahead to utilize the PCB before VED expired and need to scraped immediately. This method indirectly helps production team to be proactive and reduce unnecessary PCB scrapped which will impact factory PCB yield and incurred operational cost.

Starting Point to Enable Proactive Vigilance Triggering for PCB Wastage Management

By implementing this traceability to VED and combine this effort to enable automatic vigilance triggering, it lead to adaptation of same triggering concept to manage and monitor PCB lot which lead to static or unmove lot, nearly expired PCB Moisture Expiry Time (MET) which lead to quality and reliability concerns to factory product if consumed after expired as well as handling phantom PCB lot. Phantom PCB lot is the situation whereby the physical PCB lot exist in SOR but not exist in physical lot or vice versa between warehouse SAP inventory system to factory SOR system.

Knowledge Sharing to Others Factories Plant

Upon the implementation of traceability enabling to address PCB waste reduction , all of Best Known Method (BKM), Business Process Reengineering (BPR) as well as the main poka-yoke solutions which is Automatic Vigilance Triggering are shared across factories in the same organization. This proactive triggering concept can be applied in other area other than manufacturing. For triggering as early reminder to take certain action before the consequences incurred additional cost or unnecessary spending which resulted to waste.

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CONCLUSION

In conclusion, this research has met its objective. An improvement using traceability enabling in material inventory system for material waste reduction effort in assembly manufacturing operation has been proliferated. Factory A achieved 99.85% and above PCB yield yearly from year 1 until year 2 of implementation. PCB scrapped reduction recorded 63% reduction trend within first year of improvement effort and 90% reduction in next 2 years' data after traceability enabling implemented. There is total USD0.5 million is achieved for Factory A PCB Wastage reduction within 6 quarters of implementation.

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LEARNPROG: PROGRAMMING LEARNING TOOL BASED ON AUGMENTED REALITY

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Abstract

Augmented Reality (AR) provides an authentic and realistic learning experience. A new generation of learners are looking a new technology can be used in the learning process rather than conventional learning. Currently, learning process of programming languages using textbook for lab exercises are still lacking. This article discusses the process of designing and developing a LearnProg for lab exercises in programming language learning using AR technology. The aim of LearProg is provide alternative approach to learners to access all lab exercise guides in video format using mobile device. Several experiments have been selected to be included in LearnProg. Future work includes user evaluation of LearnProg on real classroom settings.

Keywords: Augmented Reality, LearnProg, Learning

INTRODUCTION

Education in Malaysia is overseen by the Ministry of Education where each state and federal territory has an education department to coordinate education matters. Currently, the process of teaching and learning more to the traditional with verbal educational method and it is not necessarily effective (Izwan, N. M. B., et. al., 2017). In fact, many educational institutions still use the ineffective method to deliver their lectures which still cause the lack of student interest. Thus, educators have to find the appropriate method in order to deliver the teaching to the student and to give a better approach to improve their learning experiences. One of the way methods of teaching and learning must be changed to more sense such as sight, hearing, sound and touch.

Augmented Reality one approach can be used to enhance student motivation and interest, then support the teaching and learning process. Augmented Reality (AR) is a real-time direct or indirect view of a physical real-world environment that has been enhanced by adding virtual computer generated information to it (Julie, C., et. al., 2010). AR is a field in which 3D virtual objects are integrated into a 3-D real environment in real time (Huma, S., et. al., 2015; Diserio A., 2012). AR for interactive learning in education is the greater context of immersive virtual learning environment. Through the use of advanced technology an empty space is turned into a very rich educational experience. According to JIM Scrivener, the teacher's main role is to help learning to happen which includes involving students in what is going on by enabling them to work at their own speed, by not giving long explanations, by encouraging them to participate, talk, interact, do things, etc. (Scrivener, J. (2005)). AR has the potential to engage, stimulate and motivate students to study, learn and do it itself.

This research will be focuses on the way best to develop application system using AR. Besides that, to enhance the conventional system to the technological approached in Augmented Reality environment with the evolving technology and to ensure that the process of learning become fun and effective.

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AUGMENTED REALITY IN EDUCATION

AR is a very efficient technology for both higher educations such as universities and colleges (Kangdon Lee, 2012). Implementation of AR technology can improve their knowledge and skills, especially on complex theories, technicals or mechanism of systems. AR technology has been implemented in few domains of education such as astronomy, biology, physics, mathematics, etc.

A Nine Planets and Garden Learning System has been developed for nature and earth science materials (Jung, C.Y., 2013). In this system, AR instructional model can give a full demonstration of 3D virtual objects, which is a great advantage model can effectively improve learners' attention and learning outcomes. Moreover, implementation of AR technology in learning process can provide learners with perceptual feedback and interaction, allowing them to understand the content better and reach the learning objectives more easily and less practice through actual interaction with the system.

AR technology also can be used to study the anatomy of the body in biology. This system has been developed based on integrated textbook and AR technology (Siti Syamsudduha, 2019). AR technology can be used in Biology learning activities because it has a validity, practicality, and high effectiveness. In addition, the AR enables students to learn actively, creatively, and support the fun learning. Physics is another area where AR can also be used to demonstrate various kinematics properties. MARPEX has been developed to provide rigorous information beyond conventional experiment practices and additional learning materials in physics (Juliana, A. AbuBakar,. et. al., 2018). MARPEX app is unique path for students to discover the fun of science experiments. This app provides an opportunity to control the manipulating, responding, and constant variables in the respective experiments. Students can experience the zoom in and zoom out function by pointing the mobile closer or move it further from the AR bookmark respectively. They can visualize it in 3D environment allowing them to pan and rotate the 3D models. Through this app, physics experiments learning can be more interesting and fun.

AR technology is significantly providing an innovation approach in learning and teaching process and also give more benefits to students and educators. In addition, AR technology can be more interesting by integrated with mobile device. Nowadays, mobile device is not only for communication purposes but also can be used as a tool in teaching and learning process. This paper proposed an alternative approach to study and learn programming language by integration of AR technology and mobile device.

ARCHITECTURE OF LEARNPROG

"LearnProg" application is proposed for learners/students to learn and study about programming language. LearnProg are divided into four (4) components. There are learners, augmented reality (AR), mobile app and sources. Based on Figure. 1, AR will be integrated with mobile device in order to allow learners used the mobile device to access all sources such as video, audio, etc.

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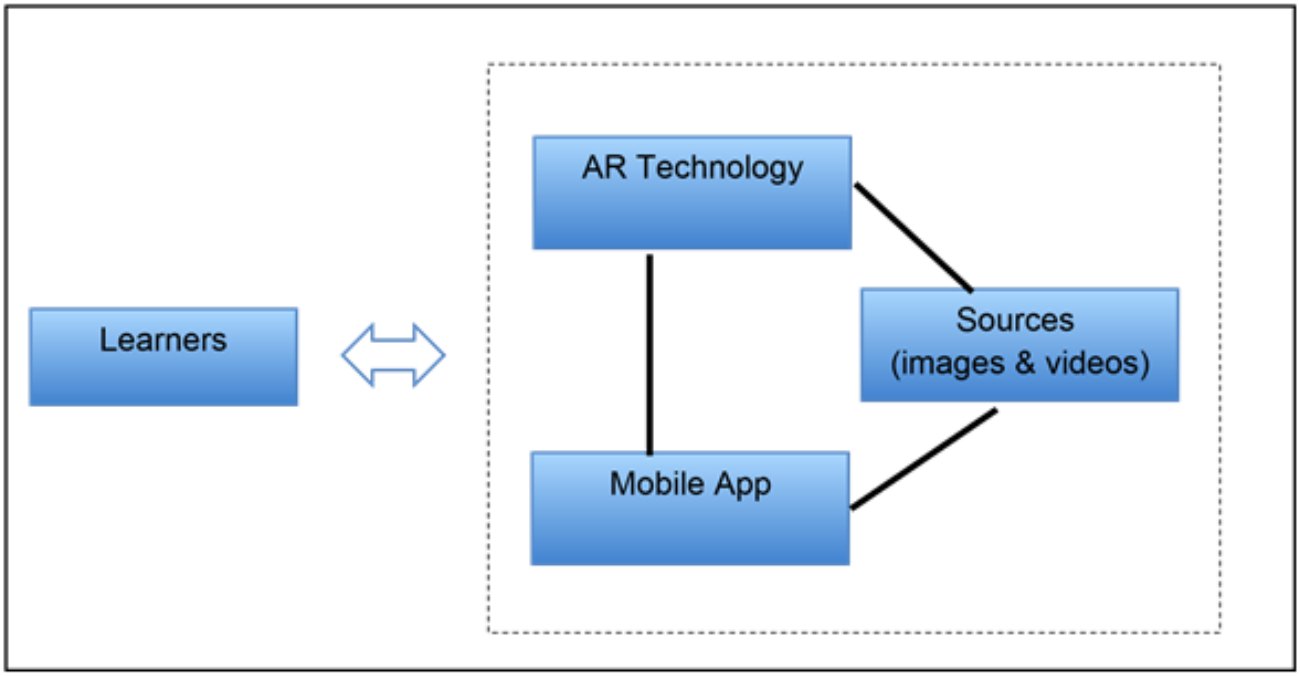

Figure. 1: Architecture of LearnProg

Based on the architecture of LearnProg in Figure. 1, we can define N is set of components in LearProg; N = {A, B}, which are A as learners, B as a combination among AR technology, mobile app and sources.

A is a set number leaners and can be defined as A = {u1, u2, u3, un}, which is u1 until un is number of learners.

B is a set number of components in augmented reality for development of LearnProg. Let B = {X, Y, Z} which is X is AR technology, Y is mobile app and Z is sources.

Interaction among AR, mobile App and Sources

The interaction components; among AR, mobile app and sources are important for development of LearnProg in order to allow learners using this application. Fig. 2 shows the interaction among these components. Based on Figure. 2, image is represented as a maker and each image must be pointed to correct video. Simple algorithm is required between image as a maker and video. The process is simple, when learners scan the image, the application is automatically search a correct video, then display to learners in video format.

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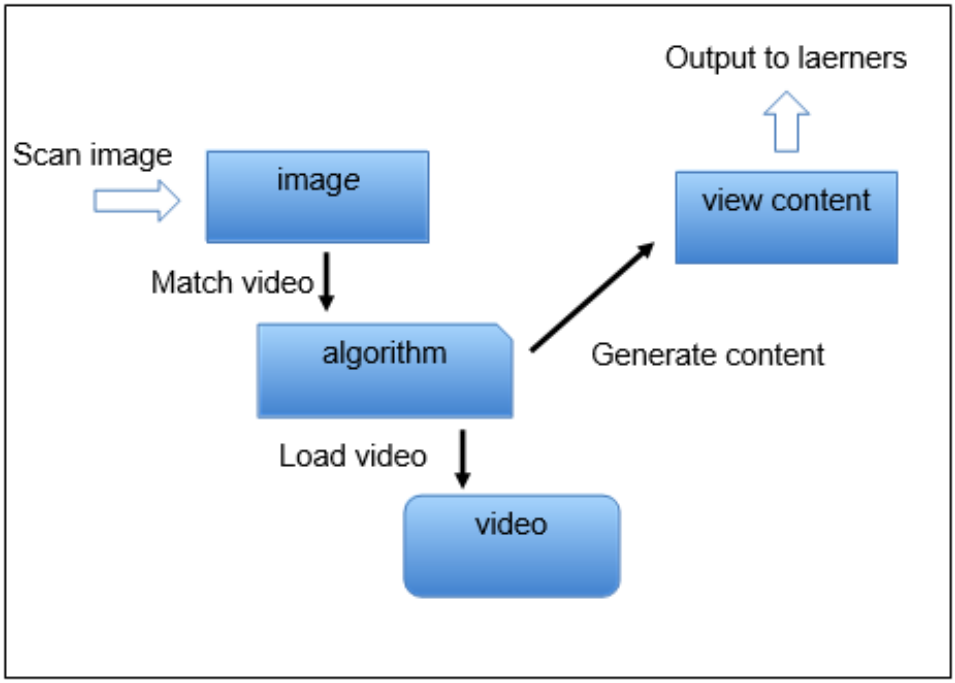

Figure. 2: Interaction between AR and mobile app

Based on Figure. 2, we can define S is set of image. Let S = {s1, s2, s3, sn}, where s1 until sn number of images. Meanwhile, V is set of video. Let T = {t1, t2, t3, tn}, where t1 until tn is number of videos. Finally, U is set combination elements of S and T. Let U = {s1.t1, s2.t2, s3.t3, sn.tn}, where s1.t1 until sn.tn is number of combination between image and video. Figure. 3 shows a simple algorithm between image and video. Based on Figure. 3, input value can be any image, elements of S. Then, the searching process will be find out a correct video based on value of sn.

Input: image, s_n // s_n can be any image, element of S
Step:
Declare elements number of S equal to i, Declare
elements number of T equal to j.
Set variable k equal to 1
while (k! = i) { // find a correct video based on image, s_n
U = $s_k.v_k$
}
Output: display U // elements of U

Figure. 3: Simple algorithm to match image and video

IMPLEMENTATION AND RESULTS OF LEARNPROG

LearnProg has be developed using Unity and C# as a programming language. In this development, textbook in learning and teaching programming language will be replaced using a brochure. Figure. 4 shows an example of selected information from textbook are transform into a brochure. Based on Figure. 4, four (4) images are represented as a maker.

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Based on the definition above, S = {s1, s2, s3, sn}, where image 1 equal to s1, image 2 equal to s2, image 3 equal to s3 and image 4 equal to s4.

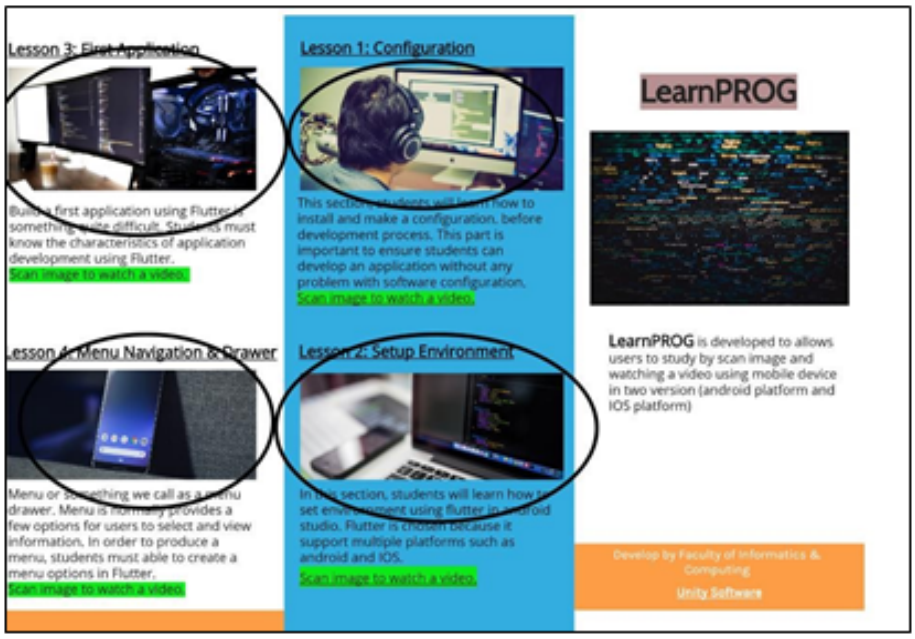

Figure. 4: Brochure template

The purpose of this maker is to allow learners to scan the image and play a video for learning process. Each maker must point to correct video. Figure. 5 shows, how a maker is embedded with a correct video using Unity.

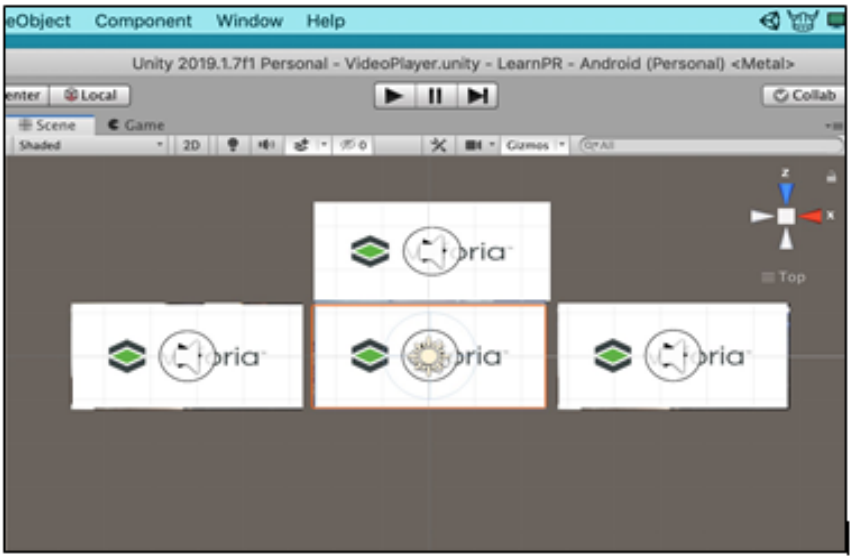

Figure. 5: Combination image and video

Based on the definition above, T = {t1, t2, t3, t4}, where video 1 equal to t1, video 2 equal to t2, video 3 equal to t3 and video 4 equal to t4.

When a learners scan the image, LearnProg is automatically detect and load the correct video such as in Figure. 6. Based on the definition above, U = {s1.t1, s2.t2, s3.t3, sn.tn}, where s1.t1 is combination between image as maker and video.

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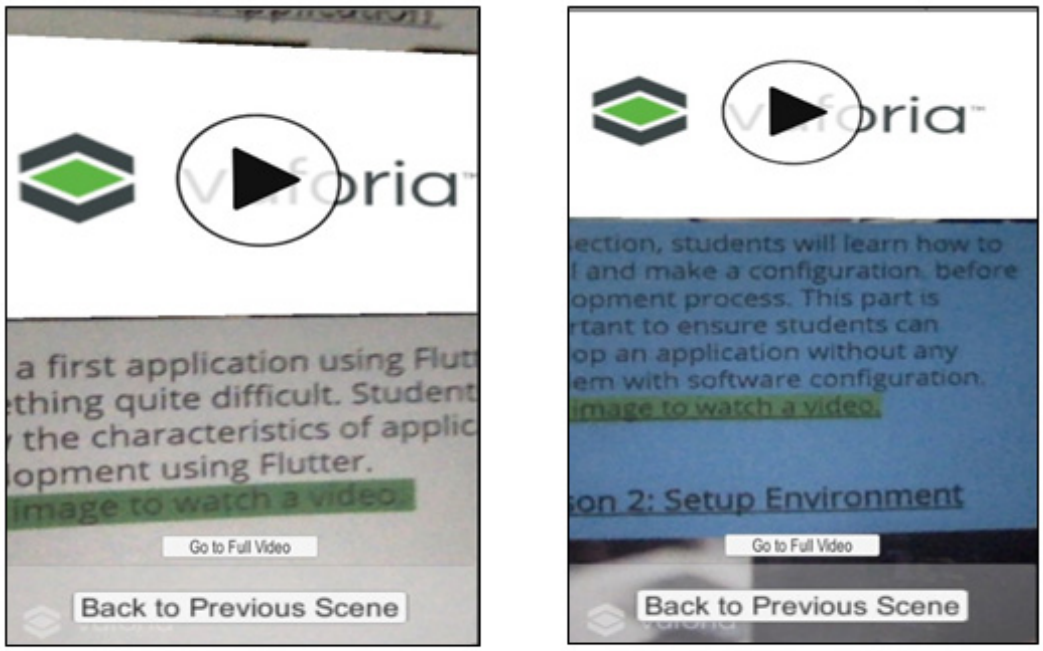

Figure. 6: Load video

When a learners click the play icon in Figure. 6, LearnProg is automatically display a video. From the video, learners will learn about programming language via mobile device. Figure. 7 shows an example of tutorial video appear when learners click the play icon.

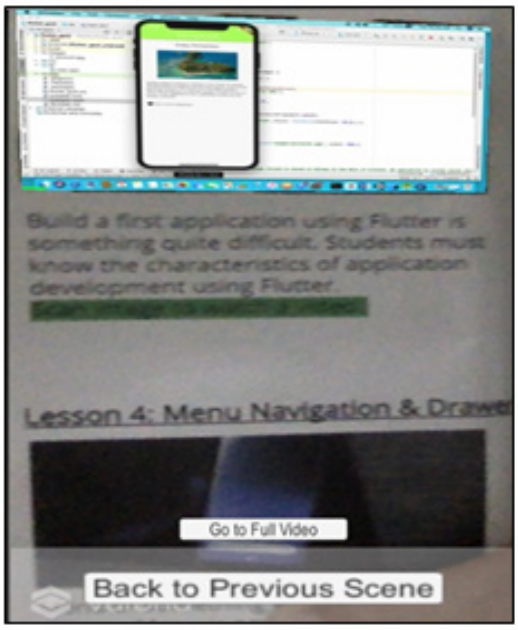

Figure. 7: Example of tutorial video

CONCLUSION AND FUTURE WORK

LearnProg is innovation product to replace a traditional approach in teaching and learning process. Combination of mobile app and AR technology give more benefits not only for learners but also in education environment especially in teaching concepts, presentation, learning type and content understanding. Table 1 shows the impact of implementation LearnProg in education environment.

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Table. 1: Impact of LearnProg

Categories	**Components**	**Explanation**
State of mind	Increased motivation	More interested, and engaged to deal with new technology
	Increased attention	Attention users pay to the technology and thus to the teaching and learning content
Presentation	Increased information accessibility	Can improve and ease the access the information
	Increased interactivity	New ways of interaction with the learning tool
Content understanding	Improve development of spatial abilities	Students are able to acquire a new level of spatial abilities
	Improve memory	Refers to the retention of knowledge acquired during the use of an AR application
Learning type	Increased creativity	AR supports creative learning, supports students' creativity and the ability to explore and absorb new knowledge

The future direction of this study are to focus on the interface and functionality evaluation by experts as well as to gather user evaluation. Intrinsic and extrinsic motivation will take into consideration to determine the learning experience using LearnProg.

This paper can provide guidance for the AR developers and academicians whom interested to pursue research related to this background.

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IMPROVED CONTROL STRUCTURE FOR 3D OBJECT ROTATION WITHIN HANDHELD AR

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Abstract

Augmented Reality (AR) is a technology designed to allow a 3D virtual content to be overlaid and interacted with our real surrounding in real-time. Handheld AR interface often refers to the use of any movable handheld device to offer compatible interaction in AR applications especially which installed within smartphones and tablets. This paper focusing only on interaction that involved 3D object rotation within handheld AR interface. One of the interaction categories which is the device-based interaction has been focused due to its robustness towards conclusion and two-hands interaction. A new control structure in device-based interaction category is proposed to answer one of the existing issues and further evaluation will be carried out to measure the performance of the proposed technique.

Keywords: Device-based, Interaction technique, 3D interaction, 3D rotation.

INTRODUCTION

Recently, handheld augmented reality (AR) has begun to be seen as a major research area. Handheld devices are capable of executing AR more robustly compared to see-through devices such as head-mounted displays (HMD) (Wagner & Schmalsteg, 2006). Handheld device is a relatively new approach in AR where the user can see through the device's video camera and perceive the environment enriched by 3D objects. Recently, handheld devices commonly refer to smartphones which, specifically: have built-in powerful processors; are attached with high-resolution cameras; and can run a range of sensors such as Global Positioning Systems (GPS), accelerometers and magnetometers (Kurkovsky, Koshy, Novak & Szul, 2012). These components are companionable with running a conservative AR system and use in a movable device; with the added advantage of being portable and appropriate for personal use. Users do not need to carry or wear any special equipment and the applications are not constrained to any specialized area (Kurkovsky et al., 2012; Sa & Churchill, 2012).

Besides, AR has been upheld as the new direction in human-computer interaction (HCI) field to enhance human ability in HCI using AR (Rekimoto, 2014). Due to this concern, interaction in AR becomes the main topic and research interest among researchers. One of the important aspects is creating appropriate interaction techniques for AR applications that allow end users to interact with virtual content in an intuitive way (Zhou, Duh & Billinghurst, 2008). As stated in (Billinghurst, Kato & Poupyrev, 2001), one of the interaction categories is handheld interaction. Handheld interaction and entail 3D interaction in AR due to the rapid advent of application on cell phones, and now smart phones, bringing AR almost to the main stream (Kruijff, Swan II & Feiner, 2010).

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In handheld AR, there is a number of important differences between using a handheld AR interface and a traditional desktop AR interface, including: 1) different input options (no mouse or keyboard) (Billinghurst, Kato, Myojin, 2009), 2) limited screen size (Billinghurst, Kato & Myojin, 2009), and 3) limited activity time due to the battery operation hour of handheld devices. Meanwhile, compared to the traditional head-mounted display-based AR system, display and input devices in handheld AR are connected which means that interface metaphors developed for desktop and head-mounted display-based systems may not be appropriate (Billinghurst et al., 2009).

On the basis of these concepts, many techniques have been introduced based on handheld AR interaction that allow the user to interact with the virtual object in real environments. In handheld AR, the 3D object manipulation is one the main tasks for user to interact in AR system discussed in many previous works (Hancock, Carpendale & Cockburn, 2007; Martinet, Casiez & Grisoni, 2012; Polvi, Taketomi, Yamamoto & Dey, 2016) that are based on fundamental 3D object manipulation tasks including 3D object selection, translation and rotation (Bowman, Kruijff, LaVoila & Poupyrev, 2005). Thus, many interaction techniques proposed are based on 3D object manipulation since one of the essential parts of AR applications is the spatially consistent alignment of virtual and real objects (Azuma, Baillot, Behringer, Feiner, Julier & MacIntyre, 2001) that required accurate and efficient 3D manipulation. It is crucially important when AR potentially has been explored to support the real-world assembly tasks (Boud, Haniff, Baber & Steiner, 1999; Webel et al., 2013; Radkowski, Herrema & Oliver, 2014; Funk, Kosch, Greenwald a&nd Schmidt, 2015; Dini & Mura, 2015). Hence, this paper focuses on the interaction techniques used in handheld AR to perform 3D object manipulation tasks which consist of 3D object translation and rotation that are fundamental in 3D interaction (Hancock, Carpendale & Cockburn, 2007; Bowman et al., 2005).

INTERACTION CATEGORIES IN HANDHELD AR

According to Polvi et al., 2016; Tanikawa, Uzuka, Narumi & Hirose, 2015; Samini & Palmerius, 2016, interaction technique in handheld AR can be categorized mainly into: 1) touch-based interaction, 2) mid-air gesture-based interaction and 3) device-based interaction based on 3D object manipulation tasks.

Touch-based interaction is an interaction category that involves all uses of on-screen touch inputs that are performed by fingertips for the manipulation of 3D objects. The mid-air gestures-based interaction category includes all techniques by means of tracking the bare hands or finger gestures as inputs that allow the manipulation of 3D objects. The device-based interaction category includes techniques that enable the handheld device's physical attributes to be tracked for 3D object manipulation. Users rotate, tilt, skew, or move the handheld device itself as inputs so as to manipulate the 3D object. Each category has its own strength and drawbacks.

In touch-based interaction, high accuracy rate (Hancock et al., 2007; Polvi et al., 2016) in manipulating 3D object is its main strength, however it is suffering several other problems such as occlusion (Jung, Hong, Park and Yang, 2012; Bai, Lee a&nd Billinghurst, 2012; Mossel, Venditti & Kaufmann, 2013), fatigue phenomenon since users need to hold the handheld device with one hand and stretch out another hand to interact (Yusof, Bai & Billinghurst, 2016; Benko & Feiner, 2007; Boring, Ledo, Chen, Marquardt, Tang & Greenberg, 2012) and also the difficulties to using more than 2 finger touches to manipulate 3D object (Bai et al., 2012; Lee, Yang, Kim, Jo and Kim, 2009).

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Although some researchers had provided several solutions towards some of these highlighted problems (Vogel & Paudisch, 2007; Paudisch & Chu, 2009) but those solutions are extending to other problems that still retain unsolved especially occlusion and fatigue still are the issues required serious attention. In mid-air gestures-based interaction, low accuracy rate, occlusion and fatigue are some of the existing issues (Hancock et al., 2007; Jung et al., 2012; Yusof et al., 2016; Paudisch & Chu, 2009; Kim & Lee, 2016; Hürst & Wezel, 2013; Chun & Höllerer, 2013; Bai, Lee, Ramakrishnan & Billinghurst, 2014; Hincapié-Ramos, Guo, Moghadasian & Irani, 2014; Xu, Gandy, Deen, Schrank, Spreen, Gorbsky & MacIntyre, 2008). Solution had been suggested previously (Jang, Noh, Chang, Kim and Woo, 2015) for fatigue issue, but this solution is expensive due to the huge calculation requirement and also the limitation of the numbers of dataset according to each of the potential hand and fingers motions. Also, the other problems still remain unsolved.

As for device-based interaction, although it is suffering two (2) main issues according to large-range 3D rotation and, position and orientation deviation problems that lead to slow 3D object rotation unilaterally and 3D manipulation comprehensively (Samini & Palmerius, 2016; Mossel et al., 2013; Lee et al., 2009), it is the only interaction category that allows the user to interact with both hands and without occlusion problem (Polvi et al., 2016; Tanikawa et al., 2015; Benko & Feiner, 2007). In this context, we chose device-based interaction category as our main study to detail up according to its limitations stated in the following section.

DEVICE-BASED INTERACTION

Device-based interaction appeared to be the most appropriate technique to be explored in detail based on the two (2) primary issues of occlusion and fatigue phenomenon. Currently, the existing device-based interaction technique maps the position and rotation of the handheld device with the 3D object; when the user moves and rotates the handheld device, the 3D object will also be moved and rotated. The existing technique had been proved effective when being used for 3D object translation as stated in the previous studies (Samini & Palmerius, 2016; Mossel et al., 2013; Lee et al., 2009) until it was used in the comparison process for 3D object translation (Polvi et al., 2016) within handheld AR interface. However, the existing device-based technique consists two (3) main problems stated previously in Section II which are: 1) large range 3D rotation, and 2) 3D object' position and orientation deviations. Both problems lead to 3) slow 3D object rotation unilaterally and slow 3D object manipulation comprehensively.

Large Range 3D Object Rotation

Large range 3D object rotation is not a new problem; it is also occurred in mid-air gesture-based interaction category (Marquardt, Jota, Greenber & Jorge, 2011). In existing device-based interaction, large range 3D object rotation cannot be performed effectively because over-rotation of the handheld device may occur when user wants to rotate the 3D object on x and y axes in short time (Samini & Palmerius, 2016; Mossel et al., 2013; Marzo, Bossavit & Hachet, 2014). Device' over-rotation can cause 3D object registration error when AR marker not exist in the trackable range and user may also cannot view the 3D object on the display screen when device is rotated on certain rotation angles.

Although solution towards large range rotation problem had been suggested by (Samini & Palmerius, 2016) that is holding 3D object at different holding points to complete large range 3D rotation, it is still cannot prevent user from over-rotate the handheld device.

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Position and Orientation Deviations

In the existing device-based technique, only one (1) control structure which is mapping the 3D object' position and orientation with the position and orientation of the handheld device' built-in camera had been used to translate and rotate 3D object integrally. The full degree of freedom (6DOF) that consists 3DOF for 3D translation and 3DOF for 3D rotation are controlled integrally thus it is impossible to move the 3D object without rotate it and oppositely. As stated in (Samini & Palmerius, 2016; Mossel et al., 2013; Marquardt et al., 2011). Currently, this problem still retains unsolved.

Slow 3D Object Rotation and Manipulation

Both issues stated previously lead to the slow 3D object rotation unilaterally and 3D object manipulation comprehensively. As stated in Figure 2, holding object at different holding points required the user to hold and release the object frequently and device reposition is required to adjust the 3D object allocation. Furthermore, user needs to move around (rotate the device around) to orient the 3D object on z-axis that had been proven slow (Polvi et al., 2016; Samini & Palmerius; 2016; Mossel et al., 2013; Marzo et al., 2014).

Following is the position and orientation deviations which causing the user to adjust the 3D object position and orientation to achieve accurate allocation which may also slowing down the 3D object manipulation process.

PROPOSED TECHNIQUE

In order to answer one of the above problems which is the large-range 3D object rotation issue, we suggest a new control structure that still within device-based category. We utilize the device's tilting and skewing amplitudes on x, y and z axes to determine the rotation axes and directions supported with automatic angular speed per second (Figure 1). This proposed technique retains the strengths of device-based technique which still can be used for both hands' interaction without occlusion.

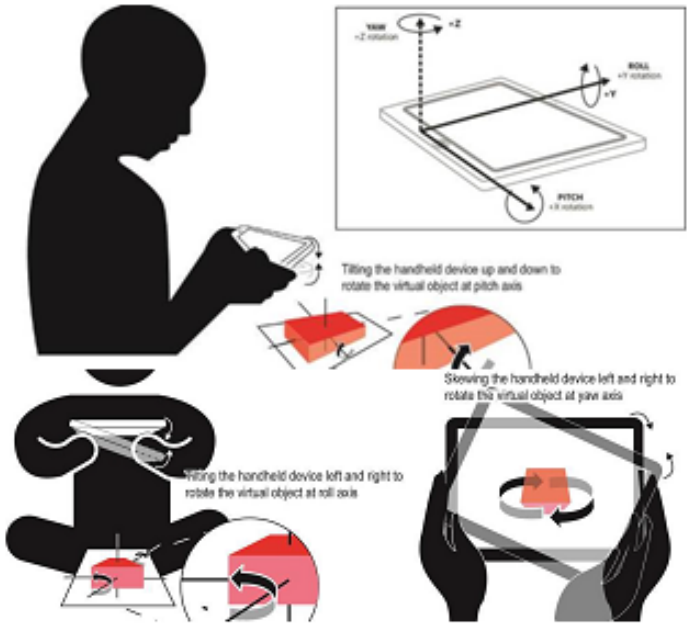

Figure 1. Proposed device-based interaction technique that utilizes tilting and skewing amplitudes of a handheld device to determine the axes and directions supported with pre-defined angular speed per second to rotate 3D object in a handheld AR interface.

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Through the design of automatic pre-defined angular speed per second, device' over-rotation can be prevented. By enhancing the existing technique through the solutions explained above, we believe it can improve the current technique towards its performance on task completion time by providing faster 3D rotation unilaterally and 3D manipulation comprehensively.

CONCLUSION AND FUTURE WORKS

Due to the huge market potential for handheld devices, handheld AR has played a predominant role in present researches (Zhou et al., 2008; Dey. Billinghurst, Lindeman & Swan, 2018). It has found application in tourist industries (Chen, 2014), maintenance (Mourtzisa, Zogopoulosa & Vlachoua, 2017) and task support (Polvi, Taketomi, Moteki, Yoshitake, Fukuoka and Yamamoto, 2018), education (Rezende, Albuquerque & Ambrosio, 2017), and medical practices (Vávra, Roman, Zonča, Ihnát, Němec, Kumar, Habib & El-Gendi, 2017) respectively. An essential part of AR applications is the spatially consistent alignment of virtual and real objects (Azuma et al., 2001) that required accurate and efficient 3D manipulation. It is crucially important when AR potentially has been explored to support the real-world assembly tasks such as (Webel, Bockholt, Engelke & Peveri, 2013). Currently, many of the existing handheld AR applications are not considered very practical due to insufficient functionality and not being able to fully answer to the needs of the users (Olsson, Lagerstam & Kärkkäinen, 2013). Many design and technical challenges still remain and 3D manipulation (including 3D translation and rotation) is one of them. In order for handheld AR to become widely accepted, the users must be able to create AR contents by positioning and rotating virtual objects in the real environment (Langlotz, 2013). In this context, the basic 3D manipulation (Bowman et al., 2005) of virtual objects is fundamental in handheld AR content creation.

Therefore, the existing device-based interaction technique that is free from occlusion and can be interacted using both hands should be given the priority to solve its remaining issues immediately and become our motivation. It is believed that the proposed technique can improve the existing device-based interaction technique that only utilized the mapping of built-in camera position through its performance. It is considered that it will be faster in performing the 3D object rotation task. Further performance test is being planned to compare the proposed technique with the existing technique due to their performances on 3D object rotation task.

Besides, through the improvement on the 3D rotation technique also, it can be implemented in AR supporting training tools within the education system especially related with technical and vocational (TVET). Improvement towards the interaction within trainee and the AR training tools and providing better AR experience in the enhanced learning process.

eISBN

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TCP PERFORMANCE OVER WIRELESS ACCESS IN VEHICULAR ENVIRONMENTS (WAVE) IN VEHICULAR AD-HOC NETWORKS (VANETS)

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Abstract

Vehicular Network is a network design that involves communication between vehicles and vehicles, vehicles and roadside units and sometimes among Wireless Access in Vehicular Environment (WAVE) devices. WAVE system using Dedicated Short-Range Communication (DSRC) technology is a new system, designed to facilitate and to enhance message dissemination operation in a vehicular network environment. The purpose of this study is to evaluate the performance of the Transmission Control Protocol (TCP) operating within the WAVE system. It is well known that TCP originally was developed dedicated to fixed network. The questions are: How TCP handle large amounts of data that moves with various speeds in the vehicular network? Do the WAVE systems act the performance of TCP? Therefore, the method using NCTUns 6.0 simulation tool will be used to measure the performance of TCP in terms of throughput and packet drop.

Keywords: Vehicular Network, WAVE, DSRC, NCTUns

INTRODUCTION

The origin of Intelligent Transportation System (ITS) started in nineteen sixties with the development of the Electronic Route Guidance System (ERGS) in United State of America. Then in 1986, Intelligent Vehicle Highway System (IVHS) was formulated and originally led to the development of ITS America in 1996. The same era saw the development of Japanese Comprehensive Automobile Traffic Control System (CACS) program (L.Vanajakshi et.al., 2010). This trend leads to the shifting in vehicles' technology where automotive industry particularly car manufacturers are competing in order to be the world leading organization. They collaborate with researchers from various fields in deploying the latest technology to meet customer needs and in line with other vehicles industry.

The ITS is not complete without the support of a wireless network environment specifically the Vehicular Ad hoc Networks (VANETs). This new type of network is categorized under Mobile Ad hoc Networks (MANET) which involves the movement of nodes from one network coverage area to another area but with distinct characteristics that include frequent topology changes and vehicle speed range. Hence, networking engineers, designers and researchers are currently working on enhancing the efficiency and performance of VANETs either focusing on the physical and MAC layer, network layer, transport layer and also at application layer.

RESEARCH BACKGROUND

Vehicular Ad-hoc Networks (VANETs) is a kind of network which involves vehicles-to-vehicles wireless communication and vehicles-to-roadside communication. Figure 1 show the basic components of vehicular networks which encompasses of vehicles and roadside units. The road design could be one lane or multiple lanes, straight lane or intersection and the vehicles move either in the same direction or opposite direction.

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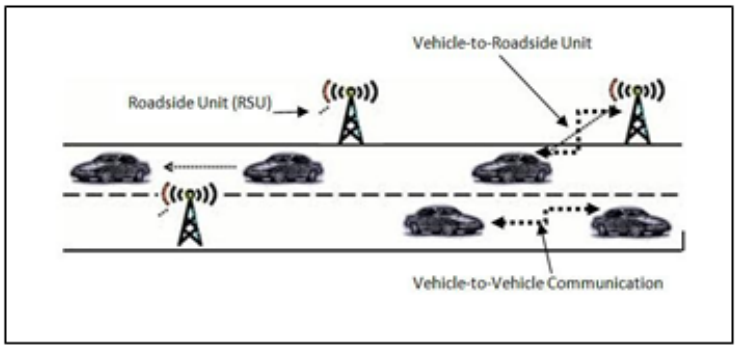

Figure 1: Basic Components of Vehicular Networks

In vehicular networks environment, the scenario in which vehicles communicate to other vehicles is called V2V communication and the communication between vehicles and the base station or roadside units(RSUs) is called V2R communication. The vehicles are equipped with wireless devices called On Board Unit (OBU) to communicate in the networks. The Wireless Access in Vehicular Environment (WAVE) system using the Dedicated Short-Range Communications (DSRC) technology with IEEE 802.11(p)/1609 protocol standard was defined by the Internet Engineering Task Force (IETF) to improve the communication of vehicles in the VANETs environment which can support the data transfer in rapidly changing communication environments.

Wireless Access in Vehicular Environment (WAVE) is a radio communication system intended to provide interoperable services to transportation. It provides the rules of communication between vehicles and vehicles, between vehicles and roadside units and among WAVE devices in the vehicular environments and employed the Dedicated Short-Range Communications (DSRC) technology which is highly dependent on cooperative standards for interoperability. The protocol standards for WAVE systems are the IEEE P1609.0 - WAVE architecture, IEEE P1609.1 - Resource Manager IEEE P1609.2 - security services, IEEE Std 1609.3 - Networking Services, IEEE Std 1609.4 - Multichannel Operation, IEEE Std 802.11 - Local and Metropolitan Area Networks and IEEE Std 802.11(p) - amendment of 802.11 for WAVE as shown in Figure 2.

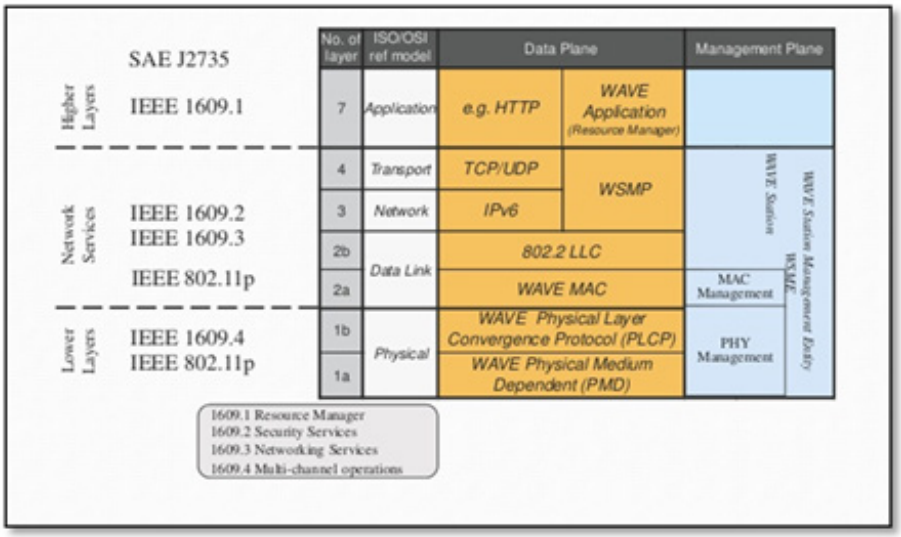

Figure 2: WAVE Protocol Stack

From Figure 2, this research will focus on the performance of TCP protocol over the WAVE message-passing operation. Detail information on how efficient TCP over the WAVE systems is going to be the main matter in this research.

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Transmission Control Protocol (TCP)/Internet Protocol (IP) is the well-known internet protocol that is connection-oriented and communication reliability. It is said as reliable because TCP implements the flow and error control. This is to ensure that the message sent arrived in order and complete at the destination. Furthermore, the connection established through the handshaking process where the sender must wait for acknowledgement from the receiver before sending the message.

PROBLEM STATEMENT

TCP/IP is well known as the best protocol for wired connection, but from the results of research that were implemented decades ago, TCP performance is not impressive when used in wireless network environment. Currently, related to VANETs, the IEEE Standard for Wireless Access in Vehicular Environments (WAVE) states that the WAVE systems support the IPv6 as well as the transport layer protocol. This shows that TCP protocol can be employed in VANETs. The applications used in VANETs such as file transfer and electronic banking required the use of transport layer protocol that ensure the contents of data are intact and complete, especially when related to disseminate a bulk of data, which is important and confidential. There are several questions to be answer. How efficient TCP/IP in disseminate WAVE messages in vehicular networks? Then, could TCP be used as a transport mechanism in vehicular networks, which is very dynamic in terms of the speed of vehicles and topology changes? Next, why the IETF, stated in the document standard, that the WAVE system supports TCP protocol operation, when known, the performance was not improved. Moreover, the results of research conducted by many researchers as in the literature review proved that WAVE systems still need a room for improvement. This means that the TCP protocol performance within the WAVE system is yet to be proven from various perspectives. Therefore, this study will evaluate the TCP performance within the WAVE system through different point of view.

RESEARCH OBJECTIVES

The general objective of this study is to measure the performance of TCP in message dissemination through the WAVE system. The measurement result is to verify the efficiency of TCP performance and finally make a conclusion whether TCP is the right mechanism to be used in the vehicular networks' environment. Next, the specific objectives of this research includes:

1. To study the relationship between TCP throughput and transmission range by inclusion of vary vehicle speeds

2. To measure the packet dropped within certain transmission range and simulation time.

LITERATURE REVIEW

The early research papers, (Auge and Aspas, 1998) and (Ratnam and Matta, 1998) had stated that the problem of the TCP when applied to wireless link is due to frequent handover processes, which lead to frequent packet losses and bit of error rates (BER). This burst of errors decreased the performance of transport protocol. Starting from that time, many studies have been conducted to evaluate the performance of TCP and suggested solution on how to improve the performance. However, the study found to vary according to the latest technology of that time.

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Further, the trend of research continues with the evaluation on the TCP performance over different types of communication network. The TCP used in wireless communication network results in unforeseen problems due to uncertainty in wireless links at radio link level. High bit errors and frequent handoffs in the radio link are interpreted by TCP as congestion, and the actions taken to mitigate congestion result in poor or degraded performance (V.Vaidya and A.Jeyakumar, 2016).

Based on the VANET environment specifically, a study was done to look at the performance of MPTCP on two VANET scenarios: Vehicle-to-Infrastructure (V2I), and Vehicle-to-Vehicle, (V2V) under distinct velocities. From the results of the study, it demonstrates that MPTCP performance does not suffer significant impact under moderate velocities, 45mph in their experiments; however at higher speeds, MPTCP performance starts to suffer (J.Mena et.al., 2017).

Many video streaming applications in VANET are used to improve safety issues and help to have a more comfortable ride. However, there are some important challenges including, high VANET dynamic topology, links disconnection and transmission video errors which decrease the video quality in such networks. (Yesin Sahraoui et.al., 2018) proposed an adaptation of UDP and TCP protocols for video streaming in VANET. The metrics considered in the study are throughput, packet delivery ratio, end-to-end delay and PSNR.

Currently, researchers (W.Na et.al. 2019) study on the technical challenges for mmWave TCP design in Connected Vehicular Networks (CVNs). Principally, they examine how con-ventional TCP functions, such as congestion control, error control, and flow control, work in the CVNs. The simulation results show that existing TCPs cannot accurately detect network congestion due to various link errors in mmWave CVNs. The research does not stop and now, since the appearance of the vehicle network, many researchers began to study of VANETs. Although few studies found to be concerned with WAVE technology, but it is believed that most of the studies in progress right now are focusing on the evaluation and development of VANETs, specically on the impact of WAVE systems in the vehicular network environments. At this point, this research paper is focusing whether the TCP protocol is an effective protocol in the WAVE systems.

This research proposal indicates that the TCP throughput varies depending on the varies of vehicle speeds and congestion window size. The flexibility of window size would help to increase the TCP throughput and thus increase the performance of the TCP but with the changes of vehicle's speed, the result would be different.

RESEARCH METHODOLOGY

This research will implement the NCTUns-6.0 simulation tool because it is a real-world network device which can set up TCP connections with any host in the simulated network to exchange their information. In addition, packets generated from a simulated network can be directed to a router in the real world and then come back into the simulated network to test the functions and performance of a real-world router. These unique capabilities are difficult to achieve by traditional network emulators. Moreover, the simulation method was used by prior researchers in this area and it is very helpful in the research process.

Two performance metrics are selected that are: (i) Throughput which is a total number of received packets by the receiver. It is calculated in bytes/second. (ii) Packet dropped which is the number of packets that does not reach the destination. The parameters selected for presented are: 1. Number of nodes 2. Speed of nodes 3. Transmission Range

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CONCLUSION

In conclusion, it is hoped the recommendations of this study can produce results that can help others to make conclusions concerning the performance of TCP in the WAVE system. After investigating, still less research conducted on this TCP performance. If a lot of research results, stating that TCP is not suitable for vehicle network environment, it is only natural that the IETF to make changes to the standard document produced. Then, this WAVE system performance should be improved, to enable larger data transactions, worked well.

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FRAMEWORK FOR DOCUMENT FEATURE EXTRACTION BASED ON UNOCCUPIED SPACE USING TRIANGLE MODEL

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Abstract

Document identification is used to extract information from an offline document such as Al-Quran, articles, agreement, etc. With increasing digital documents on the internet, it is crucial to identify that the document is genuine or not. However, the problem occurs when character recognition did for a particular language only, and it is hard to recognize character when the image dataset size was small. Therefore, the purpose of this research is to propose a framework for document feature extraction based on unoccupied space using the triangle model. This research will review the framework from other researches. Then, it will come out with the proposed framework adapted from the review framework and modified to suit this research. This research using the local dataset and the proposed techniques such as Otsu's method, vertical histogram projection, triangle model, SVM, and MLP classifier.

Keywords: Document identification; Unoccupied space; Otsu's Model; Vertical Histogram Projection; Triangle Model.

INTRODUCTION

The document is a draft or report in a text or graphic that has been written and presented. The example of a text that can be either online or offline is books, journals, newspapers, Al-Quran, and legal documents. Documents are readily available and accessible online in the rapidly developing technology era, which not only brings benefits to us but also brings disadvantages as a document's authenticity is very dubious. Documents have been digitized to protect them from aging, but plagiarism and manipulation have exploited some of them. As a result, fake documents and original documents are mixed up online and difficult to identify. It becomes a significant problem throughout the world and triggers the world community's lack of trust. Thus, there is a need to make document identification.

Document identification is one of a domain in image processing. It is used to extract more information from documents. This document doubts its authenticity as there are duplicate and unmanageable document modifications. There are also documents that the author is unknown but copied by another author. As such, the purpose of document identification is to ensure that the document is genuine regardless of its author and to analyze whether all parts of the document written by the same author (known or unknown) (Almarimi, Andrejkov, & Sedm, 2015). In this paper, will be discussed on a framework for document identification based on unoccupied space. Since unoccupied space is a character that has similarities in all languages, it will be used as the point to process a document and extracting its features. Then, these features go through the classification process to obtain the result and check the accuracy. This paper's structure is as follows: In the second section, it provides some related works of the recent developments that focus on document identification, thresholding, vertical histogram projection, triangle model, feature extraction, and its framework. The third section contains the preprocessing phase, and in the fourth section is the proposed framework for this research. The fifth section concludes the paper.

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RELATED WORKS

Document identification is one of the areas in image processing. It is used to identify, verifying, and authenticate the originality of the documents and get known the author. The purpose of document identification is to get information about one document as much as possible. There is existing research on document identification conducted based on character recognition (Lawgali, 2014), signature recognition (Ahmed et al., 2012), digit recognition (Azmi et al., 2015), handwriting recognition (Al Abodi & Li, 2014) and more. These research using existing, improved and new techniques such as centroid detection (Low et al., 1998), triangle model (Azmi & Omar, 2011), watermarking (García-soto et al., 2013), n-grams and histograms of words (Almarimi et al., 2015), statistical and Gabor features (Chaudari & Gulati, 2016) and also geometric distortion (Joost van Beusekom, 2011).

Some of the research get an accurate result, but some of it has lack of resources such as size of data from database (Norzaidah Md Noh et al., 2009), also depending on the dataset training available and the result obtained when testing with the actual document is lower than expected (Marušić, Marušić, & Šeremet, 2015). Other than that, the studies only relevant to their own research and cannot be used for other research which is limited to one language, digit or sub-word in a document such as Arabic (Almarimi et al., 2015), Malay (Norzaidah Md Noh et al., 2009), Tamil (Urala, Ramakrishnan, & Mohamed, 2014) and English (Chaudari & Gulati, 2016) or bilingual such as Gujrati-English (Chaudari & Gulati, 2016). For example, the Arabic character recognition can only be used for documents with Arabic language and not for English or Chinese language. Worse yet, when there are mixing languages within a document. However, there is existing research that has done on bilingual or multilingual languages such as (Mohammadi, 2016), (Bozkurt, Duygulu, & Cetin, 2015) and (Chaudari & Gulati, 2016). Each language has a different and unique character. Therefore, a proper technique should apply to all language characters. The thing to consider is to look for the similarity of each language character, which is space or unoccupied space. Figure 1 shows the existent of unoccupied space in a document.

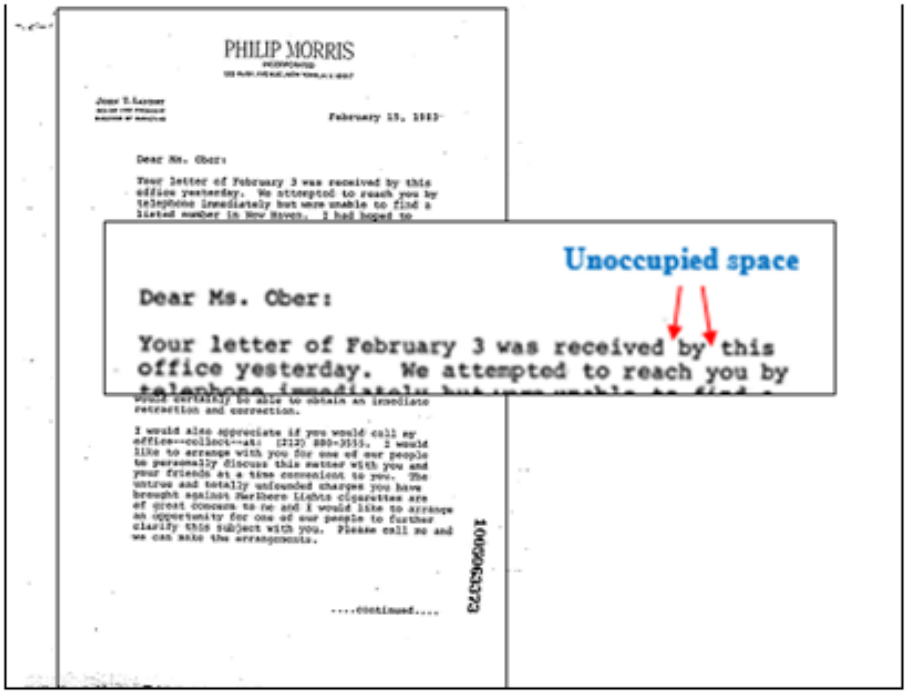

Figure 1: Unoccupied space in a document.

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Thresholding is a process of analyzing images using image thresholding techniques (Sauvola & Pietikäinen, 2000). This technique is a simple but effective way to partition the image into background and foreground (Azmi & Omar, 2011). It is also known as a type of image segmentation that used to isolates an object from the background by converting grayscale images into binary images. In the binarization process, Otsu's method is used to convert the document from grayscale to binary image (Azmi & Omar, 2011). Otsu's method is chosen to binaries the document image, which is used to reduce the color image into a gray level image then to binary image. While Laith (2015) states that a binary image is a conversion of a digital image that has two values, only '1' and '0'. Binary representation is a base-2 number that refers to an independent state in representing information. Generally, it will have two states only, which are 1 and 0. When a document image is converting to binary, it will distinguish the objects from its background.

After the binary image is generated, the vertical histogram projection will take part. The histogram is used to cover the similarities of a text document (Escalante et al., 2011) while Almarimi et al. (2015) make a comparison of the histograms of the full document to the histograms of the document parts to shows discrepancies in the combined documents. The histogram used to analyze the binary image by counting the occurrence of the pixel value of each row and column (Almarimi et al., 2015). Pixel value here refers to '0' for object and '1' for the background.

The triangle features proposed by (Azmi & Omar, 2011) is to address the issue of recognizing images in the same category but in different type. The triangle model has been widely used not only in digit recognition (Arbain et al., 2016) but also in biometric research such as face recognition (Gao & Xu, 2012) and fingerprint recognition (Zheng, Gao, & Zhang, 2009). Besides that, the triangle model also has been implemented in intrusion detection (Tang, Jiang, & Zhao, 2010) and vehicle detection (Haselhoff & Kummert, 2009).

The triangle model is formed based on three points before the features extracted. In face recognition, body elements such as nose, eyes, mouth, and ears are used to form a triangle (Gao & Xu, 2012). While fingerprint recognition, minutiae are used to construct a triangle. It can be proved when (Chen, Tian, Yang, & Zhang, 2006) had proposed a novel method called Fuzzy Feature Match (FFM), which based on a local triangle set to recognize the fingerprint. Azmi & Omar (2011) and Arbain et al. (2016) use a single character as the point selection for the triangle model. Next, study on digit recognition using MNIST (Borji, Hamidi, & Mahmoudi, 2008), HODA (Khosravi & Kabir, 2007) and IFCHDB (Mozaffari et al., 2006) datasets have adopted triangle geometry to extract some properties of triangle in order to produce proposed triangle features for classification process (Mohd Sanusi Azmi, 2013).

Three types of framework are selected based on the technique in each phase of the researches. The first framework is a hybrid framework for human identification using codebook and polygon features through an offline handwritten document. The handwritten document image will go through two types of feature extraction, which are codebook features and polygon features. After that, two metrics apply for each type of feature extraction. Those metrics are Euclidean and chi-square distance to use for each of the feature space. Then, the computed distances combined into a hybrid distance space. Finally, writer identification is carried out by using the nearest neighbor classification. Figure 2 shows the framework proposed by Khalid et al. (2015).

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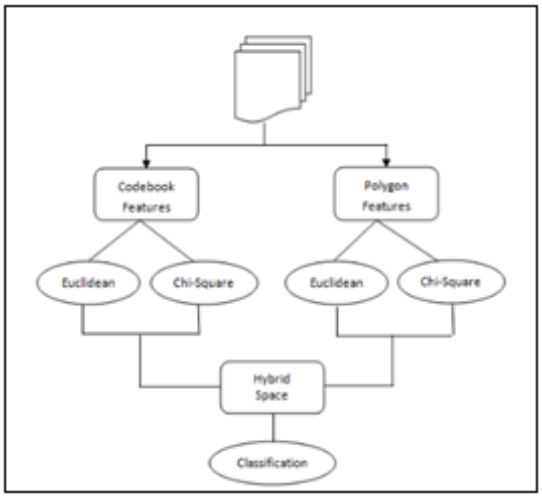

Figure 2: Framework for Human Identification through Offline Handwritten Documents (Khalid et al., 2015).

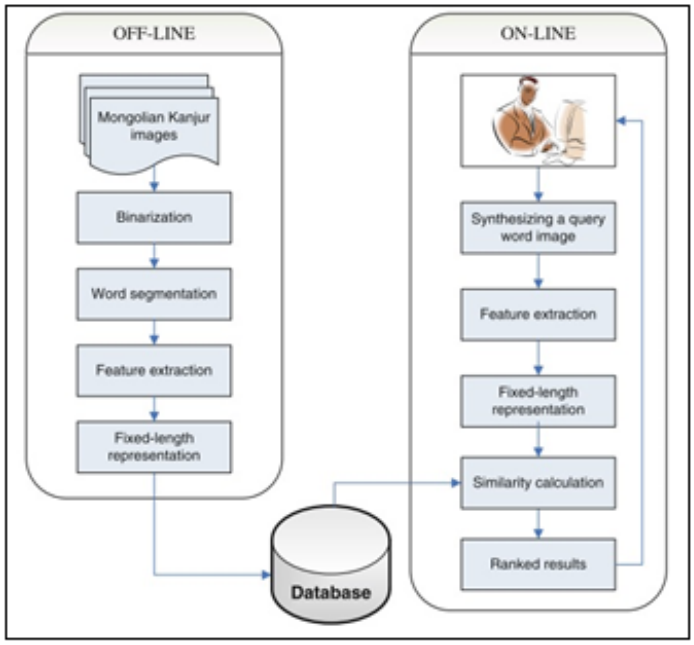

Figure 3: Framework for keyword retrieval system (Wei & Gao, 2014).

Figure 3 is a framework for the keyword retrieval system developed by (Wei & Gao, 2014), where the system was working on off-line and on-line. Firstly, these images are converted into binary using three global methods Otsu algorithm, the Kittler algorithm, and the fuzzy c-means clustering method (FCM). Word images can then be obtained using the connected element labeling algorithm on each binary image. In the feature extraction process, four profile features extract from per image row because of the unique writing system of the Mongolian language, which is horizontal projection profile, left profile, right profile, and horizontal background-to-foreground transitions. Another four profile feature is extracted from per image column vertical projection profile, upper profile, low profile, and vertical background-to-foreground transition. Next, DWT use for fixed-length representation, but this technique is not suitable for on-line in which DCT selected, then it will be stored in the database.

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Figure 4 shows the framework for Digital Jawi Paleography (Azmi, 2013), which divides to three-phase. The phase is data collection and preprocessing, triangle model and zoning features, and lastly, classification and evaluation. In the first phase, the data collection process involves the use of two types of datasets. Dataset types are both standard and local datasets. Local data set, involves the development of data sets written by khat writers, then scanned and segmented. The images of the khat, which has segmented, then made by naming before entering the pre-processing process. Standard and local data set images in the pre-processing process will be converted to a binary color scale and performed labeling.

After the first phase complete, the next phase is to extract features using backup algorithms. This phase will generate the vector features used in the last phase, which the Classification and Recognition phase. After extraction features that generate proposal vector features based on zone, the classification is carried out to obtain percent recognition accuracy. Percentage accuracy is then assessed to obtain the best vector features of the zoning process.

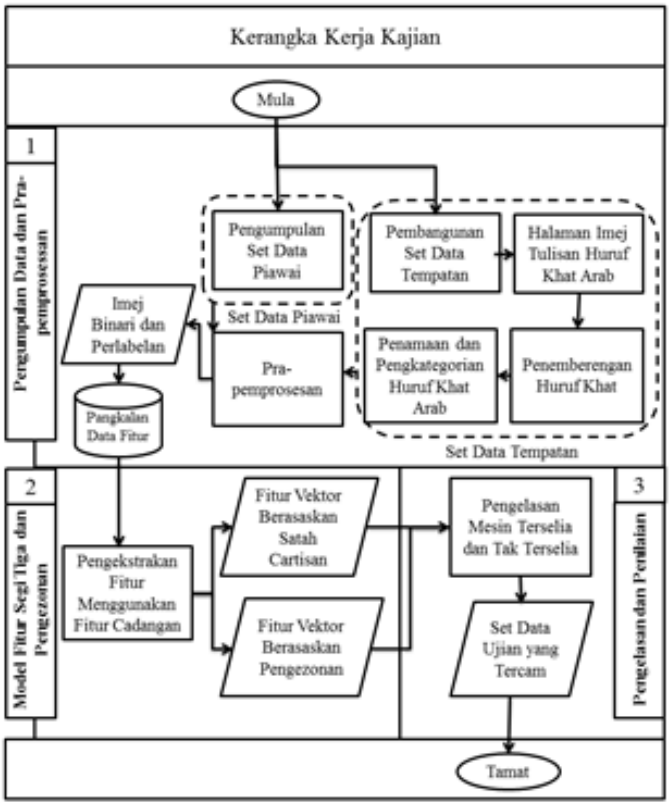

Figure 4: Framework for Digital Jawi Paleography (Azmi, 2013)

PROPOSED FRAMEWORK

In this section, we present the proposed framework for document identification using the triangle model. Based on related works, the framework from (Azmi, 2013) is the most suitable and adaptable to this research with little modification. Figure 5 is the proposed framework for this research.

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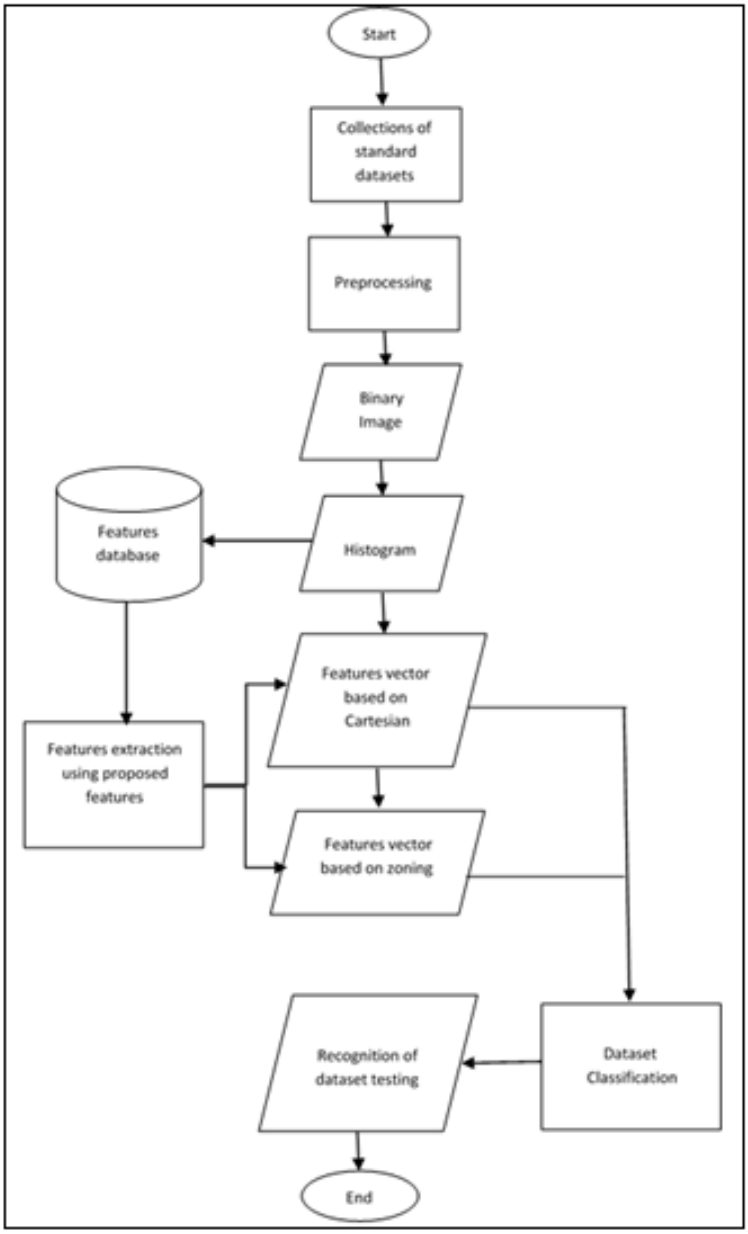

Figure 5: Proposed Research Framework

The framework divide into three-phase, the first phase is Data Collection and preprocessing, the second phase is Triangle Model Features and Zoning, and the third phase is Classification and Evaluation. In the first phase, the dataset chosen is local. In the preprocessing process, this dataset will convert to grayscale then using the Otsu's method to convert to a binary image. Figure 6 shows the original documents, and Figure 7 shows the image after changing the color to grayscale. Figure 8 is the document image after converting to a binary image using Otsu's method.

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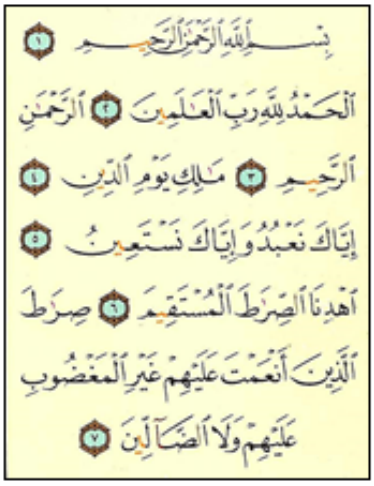

Figure 6: Original document image

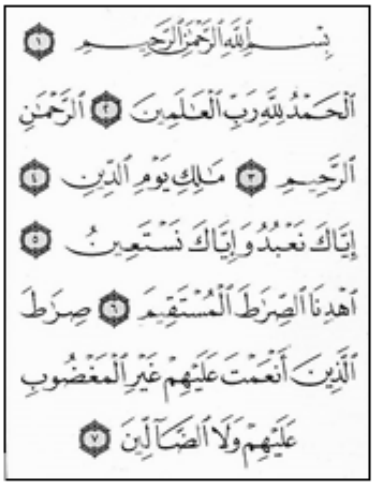

Figure 7: Grayscale Image

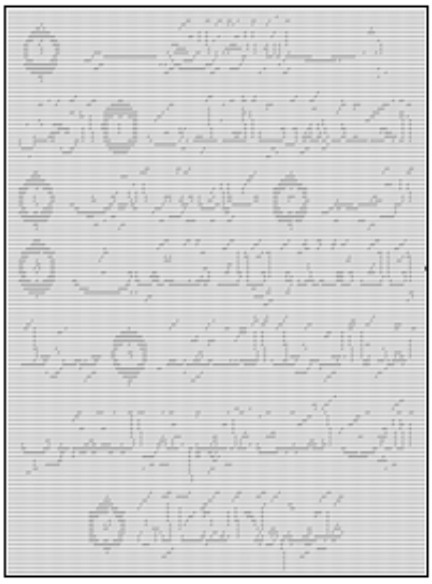

Figure 8: Binary Image

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Then, the analysis on binary image been done to calculate the occurrence of value '0' that represents to object. After the calculation process, based on the occurrence pixel value histogram was create. The boundary between occupied space and unoccupied space obtained from the maximum coordinates each column in the histogram. The list of coordinates is generated from this histogram and save in the database. Figure 9 presents the histogram generated from its binary image.

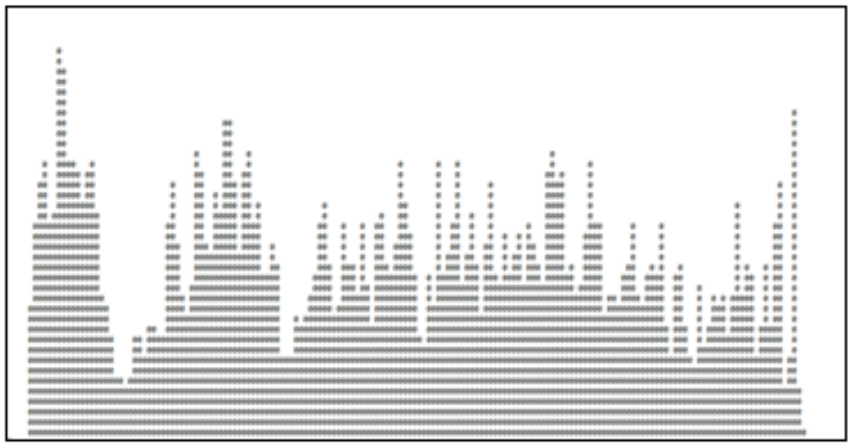

Figure 5: Vertical Histogram Projection

For the second phase, the resulting histogram will process features extraction using the proposed features technique, the triangle model. This technique is a combination of two vector features, namely Cartesian and zoning. It will produce feature extraction that contains the information of the image. The classification and evaluation phase will use this features extraction result with SVM and MLP classifiers to get the percent recognition accuracy.

CONCLUSION

This paper presented a framework for document identification from offline documents. The objective of this study was to propose an effective way in document identification based on unoccupied space and use of histogram for feature extraction. There is existing research using a triangle model for digit recognition but never use for the document. The proposed framework, instead of considering the features extracts from the binary image using the triangle model technique, develops a different technique by extracting the features from the histogram using the triangle model. It should also note that the proposed techniques are not limited to one language or specific characters.

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THE IMPACT OF MAKERSPACE CURRICULUM IN EDUCATION

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Abstract

The Fourth Industrial Revolution (IR4.0) promises technological advancement in facilitating business growth where smart and autonomous processes will have impact on human talent. Education in IR4.0 era need to be reconfigured from specialization into interdisciplinary to enrich expertise. Penang Island City Council (MBPP) introduce The Maker Space @Balik Pulau on March 2019 to create space for school students to take up Science, Technology, Engineering, Arts and Mathematics(STEAM) program. Balik Pulau Polytechnic in collaboration with MBPP and Penang Science Cluster(PSC) to start the Corporate Social Responsibility Project using 40 computers sponsored by Intel Malaysia to deliver the curriculum. The 'Coding For School' program was conducted for five months to help primary and secondary school students having basic coding and maker experience using Scratch, Micro Bit and Arduino. The program obtained positive responses from teachers and students. Furthermore, it will be a great move to enhance the makerspace in education by integrating the curriculum in the mainstream education.

Keywords: Makerspace, The Maker Space @Balik Pulau, STEAM program, Coding for School, Scratch, Micro Bit, Arduino.

INTRODUCTION

Education has long been focused and narrowed into specialize skills and monodisciplinary. Moving in the era of IR4.0 there are needs to reconfigure it into interdisciplinary where people with skills outside their specialization area offer complimentary knowledge that enables them to enrich their field of expertise (Gwata, 2019). Makerspace are place for creative production in science, technology, engineering, arts and mathematics and engineering (STEAM) where people of all ages blend digital and physical technologies to explore ideas, learn technical skills and create new products. The collaborative design and making activities have generated interest in various educational field. (Sheridan et. al, 2014). Students in 21st century are facing challenge to have the 4C' skills in learning which are Critical thinking, Creativity, Collaboration and Communication. These four qualities are essential for modern students to succeed in school and the workplace. Having a makerspace is one of the way to provide the 4C (Kleinbort, 2017).

Makerspaces are becoming more common in schools as well as at the university level and encourage educators to think differently about learning. This paper examines how a makerspace curriculum impacts the way in which learners apply the 4 C's (creativity, critical thinking, collaboration, and communication). This problem is important because nowadays most of the schools have makerspace (Nagel, 2018). In fact, "user-reported numbers show nearly 1,400 active spaces, 14 times as many as in 2006" (Lou, 2016, p.88). It would be helpful to have information demonstrating how these facilities impact students. The topic is important because there is an increased emphasis on 21st-century skills such as creativity, collaboration, communication, and critical thinking (Bowler, 2014). Teachers are preparing students for jobs that do not yet exist. Certain skills, however, like those of the 4C's are essential in any future profession.

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The scope of this paper includes all students in 'Coding for School' program which conducted for five months involving 12 primaries and 4 secondary schools in Southwest Penang Island District. In this program, students learn basic coding using Scratch, Micro Bit and Arduino at Makerspace @Balik Pulau.

Due to the popularity of makerspaces, it is necessary to measure how makerspaces affect students' creativity, critical thinking, communication, and collaboration. This paper can be applied by librarians, teachers, and other educators to demonstrate how the creativity, critical thinking, collaboration, and communication of learners with access to a makerspace at their school are impacted. It could lead principals and other educators to the reasoning for or against the implementation of a makerspace because of the increased importance of learners having 21st-century skills such as the 4C's.

IMPLEMENTATION

The rapid changing of today technologies giving a very big impacts in educations field. The educators also have to follow the changing of technologies especially in information and communication technology, to make sure our young generations can face that fast changing and challenging world, in order to prepare themselves for the future. The modern technologies are demanding that teachers learn how to use these technologies in their teaching (R. Raja, P. C. Nagasubramani; 2018). The modern technologies can be realized through the application of Science, Technology, Engineering, and Mathematics or STEM in education. STEM also can improve competitiveness in science and technology development, making science more attractive (notably to young people), increase society's appetite for innovation and open up further research and innovation activities (R. Sheffield et. al, 2017). In the current world climate, STEM innovations are considered to be crucial to the economic future of all countries and so there needs to be funds, time and promotion for improving STEM education to ensure a robust pipeline of STEM engagement (European Union, 2015; Hackling, Murcia, West & Anderson, 2014). Caprile, Palmen, Sanz & Dente (2015) stated that improving STEM education in developed and developing countries remains a challenge, and the USA National Research Council (2011) suggested that a way to increase students' interest and engagement in STEM education was to extensively use information and communication technologies (ICT) in STEM teaching and learning.

Penang Island City Council (MBPP) introduce The Maker Space @Balik Pulau on March 2019 to create space for school students to take up Science, Technology, Engineering, Arts and Mathematics (STEAM) program. Balik Pulau Polytechnic in collaboration with MBPP and Penang Science Cluster(PSC) to start the Corporate Social Responsibility Project using 40 computers sponsored by Intel Malaysia to deliver the curriculum. All lecturers involved as facilitators in the Maker Space @Balik Pulau were compulsory to attend one day workshops at PSC in February and March 2019. The workshops were conducted by trainers from PSC for training twenty two lecturers from Balik Pulau Polytechnic, and these workshops was monitored by MBPPs' staffs. The workshop focus on three program known as Scratch, Micro Bit and Arduino, and all these three softwares will be use in the 'Coding For School' program to teach basic coding to selected primary and secondary school students at The Maker Space @Balik Pulau. The 'Coding For School' program was conducted for five months started from March 2019 until August 2019, and the purpose of this program were to help primary and secondary school students having basic coding and maker experience using Scratch, Micro Bit and Arduino. There were sixteen schools involved in the program. Twelve schools are primary schools and another 4 schools are secondary schools from Southwest Penang Island District.

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Table 1. The list of primary and secondary schools

No	Schools	Software/Learn
1	SEKOLAH KEBANGSAAN SUNGAI PINANG	Scratch and Microbit
2	SEKOLAH KEBANGSAAN TITI TERAS	Scratch and Microbit
3	SEKOLAH KEBANGSAAN TELOK BAHANG	Scratch and Microbit
4	SEKOLAH JENIS KEBANGSAAN (CINA) WEN KHAI	Scratch and Microbit
5	SEKOLAH KEBANGSAAN SUNGAI BATU	Scratch and Microbit
6	SJKT SUNGAI ARA	Scratch and Microbit
7	SEKOLAH JENIS KEBANGSAAN (CINA) SACRED HEART	Scratch and Microbit
8	SEKOLAH JENIS KEBANGSAAN (TAMIL) BAYAN LEPAS	Scratch and Microbit
9	SEKOLAH JENIS KEBANGSAAN (CINA) TAR THONG	Scratch and Microbit
10	SK TAN SRI AWANG HAD SALLEH	Scratch and Microbit
11	SEKOLAH JENIS KEBANGSAAN (CINA) POI ENG	Scratch and Microbit
12	SEKOLAH KEBANGSAAN SERI PERMAI	Scratch and Microbit
13	SMK BAYAN LEPAS	Arduino 3D Modelling
14	SMK ST. GEORGE (M) BALIK PULAU	Arduino 3D Modelling
15	SMK TELUK BAHANG	Arduino 3D Modelling
16	SMK TELUK KUMBAR 2	Arduino 3D Modelling

During the implementation of the ‘Coding For School’ program, all students from each school will be divided into a few small groups with at least three members, and all groups will be shared a laptop, module (attractive, simple and colourful notes) and other devices such as Microbit board, Arduino board and other electronic components. Then the facilitators will start the session about 10 to 15 minutes as an introduction, and after that every student will explore the given module and can start using the software and devices until each module is completed. Each group will be monitored by three facilitators during each session, and the facilitators will make sure that every single student can use and completed the module at the end of the ‘Coding For School’ session. This program was a pilot MakerSpace in Balik Pulau as the first step to transform the small town into an education hub. The program also purposely to prepare the youths for the future, to hone their talents, and to train local talent, especially those living in rural areas in Balik Pulau Penang (Opalyn Mok. 2019). This effort will be a great move to enhance the makerspace in education by integrating the curriculum in the mainstream education.

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METHOD

Two methods will be used to gather an information of the impact of makerspace curriculum in education. The two methods are an observation during the session of The 'Coding For School' program, and the interviews with the teachers and few selected students. During each session, at least three to four teachers will monitor all their students. And this is a very good chance for facilitators and teachers to sit down together and discuss about the program and the respond and also performance of students whose participated, for enhancement in the next session with the same schools or other schools. The data collected allowed researchers to observe a makerspace experience from multiple perspectives thereby, providing insight into the use of makerspaces as professional development and within the educational setting as a whole (A. Paganelli, J.D. Cribbs, X 'Silvie'Huang. et. al. 2017).

Normally an observation always done by facilitators during the implementation of the 'Coding For School' program. After finished each session, all facilitators will discuss and share experiences and opinions to enhance the next sessions. Meanwhile for an interview session, the facilitators will take a chance to interviews one or two the teachers during a break time. The session will start at 8.00 a.m. in the morning and have about 30 minutes break about at 10.30 a.m. And for participants or students, all facilitators will do an interview session during the session, at break time and also after finish the session.

This paper will use a framework uTEC Maker Model created by Loertscher, David V., Leslie Preddy, and Bill Derry (2013) as a guideline to complete this research about the impact of makerspace curriculum in education. The framework focus on four levels to makerspace participant begins every session of makerspace activity or program. All four levels are using, tinkering, experimenting and creating.

Figure 1: uTEC Maker Model created by Bill Derry, David V. Loertscher, and Leslie Preddy 2013

The framework was created to assist those who are interested in the Makerspace movement to recognize the progression in many fields the characteristics of a person of any age who is making progress along a continuum from being a user of something created by others to the act of creating something that is innovative (Loertscher, David V., Leslie Preddy, and Bill Derry; 2013). This framework also can help this paper to dig more information about the impact of makerspace curriculum in education, and then share with educators and participants' schools to give more benefits to development of education in the future.

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DISCUSSION

Students came to makerspace with different views and expectation, thus making it a good place to create new ideas and discovery. The teachers responded that all of students in the program has no fundamental of Scratch and Microbit and some has minimum exposure in Arduino. From the observation throughout the program, students able to discover new things while learning at makerspace.

Students were given module to guide their task during the program and they were able to complete the task with minor help from the facilitator. This shows that students are able to develop their critical thinking skills by solving the given problems. Observation also shows that when the students completed their guided task, they are able to change some elements such as object direction and object movement in Scratch and changing the LED display into different shape in Microbit. Even more, students able to change the timer, constant value and variables in Arduino code. This shows that the students able to develop creativity and think out of the box to create new ideas in doing their task.

Activities in Makerspace@Balik Pulau promotes collaboration between students. The modules were designed in a way that each group has to collaborate to fulfill the given instructions. For example, in Microbit module, students handling the right side of the module need to follow the instruction so that the output on screen matched the image on the left side of the module. As in Arduino, students handling the left side need to follow the instruction to build the hardware part. Then the right side person need to write the code given in the module to make the hardware functioning. The only way of getting the correct output is by collaboration between the team on right side and left side of the module. From observation, students enjoyed the collaboration process and also develop communication among other students in their group and other groups. The excitement of learning spotted when students shows confidence in asking questions to the instructors while exploring the makerspace activities.

CONCLUSION

Considering the outcome of the ‘Coding For School’ program, Makerspace @Balik Pulau is capable of providing spaces for students to gain the 4C’s of 21st century learning. The design of the makerspace curriculum by Penang Science Cluster allows positive outcome in developing the student’s creativity, critical thinking, collaboration, and communication skills along the program. At this moment, the ‘Coding For School’ allows the process of ‘Using’, ‘Tinkering’ and ‘Experimenting’ as in uTEC model by Loertscher, David V., Leslie Preddy, and Bill Derry(2013). The impact of the curriculum will be perceived even more in the future when the students started the ‘Creating’ process in their makerspace education.

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PENGAMALAN SOLAT DAPAT MENINGKATKAN PENCAPAIAN CGPA DALAM KALANGAN PELAJAR POLITEKNIK NILAI

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Abstrak

Kajian ini berkaitan adakah solat dalam meningkatkan CGPA dalam kalangan pelajar di Politeknik Nilai. Objektif kajian ini dijalankan adalah untuk mengkaji sama ada solat dapat meningkatkan pencapaian CGPA pelajar DIB semester 1, Politeknik Nilai , meningkatkan kepatuhan kepada ajaran Islam dan meningkatkan sahsiah pelajar.Kaedah yang digunakan adalah kuantitatif iaitu menggunakan kaedah soal selidik. Seramai 33 pelajar diambil sebagai respondan. Hasil kajian menunjukkan 97% pelajar bersetuju bahawa amalan solat secara konsisten dapat membantu pelajar menjalani penilaian amali solat dan mempengaruhi peningkatan pencapaian CGPA mereka. Kajian ini hanya sebilangan kecil dari jumlah pelajar yang mengambil matapelajaran Pendidikan Islam di Politeknik. Kajian yang mendalam boleh dijalankan pada masa akan datang agar dapat memperincikan aspek yang pelajar lemah dalam mata pelajaran tersebut.

Keywords: solat,cgpa,politeknik.

PENDAHULUAN

Politeknik merupakan salah satu Institusi Pengajian Tinggi Awam (IPTA) yang bernaung di bawah Kementerian Pengajian Tinggi Malaysia. Visi Politeknik Nilai adalah keperluan modal insan yang bernilai dan berketrampilan melalui pendidikan terkamil dari aspek ilmu, kemahiran dan berakhlak mulia melalui pendidikan bersepadu dan berterusan. Ini sejajar dengan Falsafah Pendidikan Kebangsaan Negara, di mana pendidikan di Malaysia adalah suatu usaha berterusan kearah memperkembangkan lagi potensi individu secara menyeluruh dan bersepadu untuk mewujudkan insan yang harmonis dan seimbang dari segi intelek, rohani, emosi dan jasmani berdasarkan kepercayaan dan kepatuhan kepada Tuhan. Pembangunan pelajar yang selaras dengan falsafah pendidikan ini merupakan salah satu elemen penting dalam usaha membangunkan mutu pendidikan negara. Ini membuktikan bahawa ilmu keagamaan dan penerapan akhlak mulia adalah elemen penting dalam membentuk sahsiah seseorang pelajar.

Dalam kurikulum pembelajaran pelajar Politeknik Nilai, subjek wajib dalam silibus pendidikan ialah kursus Pendidikan Islam. Subjek ini memberi penekanan terhadap penghayatan akidah serta pelaksanaan ibadah dalam kehidupan seharian pelajar. Kursus ini juga dapat memberi panduan dalam membentuk sahsiah pelajar politeknik. Pentaksiran berterusan dijalankan sepanjang semester, dan salah satu elemen penilaian yang memberi markah 20% ialah ujian praktikal pelaksanaan solat dan bacaan solat. Penekanan ini menunjukkan bahawa pengamalan solat membentuk sahsiah dan seterusnya menjurus kearah pembentukan pelajar cemerlang.

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Berdasarkan Surah Al-Ankabut,ayat 45 yang bermaksud " Dan dirikanlah solat, sesungguhnya solat itu mencegah dari perbuatan keji dan mungkar".Ayat ini menunjukkan kewajipan menunaikan solat kepada semua manusia termasuklah pelajar Politeknik Nilai. Menurut Abdullah Nasih Ulwan (1988) kaedah-kaedah asasi dalam pendidikan anak , terdiri daripada dua cara iaitu kaedah pengikatan dan kaedah pengancaman. Ikatan kerohanian iaitu solat adalah salah satu kaedah pengikatan kerohanian ,supaya si anak itu menyifati dengan kesucian hati dan kejernihan wajah,dan hendaklah hatinya terpancar dengan semangat keimanan dan keikhlasan. Apabila hati si pelajar bersih,maka mudahlah untuk mereka menerima ilmu dan cemerlang dengan kelulusan CGPA 3.5 keatas.

Berdasarkan pemerhatian melalui ujian praktikal yang dijalankan sepanjang pembelajaran, pelajar Diploma Islamic Banking and Finance , semester 1, Politeknik Nilai, didapati 60% tidak dapat membaca bacaan lazim dalam solat dan tidak solat dengan tertib yang betul. Sabda Rasulullah SAW: " Solatlah Sebagaimana Kamu Melihat Aku Solat ". Masalah ini menambah kerisauan penyelidik kerana mereka tidak dapat mencapai peratus penilaian berterusan yang memuaskan. Ini memberi pengaruh ke atas keseluruhan pencapaian pelajar tersebut di dalam kursus Pendidikan Islam. Ini menyebabkan penyelidik terpanggil untuk membuat kajian bagi mengenalpasti faktor yang dapat meningkatkan peratus pencapaian pelajar dalam praktikal amalan solat. Kajian mengenai faktor peningkatan ini perlu dilakukan segera kerana didapati ia mempengaruhi kemerosotan prestasi CGPA dalam kalangan pelajar semester satu Politeknik Nilai, Negeri Sembilan.

FOKUS KAJIAN

Fokus kajian kami adalah untuk mengenal pasti faktor yang dapat meningkatkan peratus kelulusan pelajar didalam subjek Pendidikan Islam.

OBJEKTIF KAJIAN

1. Meningkatkan pencapaian CGPA pelajar DIB semester 1, Politeknik Nilai.
2. Meningkatkan kepatuhan kepada ajaran Islam.
3. Meningkatkan sahsiah pelajar.

KUMPULAN SASARAN

Kumpulan sasaran kajian ini terdiri daripada 33 responden iaitu pelajar daripada Diploma Islamic Banking and Finance, semester satu, Politeknik Nilai.

PERLAKSANAAN KAJIAN

Proses pengumpulan data dilakukan melalui soal selidik

Soal Selidik

Penyelidik telah menyediakan borang soal selidik yang menyenaraikan faktor yang dapat meningkatkan peratusan pelajar yang solat dengan sempurna dan Berjaya memperolehi CGPA yang memuaskan. Borang tersebut telah diberi kepada 33 orang pelajar kelas DIB 1. Hasil yang diperolehi akan direkodkan dalam jadual dan graf untuk dianalisa.

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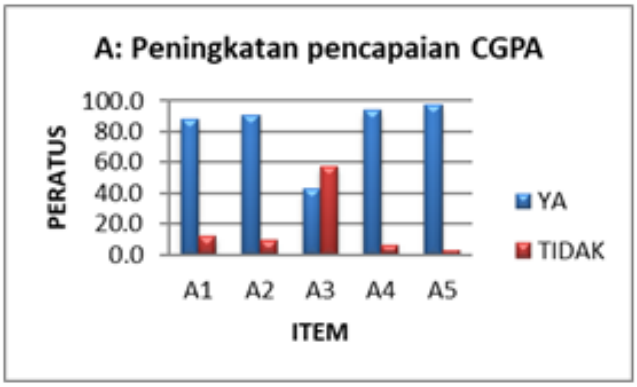
Soal selidik terdiri daripada tiga konstruk dan setiap konstruk mengandungi lima item. Konstruk yang pertama (A) ialah peningkatan pencapaian CGPA pelajar. Konstruk yang kedua (B) ialah kepatuhan kepada ajaran Islam. Konstruk yang ketiga (C) ialah peningkatan sahsiah pelajar.

ANALISA TINJAUAN MASALAH.

Peningkatan Pencapaian CGPA
Analisis data daripada soal selidik telah dijalankan mendapati bahawa peningkatan pencapaian CGPA pelajar berdasarkan pengamalan solat adalah seperti Rajah 1 di bawah.



Rajah 1: Peningkatan Pencapaian CGPA

Jadual 1: Petunjuk Peningkatan Pencapaian CGPA.

BIL	ITEM	PERATUS (%)	
		YA	TIDAK
A1	Subjek Pendidikan Islam mempengaruhi CGPA keseluruhan saya.	87.9	12.1
A2	Kecemerlangan di dalam amali solat membantu mencapai CGPA yang tinggi di dalam semester satu.	90.9	9.1
A3	Kurang kemahiran mengenai bacaan di dalam solat menyebabkan skor penilaian amali solat saya rendah.	42.4	57.6
A4	CGPA yang tinggi membantu dalam kebolehpasaran pekerjaan.	93.9	6.1
A5	Amalan solat secara konsisten membantu saya menjalani penilaian amali solat.	97.0	3.0

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Berdasarkan Jadual 1 iaitu peningkatan pencapaian CGPA berdasarkan pengamalan pelajar mendapat peratus interpretasi perangkaan yang menunjukkan sejumlah lima item bersetuju (A1= 87.9 , A2= 90.9 , A3= 42.4, A4= 93.9, dan A5= 97)peratus dan lima item tidak bersetuju (A1= 12.1 , A2= 9.1 , A3= 57.6 , A4= 6.1 , dan A5= 3) peratus. Berdasarkan analisa yang dijalankan, didapati kurangnya kemahiran mengenai bacaan di dalam solat menyebabkan skor penilaian amali solat pelajar rendah. Item 3 menunjukkan 57.6% daripada keseluruhan pelajar tidak bersetuju bahawa kurang kemahiran bacaan di dalam solat mempengaruhi skor amali solat.Ini menunjukkan pelajar ini tidak menyedari kemahiran bacaan dalam solat sangat penting dalam meningkatkan skor amali solat mereka. Walaubagaimana pun, 97% pelajar bersetuju bahawa amalan solat secara konsisten dapat membantu pelajar menjalani penilaian amali solat dan mempengaruhi peningkatan pencapaian CGPA mereka.

Kepatuhan kepada Ajaran Islam

Analisis data daripada soal selidik telah dijalankan mendapati bahawa kepatuhan kepada ajaran Islam adalah seperti Rajah 2 di bawah.

Rajah 2: Kepatuhan kepada Ajaran Islam

Jadual 2: Kepatuhan kepada Ajaran Islam

Bil	ITEM	PERATUS (%)	
		YA	TIDAK
B1	Saya menunaikan solat lima waktu dalam sehari.	81.8	18.2
B2	Saya bersolat mengikut cara dan tertib yang betul.	90.9	9.1
B3	Kurang kefahaman mengenai tertib solat lima waktu menyebabkan kemerosotan markah penilaian amali solat.	48.5	51.5
B4	Saya berasa bersalah sekiranya tidak mahir menunaikan solat.	97.0	3.0
B5	Saya berasa sedih sekiranya tidak pandai bersolat.	97.0	3.0

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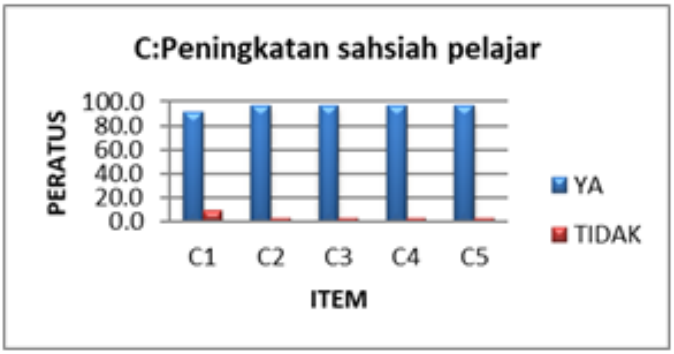
Berdasarkan Jadual 2 iaitu kepatuhan kepada ajaran Islam mendapat peratus interpretasi perangkaan yang menunjukkan sejumlah lima item bersetuju (B1 = 81.8, B2= 90.9 ,B3= 48.5, B4 = 97, dan B5 = 97) peratus dan lima item tidak bersetuju (B1 = 18.2 , B2 = 9.1 , B3 = 51.5, B4 = 3 dan B5 = 3) peratus. Berdasarkan analisa yang dijalankan, didapati 51.5 % pelajar tidak bersetuju bahawa kurang kefahaman mengenai tertib solat mampu mempengaruhi markah penilaian amali solat mereka. Ini menunjukkan pelajar ini tidak menyedari kefahaman mengenai tertib solat sangat penting dalam meningkatkan skor amali solat mereka. Walaupun begitu, 97% pelajar berasa bersalah serta sedih sekiranya tidak mahir dalam menunaikan amalan solat .

Peningkatan Sahsiah Pelajar

Analisis data daripada soal selidik telah dijalankan mendapati bahawa peningkatan sahsiah pelajar adalah seperti Rajah 3 di bawah.



Rajah 3: Peningkatan Sahsiah Pelajar

Jadual 3: Peningkatan Sahsiah Pelajar

Bil	ITEM	PERATUS (%)	
		YA	TIDAK
C1	Saya berasa sedih sekiranya rakan saya tidak bersolat.	90.9	9.1
C2	Saya berasa sedih sekiranya ahli keluarga saya tidak bersolat.	97.0	3.0
C3	Amalan solat memberi kesan positif terhadap perkembangan sahsiah dan akhlak pelajar.	97.0	3.0
C4	Pengamalan solat yang konsisten membantu saya menghindari gejala sosial yang negatif.	97.0	3.0
C5	Pengamalan solat yang konsisten membantu pembentukan keperibadian yang mulia.	97.0	3.0

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Berdasarkan Jadual 3 iaitu peningkatan sahsiah pelajar mendapat peratus interpretasi perangkaan yang menunjukkan sejumlah lima item bersetuju (C1 = 91 , C2 = 97, C3 = 97, C4 = 97 dan C5 = 97) peratus dan lima item tidak bersetuju (C1 = 9 , C2 = 3, C3 = 3, C4 = 3, dan C5 = 3) peratus. Berdasarkan analisa yang dijalankan, didapati bahawa 9% pelajar tidak berasa sedih sekiranya rakan mereka tidak bersolat. Ini menunjukkan pelajar ini mempunyai sahsiah yang rendah dan perlu ditingkatkan. Terdapat empat item yang mempunyai dapatan peratus bersetuju yang tinggi iaitu item C2, C3 , C4 dan C5 iaitu sebanyak 97%. Amalan solat mempengaruhi sahsiah pelajar di mana 97% bersetuju amalan solat yang konsisten dapat membantu menghindari gejala sosial yang negatif. 97% pelajar juga bersetuju bahawa pengamalan solat yang konsisten membantu pembentukan keperibadian yang mulia. Jadual 1 juga menunjukkan bahawa pelajar sedar akan kesan amalan bersolat dalam peningkatan sahsiah mereka.

CADANGAN UNTUK KAJIAN SETERUSNYA

Hasil daripada analisa di atas, penyelidik telah menjalankan beberapa tindakan untuk mengatasi masalah tersebut seperti berikut:

1. Mewujudkan klinik solat di Politeknik Nilai.
2. Mengadakan ceramah agama mengenai kebaikan solat.
3. Mengadakan kem intensif solat .

PENUTUP

Tindakan yang dicadangkan ini selaras dengan dapatan kajian yang menunjukkan bahawa pelajar kurang kemahiran mengenai bacaan di dalam solat yang menyebabkan skor penilaian amali solat rendah.Masalah lain yang telah dikenalpasti ialah pelajar kurang kefahaman mengenai tertib solat lima waktu dan terdapat kelemahan dari segi sahsiah pelajar iaitu pelajar tidak berasa sedih sekiranya rakan mereka tidak solat. Tindakan yang dicadangkan adalah untuk membantu meningkatkan CGPA pelajar, kepatuhan kepada ajaran Islam serta meningkatkan sahsiah pelajar.

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CAMPURAN PEMASARAN 4P TERHADAP PENGURUSAN PERHUBUNGAN PELANGGAN SYARIKAT DALAM RANTAIAN BEKALAN : SYARIKAT ENTOHYGIENE SERVICES SDN BHD

Sharipah Khadijah binti S.Hashim, Izan Fahmee binti Nordin, Abdul Rahman bin Mat Abu
Politeknik Seberang Perai, Pulau Pinang

ABSTRAK

Kajian ini bertujuan untuk mengenalpasti faktor paling utama yang mendorong Syarikat Entohygiene Services Sdn Bhd terhadap pengurusan perhubungan pelanggan dalam rantaian bekalan. Konsep campuran 4Ps telah digunakan sebagai faktor-faktor yang menjadi objektif kajian seperti perkhidmatan, harga, promosi dan lokasi. Sebanyak 34 buah syarikat telah diedarkan soalselidik. Data yang diperolehi telah dianalisis dengan menggunakan perisian komputer Microsoft Excel untuk mengira frekuensi dan peratusan. Hasil dapatan yang diperolehi menunjukkan keempat-empat faktor yang telah dikaji mempunyai hubungan yang berkaitan dengan kecenderungan pelanggan untuk memilih perkhidmatan Syarikat Entohygiene Services Sdn. Bhd sebagai syarikat Hygiene dan PEST Control. Elemen yang diberi keutamaan adalah dari aspek perkhidmatan, di mana pengguna diberi kemudahan untuk mendapat maklumat dan perkhidmatan dengan cepat dan tepat. Syarikat Entohygiene Services Sdn. Bhd. disarankan perlu lebih peka terhadap keadaan semasa dalam mempromosikan perkhidmatan yang diberikan, pihak syarikat perlu sentiasa mengemas kini laman sosial seperti facebook, Instagram dan laman sesawang bagi memastikan pelanggan mendapatkan maklumat terkini.

Katakunci: perkhidmatan, harga, promosi, lokasi

PENGENALAN

SYARIKAT ENTOHYGIENE SERVICES SDN BHD telah diperbadankan pada 22 Oktober 2015 dan dikenali sebagai VENTURE PERKHIDMATAN ENTOHYGIENE yang ditubuhkan pada 16 Oktober 2013. Ia adalah perniagaan Bumiputra milik 100% dan berdaftar dengan Kementerian Kewangan sebagai sebuah syarikat yang mengendalikan perkhidmatan kawalan perosak dan perkhidmatan alam sekitar. SYARIKAT ENTOHYGIENE SERVICES SDN BHD juga komited untuk kesihatan dan keselamatan kepada pekerja dan alam sekitar. Mereka juga mengekalkan prestasi terbaik dalam pengendalian transaksi dan sentiasa meningkatkan prestasi syarikat untuk kedudukan yang lebih baik supaya syarikat dapat menyediakan perkhidmatan terbaik dan memenuhi keperluan pelanggan.

Berbekalkan kemahiran dan pengalaman sedia ada, SYARIKAT ENTOHYGIENE SERVICES SDN BHD mampu mengendalikan dan menguruskan tugasan yang diberikan. Pihak syarikat memberikan komitmen penuh seperti yang dinyatakan dengan memberi keutamaan kepada kualiti kerja yang terbaik.

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Campuran pemasaran 4P adalah satu medium untuk mengawal pemasaran secara strategi iaitu terdiri daripada produk (product), harga (price), promosi (promotion) dan tempat (place) merupakan asas yang bertujuan dalam menghasilkan tindak balas untuk mencapai target pasaran (Nurulhayah & Ahmad, 2017). Pihak syarikat menitikberatkan Insight dalam menyediakan perkhidmatan terbaik pada kadar yang berpatutan, di mana mendapatkan pelanggan baru dari semasa ke semasa sambil mengekalkan pelanggan sedia ada. Visi syarikat untuk menjadi organisasi perkhidmatan dinamik dan kompetitif yang terkemuka melalui kerja berpasukan yang mantap, manakala misi syarikat menitikberatkan memberi perkhidmatan berkualiti, cepat dan fleksibel untuk mencapai seratus peratus tahap kepuasan pengguna. Konsep jawab 123 pula adalah menjawab maklum balas pelanggan dalam masa satu jam dan mengambil tindakan untuk menyelesaikan isu pelanggan dalam masa 23 jam.

Pengurusan perhubungan pelanggan merupakan faktor penting bagi setiap perniagaan samada perniagaan melibatkan perkhidmatan ataupun produk. Begitu juga dalam bidang logistik dan rantaian bekalan. Untuk mencapai matlamat syarikat, maka pengurusan perhubungan pelanggan perlu diambil perhatian dan diberi penekanan. Maka kajian yang dilakukan ini amat berkepentingan untuk mengetahui campuran pemasaran 4P terhadap pengurusan perhubungan pelanggan dalam rantaian bekalan Syarikat Entohygiene Services Sdn Bhd bagi mencapai matlamat syarikat.

SOROTAN KAJIAN

Rachmawati R. (2011) menyatakan bahawa dukungan faktor-faktor bauran pemasaran (marketing mix) diharapkan mampu menciptakan kepuasan pelanggan, yang berimbas kepada loyalitas pelanggan. Strategi ini merangkumi 4 elemen asas yang disebut sebagai 4P iaitu tempat (place), produk (product), harga (price), dan promosi (promotion) (Kotler P., 2009).
Kajian Mohamad, N & Ajazi, A.H.R.A (2017) mendapati bahawa hanya tiga faktor iaitu produk, promosi dan tempat yang memberi kesan kepada kepuasan pelanggan. Namun didapati faktor harga tidak mempengaruhi kepuasan pelanggan. Menurutnya lagi, harga merupakan sejumlah wang yang dikenakan untuk sesuatu keluaran atau nperkhidmatan yang diberikan. Harga merupakan satu-satunya elemen campuran pemasaran yang mengeluarkan hasil, sementara kesemua elemen lain merupakan kos. Harga adalah salah satu elemen yang paling fleksibel dalam campuran pemasaran, kerana ianya mudah untuk diubah mengikut kesesuaian pasaran. Harga adalah satuan moneter atau ukuran lainnya termasuk barang dan jasa lainnya yang ditukarkan agar memperoleh hak kepimilikan atau pengguna suatu barang dan jasa (Tjiptono F., 2000).

Satit, R. P. et al. (2012) mengkaji hubungan di antara 4Ps yang dikenali sebagai harga, promosi, tempat dan produk dan pembuatan keputusan pelanggan di Palembang, Indonesia dan mendapati bahawa industri pelancongan akan menjadi tidak teratur dan huru hara sekiranya agensi pelancongan tidak menggunakan sumber 4P dengan berkesan dan efektif.

Ramli M. B. C (2012) telah menjalankan satu kajian bertujuan untuk mengenalpasti penggunaan Campuran Pemasaran (4P) oleh Usahawan Perusahaan Kecil Dan Sederhana (PKS) Industri Perikanan di Kg Geting, Pengkalan Kubor Kelantan. Terdapat empat persoalan yang dikaji iaitu penggunaan produk, harga, promosi, dan lokasi penempatan barangan (product, price, promotion, place) dalam pemasaran. Dapatan kajian menunjukkan bahawa produk merupakan pemboleh ubah yang paling dominan digunakan dalam pemasaran. Manakala lokasi penempatan produk merupakan pemboleh ubah yang kedua tinggi dalam pemasaran. Pemboleh ubah yang sederhana ialah harga dan yang paling rendah ialah pemboleh ubah promosi. Rumusan kajian menunjukkan semua usahawan menggunakan produk dalam pemasaran dan promosi kurang digunakan.

eISBN

Kajian yang bertujuan untuk mengkaji hubungan antara strategi campuran pemasaran ke atas pelanggan dalam pemilihan produk gadaian Islam Ar-Rahnu YaPEIM mendapati elemen-elemen campuran pemasaran iaitu produk, harga, tempat dan promosi merupakan perkara penting yang menjadi asas bagi sesuatu perniagaan sama ada berbentuk pengeluaran mahupun perkhidmatan. Ini jelas menunjukkan strategi campuran pemasaran yang dijalankan amat penting dalam mempengaruhi pemilihan pelanggan (Zulkeply M. A, 2013).

Setiap perusahaan dapat meningkatkan penjualan produknya dengan menggunakan sistem pemasaran yang efektif, serta strategi-strategi yang khusus dalam meningkatkan pasar konsumen yang ada. Strategi pemasaran tersebut adalah Strategi tentang Marketing Mix yaitu Price (harga), Product (produk), Promotion (promosi), dan Places (distribusi). Pemasaran merupakan salah satu fungsi yang sangat penting dalam perusahaan, dimana dengan pemasaran yang tepat dapat menentukan volume penjualan dan posisi perusahaan (produk) di pasar. Penguasaan pangsa pasar sangat tergantung kepada kemampuan untuk memanfaatkan strategi pemasaran perusahaan seperti: a). bagaimana mempromosikan suatu harga produk, b). bagaimana strategi harga dengan pesaing yang ada, c). bagaimana kebijakan promosinya, d). bagaimana proses distribusi yang tepat, dan e). bagaimana mengenal lingkungan pasar dan lain sebagainya.

Strategi campuran pemasaran merupakan satu set peralatan pemasaran yang mana ia memberi manfaat dalam membantu menentukan objektif pemasaran di dalam pasaran yang ingin disasarkan. Dengan kata lain apabila sebuah produk itu ingin dipasarkan ia terlebih dahulu harus dihasilkan dengan berkualiti, dijual dengan harga yang berpatutan, dipasarkan di tempat yang betul dan menggunakan kaedah pemasaran yang efektif (Yusniza & Nor Khalidah, 2012).
Dalam membentuk strategi pemasaran terdapat pelbagai faktor yang perlu diambil kira. Faktor-faktor luaran seperti faktor teknologi, sama ada teknologi produk, teknologi proses mahupun teknologi pengurusan, yang menjadi antara faktor yang tidak boleh diabaikan dalam sesuatu proses pemasaran. Menurut Mustafa S. E & Adnan H. M (2012), faktor ini boleh mempengaruhi sesebuah organisasi perniagaan, terutama dalam persaingan merebut pasaran dan pelanggan. Hubungan dengan pelanggan juga dapat dilakukan dengan mudah dan berkesan. Oleh itu, faktor ini perlu diberi perhatian yang sewajarnya untuk terus berada dalam pasaran yang kompetitif.
Menurut Hutt dan Speh (2010) di dalam sesebuah firma perkhidmatan 4 elemen asas yang digunakan ialah promosi, harga, pembangunan pakej perkhidmatan dan agihan. Walaubagaimanapun elemen-elemen ini sering diperlukan untuk mempengaruhi pembuatan keputusan pelanggan dan membawa kepada urusniaga yang menguntungkan. Setiap elemen ini akan memberi kesan kepada pelanggan dalam pelbagai cara (Peter & Donnelly, 2007).

Kajian Howard, D. J., & Kerin, R. A. (2004) menekankan bahawa elemen promosi terdiri daripada alat-alat yang bersesuaian untuk pemasaran. lanya dikenali sebagai promosi campuran seperti pengiklanan, jualan secara langsung, promosi jualan, hubungan awam dan pemasaran secara langsung.

Promosi merujuk pada semua metode komunikasi yang digunakan untuk memberikan informasi terhadap pihak lain tentang produk. Promosi terdiri dari elemen-elemen seperti iklan, public relations, dan promosi penjualan. Iklan mencakup komunikasi apapun yang dibayar, mulai dari iklan televise, radio, internet sampai media cetak dan billboard. Public relations adalah saat komunikasi tidak dibayar secara langsung dan mencakup press release, perjanjian sponsor, pameran dan seminar (Hartono H. et al, 2012).

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Menurut Hartono H. et al lagi, terdapat juga anggapan bahawa produk yang berkualiti akan terjual dengan sendirinya. Tetapi, dalam strategi mempromosi, pemasar melaksanakan aktiviti memperkenalkan produk yang hendak ditawarkan kepada pengguna. Dalam usaha tersebut berbagai kaedah promosi perlu dilaksanakan agar pengguna mengetahui, memahami dan seterusnya membuat keputusan untuk menggunakan produk. Tanpa aktiviti promosi, pemasaran produk yang berkualiti sekalipun tidak menjadi aktif dan industri sukar memperoleh tahap kompetitif yang dikehendaki di pasaran. Untuk menarik pengguna membeli produk bukannya tugas yang mudah. Mereka perlu dipengaruhi, bukan setakat di perkenal sahaja. Mereka perlu diberi kesedaran hingga mereka merasa perlu untuk membeli produk yang ditawarkan. Pengiklanan melalui media massa utama, antara kaedah mempromosi yang termahal, menjadi pilihan industri yang berkemampuan. Walaupun tahap keberkesanannya agak sukar diukur, tetapi yang lebih penting di sini adalah faktor penyebaran maklumat produk yang meluas. Di samping pengiklanan, kaedah promosi yang lain-lain boleh digunakan, samaada serentak mahupun berasingan, bersesuaian dengan objektif pemasaran serta faktor-faktor seperti kos, peluang dan kebolehan berinteraksi yang lebih terbuka dengan pelanggan

Neil H. B (1984) dalam kajiannya menyatakan bahawa secara konsepnya tempat adalah didefinisikan sebagai saluran, pengagihan atau intermerdiari. Ia merupakan mekanisma barangan dan perkhidmatan yang disediakan disalurkan kepada pengusaha dan penyedia perkhidmatan sedia ada pada kuantiti dan lokasi yang betul apabila pelanggan memerlukannya.

Place merujuk pada menyediakan produk tersebut pada sebuah tempat yang nyaman bagi pelanggan untuk mendapatkannya. Place hamper sama dengan distribusi. Bermacam-macam strategi seperti franchising dapat digunakan oleh perusahaan untuk melengkapi aspek lainnya dari bauran pemasaran. Place Strategi penempatan memberi penekanan kepada aspek saluran pengedaran produk yang berfungsi menyampaikan produk kepada pengguna sasaran. Hal itu melibatkan aktivitas perkhidmatan seperti transaksi, inventaris, logistik dan kelengkapan fasilitas. Disamping itu, strategi ini juga perlu mengambilkira faktor liputan pengedaran dan kebolehan kakitangan serta tahap perkhidmatan mereka. Menawarkan produk yang betul, di tempat/lokasi yang betul dan pada masa yang betul, adalah tujuan kepada strategi ini. Kesemua ini sangat bergantung kepada keberkesanan saluransaluran pengedaran yang ditetapkan. Bagaimana produk ditempatkan di kalangan pengguna, begitu jugalah penerimaan mereka (Hartono H. et al, 2012).

Artikel oleh Leh F. C et al. (2013) bertujuan mengupas kepentingan pemasaran tempat sebagai suatu strategi meningkatkan persaingan dalam sektor pelancongan berasaskan warisan dan konsep Diraja di bandar Diraja Kuala Kangsar, Perak. Dapatan kajian menyatakan bahawa Strategi pemasaran tempat dan peranan pengguna wajar diintegrasikan. Pengintegrasian peranan pemasaran tempat dan kepenggunaan tempat dijangka dapat merangsang pembangunan sektor pelancongan yang lebih efisien dan efektif. Untuk mendapat kelebihan dalam persaingan dan merangsang pembangunan sektor pelancongan, rujukan kepada perubahan tren dan citarasa pengguna serta penerapan elemen keusahawanan yang bersesuaian dengan situasi tempat adalah pertimbangan terpenting yang perlu dilaksanakan.

eISBN

Abu-Jalil, M. M. (2017) mendapati kepuasan pelanggan mempunyai hubungan dan saling berkait rapat antara satu sama lain dengan kualiti perkhidmatan yang disediakan oleh pihak organisasi. Melalui pengalaman pelanggan itu sendiri, pelanggan dapat merasakan kepuasan atau ketidakpuasan hati terhadap perkhidmatan yang mereka terima. Perkhidmatan-perkhidmatan yang disediakan mestilah merangkumi aspek-aspek yang bercirikan kemudahan dan keselesaan supaya pelanggan berpuas hati untuk mendapatkan servis yang diberikan. Kesemua jenis perkhidmatan ini perlu diberi perhatian agar ianya mencapai kualiti da standard yang telah ditetapkan oleh organisasi itu senidri supaya prestasi dan imej dapat dijaga apabila tahap kepuasan pelanggan dapat dikenalpasti.

Menurut Noordin N. et al. (2009) mendapati bahawa prestasi perkhidmatan mempunyai hubungan yang signifikan dengan tahap kepuasan pelanggan yang dilakukan terhadap perkhidmatan di Malaysia. Terdapat dua faktor penting yang mempengaruhi prestasi perkhidmatan barisan hadapan iaitu kemudahan atas talian dan pendidikan pengguna. Kepuasan pengguna merupakan satu elemen yang penting dalam menentukan mutu produk dan perkhidmatan yang disediakan oleh sesebuah organisasi yang sememangnya amat penting untuk mendapatkan kepercayaan pengguna terhadap produk dan servis yang disediakan (Jalil, N. H. A. et al, 2017).

Hill T. P (1977) dalam kertas kajiannya menekankan konsep, definisi dan pengukuran dalam perkhidmatan. Seringkali perkhidmatan disalahertikan dengan barangan bukan material, bukan barang istimewa dan tergolong dalam kategori barangan logikal yang berbeza. Perkhidmatan adalah sama pentingnya dengan barangan dalam pembangunan ekonomi moden dan perlu dikenali dan diukur dengan bersesuaian kerana ia memberi kesan kepada ekonomi secara keseluruhannya.

Perkhidmatan pelanggan adalah salah satu bahagian yang paling penting dalam pemasaran untuk produk atau perkhidmatan. Perkhidmatan pelanggan yang berkualiti tinggi dapat membantu untuk mewujudkan kesetiaan pelanggan dan membina kepercayaan kepada pelanggan baru. Ia juga akan mewujudkan rantaian pelanggan apabila pelanggan yang setia itu dengan sendirinya mempromosi produk atau perkhidmatan kepada rakan sekeliling. Pelanggan hari ini bukan sahaja berminat dengan produk atau perkhidmatan yang ditawarkan tetapi semua unsur-unsur tambahan perkhidmatan yang mereka terima bermula dari ucapan yang mereka terima semasa memasuki permis sehinggalah perkhidmatan selepas jualan. Pelanggan akan berpuas hati jika perkhidmatan yang diberikan cepat, tiada kesilapan, mudah diperolehi, tidak membebankan pelanggan dan disertai dengan layanan yang mesra serta bersopan. Hubungan mesra di antara pelanggan dan organisasi amat diperlukan dalam memberikan input penambahbaikan bagi memberikan kualiti produk atau perkhidmatan yang diingini. Produk atau perkhidmatan yang diberikan akan mengambarkan kualiti sesebuah organisasi, semakin berkualiti produk atau perkhidmatan yang diberikan, semakin tinggi kepercayaan diperolehi.

Menurut Amiruddin, N. A. (2014), perkhidmatan yang berkualiti menjadi sebahagian daripada perkara asas kepada organisasi untuk berjaya. Manakala Zakaria I. et al, (2011) menyatakan bagi mengekalkan kesetiaan dan kepercayaan pelanggan dalam perkhidmatan yang diberikan, produk yang berkualiti tinggi amat diperlukan. Pengguna ataupun pelanggan ketika telah mempunyai pengetahuan berkaitan kesedaran terhadap nilai perkhidmatan atau produk yang akan dan mereka perolehi. Pelanggan pada kebiasaannya akan membandingkan produk/ perkhidmatan yang mempunyai kualiti dan nilai yang terbaik. Ini disebabkan mereka mempunyai alternatif yang luas dalam membuat pemilihan sama ada melakukan carian atas talian, carian dikedai, pendapat individu, iklan dan sebagainya.

eISBN

Azemi, N. C., & Assain, F. M. (2010) berpendapat kepuasan pengguna merupakan satu elemen yang penting dalam menentukan mutu produk dan perkhidmatan yang disediakan oleh sesebuah organisasi yang sememangnya amat penting untuk mendapatkan kepercayaan pengguna terhadap produk dan servis yang disediakan. Kepuasan pelanggan biasanya diukur dari perkhidmatan atau produk yang disampaikan/ dikeluarkan oleh sesebuah organisasi yang boleh memenuhi ciri-ciri/ jangkaan keperluan dan kehendak pelanggan. Wahid, H., Ahmad, S., Nor, M. A. M., & Rashid, M. A. (2015) pula menyatakan kualiti perkhidmatan adalah satu elemen penting dalam menilai keupayaan institusi untuk memenuhi matlamatnya.

Price (Harga) Harga adalah banyaknya uang yang dibayarkan oleh pelanggan untuk produk tersebut. Harga sangat penting mengingat hal tersebut menentukan keuntungan perusahaan. Menyesuaikan harga memiliki dampak yang mendalam pada strategi pemasaran, dan terkadang dapat juga memengaruhi permintaan dan penjualan (Hartono H. et al, 2012).

Dunia pemasaran pun mengikuti perubahan yang cenderung lebih banyak memanfaatkan komunikasi dunia internet yang semakin optimal. Para marketer menjadi terbiasa dengan istilah facebook, blog, web 2.0, Wikipedia, social networking, mobile marketing dan sebagainya. Dengan blog kita bisa menulis ide apapun yang berseliweran di kepala kita. Setelah ide ditulis, kita juga bisa mengajak teman-teman untuk aktif berpartisipasi dengan berdiskusi atau sekedar ngobrol, memberikan komentar, menuangkan ide, atau memberi tanggapan. Itu berbeda dengan website yang dulu kita kenal sebatas tempat mencari informasi. Contoh lain adalah social media seperti YouTube, Flickr, Facebook, MySpace, Second Life, juga Yahoogroups dan Friendster yang memungkinkan konsumen bisa berinteraksi dan berkomunitas secara intens. Perubahan yang demikian cepat ini maeter perlu juga melakukan pendekatan pendekatan baru ,karena jika pengelolaan pemasaran masih mempertahankan cara cara atau model marketing tradisional maka bisnis akan tidak mampu bertahan ditengah perkembangan tehnologi internet (TI) yang semakin canggih (Alriani I. M., 2014).

Kajian Zainudin I. S & Kin Q. C (2004), perkembangan e-dagang semakin popular dewasa ini dengan wujudnya perdagangan atau perniagaan yang dijalankan menggunakan Internet dalam-talian. Ia kini merupakan cara baru mengiklankan perkhidmatan atau produk tertentu melalui Internet. E-dagang melibatkan urusniaga yang dijalankan melalui saluran elektronik antara sebuah syarikat dengan syarikat yang lain atau antara syarikat dengan pengguna (Stair, R. M., & Reynolds, G. W. , 1999).

OBJEKTIF KAJIAN

Objektif kajian ini adalah untuk :

1. Mengenalpasti kepuasan pelanggan dari segi faktor perkhidmatan.
2. Mengenalpasti kepuasan pelanggan dari segi faktor harga.
3. Mengenalpasti kepuasan pelanggan dari segi faktor promosi.
4. Mengenalpasti kepuasan pelanggan dari segi faktor lokasi.
5. Mengenalpasti faktor keutamaan yang memberikan kepuasan terhadap pelanggan Syarikat Entohygiene Services Sdn Bhd.

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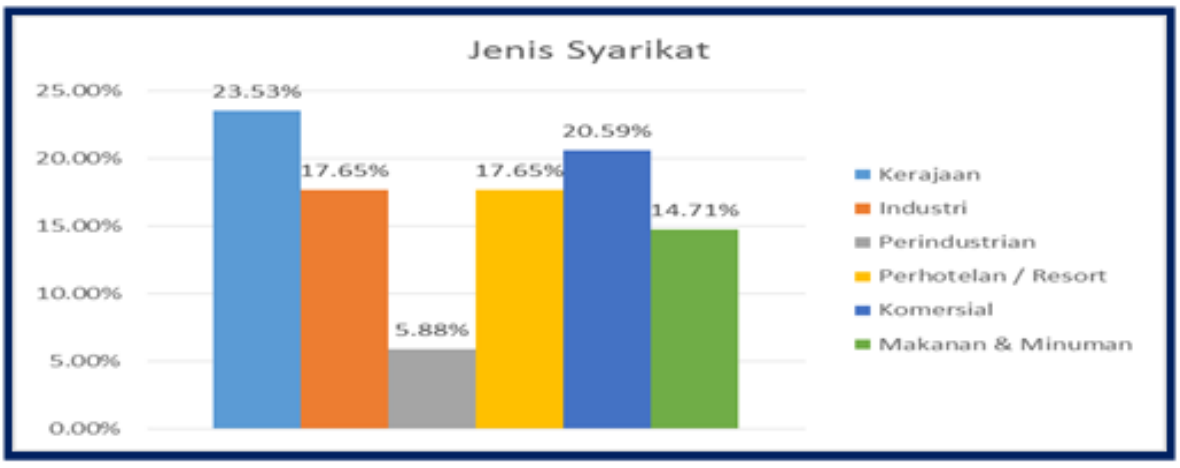
METODOLOGI KAJIAN

Kajian ini mengaplikasikan analisis data secara kuantitatif. Bagi data yang diperoleh dari borang soal selidik, ia dianalisis menggunakan perkiraan di dalam perisian Microsoft Excel. Microsoft Excel merupakan perisian jenis hamparan dan sebahagian daripada pakej Perisian Microsoft Office dan menjadi pilihan ramai untuk kegunaan analisis mudah dan menjadi keperluan pejabat hari ini. Perisian ini berupaya memproses data secara automatik yang boleh dalam bentuk pengiraan asas, formula, penggunaan fungsi, pemprosesan data dan jadual, grafik dan pengurusan data.
Menurut Emzir, M. P. K. (2010) dalam Metodologi Penelitian Kualitatif: Analisis Data, teknik statistik deskriptif digunakan untuk meneliti taburan demografi responden. Dalam kajian ini, demografi pelanggan yang dibincang termasuk jenis syarikat pelanggan, jenis perkhidmatan yang pelanggan gunakan, tempoh perkhidmatan dan nilai kontrak.
Menurut Cresswell, J. W. (2008), kajian kuantitatif adalah jenis penyelidikan pendidikan di mana pengkaji memutuskan apa yang hendak dikaji, bertanya soalan yang khusus, mengecilkan skop soalan, mengumpul data yang boleh dikuantitatifkan daripada responden, menganalisa nombor-nombor tersebut menggunakan statistik dan menjalankan pertanyaan dalam bentuk yang objektif. Dalam kajian ini, soalan-soalan mengenai faktor perkhidmatan, faktor harga, faktor promosi dan faktor lokasi sebagai faktor yang dapat memberikan kepuasan pelanggan terhadap perkhidmatan Syarikat Entohygiene Services Sdn. Bhd dan pengumpulan data adalah dikuantitatifkan serta dianalisis menggunakan statistik.

ANALISA DATA

Bahagian A: Demografi

Bahagian ini menganalisis latar belakang pelanggan iaitu jenis syarikat pelanggan, jenis perkhidmatan yang pelanggan gunakan, tempoh perkhidmatan dan nilai kontrak. Rajah 1 sehingga Rajah 4 menunjukkan analisis berkenaan latar belakang pelanggan.



Rajah 1: Taburan pelanggan Mengikut Jenis Syarikat

Rajah 1 menunjukkan hasil analisa jenis syarikat pelanggan. Dapatan menunjukkan syarikat kerajaan terdiri daripada 23.53 % diikuti syarikat komersial 20.59 %, 17.65 % bagi industri dan perhotelan/resort. 14.17 % pula untuk makanan & minuma, manakala 5.88 % untuk perindustrian.

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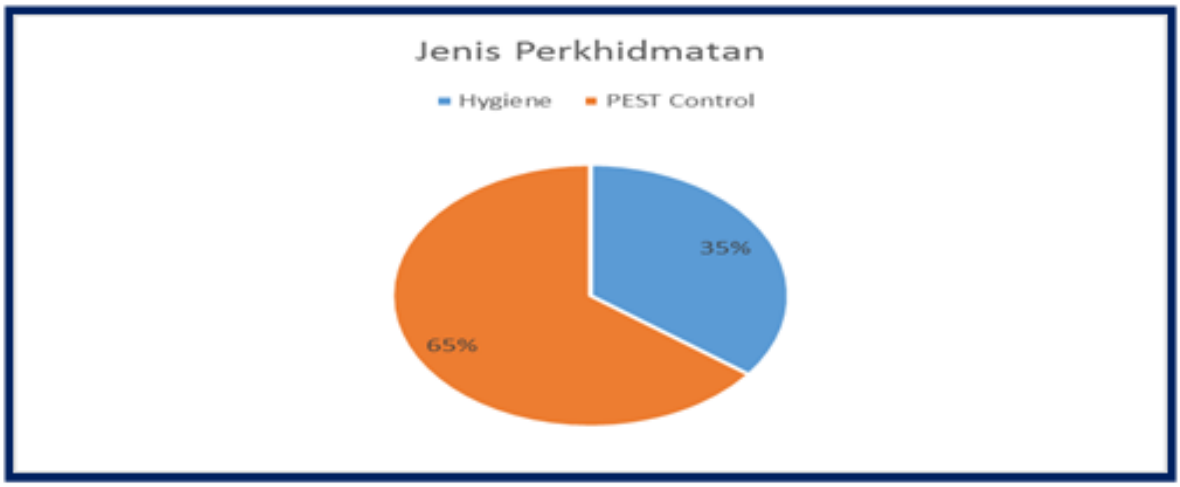

Rajah 2: Taburan Pelanggan Mengikut Jenis Perkhidmatan

Rajah 2 menunjukkan taburan pelanggan mengikut jenis perkhidmatan. Hasil dapatan didapati bahawa majoriti pelanggan adalah yang menggunakan jenis perkhidmatan PEST Control iaitu 65 % berbanding 35% daripada pelanggan yang menggunakan perkhidmatan Hygiene.

Rajah 3: Taburan Pelanggan Mengikut Tempoh Perkhidmatan

Analisis menunjukkan taburan pelanggan mengikut tempoh perkhidmatan. Merujuk kepada rajah 3 sebanyak 88 % adalah pelanggan yang menggunakan perkhidmatan secara kontrak dan hanya 12 % sahaja pelanggan menggunakan perkhidmatan secara One Time Job.

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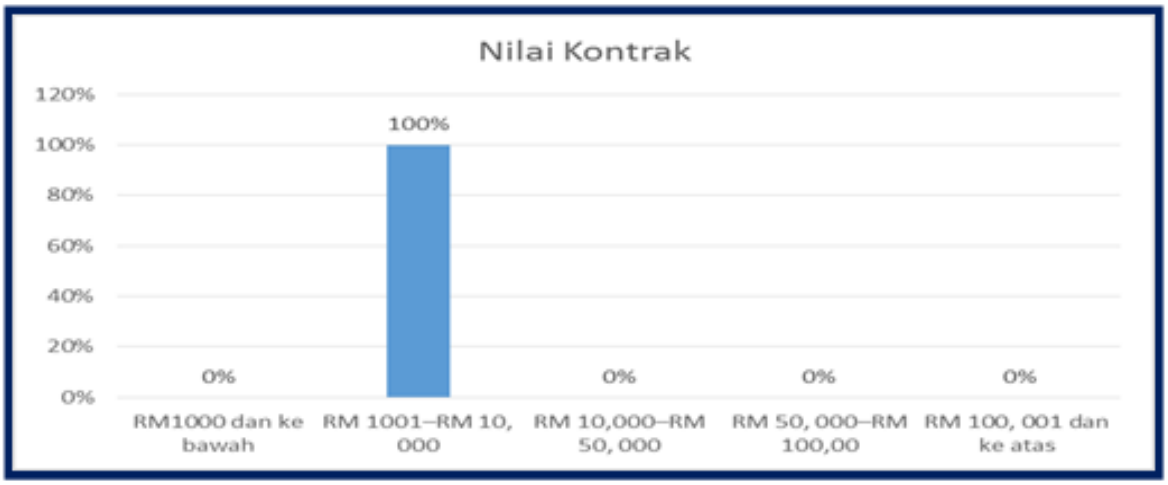

Rajah 4: Taburan Responden Mengikut Nilai Kontrak

Rajah 4 menunjukkan pelanggan mengikut nilai kontrak yang dibuat. Sebanyak 100 % nilai kontrak pelanggan berada pada nilai kontrak RM 1,001 – RM 10,000.

Bahagian B: Mengkaji Faktor Yang Dapat Memberikan Kepuasan Pelanggan Terhadap Perkhidmatan Syarikat Entohygiene Services Sdn. Bhd.

Di bahagian ini membincangkan tentang hasil maklum balas pelanggan terhadap mengkaji faktor yang dapat memberikan kepuasan pelanggan terhadap perkhidmatan Syarikat Entohygiene Services Sdn. Bhd. mengikut objektif kajian iaitu faktor perkhidmatan, harga, promosi dan lokasi.

Soal selidik ini diedarkan kepada 34 syarikat yang telah menggunakan perkhidmatan Entohygiene Services Sdn. Bhd. bagi mendapatkan maklum balas pelanggan. Semua data yang diperoleh daripada pelanggan ditunjukkan dalam bentuk jadual. Bagi menganalisis tahap persetujuan pelanggan terhadap ke semua faktor, soalan adalah berbentuk skala likert diberikan. Pengiraan min dan peratusan digunakan. Min diperolehi berdasarkan skor pada jawapan yang digunakan (Bryman, M. A. H. A. , 2004). Formula pengiraan bagi jumlah skor, min dan peratus adalah seperti berikut :

Jumlah skor = kekerapan setiap skala x skor setiap skala

$$\text{Peratusan (\%)} = \frac{\text{Jumlah kekerapan}}{\text{Bilangan pelanggan}} \times 100$$

$$\text{Min (X)} = \frac{\text{Jumlah skor}}{\text{Bilangan pelanggan}}$$

(Sumber: Riduwan & Akdon ,2007)

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Tahap taburan pelanggan bagi soal selidik ini telah dikelaskan kepada 3 kategori iaitu pada tahap skala seperti berikut:

Jadual 1: Tahap Skala

Julat	Tahap
1.00-2.33	rendah
2.34-3.66	sederhana
3.67-5.00	tinggi

(Sumber: Jawatankuasa Penyelidikan Fakulti Pendidikan, UTM 2001/2002 dalam Azizi et al.,2003)

Jadual 2: Nilai peratusan bagi setiap item faktor perkhidmatan

No	Perkara	% Sangat Tidak Setuju	% Tidak Setuju	% Sederhana Setuju	% Setuju	% Sangat Setuju
1	Perkhidmatan yang disediakan oleh Syarikat Entohygiene Services Sdn. Bhd dapat membantu pelanggan menyelesaikan masalah *Hygiene* atau *PEST Control.*	0	0	0	15	85
2	Maklumat mengenai perkhidmatan yang ditawarkan dapat diperolehi dengan mudah dan cepat.	0	0	0	24	76
3	Pelanggan dapat maklumat mengenai anggaran masa untuk setiap perkhidmatan yang diberikan.	0	0	3	9	88
4	Syarikat Entohygiene Services Sdn. Bhd sentiasa memberikan perkhidmatan	0	0	0	38	62

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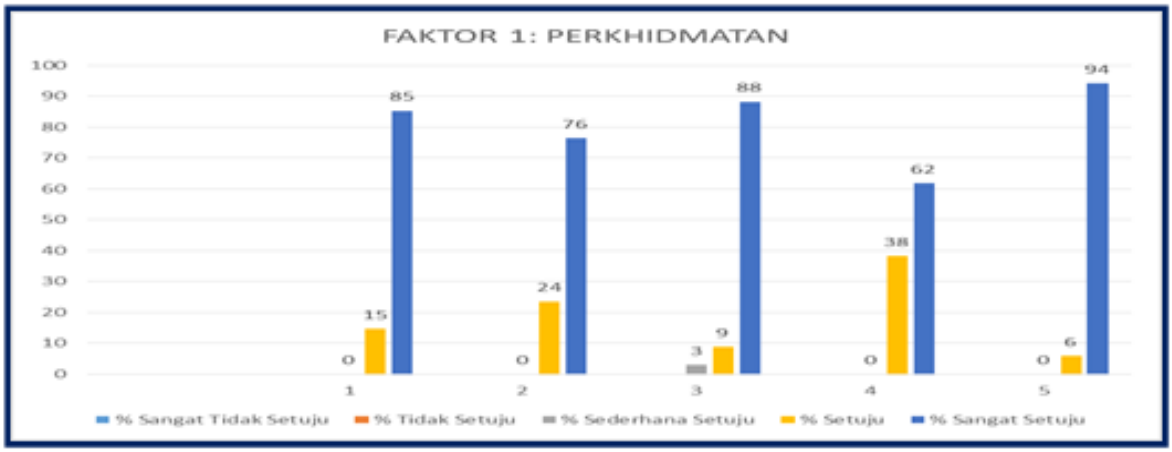
	tepat pada masanya.					
5	Syarikat kami berpuas hati dengan perkhidmatan yang diberikan oleh Syarikat Entohygiene Services Sdn. Bhd.	0	0	0	6	94



Rajah 5: Nilai peratusan bagi setiap item faktor perkhidmatan

Jadual 3: Analisis Tahap Persetujuan Pelanggan bagi faktor perkhidmatan

Faktor Perkhidmatan	Jumlah skor	Min
1	165	4.9
2	161	4.7
3	165	4.9
4	154	4.5
5	162	4.8
Purata min keseluruhan		4.76

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Hasil kajian menunjukkan purata min keseluruhan adalah 4.76, iaitu menunjukkan pelanggan berada pada tahap tinggi persetujuan dengan faktor perkihdmatan. Min tertinggi dalam Jadual 2 ialah 4.9 iaitu pada soalan nombor 1 dan soalan nombor 3. Ini bermakna pelanggan amat berminat dengan perkidmatan yang disediakan dimana perkhidmatan Entohygiene ini dapat membantu pelanggan menyelesaikan masalah Hygiene atau PEST Control dan pelanggan dapat maklumat mengenai anggaran masa untuk setiap perkhidmatan yang diberikan. Daripada Jadual 1 juga skor min terendah adalah bagi soalan 4 iaitu 4.5. Secara keseluruhannya pelanggan berpuas hati dengan perkhidmatan Entohygiene Services Sdn Bhd.

Jadual 4: Nilai peratusan bagi setiap item faktor Harga

No	Perkara	% Sangat Tidak Setuju	% Tidak Setuju	% Sederhana Setuju	% Setuju	% Sangat Setuju
1	Harga yang ditawarkan adalah berpatutan dengan perkhidmatan yang diberikan.	0	0	9	21	70
2	Syarikat Entohygiene Services Sdn. Bhd tidak mengenakan caj lebihan kepada pelanggan	0	0	0	21	79
3	Caj permulaan tidak dikenakan untuk tinjauan rundingan permulaan.	0	0	3	9	88
4	Diskaun diberikan kepada pelanggan mengikut kuantiti dan nilai kontrak.	0	0	9	56	35
5	Syarikat kami berpuas hati dengan sebutharga yang diberikan oleh Syarikat Entohygiene Services Sdn. Bhd.	0	0	0	15	85

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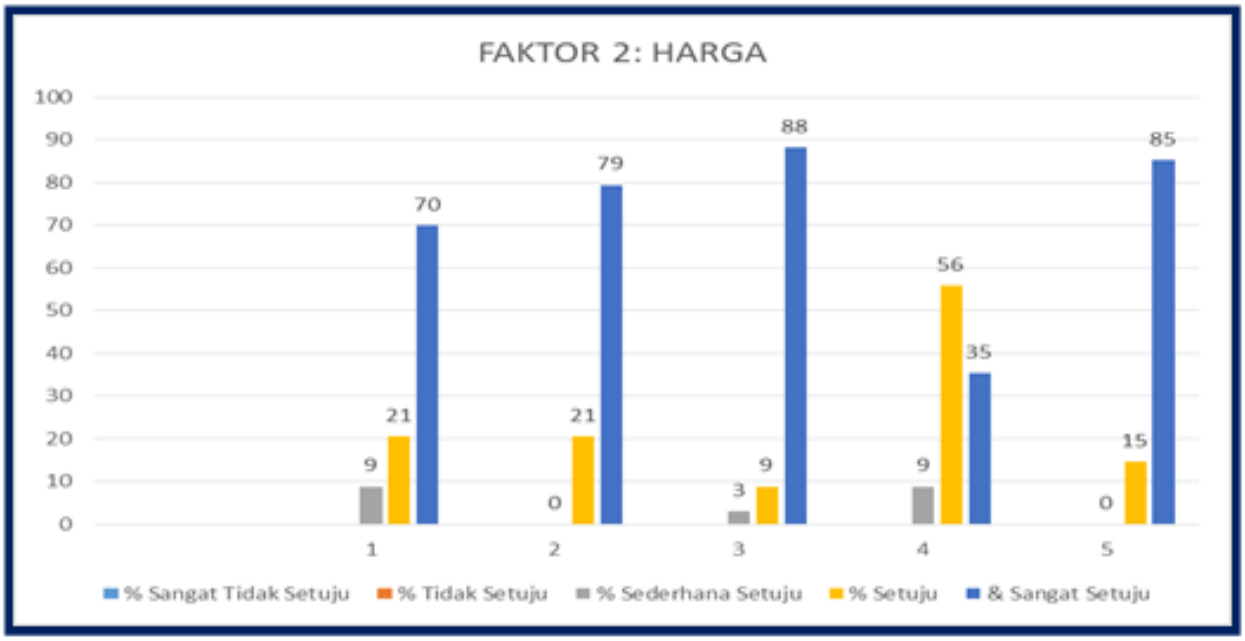

Rajah 6: Nilai peratusan bagi setiap item faktor Harga

Jadual 5: Analisis Tahap Persetujuan Pelanggan bagi faktor Harga

Faktor Harga	Jumlah skor	Min
1	157	4.6
2	163	4.8
3	165	4.9
4	139	4.1
5	165	4.9
Purata min keseluruhan		4.66

Hasil kajian menunjukkan purata min keseluruhan adalah 4.66, iaitu menunjukkan pelanggan berada pada tahap tinggi persetujuan dengan faktor harga. Min tertinggi dalam Jadual 4 ialah 4.9 iaitu pada soalan nombor 3 dan soalan nombor 5. Ini bermakna pelanggan amat berpuas hati pada caj permulaan yang tidak dikenakan untuk tinjauan rundingan permulaan dan pelanggan amat berpuas hati dengan sebutharga yang diberikan oleh Syarikat Entohygiene Sdn. Bhd. Daripada Jadual 4 juga skor min terendah adalah bagi soalan 4 iaitu 4.1. Secara keseluruhannya pelanggan amat berpuas hati dengan harga yang ditawarkan oleh Entohygiene Services Sdn Bhd.

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Jadual 6: Nilai peratusan bagi setiap item faktor Promosi

No	Perkara	% Sangat Tidak Setuju	% Tidak Setuju	% Sederhana Setuju	% Setuju	% Sangat Setuju
1	Laman sosial seperti *Facebook, Instagram* dan Laman sesawang syarikat sentiasa memberi maklumat terkini mengenai perkhidmatan Syarikat Entohygiene Services Sdn. Bhd.	0	0	3	47	50
2	Laman sosial seperti *Facebook, Instagram* dan Laman sesawang syarikat sebagai media komunikasi memudahkan pelanggan untuk mendapatkan maklumat mengenai perkhidmatan Syarikat Entohygiene Services Sdn. Bhd.	0	0	3	47	50
3	Brosur syarikat disediakan untuk mempromosikan maklumat mengenai perkhidmatan yang disediakan oleh Syarikat Entohygiene Services Sdn. Bhd. melalui brosur.	0	0	0	41	59
4	Pelanggan mengikuti semua laman sosial Syarikat Entohygiene Services Sdn. Bhd.	0	0	12	44	44
5	Promosi yang dijalankan oleh Syarikat Entohygiene Services Sdn. Bhd. meyakinkan pelanggan untuk memilih perkhidmatan yang disediakan.	0	0	3	44	53

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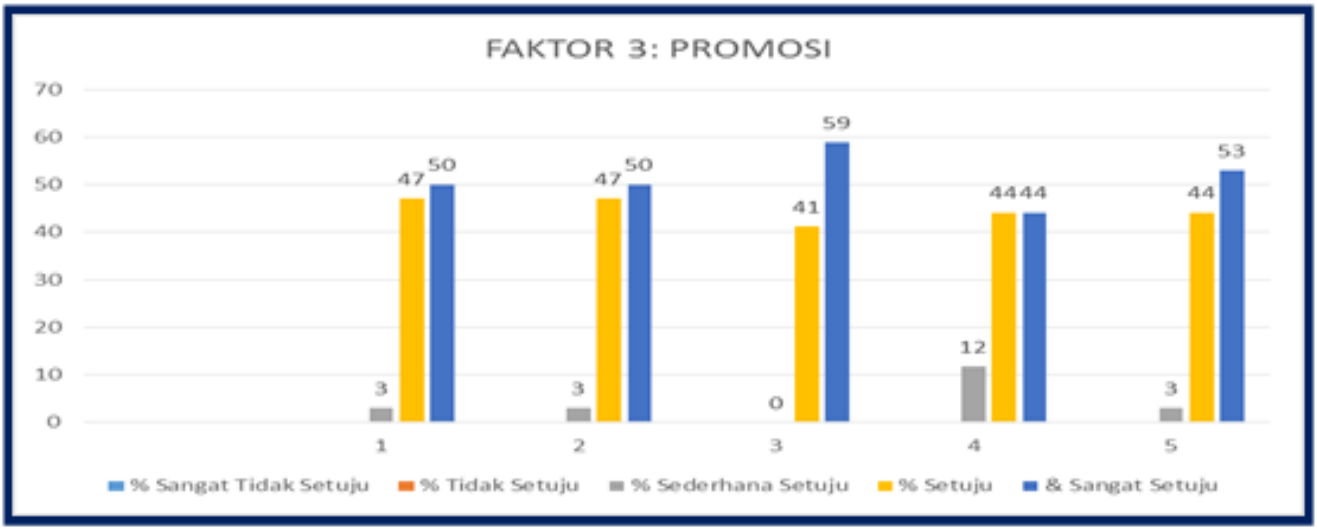

Rajah 7: Nilai peratusan bagi setiap item faktor promosi

Jadual 7: Analisis Tahap Persetujuan Pelanggan bagi faktor Promosi

Faktor Harga	Jumlah skor	Min
1	152	4.5
2	152	4.5
3	156	4.6
4	147	4.3
5	153	4.5
Purata min keseluruhan		4.48

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Hasil kajian menunjukkan purata min keseluruhan adalah 4.48, iaitu menunjukkan pelanggan berada pada tahap tinggi persetujuannya dengan faktor promosi. Min tertinggi dalam Jadual 6 ialah 4.6 iaitu pada soalan nombor 3. Ini bermakna pelanggan banyak mengetahui tentang perkhidmatan syarikat melalui brosur syarikat yang disediakan. Daripada Jadual 6 juga skor min terendah adalah bagi soalan 4 iaitu 4.3. Secara keseluruhannya pelanggan amat berpuas hati dengan promosi yang telah dilaksanakan oleh Entohygiene Services Sdn Bhd.

Jadual 8: Nilai peratusan bagi setiap item faktor Lokasi

No	Perkara	% Sangat Tidak Setuju	% Tidak Setuju	% Sederhana Setuju	% Setuju	% Sangat Setuju
1	Lokasi yang jauh tidak menghalang Syarikat Entohygiene Services Sdn. Bhd. memberikan perkhidmatan yang terbaik.	0	0	6	32	62
2	Syarikat Entohygiene Services Sdn. Bhd. berhampiran dengan premis pelanggan.	0	0	3	41	56
3	Syarikat Entohygiene Services Sdn. Bhd. terletak di lokasi yang strategik.	0	0	9	21	70
4	Faktor lokasi bukan penghalang pelanggan memilih perkhidmatan Syarikat Entohygiene Services Sdn. Bhd.	0	0	6	56	38
5	Syarikat Entohygiene Services Sdn. Bhd. memberikan perkhidmatan di kawasan utara semanjung (Pulau Pinang, Kedah, Perlis)	0	0	0	3	97

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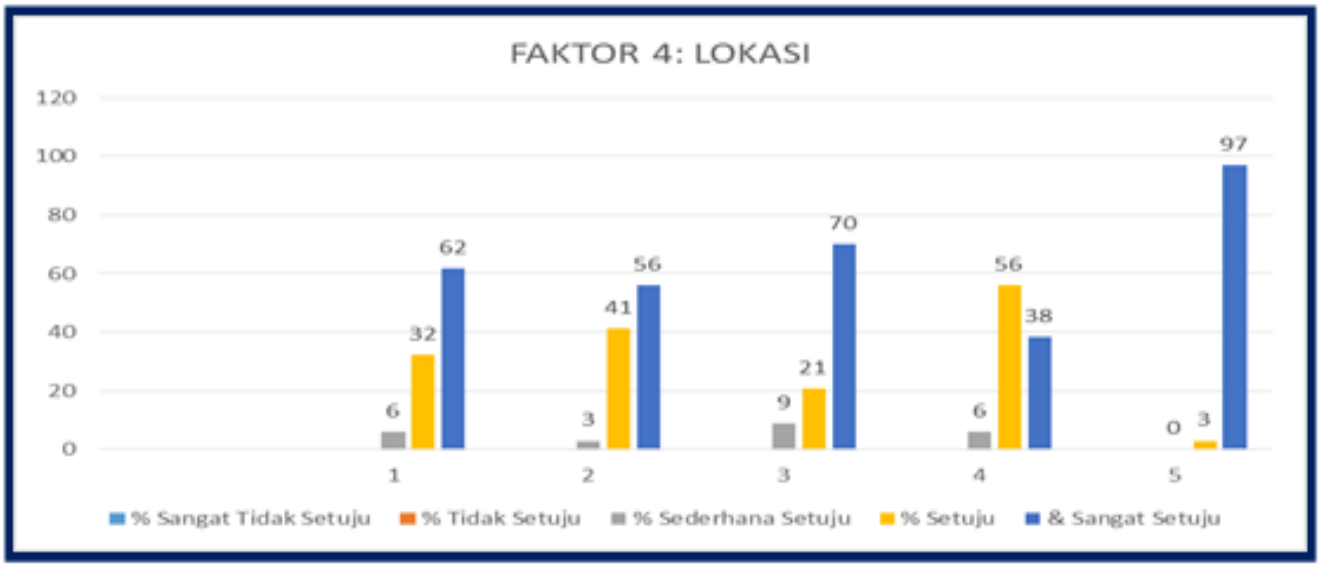

Rajah 8: Nilai peratusan bagi setiap item faktor lokasi

Jadual 8: Analisis Tahap Persetujuan Pelanggan bagi faktor Lokasi

Faktor Harga	Jumlah skor	Min
1	155	4.6
2	154	4.5
3	136	4.0
4	144	4.2
5	169	5.0
Purata min keseluruhan		4.46

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Hasil kajian menunjukkan purata min keseluruhan adalah 4.46, iaitu menunjukkan pelanggan masih berada pada tahap yang tinggi persetujuannya dengan faktor lokasi. Min tertinggi dalam Jadual 8 ialah 5.0 iaitu pada soalan nombor 5. Ini bermakna pelanggan amat bersetuju dimana Syarikat Entohygiene Services dapat memberikan perkidmatan di kawasan utara semanjung (Pulau Pinang, Kedah dan Perlis). Daripada Jadual 8 juga skor min terendah adalah bagi soalan 3 iaitu 4.0. Secara keseluruhannya pelanggan tetap berpuas hati dengan faktor lokasi.

PERBINCANGAN

A.Faktor Perkhidmatan

Dalam faktor yang pertama iaitu perkhidmatan terdapat 5 item yang dikemukakan dalam bahagian ini. Item 1 menunjukkan min skor yang tertinggi pada 4.9 pelanggan yang bersetuju bahawa perkhidmatan yang disediakan oleh Syarikat Entohygiene Services Sdn. Bhd dapat membantu pelanggan menyelesaikan masalah Hygiene atau PEST Control. Ini bermakna pelanggan dapat merancang dan mengetahui tentang semua maklumat yang dikehendaki lebih teratur dengan menggunakan perkidmatan Syarikat Entohygiene.

Item 3 yang menyatakan pengguna dapat maklumat mengenai perkhidmatan yang ditawarkan dapat diperolehi dengan mudah dan cepat juga mendapat min yang tinggi 4.9.

Dapatan bagi min terendah ialah pada skor 4.5 berada pada item 4 juga berada pada tahap tinggi iaitu pelanggan bersetuju menyatakan Syarikat Entohygiene Services Sdn. Bhd sentiasa memberikan perkhidmatan tepat pada masanya. Secara keseluruhannya, faktor perkhidmtan mendapat purata min keseluruhan paling tinggi iaitu 4.76.

B.Faktor Harga

Dalam faktor harga terdapat sebanyak 5 soalan yang telah dikemukakan. Item soalan 3 ini telah membawa nilai min tertinggi iaitu 4.9 mewakili 88% pelanggan sangat setuju bahawa caj permulaan tidak dikenakan untuk tinjauan rundingan permulaan bagi pelanggan yang ingin meninjau dan membuat semakan harga terlebih dahulu. Purata Min Keseluruhan bagi faktor harga adalah 4.66 masih ditahap yang tinggi.

Tiada sebarang caj harga dikenakan bagi mana-mana pelanggan yang inigin mendapatkan khidmat rundingan pada peringkat awal, sangat banyak membantu pihak syarikat untuk terus menjadi pilihan pelanggan yang memerlukan perkhidmatan PEST dan Hygiene ini. Dapatan ini disokong oleh Douglas M. Lambert & James R. Stock (1993) yang menyatakan keberkesanan harga adalah salah satu ukuran prestasi dan boleh diukur melalui perbandingan antara harga sebenar dan perancangan.

C. Faktor Promosi

Menurut Bowersox, D. J., & Closs, D. J. (1996), promosi jangka masa pendek dapat membekal insentif untuk pembelian. Dalam usaha untuk menstabilkan harga promosi, syarikat membentuk program rantaian nilai bersepadu dan merancang promosi dan strategi pengiklanan bersama syarikat yang lain bagi satu kategori produk atau barangan. Perjanjian boleh dicapai untuk sesuatu peristiwa yang berlaku dalam masa yang pendek.

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Laman social seperti Facebook, Instagram dan laman sesawang sebagai media komunikasi memudahkan pengguna untuk mendapatkan maklumat mengenai perkhidmatan Syarikat Entohygiene Services Sdn. Bhd. Menurut Bickerton, P., Bickerton, M., & Pardesi, U. (2007), penggunaan media sosial merupakan medium untuk menyebarkan maklumat penting khususnya kepada pengguna. Sebagai contoh, pengguna dapat melihat promosi yang ditawarkan oleh Syarikat Entohygiene melalui media sosial Facebook dan Instagram Selain itu, pengguna juga dapat melihat gambar-gambar terbaru yang disebarkan oleh Syarikat Entohygiene Services Sdn. Situasi ini adalah bersesuaian dengan tujuan campuran promosi yang digariskan oleh mereka iaitu untuk menggalakkan persampelan produk atau perkhidmatan yang ditawar dan menggalakkan perniagaan bagi mewujudkan dan mengekalkan imej korporat yang akan membantu usaha pemasaran secara keseluruhan. Item 3 menyatakan min yang tinggi 4.6 yang membawa maksud 59% pelanggan setuju dengan penggunaan brosur syarikat disediakan untuk mempromosikan maklumat mengenai perkhidmatan yang disediakan oleh Syarikat Entohygiene Services Sdn Bhd. Maklumat yang diperolehi dari brosur syarikat mencukupi bagi pelanggan untuk memperolehi jenis perkhidmatan yang ditawarkan oleh pihak syarikat.

Terdapat penurunan bagi nilai purata min keseluruhan untuk faktor promosi iaitu 4.48 berbanding faktor perkhidmatan dan faktor harga. Namun begitu nilai 4.48 bagi faktor promosi ini, masih ditahap tahap skala yang tinggi.

D. Faktor Lokasi

Sebanyak 5 soalan dikemukakan di bahagian ini. Item 5 telah membawa nilai min tertinggi iaitu 5 dan 97% pelanggan sangat setuju bahawa Syarikat Entohygiene Services Sdn Bhd. Dapat memberikan perkhidmatan di kawasan utara semenanjung (Pulau Pinang, Kedah dan Perlis. Ini jelas menunjukkan kawasan lokasi yang dekat dengan pelanggan mampu memberikan perkhidmatan yang terbaik dari Syarikat Entohygiene.

Item yang menunjukkan min sederhana berada pada item 3 menunjukkan lokasi syaraikat tidak berhampiran dengan permis perniagaan, namun begitu min 4.0 masih berada pada tahap yang tinggi dalam tahap skala.

Secara keseluruhannya, purata min keseluruhan bagi faktor lokasi berada paling rendah iaitu 4.46 berbanding dengan tiga faktor yang lain.

E. Implikasi Kajian

Hasil kajian ini telah berjaya mengenalpasti faktor-faktor yang dapat memberikan kepuasan pelanggan terhadap perkhidmatan Syarikat Entohygiene Services Sdn. Bhd. Pemilihan pengguna terhadap perkhidmatan Syarikat Entohygiene Services Sdn. Bhd. sebagai sebuah syarikat yang dapat menyelesaikan masalah dan sekaligus dapat membantu pelanggan dalam menyelesaikan masalah Hygiene atau PEST Control. Hasil dapatan kajian jelas mencadangkan pentingnya perkhidmatan Hygiene atau PEST Control untuk menguasai keempat- empat faktor pemilihan pengguna terhadap kepuasan pelanggan terhadap perkhidmatan Syarikat Entohygiene Services Sdn. Bhd.

Hasil kajian ini mampu memberi kesedaran kepada pengguna-pengguna perkidmatan Hygiene atau PEST Control khasnya pengguna perkhidmatan Syarikat Entohygiene Services Sdn. Bhd. untuk memilih dan memberi kepercayaan kepada perkhidmatan Syarikat Entohygiene Services

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Sdn. Bhd. Sebagai syarikat Hygiene atau PEST Control tanpa sebarang kesangsian. Syarikat Entohygiene Services Sdn. Bhd. sebagai pengusaha yang menceburi bidang Hygiene atau PEST Control juga dapat menggunakan dapatan kajian ini untuk mempertingkatkan lagi penekanan dan strategi untuk menambah nilai-nilai perkhidmatan Syarikat Entohygiene Services Sdn. Bhd.

Bagi pusat-pusat pengajian tinggi, terutamanya politeknik-politeknik yang menawarkan kursus Pengurusan Logistik dan Rangkaian Bekalan, kajian ini mampu memberi input tentang kesedaran menjaga kebersihan yang akan bermula dari peringkat awal lagi dalam bidang logistik iaitu dimana bermula dengan penyimpanan barang, persediaan barangan, penghantaran barangan dan pergerakan barang.

Bagi penyimpanan barang terutamanya untuk bahan mentah, ianya perlu lah diselanggara dengan baik terutamaya bagi mengelakkan bahan tercemar dengan serangga perosak. Kaedah PEST Control perlu dilaksanakan terlebih dahulu bagi mengelakkan semua bahan mentah tercemar dan rosak. Sesebuah organisasi itu akan musnah tanpa logistik kerana unit Logistik adalah untuk menggerakkan proses perjalanan barang.

CADANGAN

Pengkaji telah berjaya mendapatkan maklum balas daripada pelanggan yang menggunakan perkhidmatan Syarikat Entohygiene Services Sdn. Bhd. Setelah semua data tesebut di analisis oleh pengkaji, beberapa cadangan dapat di hasilkan demi penyelesaikan permasalahan bersama. Dalam usaha memastikan perkhidmatan Syarikat Entohygiene Services Sdn. Bhd dipilih sebagai syarikat Hygiene dan PEST Control di kawasan utara semenanjung (Pulau Pinang, Kedah dan Perlis) pelbagai faktor diperlukan dan perlu disediakan oleh Syarikat Entohygiene Services Sdn. Bhd.

Syarikat Entohygiene Services Sdn. Bhd. perlu melihat perkara ini sebagai aspek yang perlu diberi perhatian serta mengambil berat soal perkhidmatan yang diberikan.
Pembangunan dunia globalisasi menuntut supaya pengusaha perkhidmatan Hygiene dan PEST dapat menawarkan perkhidmatan yang murah, selamat dan mesra pengguna kerana faktor-faktor tersebut adalah kunci kepada persaingan untuk mendapatkan pelanggan pada zaman yang semakin mencabar ini.

Berdasarkan dapatan kajian, pengkaji ingin mengemukakan beberapa cadangan yang boleh dipertimbangkan oleh Syarikat Entohygiene Services Sdn. Bhd. Cadangan ini dibahagikan kepada empat bahagian iaitu cadangan ke atas faktor perkhidmatan, faktor harga, faktor promosi dan faktor lokasi.

Cadangan kepada pelanggan SYARIKAT ENTOHYGIENE SERVICES SDN. BHD.

Berdasarkan dapatan kajian, pengguna dicadangkan agar terus menggunakan perkhidmatan Syarikat Entohygiene Services Sdn. kerana perkhidmatan Syarikat Entohygiene Services Sdn. adalah lebih bersistematik dan menjamin keselamatan pengguna.

Perkhidmatan yang baik dapat memberikan kemudahan dan keselesaan kepada setiap pengguna. Secara sedar atau tidak, setiap pengguna perkhidmatan Syarikat Entohygiene Services Sdn. mempunyai hak sebagai pelanggan yang wajar dimanfaatkan. Antaranya ialah hak untuk mendapatkan perkhidmatan yang bersih, berkesan dan selamat.

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Harga memainkan peranan penting kepada pengguna dalam pemilihan pengangkutan awam. Pengguna perlu memilih syarikat Hygiene dan PEST yang dapat menjimatkan kos dan berpatutan. Pengguna Syarikat Entohygiene Services Sdn. perlu memastikan harga yang dikenakan bersamaan dan berpatutan dengan harga yang diberikan.

Setiap pengguna Syarikat Entohygiene Services Sdn. pastinya ingin mendapatkan perkhidmatan yang terbaik. Maklumbalas dari pelanggan-pelanggan terdahulu amat membantu dalam menganalisa keberkesanan perkhidmatan yang disediakan. Maka medan media sosial dapat memberikan makluman yang terkini bagi pelanggan menilai keberkesenan perkihmatan yang diberikan.

Lokasi syarikat yang strategik jugak memainkan peranan yang penting dalam faktor pemilihan pelanggan. Ini kerana pelanggan akan mudah untuk mendapatkan perkihdmatan yang cepat dan pantas jika berlaku sebarang keperluan yang mendesak.

Cadangan kepada SYARIKAT ENTOHYGIENE SERVICES SDN. BHD.

Hasil daripada kajian ini, beberapa cadangan telah di ajukan kepada Syarikat Entohygiene Services Sdn. untuk membuat pertimbangan bagi penambahbaikan dari aspek perkhidmatan, harga, promosi dan infrastruktur untuk menarik minat orang awam untuk menggunakan perkhidmatan Hygiene dan PEST Control.

Langkah menjadikan Syarikat Entohygiene Services Sdn. sebagai tumpuan untuk pelanggan bagi perkhidmatan Hygiene dan PEST Control supaya sentiasa membuat tindakan susulan setiap keli perkhidmatan dibuat kepada pelanggan mengenai kepuasan pelanggan terhadap perkihdmatan yang ditawarkan. Dan syarikat perlu sentiasa membuat penambahbaikan bagi setiap aduan yang diberikan kepada pelanggan.

Syarikat Entohygiene Services Sdn. dicadang untuk membuat pertimbangan bagi memberi potongan harga kepada pelanggan yang membuat kontrak yang panjang seperti kontrak yang melebihi 2 tahun bagi setiap jenis perkhidmatan yang diambil. Selain itu, langkah untuk memberi potongan harga kepada pelanggan Syarikat Entohygiene Services Sdn. yang menbuat penempahan awal juga dicadangkan. Cadangan lain yang dituju kepada Syarikat Entohygiene Services Sdn. ialah memberi potongan harga kepada pengguna perkhidmatan Syarikat Entohygiene Services Sdn. yang memperkenalkan perkhidmatan tersebut kepada kawan-kawan atau ahli keluarga.

Syarikat Entohygiene Services Sdn. perlu lebih peka terhadap keadaan semasa dimana dalam mempromosikan perkhidmatan yang diberikan, pihak syarikat perlu sentiasa mengemas kini laman sosial seperti facebook, Instagram dan laman sesawang sentiasa. Bagi memastikan pelanggan mendapatkan maklumat terkini.

Lokasi yang bersesuaian amat memainkan peranan yang penting bg sesebuah syarikat. Ini bagi memastikan pelanggan mudah menghubungi dan mendapatkan produk atau perkhidmatan yang ditawarkan. Syarikat Entohygiene Services Sdn. perlu membuka lagi beberapa cawangan bagi setiap kawasan seperti di kedah memilik satu atau dua buah cawangan, supaya perkhidmatan dapat diberikan dengan segera dan kos untuk operasi syarikat dapat dikurangkan seperti kos pengangkutan dan kos penyelenggaraan.

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Cadangan Susulan Kajian

Untuk mendapat hasil kajian yang lebih tepat dan boleh dipercayai, terdapat beberapa cadangan yang boleh dinyatakan kepada pihak-pihak yang ingin menjalankan kajian ini pada masa depan. Antara cadangan ialah:

i. Meluaskan skop kajian

Pengkaji mencadangkan agar pengkaji akan datang dapat meluaskan skop kajian kepada pelanggan yang berada di kawasan di seluruh Malaysia. Pelanggan yang lebih ramai membolehkan pelbagai masalah dapat dikenalpasti dan hasil yang akan diperolehi adalah lebih sahih dan kukuh.

ii. Memperincikan faktor kajian

Untuk kajian pada masa hadapan, penyelidik dicadangkan supaya menjalankan kajian dalam aspek yang lebih mendalam dan terperinci mengenai perkihdmatan, harga, promosi dan lokasi untuk faktor pemilihan perkhidmatan Syarikat Entohygiene Services Sdn. sebagai syarikat yang menawarkan Hygiene and PEST Control.

iii. Mengkaji faktor-faktor lain

Untuk kajian pada masa hadapan, para penyelidik dicadangkan supaya memperbanyakkan lagi objektif-objektif dan faktor-faktor daripada kajian ini agar dapat memberi gambaran yang lebih menyeluruh dan memaparkan lebih banyak manfaat jika dibandingkan dengan penyelidik sebelumnya

KESIMPULAN

Kesimpulannya, kajian terhadap faktor yang dapat memberikan kepuasan pelanggan terhadap perkhidmatan Syarikat Entohygiene Services Sdn. Bhd. ini telah berjaya dilaksanakan. Pengkaji telah mengenalpasti bahawa faktor perkihdmatan amat dititik beratkan dan menjadi faktor utama untuk pengguna memilih perkhidmatan Syarikat Entohygiene Services Sdn. Bhd. sebagai syarikat yang menawarkan perkhidmatan Hygiene dan PEST Control. Hal ini adalah kerana penggunaan amat memerlukan perkhidmatan yang terbaik dimana sebuah syarikat yang dapat memberikan bantuan penyelesaian masalah dan perkihmatan terbaik untuk pelanggan.

Kemudian diikuti oleh faktor harga di mana perkhidmatan Syarikat Entohygiene Services Sdn. Bhd. memberi keyakinan kepada pengguna untuk memilih perkhidmatan Hygiene dan PEST Control di kawasan utara semenanjung. Faktor promosi juga penting bagi membolehkan pelanggan mengetahui dengan cepat dan terkini tentang apa jua maklumat yang diberikan oleh syarikat. Akhir sekali, faktor lokasi yang tidak begitu memainkan peranan sebagai faktor pemilihan pengguna terhadap perkhidmatan Syarikat Entohygiene Services Sdn. Bhd. tetapi masih perlu dititik beratkan oleh Syarikat Entohygiene Services Sdn. Bhd untuk memulih dan mengekalkan imej korporat syarikat.

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Justeru itu, diharapkan dapatan kajian yang diperolehi oleh pengkaji dapat memberi manfaat serta faedah kepada pelanggan perkhidmatan Syarikat Entohygiene Services Sdn. Bhd khasnya, pengkaji masa depan serta semua yang terlibat dalam mencapai hasrat Syarikat Entohygiene Services Sdn. Bhd. Dengan pelbagai langkah dan cadangan yang diutarakan secara tidak langsung dapat membantu pihak-pihak yang terlibat dalam perkhidmatan Hygiene dan PEST Control.

Secara keseluruhannya, dapat dikatakan bahawa objektif kajian yang dibentuk oleh pengkaji telah dicapai. Hasil dapatan yang diperolehi menunjukkan keempat- empat faktor yang telah dikaji mempunyai hubungan yang berkaitan dengan kecenderungan pelanggan untuk memilih perkhidmatan Syarikat Entohygiene Services Sdn. Bhd sebagai syarikat Hygiene dan PEST Control. Elemen yang paling kritikal atau diberi keutamaan dalam perkhidmatan Syarikat Entohygiene Services Sdn. Bhd adalah dari aspek perkhidmatan, di mana pengguna diberi kemudahan untuk mendapat maklumat dan perkhidmatan dengan cepat dan tepat. Ini diikuti oleh faktor harga dan faktor promosi yang juga dititikberatkan pada perkhidmatan Syarikat Entohygiene Services Sdn. Bhd Akhir sekali, faktor lokasi juga perlu diberi perhatian tetapi di dalam perkhidmatan Syarikat Entohygiene Services Sdn. Bhd lokasi boleh dikatakan sebagai faktor yang kurang mempengaruhi pengguna untuk memilih perkhidmatan Syarikat Entohygiene Services Sdn. Bhd sebagai syarikat yang menawarkan perkhidmatan Hygiene dan PEST Control.

PENGHARGAAN

Kajian ini diberi kerjasama sepenuhnya oleh pihak Syarikat Entohygiene Services Sdn Bhd. Pengkaji merakamkan setinggi perhargaan kepada pihak yang terlibat dengan penyelidikan.

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KEBERKESANAN PENGGUNAAN ALGEBRATOR DALAM PENGAJARAN DAN PEMBELAJARAN BAGI TOPIK BASIC ALGEBRA DALAM KURSUS MATEMATIK KEJURUTERAAN 1 (DBM1013) BAGI PELAJAR DEP1A, POLITEKNIK SULTAN IDRIS SHAH.

Marini Binti Mohd Thaib, Norsuzana Binti Zakaria, Rozilaili Binti Mustapa
Politeknik Balik Pulau, Pulau Pinang

Abstrak

Kajian ini dijalankan untuk menguji keberkesanan penggunaan Algebrator bagi topik Basic Algebra dalam kursus Matematik Kejuruteraan 1 (DBM 1013) bagi pelajar program Diploma Kejuruteraan Elektrik (Komunikasi) Semester Satu (DEP 1A) di Politeknik Sultan Idris Shah. Kajian ini menggunakan reka bentuk statistik deskriptif. Seramai 15 orang pelajar dari program DEP 1A dipilih dalam kajian ini. Instrumen yang digunakan dalam kajian ini ialah soalan soal selidik dan juga Algebrator yang dibangunkan menggunakan perisian Microsoft Excel dan Microsoft Power Point. Data-data dianalisis menggunakan pakej perisian Statistical Package for Social Sciences (SPSS) versi 17.0 bagi mendapatkan skor min. Kajian menunjukkan bahawa nilai min (4.48) bagi tahap motivasi pelajar dalam mempelajari topik Basic Algebra adalah sangat tinggi. Peningkatan tahap kefahaman pelajar dalam topik Basic Algebra selepas menggunakan Algebrator juga didapati sangat tinggi nilai minnya iaitu sebanyak 4.72. Maka dapatlah disimpulkan bahawa penggunaan bahan bantu mengajar berbantukan komputer melalui Algebrator telah memberi kesan positif ke atas pengajaran dan pembelajaran topik 'Algebra bagi matapelajaran DBM 1013.

Kata Kunci: Algebrator, Matematik Kejuruteraan 1, Basic Algebra.

PENGENALAN

Matlamat Pendidikan Matematik adalah untuk memperkembangkan pemikiran analitis, bersistem dan kritis, kemahiran penyelesaian masalah serta kebolehan menggunakan ilmu pengetahuan matematik supaya individu dapat berfungsi dalam kehidupan seharian dengan berkesan (Idris, 2001). Pada masa kini, segelintir murid tidak meminati, tidak memahami, takut dan bimbang terhadap subjek Matematik kerana subjek ini dianggap susah dan mereka tidak dapat memahaminya. Kajian Klados (2015) mengenai kebimbangan matematik mendapati, kebimbangan matematik yang tinggi dikaitkan dengan pengaktifan kortikal yang lebih rendah pada peringkat awal pemprosesan rangsangan angka dalam konteks tugas kognitif. Maka, adalah penting bagi guru untuk mewujudkan pengajaran dan pembelajaran (PdP) matematik yang seronok supaya murid tidak bimbang dengan matematik atau angka dan meningkatkan keupayaan kognisi mereka dalam menyelesaikan masalah matematik. Kajian Radisic (2015) pula mendapati pencapaian dan minat terhadap matematik, konsep kendiri dan suasana bilik darjah yang positif mampu mengurangkan kebimbangan matematik murid.

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Perkembangan teknologi terutamanya dari segi elektronik seperti komputer telah memberi impak dan perubahan yang besar dalam PdP matematik kerana ia membekalkan satu tapak bagi mempercepat dan mempelbagaikan aktiviti dan bentuk persembahan. Matematik ialah suatu bidang ilmu yang berkaitan dengan nombor dan dapat memperkembangkan pemikiran manusia dari pelbagai sudut. Menurut Noraini Idris (2005), matematik meliputi pelbagai jenis aktiviti seperti pemprosesan data, simulasi, membuat keputusan dan komunikasi. Mempelajari konsep dan kemahiran dalam bidang matematik merupakan satu proses yang aktif. Pembelajaran matematik bukan semata-mata pengiraan, penghafalan formula atau teori, bahkan ia melibatkan penyelidikan, pengujian dan penyelesaian masalah. Menurut Ismail (2002), perisian multimedia boleh menjadi pemudah cara yang kuat bagi pengajaran dan pembelajaran dengan sebab-sebab dan kebijaksanaan untuk berjaya.

PERNYATAAN MASALAH

Setiap kali apabila penyelidik melihat pelajar di dalam kelas, dapati ada pelajar yang kurang minat terhadap matematik. Menurut Hafizah (2012) didapati bahawa antara sebab pelajar tidak berminat mengikuti pelajaran dalam kelas disebabkan corak dan pola pengajaran guru yang hanya menggunakan strategi pengajaran konvensional secara chalk and talk. Teknik PdP kini seharusnya seiring dengan perubahan dan kebangkitan era teknologi maklumat yang melibatkan penggunaan teknologi yang canggih dan terkini seperti komputer.

Kursus Matematik Kejuruteraan 1 (DBM 1013) merupakan subjek wajib bagi pelajar kejuruteraan di politeknik. Objektif kursus ini adalah untuk mengukuhkan penguasaan matematik pelajar terutama bagi topik Basic Algebra, Trigonometry, Complex Number, Matrices and Vector and Scalar. Dalam topik Basic Algebra, pelajar perlu menguasai beberapa subtopik iaitu Asas Algebra, Persamaan Kuadratik dan Pecahan Setara. Berdasarkan pemerhatian di dalam kelas sebelum ini dan soal selidik yang dilakukan serta Pre-Test yang telah dijalankan pada sesi Disember 2016, terdapat beberapa permasalahan dikenalpasti yang merumitkan kaedah penyelesaian pelajar. Melalui pemerhatian semasa menanda kertas soalan Pre-Test didapati antara pemasalahan tersebut ialah:

1. Pelajar kurang mahir menyelesaikan masalah yang melibatkan gabungan operasi iaitu Operasi Tambah , Tolak , Darab dan Bahagi .
2. Pelajar lemah asas penyelesaian masalah yang melibatkan kaedah Factorization.
3. Pelajar kurang mahir dalam penyelesaian masalah yang menggunakan istilah simplify dan solve terutamanya yang melibatkan pengembangan pernyataan matematik.

Permasalahan ini timbul disebabkan asas Algebra yang lemah di kalangan pelajar. Bagi mengukuhkan lagi pernyataan tersebut penyelidik meringkaskan keputusan Pre-Test dan Post-Test bagi Topik Basic Algebra di kalangan respondan.

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Jadual 1: Analisa Pencapaian Pelajar bagi *Pre-Test* Topik *Basic Algebra*

Kriteria Soalan	Nombor Soalan	Peratus Pelajar yang Menjawab Betul
Pengoperasian Tambah, Tolak, Darab dan Bahagi	1	60.0
	2	66.7
	3	53.3
	4	73.3
	5	53.3
Asas penyelesaian masalah yang melibatkan kaedah *Factorization*.	6	33.3
	7	40.0
	8	46.7
	9	73.3
	10	40.0
Penyelesaian masalah yang melibatkan kaedah *Simplify* dan *Solve*	11	26.7
	12	33.3
	13	40.0
	14	26.7
	15	53.3

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Bagi menyelesaikan permasalahan tersebut, satu kaedah penyelesaian dibuat iaitu dengan membina Algebrator menggunakan perisian Microsoft Excel dan Microsoft Power Point. Justeru, kajian ini dilaksanakan bagi meninjau keberkesanan penggunaan perisian Algebrator bagi pelajar semester satu program Diploma Kejuruteraan Elektrik (Komunikasi) dalam topik Basic Algebra.

OBJEKTIF KAJIAN

Melalui kajian ini, penyelidik telah menetapkan beberapa objektif kajian iaitu:

1. Mengenalpasti samada Algebrator dapat meningkatkan tahap motivasi pelajar dalam mempelajari topik Basic Algebra.
2. Mengenalpasti samada Algebrator dapat meningkatkan tahap kefahaman pelajar dalam topik Basic Algebra.

SKOP DAN BATASAN KAJIAN

Kajian ini tertumpu kepada 15 orang pelajar semester satu Diploma Kejuruteraan Elektrik (Komunikasi) di Politeknik Sultan Idris shah. Kajian ini hanya menumpukan kepada sesi tutorial sahaja di mana latih tubi dilakukan dengan menggunakan Algebrator berbanding latih tubi menggunakan kaedah konvensional di dalam kelas.

KAJIAN LITERATUR

Multimedia Dalam Pendidikan

Multimedia ialah integrasi elemen-elemen teks, audio, grafik, animasi, video dengan menggunakan komputer sebagai alat kawalan persembahan untuk membolehkan proses pembelajaran secara signifikan. Menurut Jamaluddin dan Zaidatun (2003), penggunaan perisian multimedia sudah semestinya mendatangkan kebaikan kepada pelajar di dalam pendidikan. Penggunaannya dapat mengatasi kelemahan serta masalah yang dihadapi di dalam proses pengajaran biasa di dalam kelas yang dilaksanakan secara konvensional. Ianya menjadi peransang kepada pendidik serta menjadi alat yang dapat membantu pendidik menyampaikan pengajaran dengan berkesan. Antara beberapa faedah pembelajaran dengan menggunakan perisian multimedia adalah :

a) Menyokong pembelajaran kendiri.

Penggunaan multimedia membolehkan pembelajaran kendiri dilaksanakan dengan lebih berkesan. Pelajar dapat memilih masa serta hala tuju pembelajaran mereka dengan kadar yang cepat kerana program multimedia memberi kebebasan kepada pelajar untuk memilih maklumat yang digemari mengikut kebolehan individu. Pelajar juga berpeluang belajar tajuk yang sukar berulang kali sehingga pemahaman dicapai. Pembelajaran berbantu multimedia sebagai salah satu media pembelajaran dapat digunakan secara berkesan untuk memenuhi keperluan pelajar yang berbeza dari segi keupayaan, intelek dan gaya pembelajaran. Jamaluddin dan Zaidatun (2003)

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b) Membantu menyelesaikan masalah pendidik dalam pengajaran.

Perisian multimedia telah membuka jalan baru dalam bidang pendidikan. Ciri-ciri perisian multimedia yang lebih mesra dan tidak jemu menjadikan ia sangat sesuai bagi para pelajar terutamanya bagi pelajar-pelajar yang kurang cerdas. Pembelajaran menggunakan multimedia dapat memberikan tindak balas serta merta kepada pelajar. Secara tidak langsung ia dapat memberi peneguhan yang sangat positif. Jamaluddin dan Zaidatun (2003)

c) Membantu imaginasi terhadap perkara abstrak.

Elemen-elemen media yang terdapat dalam pengajaran dan pembelajaran berasaskan multimedia seperti warna, muzik, animasi dan visual boleh menambahkan reliasme dalam pembelajaran secara latih tubi, permainan simulasi dan sebagainya. Dengan ini, elemen multimedia dapat menerangkan sesuatu pengajaran yang kompleks menjadi mudah untuk difahami dengan contoh-contoh yang sebenar yang tidak dapat diterangkan dengan menggunakan teks. Jamaluddin dan Zaidatun (2003).

d) Keseronokan belajar dan menjana pemikiran pelajar.

Menerusi penggunaan multimedia, ianya berbeza dengan PdP biasa yang memperlihatkan pendidik membaca teks dihadapan sambil pelajar mendengar. Penggunaan multimedia ini bukan sahaja mampu menimbulkan rasa minat dan seronok untuk belajar namun mereka juga mampu melahirkan pelajar yang mahir berfikir, kreatif dank kritis. Jamaluddin dan Zaidatun (2003)

KAJIAN LEPAS TERHADAP KEBERKESANAN PENGGUNAAN MULTIMEDIA DALAM PENGAJARAN & PEMBELAJARAN

Hiang (1997), menyatakan bahawa multimedia yang moden merujuk kepada perisian pengajaran yang disimpan dalam cakera laser atau CD-ROM dan dibaca dengan menggunakan komputer. Multimedia diserapkan bagi memangkinkan kualiti pengajaran guru dan pembelajaran pelajar khususnya di dalam subjek yang penting seperti matematik dan sains.

Selain itu, Ahmad Nizar (1997) telah menjalankan kajian ke atas pelajar tahun lima di Sekolah Kebangsaan Jabi yang berkaitan dengan keberkesanan kaedah pengajaran berbantukan komputer (PBK) bagi mata pelajaran matematik untuk Operasi Asas Matematik. Dalam kajian itu beliau mendapati terdapat perubahan sikap yang positif di kalangan responden yang terlibat untuk mencuba setiap soalan yang dikemukakan di dalam komputer.

Krebs (2004) melaporkan bahawa pelajar mempersepsikan persekitaran pembelajaran berasaskan Web menggalakkan mereka untuk bekerja mengikut kadar sendiri, menglibatkan diri secara aktif, memotivasi secara intrinsik dan menjalankan pembelajaran kendiri jika dibandingkan dengan pelajar dalam kelas tradisional. Tambahan pula, pelajar berpandangan bahawa pembelajaran adalah lebih mencabar dan pelajar adalah lebih bersedia untuk kehidupan selepas tamat sekolah.

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METODOLOGI KAJIAN

Reka Bentuk Kajian

Kajian ini menggunakan kaedah statistik deskriptif. Statistik deskriptif digunakan untuk mengumpul data, menyusun dan mempersembahkan data itu supaya data yang banyak dapat disimpulkan dengan menggunakan indeks seperti min, varians dan sisihan piawai.

Instrumen Kajian

Dalam menjalankan kajian ini penyelidik menggunakan beberapa instrumen seperti soalan soal selidik dan Alat Bahan Bantu Mengajar (Algebrator).

Soal Selidik

Dalam kajian ini, penyelidik menggunakan soal selidik sebagai instrumen kajian. Penyelidik menggunakan borang soal selidik bagi mengutip data-data disebabkan beberapa perkara seperti yang dinyatakan oleh Uma Sekaran (2000) iaitu mudah diperolehi, memudahkan proses pengkodan dan tepat kerana maklumat adalah mempunyai kesahan dan kebolehpercayaan.
Instrumen soal selidik dapat mengelakkan unsur-unsur penipuan jika dibandingkan dengan kaedah temubual. Penggunaan alat instrumen soal selidik juga dapat menjimatkan masa pengkaji, senang untuk analisis dan membantu pengkodan, penjadualan dan penterjemahan data.

Sampel Kajian

Sampel kajian adalah terdiri daripada pelajar yang mengambil matapelajaran Matematik Kejuruteraan 1 (DBM 1013) iaitu seramai 15 orang. Oleh kerana populasi kajian merangkumi satu kelas sahaja maka sampel kajian juga diambil berdasarkan jumlah populasi kajian. Sampel yang diambil berdasarkan kepada keupayaan akademik yang hampir sama tanpa mengira jantina dan latarbelakang keluarga.

Penganalisisan Data

Min digunakan bagi menunjukkan arah kecenderungan memusat responden terhadap persoalan yang dikemukakan samada memihak kepada setuju ataupun tidak setuju. Untuk memudahkan proses penganalisaan data, interpretasi skor min yang dikemukakan oleh Mohd Najib Abd. Ghafar (1998) digunakan sebagai rujukan interpretasi skor min seperti di dalam Jadual 3.2. Menurut Mohd Majid Konting (1994), sekiranya data tertabur secara normal, min merupakan nilai sukatan memusat yang unggul untuk memerihal taburan data. Ini kerana min bertindak sebagai titik pengimbang nilai di atas dan di bawahnya. Dengan ini taburan data dari segi kecenderungan memusat boleh diwakili dengan tepat. Mohd Najib Abd. Ghafar (1998).

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Jadual 2 : Interpretasi Skor Min

Julat Skor	Min Interpretasi
1.00-1.50	Sangat Rendah
1.51-2.49	Rendah
2.50-3.49	Sederhana
3.50-4.49	Tinggi
4.50-5.00	Sangat Tinggi

HASIL KAJIAN DAN PEMBINCANGAN

Analisis Tahap Motivasi Pelajar Mempelajari Topik Basic Algebra Melalui Algebrator.

Melalui analisis ini, penyelidik ingin mengenalpasti samada Algebrator dapat meningkatkan tahap motivasi pelajar dalam mempelajari topik Basic Algebra. Jadual 1 menunjukkan skor min bagi tahap motivasi pelajar mempelajari topik Basic Algebra melalui Algebrator. Nilai tahap skor min diambil daripada Jadual 2.

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Jadual 3: Skor min bagi tahap motivasi pelajar mempelajari topik Basic Algebra melalui Algebrator.

No.	Item	Min	Tahap
A1.	*Algebrator menarik* minat saya untuk menjawab soalan dalam topik *Basic Algebra*.	4.53	Sangat Tinggi
A2.	Saya suka membuat latihan menggunakan *Algebrator*.	4.53	Sangat Tinggi
A3.	Saya seronok belajar Algebra dengan menggunakan *Algebrator*.	4.53	Sangat Tinggi
A4.	Saya dapat menumpukan perhatian di dalam kelas semasa meggunakan *Algebrator*.	4.60	Sangat Tinggi
A5.	*Algebrator* mampu meningkatkan minat saya untuk membuat latihan Algebra berbanding menjawab latihan di atas kertas.	4.40	Tinggi
A6.	Saya bersemangat membuat latih tubi menggunakan *Algebrator*.	4.40	Tinggi
A7.	Semakin sukar sesuatu masalah semakin saya seronok menyelesaikannya dengan menggunakan *Algebrator*.	4.40	Tinggi
A8.	Saya seronok mencuba menyelesaikan masalah yang rumit dengan menggunakan *Algebrator*.	4.47	Tinggi
A9.	Saya ingin terus belajar secara mendalam menggunakan *Algebrator*.	4.47	Tinggi
Min Keseluruhan		4.48	Tinggi

Secara keseluruhannya, responden bersetuju bahawa tahap motivasi untuk mempelajari topik Algebra meningkat setelah menggunakan PBK Algebrator di mana min keseluruhan mencatatkan nilai yang tinggi. PBK dapat menggalakkan penglibatan pelajar secara aktif dalam kelas (Qi Chen,1995) di mana keadaan ini dapat mewujudkan suasana pembelajaran yang menyeronokkan dan secara tidak langsung dapat menarik minat dan motivasi pelajar untuk mempelajari sesuatu topik. Kajian ini disokong oleh Hasimah dan Rafie (1994) yang mengatakan 90 peratus pelajar yang disoal selidik mengenai PBK mengakui bahawa pengajaran ini dapat meningkatkan motivasi pelajar. Siang dan Rao (2003); de Freitas & Jarvis (2007) dalam kajiannya telah membuat satu rumusan bahawa pembelajaran yang menggunakan permainan komputer dikatakan lebih berkesan. Ini kerana pembelajaran yang berorientasikan permainan lebih mudah digunakan dan senang difahami. Kajian ini juga turut melihat nilai-nilai dari aspek psikologi pelajar seperti pelajar lebih bertindakbalas dan lebih bermotivasi.

Analisis Tahap Kefahaman Pelajar Bagi Topik Basic Algebra Melalui Algebrator.

Melalui analisis ini, penyelidik ingin mengenalpasti samada Algebrator dapat meningkatkan tahap kefahaman pelajar dalam topik Basic Algebra. Jadual 4 menunjukkan skor min bagi tahap kefahaman pelajar bagi topik Basic Algebra melalui Algebrator.

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Jadual 4: Skor min bagi tahap kefahaman pelajar bagi topik *Basic Algebra* melalui *Algebrator*.

No.	Item	Min	Tahap
1.	Saya mudah untuk menyelesaikan masalah algebra selepas mempelajari Algebrator.	4.13	Tinggi
2.	Saya berkeyakinan menjawab soalan-soalan yang diberi semasa menggunakan *Algebrator*.	4.33	Tinggi
3.	Saya dapat meningkatkan penguasaan konsep dalam topik Basic *Algebra* dengan berbantukan *Algebrator*.	4.40	Tinggi
4.	Saya mendapati kaedah pembelajaran menggunakan *Algebrator* lebih berkesan bagi mempelajari topik *Basic Algebra*.	4.47	Tinggi
5.	Saya lebih mudah memahami konsep Algebra dengan menggunakan *Algebrator*.	4.20	Tinggi
6.	*Algebrator* membantu saya meningkatkan kefahaman dalam topik *Basic Algebra*.	4.40	Tinggi
7.	Saya mampu meningkatkan kemahiran menjawab soalan Algebra dengan menggunakan *Algebrator*.	4.40	Tinggi
8.	Saya dapat menyelesaikan kebanyakan soalan yang diberikan dalam masa yang ditetapkan menggunakan *Algebrator*.	4.00	Tinggi
9.	Prestasi saya adalah lebih baik dalam topik *Basic Algebra* setelah melalui proses latih tubi menggunakan *Algebrator*.	4.20	Tinggi
10.	Jalan kerja yang dipaparkan bagi setiap soalan membantu saya memahami kaedah penyelesaian dengan lebih jelas melalui *Algebrator*.	4.40	Tinggi
11.	Saya lebih berkeyakinan menyelesaikan masalah Algebra selepas menggunakan *Algebrator*.	4.60	Sangat Tinggi
Min Keseluruhan		4.72	Sangat Tinggi

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Menurut kajian yang telah dijalankan, min keseluruhan bagi peningkatan kefahaman pelajar dalam topik Basic Algebra setelah menggunakan Algebrator adalah sangat tinggi. Ini menunjukkan bahawa Algebrator berjaya meningkat kefahaman pelajar dalam topik Algebra. Rashid Azizan & Abdul Razak Habib (1995) menyatakan PBK dapat memberikan kebaikan-kebaikan dalam pengajaran terancang, pengajaran individu, pengajaran pengayaan dan pengajaran pemulihan. Melalui pengajaran terancang, guru dapat membina program-program yang dirancang khas untuk keperluan para pelajar mengikut tahap kebolehan pengetahuan dan jangka masa yang sesuai dengan diri mereka. Dalam pengajaran individu, pelajar dapat berinteraksi dengan komputer tanpa rasa segan atau takut kepada keadaan persekitarannya kerana persekitaran mereka hanya melibatkan komputer dan individu pelajar sahaja. Algebrator dapat memperkayakan lagi pengetahuan pelajar-pelajar yang telah memahami sesuatu konsep melalui latih – tubi dalam pengajaran pemulihan. Algebrator juga dapat membantu pelajar-pelajar yang lemah di dalam sesuatu topik dalam pengajaran pemulihan.

KESIMPULAN

Objektif pertama kajian ini ialah untuk mengenalpasti samada Algebrator dapat meningkatkan tahap motivasi pelajar dalam mempelajari topik Basic Algebra. Hasil dapatan kajian ini mendapati responden menunjukkan minat yang tinggi semasa menggunakan inovasi ini. Ianya dapat dilihat melalui penglibatan yang aktif semasa menjawab setiap soalan yang dikemukakan dan persaingan yang wujud di antara responden juga mencetuskan keseronokan semasa menjawab soalan latihan yang diberikan.

Objektif kedua kajian ini ialah untuk mengenalpasti samada Algebrator dapat meningkatkan tahap kefahaman pelajar dalam mempelajari topik Basic Algebra. Kajian yang dijalankan menunjukkan terdapat peningkatan dari segi kefahaman melalui perbincangan yang dilakukan semasa menjawab soalan setelah jawapan sebenar dipaparkan.

Secara keseluruhannya, ini menunjukkan bahawa PBK dengan menggunakan Algebrator adalah berkesan untuk topik Basic Algebra.

CADANGAN

1. Kajian sebegini boleh diperluaskan lagi dengan menggunakan sampel yang lebih besar dan melibatkan lebih ramai pensyarah dan pelbagai politeknik agar bukti keberkesanan penggunaan Algebrator untuk PdP matematik lebih menyeluruh dan menyakinkan.

2. Dicadangkan agar kajian penggunaan Algebrator dapat dilanjutkan ke atas tajuk-tajuk lain yang terdapat di dalam silibus DBM 1013.

3. Di dalam kajian ini, pelajar hanya melihat pada paparan projektor sahaja maka untuk kajian yang akan datang dicadangkan agar sebuah komputer diperuntukkan kepada setiap pelajar.

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TWO DIMENSIONAL UWB MICROWAVE BREAST CANCER DETECTION SYSTEM

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Abstract

This paper presents simulation results detecting on breast cancer tumor detection by using Computer Simulation Technology Microwave Studio. This experiment was successfully carried out by transforming back scattered frequency domain signals from planar into a time domain signals to obtain a planar image.

Index Terms : Ultrawide band; delay and sum, S12; breast cancer. p-slot antenna.

INTRODUCTION

Breast cancer is a major global health problem and the leading cause of death among women of all ethnic backgrounds. The International Agency for Research in Cancer (GLOBOCAN) 2012 estimated the ASR of breast cancer in Malaysia as 38.7 per 100,000 with 5410 new cases in 2012 [1]. Breast cancer is not a preventable sickness but can be cured with early detection of malignant tumor in breast. The existing breast cancer detection technique such as X-ray Mammogram has its limitation with high number of false-negative detections, painful procedure and exposure the patient with ionizing radiation.

Microwave radar imaging, a non-ionizing method is used to detect tumor. This technique exploits' the contrast between dielectric property of breast tissues and cancerous cells. This article presents an active microwave imaging technique with four and eight planar UWB P-slot antenna array [2] with the inhomogeneous and homogenous breast phantom. The phantom was modeled with different dielectric and conductivity property of breast tissues [3] in CST. Antenna arrays were arranged in planar around the breast phantom and simulated using CST. The frequency domain backscattered signal from the simulation was transformed into time domain signals to obtain a planar images using a time domain image reconstruction algorithm.

METHODOLOGY

In this study 4 and 8 antennas are placed at equal distance in a 2-D planar around the breast phantom with diameter of 110 mm. With each transmitted signal the backscattered received frequency domain signals were recorded with the total number of transmission of N(N-1) [4]. In this scenario each and every antenna position will be acting as a transmitter at a time.

1. Data Acquisition

An array of P-Slot antennas were arranged around the breast phantom in two dimension (2D) as shown in Figure 1. Four and eight antennas were used in this simulation. A simulated breast phantom with tumor was designed using CST and simulated. The simulated data were acquired

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with repeated measurement (Smn and Snm where m is the transmitting signal and n is receiving signal) with and without 5 mm tumor. Each antenna was feed sequentially, enabling a total of 56 x 2 measurements be recorded. The measurement point of each sample is 2001 points with frequency sweep from 1GHz to 6GHz . The results are in frequency domain with the real and imaginary were copied and saved in excel file. Figure 2 shows a sample of simulation data obtained from CST.

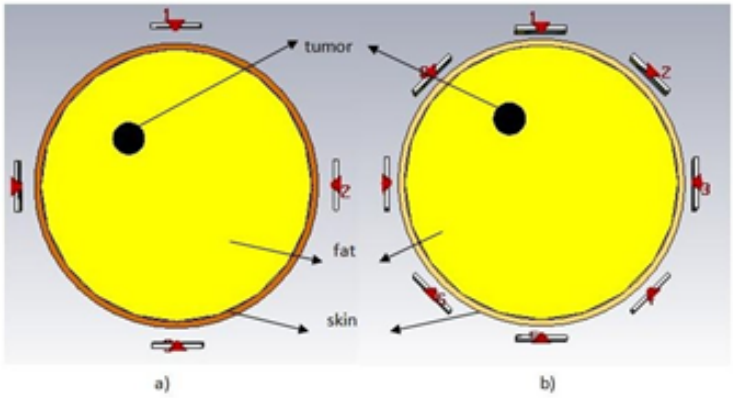

Figure 1. Arrangement of antenna in 2D with tumor for

a. 4 antenna arrays with tumor location between antenna 1 and 4 and
b. 8 antenna arrays with tumor location between antenna 1 and 8
c. 4 antenna array with tumor location between antenna 1 and 2
d. 8 antenna arrays with tumor location between 2 and 3

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2036	1.002	-0.00346	0.00119
2037	1.004	-0.00342	0.00124
2038	1.006	-0.00339	0.00129
2039	1.008	-0.00335	0.00135
2040	1.01	-0.00331	0.0014
2041	1.012	-0.00327	0.00145
2042	1.014	-0.00323	0.0015
2043	1.016	-0.00319	0.00155

Figure 2. Sample of simulation data obtained from CST

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2. Background Subtraction

The raw data obtained from CST were transformed into time domain using Inverse Fast Fourier Transform. Next a process called background subtraction is performed on this raw data [5] to remove unwanted backscatters and other artefacts like clutters as defined as follow, where;

s = Backscattered signal
m = Transmitter number[1,2,3....m]
n = Receiver number [1,2,3....n]

The difference of the two signals is shown in Figure 3.

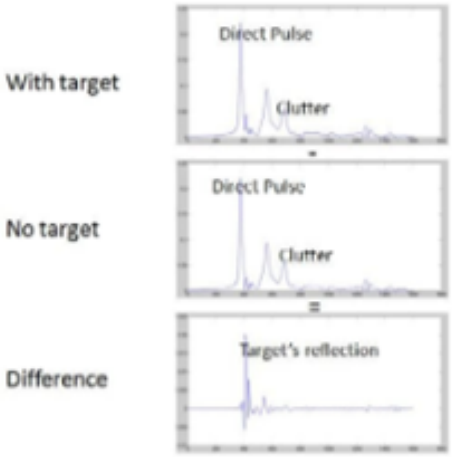

Figure 3. Background subtraction results

3. Image Reconstruction Algorithm

The target reflection data after background subtraction is used in image reconstruction algorithm. Enhance Delay and Sum (EDAS) algorithm [6] is used to generate a pure response signal of the tumor from the measured data. The flowchart of the image reconstruction algorithm for simulation results is as follow as shown in Figure 4.

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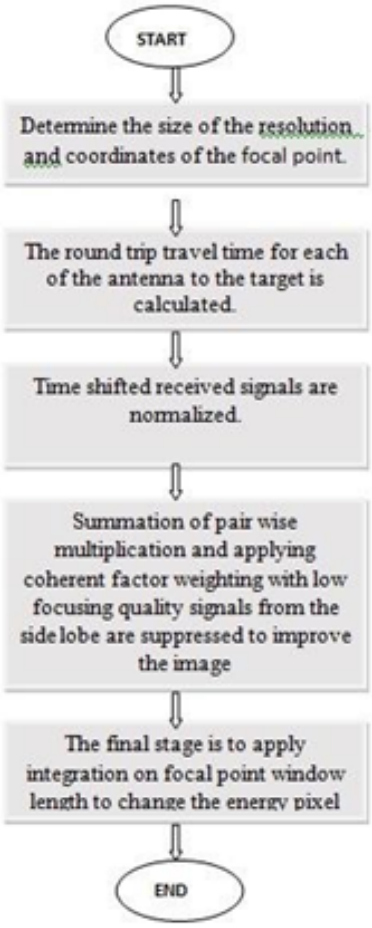

Figure 4: The flowchart of the image reconstruction algorithm for simulation results

RESULT AND DISCUSSION

The results obtained with 4 antennas and 8 antennas were discussed here. Figure 5 a) and b) are the images obtained from the reconstruction algorithm with 4 antennas for different tumor locations. The results reveal that this setup is unable to localize 10mm tumor at different locations and size of tumor. At the same time the results obtain with 8 antennas are as shown in Figure 6a) and b). The results show that antenna arrangement is able to detect different location and size of the tumor correctly.

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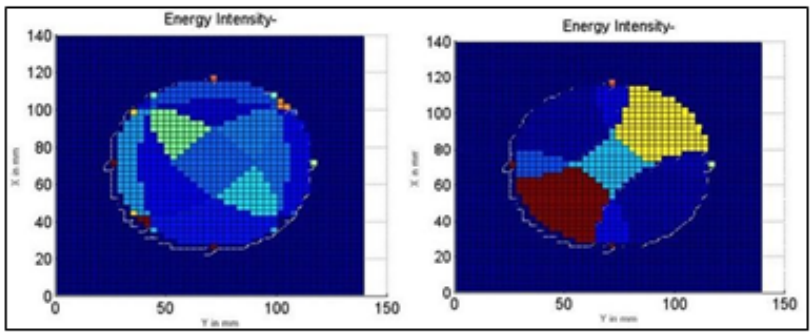

Figure 5. 4 antennas with different tumor location image reconstruction

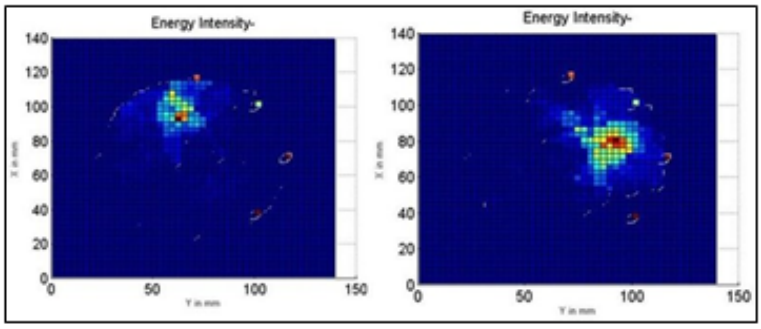

Figure 6. 8 antennas with different tumor location image reconstruction.

CONCLUSION

In this article a study of effects caused by use of different antenna array arrangement at different location of tumor were presented. The results showed that with the increase in the number of antenna array, the localization of the tumor and tumor size improved. It can be concluded that more number of antenna array will increase the image resolution for a better tumor image. The main contribution of this work is to validate the reconstruction algorithm and the antenna before using it real scenario.Future work for this project is to reconstruct planar image and 3D images using 16 antennas.

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LEARNING THE OSI LAYER AMONG POLYTECHNIC STUDENTS: THE POSSIBILITY OF USING AN IMMERSIVE VIRTUAL REALITY ENVIRONMENT

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Abstract

Open System Interconnection (OSI) Layer is one of the topics which involve abstract concepts in the computer network course. To overcome this problem, the use of three dimensional (3D) graphic simulation which is presented in an immersive Virtual Reality (VR) environment is proposed. For this study, we identified 64 polytechnic students in the northern region of Malaysian who lack the ability to visualise the real world process of the OSI Layer because of its abstract concept. Students have the difficulty to visualise mainly due to their level of spatial visualisation ability to imagine the real scenario. This may engage and clarify the abstract topic accordingly to improve the student's understanding and achievement in the classroom. Therefore, in this paper, we discuss the development of using an immersive VR based learning environment which is able to provide promising learning materials that attract students with different spatial abilities. Overall, the use of 3D graphic simulation in an immersive VR environment heightens students' spatial visualisation ability that we can benefit from this innovative learning and teaching method as compared to the 2D animation and video learning methods.

Keywords: OSI Layer, Abstract Learning, Virtual Reality Environment, Visualisation, Spatial Visualisation Ability

INTRODUCTION

'Network Fundamentals' is a compulsory course in Malaysian Polytechnics and is an important subject in the field of computer network. The OSI Model topic which is taught worldwide to students of computer science and electrical engineering in education is crucial since students need to understand its functions and services as the basis of computer networks. Further, this subject has provided users with the ability to communicate, collaborate and connect efficiently (Lal & Chiou, 2009). In this paper we started the results of a short online survey on students of the basic Network Fundamentals subject from the northern region polytechnics to identify the main challenges that students faced in learning the abstract contents. We regard this online survey as a preliminary step towards our higher goal of developing full immersive virtual reality environments (FIVRE) as a new learning method for teaching in the more difficult concepts of computer networking. The aim of this study to investigate the relationship between Spatial Visualisation Ability and achievement on OSI Model topic among the students using the FIVRE.

The preliminary online survey, as will be shown in the next section, would find that the major difficulty faced by the students. Consequently, the students disable to transfer an abstract concepts of computer networking in the real situation who understandably have been used to learning abstract concepts in the earlier part of their Diploma programme. To tackle this problem, the researcher aims to develop the FIVRE to support the learning process in classroom.

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The educators nowadays tend to apply the immersive VR because numerous researchers found that virtual environment technology offers unique capabilities that is able to provide significant and positive support for education and believe VR has potential as a learning environment tool (Pantelidis, 1993; Winn, 1993; Psotka, 1996; Roussos, Moher, Vasilakis & Barnes, 1996; Whitelock, Brna & Holland, 1996; Grove, 1996). Moreover, Winn (1993) proposes immersion as the major key point of VR for educational use, enough for VR to become a powerful educational tool in education because it has a different characteristic from the other Information & Communication Technology (ICT) application. If educators are properly developed, three-dimensional (3D) virtual environment potency be able to help students in comprehending abstract and concept information spaces because one of the latest innovation which can use for teaching and learning (Chen, Toh & Fauzy, 2003).

BACKGROUND OF PROBLEM

The OSI Model is a conceptual model that characterized and standardizes the communication function of a telecommunication or computing system without regards to its underlying internal structure and technology. The model partitions a communication system into abstraction layers. Students in Networking Programme facing tough topic and have difficulties to visualise the real process how actually OSI Model works. students who have problem with low spatial require apply the full immersive VR to facilitate them visualise the process of OSI Model in real situation or provide them the scenario compared using the Power Point slides as a learning method in classroom. that knowledge of OSI Model need to be mastered; because to start the troubleshooting process, the function each layers of OSI need to be clear understand by students (Hassan & Mohammad Ali, 2015). Understanding and learning about the functionality of complex computer networks is usually an advanced task. It takes much of time and energy that students have to spend into their studies. However, students lack to understand the abstract and advanced topic in computer network can be positively supported through visual learning method whereby students can more easily understands and adapt the information from the topic and could visually see how actually works in each layers (Janitor, Jakab & Kniewald, 2010). This advanced and abstract concept of engineering and sciences are hard to teach using traditional approach such as whiteboards and PowerPoint slide (Rahman, Hassan, Hashimm & Md Zan, 2015) and that is why the researchers introduced the new learning teaching method using the Full Immersive Virtual Reality environment (FIVRE) in classroom.

METHODOLOGY

We conducting the online survey was providing to the respondents in semester three who had learning in OSI Model. The online survey was develop using the Google Form and assign to 64 students in Information and Communication Technology Department in north region Malaysian Polytechnics. Respondents were required to answer all questions submitted in writing using the software. The online survey consists of six question that focus on OSI Model learning and teaching in classroom. Results of the online survey were compiled and processed using the Microsoft Excel software. On the other hand, the data will transform by pie chart to analyze the data.

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SURVEY RESULTS AND DISCUSSION

The resulted from responses provided by the 64 students had answered by the online survey. The results of the survey are shown in Figure 1 and indicate that students not understand the whole concept of OSI Model in their learning. Referring the structured question some of the students was answered “OSI Model is too subjective”, “not too understand the OSI Model”, and “my mind cannot higher think creatively to understand each layer of OSI Model”. Figure 2 displays the level of understanding each layer of the OSI Model. Referring Janitor, Jakab & Kniewald (2010) to understand and learn about the functionality of complex computer networks is generally an advanced task. It takes much of time and energy that students have to spend into their studies.

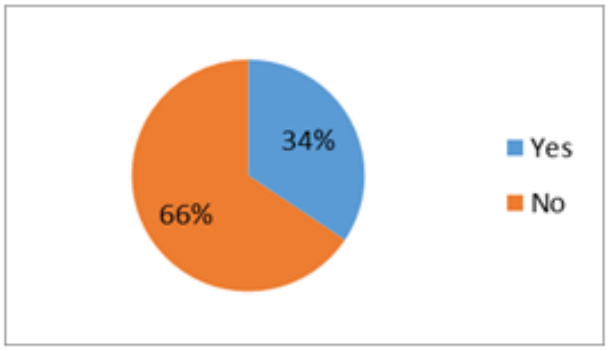

Figure 1: Students understanding on the OSI Model

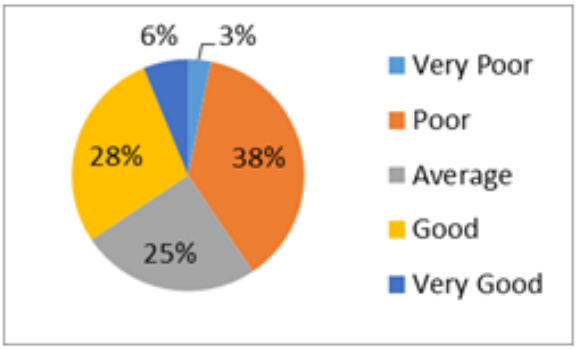

Figure 2: Understanding each layer on OSI Model

A part from the respondent’s answer, shows that some respondents not able to visualise the real situation or scenario of OSI Model in the Figure 3. The level of SVA most important to explain the abstract topic in engineering. Importantly spatial representations permit the user complete at will navigation in the 3D virtual space, as well as a first-person user point of view. Virtual settings allow the use of natural semantics, thus avoiding the use of hard to learn and recall symbolisms (Mikropoulos, Chalkidis, Katsikis, & Emvalotis, 1998). feel unsatisfied using the current teaching method in classroom because the educators still using the presentation slide as learning method because the learning environment too dull and not interactive.

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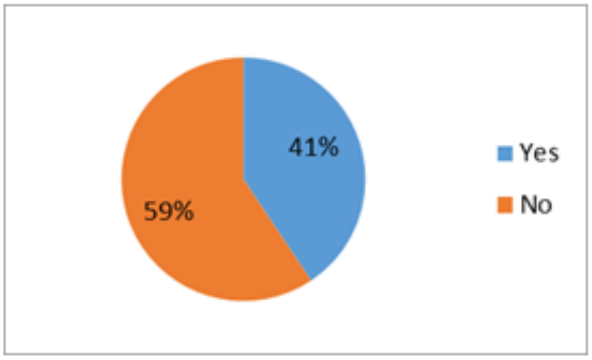

Figure 3: Ability students to visualize the OSI Model in classroom using the current teaching

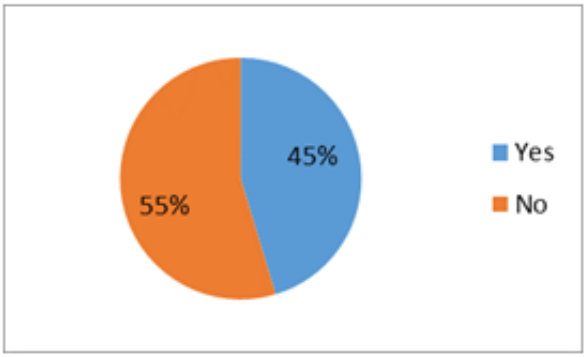

Figure 4: Students satisfaction learning OSI Model method

Moreover, based on the Figure 5, the response from students using Power Point slide, 2D animation and video as learning and teaching method in classroom. Referring the figure 6, most of respondents are dominant to prefer using 3D simulation and the researcher will implement in full immersive VR as a new learning techniques to understand the OSI Model. The students who had the low spatial problem must be tend to apply the full immersive VR. The use of new learning method encourages us as researcher to designing the immersive VR as new learning materials.

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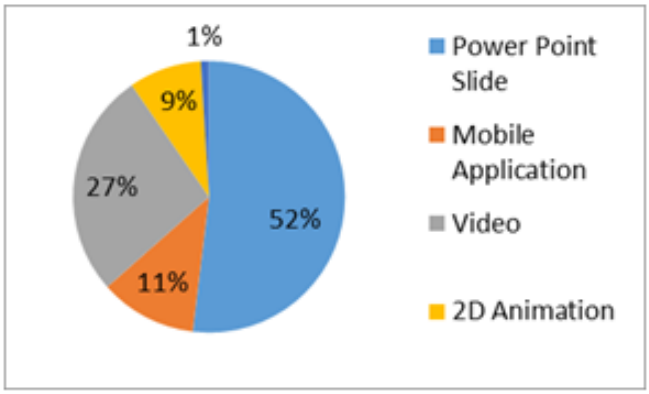

Figure 5: Teaching method used in classroom using by the current teaching method

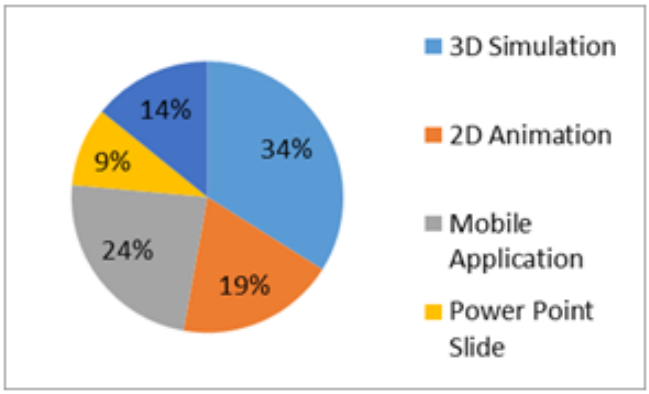

Figure 6: Learning techniques that students prefer using in classroom

Using the same learning materials every semester such as presentation slide, students will lack the engagement and motivation in classroom because they want the learning environment something attractive, interactive, and enjoyable. When lost the students' motivation automatically their not effort to perform the excellent result. The bad result will affect the student's achievements. The problem above, will provide FIVRE to transform the learning and teaching method from traditional approach to modern learning using the powerful equipment. The FIVRE can demonstrate the real process flow of OSI Model. At the very least immersive VR could increase student's motivation and feel enjoyment using that tools (Youngblut, 1998).

SOLUTION USING IMMERSIVE VIRTUAL REALITY

Most of students has the different levels of Spatial Visualisation Ability (SVA) to imagine the real scenario or situation of the OSI Model. SVA here is defined as the ability to mentally manipulate, rotate, twist, or invert pictorially presented stimulus object (Mc Gee, 1979). Students who had the low spatial visualisation ability, consequently make it difficult for student to understand the real concept of OSI Model and student who had the high level spatial visualisation ability can swiftly imagine the process of OSI Model. Students will assign the Spatial Visualisation Ability test instruments (SVATI) to identify the level of spatial ability of students before provide the full immersive virtual reality environments (FIVRE). Hence, Bricken, 1991; Dede, Salzman, Lotfin & Ash (1999) stated that VR as a powerful educational tools in learning environment.

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Thus, VR offers educators and students amazing experiences that are consistent with successful instructional strategies: hands on learning, group projects and discussions, field trips, simulations, and concept visualization (Bricken, 1991). Immersive VR to support the learning of abstract concepts presents a substantial challenge for the designers and evaluators of this emerging technology (Salzman, Dede, Loftin & Chen, 1999. The solution is to suggest using the FIVRE as learning method to replace the traditional learning approach in classroom. FIVRE might support the type of learning environments people need. The full immersive VR tools commonly displayed by head mounted display (HMD) and provide with controller. The 3D immersive environments are considered the maximum interactive on VR techniques, (Galimberti, Ignazi, Vercesi & Riva, 2003) in which subjects fully immersed in and communicate with the VR environment. The interactivity of VR is made possible by a head tracking system attached to the HMD that tracks the user's head movements, and allows the users to feel engaged with the surroundings. Hence, VR environments providing a sense of presence that is the feeling of "being there" in immersive environment as it was a real environment.

The outcomes of the survey above have contributed us some views and given us several concept of ideas about how to design and develop 3D graphic simulation in full immersive VR for learning OSI Model. This FIVRE can be effective learning method could provide students more engage, enjoyable, motivate, and more emerging experience when the interact with immersive environments. Mikropolous & Natsis (2010) mentioned that the finding in their past studies show that both students and teachers share a positive attitude towards the use of virtual reality in educational settings, have shown their potential in the understanding of concepts and in rejecting students' misconceptions.

CONCLUSIONS

In this paper we proposed a full immersive VR environment (FIVRE) for new learning and teaching method to learn the OSI Model and communication between them in a Network Fundamentals subject in Malaysian Polytechnics. We demonstrated that conducting using FIVRE in the classroom could to increased student engagement and achievement in the classroom without adversely affecting student learning. Hence, students more interest learning in the topic and help them to more understand using the FIVRE compared learning using traditional method such as Power Point slide, whiteboard and notes in classroom. Thus, the development of effective full immersive VR is most applied in learning environment to ensuring that students can be visualise and understand the abstract concepts by means of traditional media such as PowerPoint slides. Considering that the ability to realize abstract and concept information is increasingly important in research and education, learning environments that support these skills are in growing demand. In order for developer of VR learning environments to meet this requirement, competencies such as 3D graphic simulation but we need to know when and how to use them for supporting dissimilar learning tasks and variety learner needs. The affordances of VR potentially, can be used in numerous ways to support the needs of different kinds of students. In our study, we plan to continue and explore this FIVRE to developed the abstract and concept learning in education fields to serve better learning and teaching to the different of student's spatial visualisation ability.

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ISSUES IN EDUCATIONAL TECHNOLOGY

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Abstract

The main purpose of this study is to analyze educational technology issues and developments reported in the year 2016-2018. The articles are downloaded from the Malaysian Journal of Educational Technology (MOJET) and the Journal of Digital Learning in Teacher Education (JDLTE). The content analysis was applied to 107 articles in MOJET and JDLTE published the issue in the year 2016-2018. To achieve the purpose of study, software tools such as Microsoft Excel as a spreadsheet program is used for the analysis of data. This study was going through the process of download articles, categorizing topic and theme, extract important issue, analyzed and generate the findings. The findings highlighted the issues of Educational Technology by journal and the highest-ranked issues according to MOJET and JLDTE for the year 2016-2018. The implication for future research also suggested.

Keywords: Educational Technology, Research, Trend, Content Analysis

INTRODUCTION

The Association for Educational Communications and Technology (AECT) defines educational technology as “the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources.” New technologies are rapidly emerging in the field of education. Technology today is helping teachers to enhance their teaching beyond traditional text-based learning and engage students with practical ways of learning. Education is increasingly becoming high tech. All the things that are happening in the world of technology are directly affecting education and learning systems. The important thing to focus by teachers or researchers is that issues in the field of educational technology are in line with the changing trend in the education field. The research in this area has evolved especially since the Internet and communication technologies became widespread.

Lee, Driscoll & Nelson (2007) conducted a very extensive study of four main distance education journals, examining trends in the topics being discussed and the research methods being used. In developing a new research article, it is essential to know what research has been conducted in the recent past, as well as the patterns and trending issue in academic journals. Several studies have reported on some of the emerging trends.

OBJECTIVES

The aim of this content analysis study is an attempt to analyses educational technology issues and developments reported in the 2016-2018 issue of the Malaysian Journal of Educational Technology (MOJET) and the Journal of Digital Learning in Teacher Education (JDLTE).

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METHODOLOGY

For this study, content analysis was applied to 107 articles in Malaysian Journal of Educational Technology (MOJET) and the Journal of Digital Learning in Teacher Education (JDLTE) published an issue in the year 2016-2018. Content analysis is used to compare, contrast, and categorize a set of data according to different identified themes and concepts.

The journal was accessed online from the address http://www.mojet.net/ (MOJET) and https://www.tandfonline.com/toc/ujdl20/current (JLDTE). The number of articles published and analyzed in this study is as shown in Table 1 below :

Table 1: Number of research articles published in the Journal of MOJET and JLDTE

NO	JOURNAL	YEAR	NO. OF ISSUES	NO. OF ARTCILES	TOTAL
1	Malaysian Journal of Educational Technology	2016	4	19	62
		2017	4	20	
		2018	4	23	
2	Journal of Digital Learning in Teacher Education	2016	4	14	45
		2017	4	14	
		2018	4	17	
		GRAND TOTAL			107

Journals were selected based on two criterions, which are considered significant to the field and represent a wide variety of research interest held by scholars of instructional design and technology. Malaysian Online Journal of Educational Technology (MOJET) highlights the current issues in educational technology. MOJET is an international, professional referred journal in the interdisciplinary fields sponsored by Faculty of Education, University of Malaya. This journal serves as a platform for presenting and discussing the emerging issues on educational technology for readers who share common interests in understanding the developments of the integration of technology in education. While the Journal of Digital Learning in Teacher Education (formerly the Journal of Computing in Teacher Education) provides computer and technology education to preservice and in-service teachers. It offers a forum to share information about using technology in teacher education among departments, schools and colleges of education.

DATA COLLECTION AND ANALYSIS

Research topics, abstract, author keywords, primary subject issue, methodology, findings and discussion were investigated for the content analysis of articles published in MOJET and JLDTE over the past three years. To achieve the purpose of study, software tools such as Excel as a spreadsheet program is used for the analysis of data. This study was conducted in the following steps:

1. Download all the articles
2. The articles are carefully studied and categorized according to the theme and issues.
3. Extract the important issues into Microsoft excel
4. Categorized the articles in the theme
5. Analyze the categories to generate the findings

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RESULT AND DISCUSSION

Issues of Educational Technology by Journal (2016-2018)
The finding of this study reported 323 keywords extract, involving 107 articles have been analyzed from 2 journals. Table 1 shows the distribution of primary subject issue as a result of keyword classification through two selected journals to be analyzed. Referring to the list, in the year 2016 many articles review on Technology Integration and Online Learning.

Table 2 shows the content analysis of 62 articles, there are 8 main issues in MOJET within 3 years, Major issue in MOJET are Online Learning (7), 21st Century (4), Makerspace (4), Professional Development (3), Video (3), Technology Integration (2), Website (2) and Learning Approach (2). Others issues studies were found in articles numbered less than two.

Table 2: Highest- Ranked Issues for the year 2016-2018 according to MOJET

No.	Issues	MOJET (2016-2018)
1	Online Learning	7
2	21st Century	4
3	Makerspace	4
4	Professional Development	3
5	Video	3
6	Technology Integration	2
7	Website	2
8	Learning Approach	2
	Total	62

Table 3 shows, there are 8 main issues in Journal of Digital Learning in Teacher Education (JLDTE) within 3 years. Major issue trending in JLDTE is Online Learning (8), Technology Integration (6), Teaching Method (3), Learning Approach (3), Problem Solving (3), Internet (3), Augmented Reality (3) and Mobile Learning (3). Others issues studies were found in articles numbered less than three.

Table 3: Highest- Ranked Issues for the year 2016-2018 according to JDLTE

No.	Issues	JDLTE (2016-2018)
1	Online Learning	8
2	Technology Integration	6
3	Teaching Method	3
4	Learning Approach	3
5	Problem Solving	3
6	Internet	3
7	Augmented Reality	3
8	Mobile Learning	3
	Total	45

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Table 4 shows the highest rank issue by 2 journals and 3 years of publication. However, looking at the field of educational technology area studied, only 10 issues which have more than 3 number of an article are listed. Others areas studied are found in the article with the number of the article less than 3 and mostly one in each area.

Table 4: Highest- Ranked Issues for the year 2016-2018 according to MOJET and JLDTE

No	Issue of Educational Technology	Number of Articles (2016-2018)
1	Online Learning	15
2	Technology Integration	8
3	Learning Tools	6
4	Learning Approach	5
5	Educational Software	5
6	Makerspace	4
7	Professional Development	3
8	Mobile Learning	3
9	Internet	3
10	Augmented Reality	3
	Total	55

According to Figure 1, the top three issues were Online Learning, Technology Integration and Learning Tool. Besides that, the finding reveals Online Learning is the most trending issue. It is seen as a pattern in 3 years of publication, Online Learning is a continuing issue from both analyzed journals. There are 15 articles Online Learning classification is based on keywords used by authors such as online courses, online teaching, online discussion, connected learning, collaborative learning, online information searching strategies, e-learning, collaborative mobile web 2.0 and open learning.

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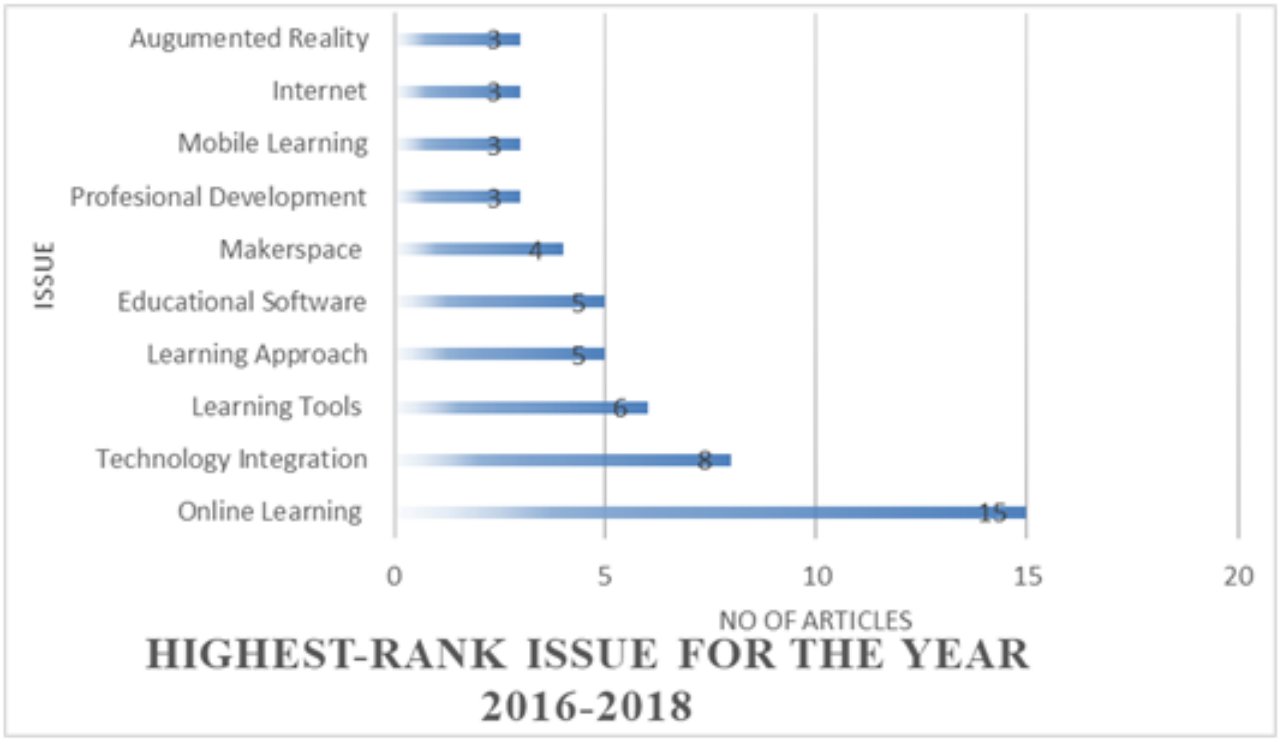

Figure 1: Highest –Ranked Issue for the Year 2016 -2018 according to MOJET and JDLTE

CONCLUSION

This study aimed to analyze the trend and issue in MOJET and JDLTE within years 2016 -2018. Total of 107 research articles was published in both journals. There are eight major issues in MOJET such as Online Learning, 21st Century, Makerspace, Professional Development, Video, Technology Integration, Website and Learning Approach. Meanwhile, major issue trending in JLDTE are Online Learning, Technology Integration, Teaching Method, Learning Approach, Problem Solving, Internet, Augmented Reality and Mobile Learning.

Overall, this analysis report discloses several interesting finding that helps the researcher to understand trending issues within 3 years in this field. From the finding, the Educational Technology field seems to emphasize online learning practices, technology integration and learning tools used in the education environment. In particular, online learning has become the most trending issue in recent year. This show from distribution of issue from 2 journals, the highest-ranked issue in the year 2016 -2018 and comparison issue from both of JDLTE and MOJET journal. Thus, these finding, provide some understanding of the overall trending issue in the Educational Technology field. This study also essential and help the researcher understand the direction for future research

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THE EFFECTS OF PAIR PROGRAMMING ON PROGRAMMING ANXIETY IN LEARNING USING WEB TUTORIALS

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Abstract

The purpose of this study is to investigate the effects of pair programming on programming anxiety in learning web programming using web tutorials. Studies showed that programming is perceived as difficult to be learnt. Students who approach programming with a negative perception tend to be demotivated and not succeeded. Misconceptions about programming can lead to anxiety in novice learner in programming. This study incorporates the use of experimental design with two groups of samples which comprises of two treatment method, namely, Pair Programming and Direct Instruction. The first group of students received Pair Programming intervention instructional strategy while the second group received Direct Instruction strategy. Both groups were learning web programming using a web tutorial, StudyTonight.com. The data were collected using Computer Programming Anxiety Scale to assess students' computer programming anxiety. The result of this study shows that programming anxiety is statistically significant between Pair Programming and Direct Instruction group. This study recommends the use of pair programming to decrease programming anxiety among new students who have no prior programming knowledge.

Keyword: Pair Programming, Computer Programming Anxiety, Web tutorials.

INTRODUCTION

UNESCO introduced the term Open Educational Resources (OER) in 2002 in a forum on Open Courseware in Paris. OER is defined as "teaching, learning or research materials that are in the public domain or released with intellectual property licenses that facilitate the free use, adaptation and distribution or resources" (UNESCO.org, 2019). These resources include textbooks, streaming videos, software and any other tools, material or technique used for gaining knowledge. In general, any website for educational purposes which can be freely accessed can be termed as OER. Using technology to deliver learning and training programs, it also applies to students nowadays where they learn in computer laboratories, using smartphones and mobile devices in a wireless environment. Students are more likely to be more motivated when using e-learning approach (Harandi, 2015). Many researches have been conducted to assess the effect of using e-learning approach in teaching programming. Programming are often viewed as difficult to learn. Negative feelings associates with high anxiety. Programming achievement of students has been seen to be negatively affected by anxiety (Owolabi, Olanipekun, & Iwerima, 2014).

Anxiety are often associated with uneasy feeling, worry, nervous at a certain occasion or situation. Students who feels anxious when confronting with a new subject are likely to have bad impression on the subject. Studies have shown where students who have these feelings, affect their performance (Hamzah, 2007; Vitasari, Wahab, Othman, Herawan, & Sinnadurai, 2010).

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PROBLEM STATEMENT

Programming is perceived as difficult to be learnt (Jenkins, 2002; Nolan & Bergin, 2016). This reputation is passed down to new students by their predecessor, and often exaggerated in the telling. Students who approach programming with a negative perception tend to be motivated and not succeeded. They may slow down or even give up learning. A systematic review of the role of anxiety when learning programming discovered evidence of positive correlation between learning to program and anxiety (Nolan et al., 2016). The factors contributed to feeling anxious are receiving errors, task complexity and collaborative learning.

In a polytechnic in Penang, there were increment in students' overall programming grade in obtaining grade D and lower from 2017 to 2018 based on the Course Learning Outcome Review Report. The programming courses enrolled by these students are C++, Java, Web Programming and Visual.net.

Students who enroll in a programming course at a polytechnic have been performing somewhat badly during the past year. Since the students are fairly new to programming scene, they develop anxiety on the subject before encountering with the actual course. This is due to their predecessor who perceived programing as difficult, they tend to have the same feeling even before taking the course. In using web tutorials, students will see how easy it is to code, view output, receive immediate feedback, have control of their learning pace and view various examples. After using the web tutorials, students will view programming differently and be more motivated to learn.

RESEARCH OBJECTIVES

The objectives of this research is:

1. To compare the effects of web tutorials on anxiety between pair programming and direct instructions.

LITERATURE REVIEW

Previous researches reported that failure rates in programming courses are about 30% to 40%. (Norwawi, Hibadullah, & Osman, 2005; Shukur, Alias, Hanawi, & Arshad, 2003) Collaborative learning are said to increase student's achievement (Johnson, Johnson, & Stanne, 2000; Ravinder Kumar, 2017) as students work in groups or in pairs. Despite many research claims cooperative learning improve students' performance (Freeman et al., 2004; McKinney & Denton, 2006; L. A. Williams & Kessler, 2001) there are findings where group work and collaborative learning increase stress and anxiety (Falkner, Falkner, & Vivian, 2013; Nolan & Bergin, 2016).

In constructivism, students gain knowledge from by creating meaning of their own experience (Ertmer & Newby, 1993). One of the factors which influenced learning is the interaction between learning and the learning environment. Justification of current situation is based on previous interactions (Clancey, 1986). For every action taken, the students chose it by what they have learnt previously or the actions that they are used to. By learning more new information, they will develop new skills by incorporating all the knowledge they have learnt. By using web tutorials to learn web programming, the students will gain real experience where the output are displayed in a website, instead of a local page.

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Pair Programming

Pair programming was introduced in 2001 while developing eXtreme Programming (XP) to increase productivity among programmers and to increase learning experience (Beck, 1999). The concept consists of two people who work together at a workstation to do programming. Both programmer have roles they must obliged to. The first one is known as the 'driver' who will write codes on computer. The other role is as a 'navigator' who will observe and monitor the partner's code writing for errors. The pair will work together on the problem solving method, algorithm, coding and testing before getting into their roles.

Pair programming have been used in many studies to address the difficulties in learning to program. In a study done by William et al. (2001), pair programming have proven to be beneficial to students' program quality. Students mentioned they feel more confident as there is someone who monitors their work and feel they can depend on their partner. In a meta-analysis study from fifteen years of empirical test with twenty two papers, resulted in pair programming produce higher quality programs than individuals. (de Lima Salge & Berente, 2016).

Direct Instructions

In the mid-1960s, Direct Instruction (DI) was introduced at the University of Illinois (Engelmann, Becker, Carnine, & Gersten, 1988). They incorporated short DI into language, reading, and mathematics. In applying DI, materials should be logically sequenced, with placement tests, a systematic review of previously taught material, and regular testing of mastery (Stockard, Wood, Coughlin, & Rasplica Khoury, 2018).

In a quasi-experimental study, two groups of student with Think Pair Share and Direct Instruction intervention, were applied to secondary school students in the subject of web programming (Alfathoni, 2017). The results showed there are significant differences in the effectiveness and efficiency of the average learning outcomes in learning using Think Pair Share models and Direct Instruction models.

METHODOLOGY

This research used quantitative approach with implementing experimental research. There were 2 groups of sample where one experimental group received pair programming treatment using StudyTonight.com, while the control group learnt using StudyTonight.com individually (Direct Instruction). Purposive sampling was used to choose 60 first-semester students and divided into 2 groups. Computer Programming Anxiety Scale (CPAS) (Choo & Cheung, 1991) was used to assess students' programming anxiety in learning programming.

RESULTS

Result in Table 1 shows the mean value of CPAS, which is programming anxiety after the intervention for both groups. According to the mean values, PP had a lower average ($\bar{X}$=1.93, SD=0.51, n=30) than DI ($\bar{X}$=2.37, SD=0.51, n=30). Based on this findings, it can be said that student who received pair programming have lower anxiety compared to student who receives direct instruction treatment.

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Table 1

Mean of CPAS

Group	Mean	N	Std. Deviation
Direct Instruction	2.3737	30	.51593
Pair Programming	1.9333	30	.51918
Total	2.1535	60	.55913

DISCUSSION

This result is supported by Freeman et al., (2004), where the students felt less stressful and agreed that there is a decreased in frustration when implementing pair programming. Another research by Müller (2004), indicate that pair programming reduced some anxiety associated with programming complexity. Other than the stated previous study, there are scarce study which specifically investigate programming anxiety in pair programming instructional strategy.

Students in Direct Instruction group shows less decreased programming anxiety compares to Pair Programming. This could be because the lack of interaction and inactive involvement during tutorial session. Anxiety did not wear off as the students have no one to discuss with, their worriedness and difficulties in solving the problem. While students in Pair Programming have less to worry as they share the responsibility to achieve learning outcomes. Being able to communicate with each other, the students can discuss and analyse the method to solve a certain problem.

CONCLUSION

Pair programming instructional strategy is a useful approach to be used in computer programming courses. It encourages students to be active in learning and be responsible for their own learning. When working in pairs, students are positively pushing each other to generate ideas and create constructive mental model with their partners. Using web tutorials such as StudyTonight.com as a platform to construct students' knowledge should be implemented in higher education. With hundreds of web tutorial available online, students can make full use of these resources to enhance their learning in any field at any time. Instructors can consider pair programming instructional strategy in teaching programming use web tutorial as supporting tools in teaching and learning.

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STUDENTS' PERCEPTIONS TOWARDS TECHNOLOGY-ENABLED ACTIVE LEARNING (TEAL) IN OBJECT ORIENTED PROGRAMMING AT POLITEKNIK BALIK PULAU

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Abstract

Technology-Enabled Active Learning (TEAL) becoming an integral part of polytechnic education which incorporates educational content, simulation and student experience using technological tools to provide students with a rich interactive learning experience. In Politeknik Balik Pulau (PBU), majority of the students gives uncertainty reaction on Object-Oriented Programming (OOP) lesson during class. The lecturer will only know the performance of the students after the formative or summative assessment being done. This problem drives to investigate the students' perceptions of Technology-Enabled Active Learning (TEAL) by using Nearpod platform in implementing an active learning approach. This study used quantitative method to collect data. The statistics used for data analysis were a mean and standard deviation. The results of the research indicated that most of the students prefer the opportunities provided by Nearpod as an effort to adopt technology in the classroom. The data obtained has proven that Nearpod can be an alternative for active learning. It also improved students' perceptions of TEAL. In future, further research can be done towards students' achievement on the usage of Nearpod platform.

Keywords: Technology-Enabled Active Learning, active learning, Nearpod

INTRODUCTION

Technical and Vocational Education and Training (TVET) has long been searching for new strategies or approaches to increase students' performance and achievement. Technology-Enabled Active Learning (TEAL) is a new learning model incorporating educational content, simulation, and the interactions of students using technological tools to provide students with a rich interactive learning experience. It is a part of the student-oriented approaches that involves various activities to ensure students' engagement with the instructions. Technology-enhanced active learning promotes the idea that by consciously engaging with technology, the learner takes an active role in the learning process through much deeper learning levels (Lim & Tschopp-Harris, 2018). The activities involved are activities that require movement, verbal communication, and listening, activating various areas of the brain and consequently producing productive teaching and learning.

In this 21st century education, the use of technology is an integral part of any modern classes to produce active learning. The use of technology and multimedia resources are helpful in improving classroom environment. There are many learning tools that can be used to facilitate active teaching and learning. One of the learning tools that can improve student's comprehension and engagement is Nearpod because it provides some unique features which can be applied in worldwide classrooms (Cummins, 2011). In addition, Nearpod is an online teaching tool that can save time for lesson preparation and involves active learning by providing features to enable teachers to add some activities between slides including selection, quizzes, videos, drawings, collaborations, open queries and other activities (Shahrokni, 2018).

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PROBLEM STATEMENT

A major challenge in TVET education today is to adapt learning content or course material with current technology to different backgrounds and learning styles of students. However, there are problems in the integration between education and technology where sometimes pedagogy and instruction are not fully integrated (Shroff et al.,2018). In Politeknik Balik Pulau, majority of the students gives uncertainty reaction on Object Oriented Programming lesson during class and lecturer will only know the performance of the students after the formative or summative assessment being done.

RESEARCH GAP

Recently, the use of technology in practical activities allows students to engage and learn more active (Mohamad Ali & Md Derus, 2014). Thus, the researcher takes these opportunities to use Nearpod platform as a learning tools to provide active learning activities during the lesson to assess the level of student perception and acceptance on Object Oriented Programming course.

RESEARCH OBJECTIVE

1. To assess students' perception of Technology-Enabled Active Learning on the usage of Nearpod.

LITERATURE REVIEW

Active Learning is generally defined as a teaching method that involves students in the learning process that require them to carry out meaningful learning. Active learning requires students to be intellectually involved with lesson content using critical or higher-level thinking thoughts such as analysis or synthesis (Edwards, 2015). The active learning activities that has been involved in this study are think-pair-share, jigsaw or peer teaching, the one-minute paper, real-time reactions, sketching and game activities. Active learning is based on a theory of learning called constructivism, which emphasises the fact that learners construct or build their understanding (Cambridge, 2019). The theory of social constructivism says that learning happens primarily through social interaction with others, such as a teacher or a learner's peers. Active learning builds both knowledge and understanding which students can then apply to new contexts and problems.

Technology Enabled Active Learning (TEAL) is a teaching strategy that merges lectures and hands-on activities to create a rich collaborative learning experience using online technologies (Shroff et al., 2018). Besides, Nearpod platform can be defined as an online presentation tool that synchronizes presentations with other devices and provide various types of content, including slide shows, quizzes, polls, draw-it, open-ended questions, collaborate, videos, selections, and other activities (Shahrokni, 2018). Object Oriented programming is a concept or programming style which combined the concepts of class, object, encapsulation, inheritance, abstraction and polymorphism. Recently, the latest programming languages such as Java, Visual Basic, C++, Python, C#, Ruby and other programming languages used the concept of object-oriented programming paradigm.

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RESEARCH METHODOLOGY

Participants of this study has been selected from the population of third-semester students at Politeknik Balik Pulau who have enrolled in DFT4024 Object Oriented Programming course in June 2019 session. The sample of this study implicated on the section 2 (S2) class which consist maximum class size (40 students) including repeaters students. The purposive sampling has been selected due to the researcher experience and knowledge where the number of students in the class will have an effect on student performance (Monks & Schmidt, 2010).

VALIDITY & RELIABILITY

The TEAL perception questionnaire was adapted from Shroff et al. (2018) consists of 16 questions based on 4 sub-constructs. The reliability of the survey was measured by using Cronbach's alpha coefficient in pilot study.

Table 3. 1: The results of Cronbach's Alpha for perception on TEAL survey

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.955	.955	10

Figure 3.1 showed the Cronbach's alpha for the TEAL perception questionnaire. Cronbach's alpha result was executed to check the reliability of items in the questionnaire. The Cronbach's alpha score for this study was $\alpha = 0.955$. This result indicated the consistency of the items and the questionnaire is reliable to be used in this research.

RESULT

In this research, descriptive analysis has been used to describe respondent's characteristics. The frequency distribution was used to describe a statistical data. The purpose of frequency distribution is to count the number of responses associated with different values of the variable.

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Table 4. 1: Percentage of respondent's characteristic on demographic profile

Data Group	Variable	Frequency	Percentage (%)
Gender	Male	14	35.0
	Female	26	65.0
Age	18 – 20 years old	35	87.5
	21 – 23 years old	3	7.5
	24 years old above	2	5.0
CGPA	Below 2.00	0	0.0
	2.00 – 2.99	2	5.0
	3.00 – 3.50	23	57.7
	3.51 – 4.00	15	37.5

Table 4.1 presented demographic profile using frequency and percentage which obtained from 40 respondents. This table indicated about 14 male and 26 female students involved in this study (N=40). Their percentages were 35 percent and 65 percent respectively. In terms of age we divided our respondent into 4 categories, 35 students in the first category (18 – 20 years old), this constituted 87.5 percent of the sample. This is the largest group of the sample. This is followed by those in second category (21 – 23 years old), 3 respondents or 7.5 percent in this age category. Only two respondents or 5.0 percent age more than 24 years old.

Almost half of respondent (57.7 percent) scored between the range 3.00 – 3.50 of their CGPAs or HPNM. This followed by those who scored between 3.51 – 4.00 with their percentage close to 37.5 percent. Only two person scored between 2.00 – 2.99 (3.3 percent). On the other hand, none of student scored less than 2.00 point. Based on their CGPA or HPNM researcher concluded that a majority of the respondents at the midpoint. This revealed that the female respondent were slightly more than male students in this study. A majority of respondent's age between 18 to 20, there are teenagers and their academic achievement quite moderate.

Data collection from questionnaire on Technology - Enabled Active Learning has been analysed. Descriptive analysis was used to obtain mean scores to identify the result. The mean scores interpretation was analyzed from (Landell, 1977) and (Najib, 2003) suggested that the level of mean scores depends on the Table 4.2.

Table 4. 2: Interpretation of Mean Score

Mean Score	Level
1.00 – 2.33	Low
2.34 – 3.67	Medium
3.68 – 5.00	High

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Table 4.3 shows the result of students' perception on TEAL overall mean (M= 3.83) interpreted as high level. The sub construct for TEAL perception include interactive engagement, problem solving skills, interest and feedback. Each sub construct was measured by four items. Several items have mean below 3.68 which interpreted as moderate level. The data were analyzed using mean scores and standard deviation

Table 4. 3: Students' Perception on TEAL

Sub-Construct	Question	Std Dev	Mean	Level	Total Mean
Interactive Engagement	ITR1	0.79	3.92	High	3.96
	ITR2	0.85	3.87	High	
	ITR3	0.81	4.00	High	
	ITR4	0.67	4.05	High	
Problem Solving Skills	PRS1	0.84	3.55	Medium	3.65
	PRS2	0.74	3.82	High	
	PRS3	0.90	3.57	Medium	
	PRS4	0.85	3.67	Medium	
Interest	INT1	0.86	3.97	High	3.84
	INT2	1.05	3.57	Medium	
	INT3	0.86	3.97	High	
	INT4	0.85	3.87	High	
Feedback	FEE1	0.82	3.67	Medium	3.88
	FEE2	0.82	3.80	High	
	FEE3	0.80	3.97	High	
	FEE4	0.70	4.10	High	
				Overall Mean	3.83

Table 4.3 indicated the TEAL perception of the sample (n= 40). The interpretation of mean score for Interactive Engagement is the highest level mean scores (M= 3.96), followed by feedback (M= 3.88), interest (M= 3.84) and slightly lower on problem solving skills (M= 3.65). This result revealed that the "problem solving skills" is categorized as moderate levels.

Refer to table 4.3, the standard deviation result was at the range from (SD=0.67) to (SD= 1.05) The highest result was at the "interest" sub-construct (INT2), (SD=1.05). This indicates the wide spread of data distribution on the items. The lowest result for standard deviation was at the interactive engagement (ITR4), (SD= 0.67). This revealed that the items would have more consistent scores for engagement.

DISCUSSION

Finding result for RQ1 was indicated that the TEAL perception of the sample (n= 40) was at the high levels (M= 3.83). This result revealed that the overall students' perceptions on TEAL are positive towards learning with Nearpod. However, the student's perception in problem solving skills sub-construct was categorized as moderate levels. This result showed that the lecturer needs to diversify the problem solving skills activities.

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In this case, lecturers need to achieve a balance between lab and theory activities to maintain student learning and maximize Nearpod effectiveness as an active learning tool. Results of the questionnaire also reveals that the problem solving skill is the most difficult task to achieve by students. Hence, this result proves that this research has been used as an accurate, reliable and valid instrument to measure students' perceptions of active learning in a technology-enabled learning (Shroff et al., 2018). For future studies, further research can be done on the effectiveness of Nearpod platform towards students' achievement and performance. Besides, the effectiveness of Nearpod platform need to be explored further using especially the features in the Gold account such as Virtual Reality (VR) field trips, matching pairs and fill in the blanks activity to identify the effectiveness in the classrooms.

CONCLUSION

As a conclusion, the Technology-Enabled Active Learning by using Nearpod gives positive impact on students' perception. Other than that, Nearpod also provides huge time saver in implementing all the important elements of active learning approach in a single lesson. For those lecturers who require a tool to deliver the learning materials in the classroom, Nearpod most certainly provides the necessary features. The connection and the flexibility of Nearpod will enable the lesson to be delivered in creative and innovative ways. Besides that, the impact also will depend on the ability of lecturer in utilizing all of the great features provided by Nearpod in developing powerful instructional lesson to the next level of revolutionize learning.

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A REVIEW ON LANGUAGE POLICIES AND EDUCATION ISSUES IN MALAYSIA: THE TEACHING OF MATHEMATICS AND SCIENCE IN ENGLISH

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Abstract

The current policy - the teaching of Science and Mathematics in English will be discussed, looking at the reasons of implementation and the measure taken in the implementation. Obviously, the reinstatement of English as medium of instructions for subjects related to Mathematics and Science had also drawn a lot of socio-political-reactions. Typically, some people are in favour of the ideas but some are against it. A critical opinion regarding this issue will also be discussed by relating own experience as an educator, parent and member of the public before drawing a conclusion.

Keywords: PPSMI (Pengajaran dan Pembelajaran Sains dan Matematik dalam Bahasa Inggeris), ETeMS (English for Teaching Mathematics and Science), ELT (English Language Teaching), language policy

INTRODUCTION

In 1967, Sabah, Sarawak and Singapore joined to form Malaysia and Bahasa Melayu (also known as Bahasa Malaysia or Malay) was made the national language. English was the official language since 1957 until the Language Act of 1967 removed this official role. And, ever since, status of English was becoming more insignificant in the light of the new education policy (Heng and Tan, 2006, p.309). For example, since 1979, the teaching and learning of Mathematics and Science in Malaysia began using Bahasa Malaysia.

The Kurikulum Baru Sekolah Rendah (KBSR) and Kurikulum Baru Sekolah Menengah (KBSM) were introduced in 1989 for the primary and secondary schools in Malaysia. These new curricula among others hope to produce students who are proficient in English to acquire knowledge in the field of science and technology. Besides, English Language Teaching (ELT) for the primary syllabus (KBSR) was supposed to incorporate all the four skills - reading, writing, listening and speaking with emphasize on oral activities to help students relate the language to environment. Meanwhile, the secondary syllabus (KBSM) is geared towards equipping the students to use English in everyday situations and also to prepare them for higher education. Thus, in July 2002, after a special meeting at the ministerial level, it was decided that Mathematics and Science subjects, as well as the Science and Mathematics related subjects at all level of schooling, including post-secondary level (Form 6, Matriculation and Polytechnic) are to use English as the medium of instruction (Rusilawati and Mazlan, 2008).

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Teaching of Science and Mathematics in English

In 1991, the former Prime Minister, Tun Dr Mahathir Mohamad, publicly expressed his grave concern at the poor results that students had attained in the national English language examinations. Further concern came from the public sector which claimed that many local graduates had failed to secure jobs because of their lack of competence in the English language, evident particularly during interviews. This lack of proficiency was seen as contributing to graduate unemployment: in 2002 some 44,000 were unemployed (Lee, 2004; cited in Heng & Tan, 2006).

Consequently, in 2002, Tun Dr Mahathir Mohamad made an announcement that Science and Mathematics subjects will be taught in English not only at tertiary level but also during the first year of schooling. The implementation of the new policy or more frequently referred to as PPSMI (Pengajaran dan Pembelajaran Sains dan Matematik dalam Bahasa Inggeris) took place starting 2003.

According to Gill (2006), the main reason of the change of policy is due to the influence of globalisation and the knowledge economy era which brought about two challenges: i) the challenge of ensuring the nation possesses the necessary human resource capability and whether the existing quality of human resource meets with the needs of the nation, and, ii) the implications of knowledge and information explosion on language policy.

Gill further explained that as Malaysia is aiming at getting its blueprint for the achievement of industrialisation status in year 2020 (Vision 2020), it needs to have a world-class workforce for the Knowledge Economy (K-economy) which demands brain-sensitive, thinking, creative, innovative and disciplined workforce. To achieve this, Malaysia needs to develop knowledge workers who are able to innovate in the field of science and technology and this requires access to knowledge and information in these fields.

Thus, with the crucial need to access information in the field of science and technology, one of the options is to have those science and technology books translated. But then again, the slow pace of publications/translation into Bahasa Malaysia when ‘there are over 100,000 scientific journals in the world at the rate of 5,000 articles per day adding to 30 million existing’ (Bilan cited in Martel, 2001, p.51 as cited in Gill, 2005 p.252), translation was not able to keep up with this knowledge explosion in English.

Another factor that caused the government to relook the policy was the importance of English in business and industry domain (Gill, 2005). As Malaysia, like many other countries is competing aggressively for foreign investments in order to ensure economic growth and development of the nation, English is definitely an important language.

“On one hand we have students who must learn Mathematics and Science content while they are still learning English” (McKeon, 1994, p.2) and on the other, we have teachers, who themselves have proficiency problems with the new medium of instructions. As a result, teachers who believe they lack professional preparation may opt to teach Science and Mathematics alternately with other languages (Noraini et. al., 2007).

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In order to face the problem, the Ministry of Education developed a retraining programme known as English for Teaching Mathematics and Science (ETeMS) to enhance English language proficiency among Mathematics and Science teachers (Heng and Tan 2006, Noraini et. al., 2007). The task of developing this language conversion exercise was assigned to the English language Teaching Centre Malaysia (ELTCM) who was supposed to come out with a programme at a national level and could cater for all.

There are some limitations and problems with the ETeMs programme. One of the problems is time constraints (Heng and Tan, 2006). As mentioned earlier, the programme was developed within a few months as the implementation on the new policy took place about 6 months after the announcement of the change in policy. The time constraint and limited workforce when developing the training modules could have some impact on the products. Besides that, Science and Mathematics teachers and as well as the key trainers who had to attend ETeMS courses faced disruption in their daily work routines. The fact that they have to be away from family even on weekends has caused some marital tension among the teachers. All these facts may contribute to the outcome of the training.

Observations conducted by Gurnam Kaur Sidhu (2005) on urban and rural Mathematics classrooms revealed that rural students possessed very limited English language proficiency as compared to the urban students. Thus, the change in policy may have resulted in some students having a negative attitude towards Mathematics as claimed by the teachers. Even with ETeMS, teachers are still struggling to adapt to this new policy. The sad thing is that, when a teacher finds it difficult to impart their knowledge due to language constraint, the actual victims are the students.

Socio-political Reactions

This implementation raised many debates among the general public, parents, political parties and even teachers when it was first announced. Many people were skeptical about its success citing reasons such as poor English language proficiency of teachers for these subjects and the lack of student interest towards learning English (Noraini et. al., 2007, p. 102).

In fact, the early reactions confirmed the fears of communities in a multicultural and multilingual country about their language rights. Heng and Tan (2006) in their article, the Chinese educationist were worried that the use of English in teaching Mathematics and Science in vernacular schools would change the character of Chinese schools which are known for a good training ground for Mathematics and Science subjects. Meanwhile, to Malay nationalists, the policy innovation was a threat to their ‘Malay-ness’ in terms of downgrading the use of national language.

However, the reactions from the public, teachers and parents were mixed. Some were against the idea but some were happy with the change. A study by Pandian and Ramiah (2004) shows that the teachers of Science and Mathematics were aware of the need for the change in the medium of instruction and reacted positively to this change. 76.1% of the respondents in their study felt that the move to switch to English as the medium of instruction was necessary. But, the remaining 22.9% did not agree with the new policy due to the fact that their students were not proficient in English. One of the respondents said “This move has been implemented in an abrupt manner, the government should think of students and teachers in rural schools-my students cannot cope with English” (p. 4).

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Pandian and Ramiah also pointed out even the teachers who are 'for' the idea feel that they still require some sustained programme for their own language development, require content materials that are more suited for Limited English Proficiency (LEP) students and intensive language support to help them deal with LEP students. In short, what they want is better support as the existing support does not meet their needs. As for the trainee practitioners who are supposed to teach Science and Mathematics in English once they completed their studies, the new policy is seen as a burden. Some studies conducted indicated that these future Science and Mathematics teachers are not confident to teach in the second language as their entry level to the university for English was very low (Heng and Tan, 2006). Thus, even though they have the necessary knowledge of the subject matter and able to handle the demand of the curriculum, they lack of confidence to do so in English.

Meanwhile, Khoo Kay Khim, a Malaysian Emeritus Professor pointed out that English spoken in the university campuses today was very much below the expected standard but he also argued that teaching Mathematics and Science in English would not help to improve the situation as long as the teaching of English remained ineffective. In short, he believes that using English to teach Mathematics and Science was seen to have little impact on English language mastery (Heng and Tan, 2006).

A letter written by a parent to the News Strait Times newspaper on 7 September 2008 and the feedbacks from readers show that the change of policy still attract a lot of attention from parents. Zainul Arifin in his letter "Let's parent decide on English policy" suggested a referendum within each school to decide whether or not this new policy should retain. In response to his letter, many individuals who claimed to be parents argued that they will choose to retain the current policy as they are in favour of the teaching of Science and Mathematics in English.

On the other hand, a report by Aniza Damis and Elizabeth John, "Study reveals policy flaws" (NST, Sept 7, 2008), and the letter by Rembau member of parliament Khairy Jamaluddin, "It's high time we ditched this policy" (NST, Sept 9, 2008) argued that the policy of teaching Science and Mathematics in English, introduced by Tun Dr Mahathir Mohamad is a flawed policy and should be abandoned. In the report, the argument given is that Bumiputera students from rural areas and low economic background will lose out because of their poor command of the English language.

The Khairy Jamaluddin's letter became very popular among the bloggers. Many of the blogs have discussed this matter in a very negative way, claiming that the letter was written due to oncoming general election and with personal political reason. Nevertheless, most of the comments made did not agree with the proposal to change the policy. Many points why Science and Mathematics should be taught in English were brought up. This shows that this issue can lead to a long heated argument without a conclusion as long as there are two groups of people with contradict ideas and stand.

DISCUSSION

According to Kaplan and Baldauf (1997), the process of decision making about language policy comes in two modes: 'bottom-up' and 'top-down'. The 'bottom-up' mode requires discussion with people from the grass-roots level when making decision. In contrast, the 'top-down' mode process only involve 'people with power and authority who make language-related decisions for groups, often with little or no consultation with the ultimate language learners and users' (Kaplan and Baldauf, 1997, p.196). Thus, the 'top-down' process is the accurate description of Malaysian way.

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However, according to Gill (2004) the decision or change in language policy is not a government decision made to serve political ends for personal gain or for the gain of a selected elite group. Nevertheless, being a Malaysian, the change of policy is somehow related to political influence. The decision to have Science and Mathematics in English; which was the idea of the the Prime Minister Tun Dr Mahathir Mohamad in 2002 and was being fully supported by other ministers during his time. But, when he stepped down and the post was taken by his deputy, suddenly, those ministers who were once in favour of the new policy started to give negative remarks just because the new Prime Minister (who was also once fighting for the idea to materialise it) has had a second thought. As a prove, please refer to the blog written by the former Dato' Menteri Besar (Chief Minister) of the state of Selangor in Malaysia and the letter by Rembau member of parliament Khairy Jamaluddin (mentioned earlier). Thus, in this case, it is arguable that too much politic is involved in this issue.

Gill (2004) mentioned that there is a dire need for clear direction in terms of implementation of language policy to avoid confusion so that there is synergy in expectations between the policy makers, the implementers and the ones most directly impacted by the change are the students. In fact, what has gone wrong is the implementation phase. The plan was executed in hurry - six months after it was announced. Even the modules for the ETeMS programme were prepared in a rush.

According to Rubin (1984, p.6) there should not be any doubt in the implementation of a change in policy as proper implementation is a ‘critical variable in the success of any plan’. Thus, the preparation especially on the part of the teachers should have been done much earlier so that proper training could have been carried out. Teachers cannot be blamed for not being able to conduct the classes in proper English as when language is concerned, a few weeks of training cannot do wonders. This is especially so as many of the teachers involved are the products of the Malay medium education. Concurrently, the decision to emphasize on ICT had also increased the burden of these teachers as within a short period of time, they have to master both the English language and the ICT skills.

Thus, as a parent whose child is able to speak English, it is unfair to look down at these teachers who never thought that they would have to teach in a second language. These teachers should not be expected to be fluent within a few weeks of language training. Hence, at times, complaints such as the Mathematics teacher was using ‘weird’ English in class were made. Instead of being angry, it was a pity for the teachers.

Experience on giving training to some colleagues in preparing them for the change of medium of instruction in the polytechnic had triggered an awareness. Some of these lecturers who have very good technical skills were once polytechnic students. Quite a number did not do well in their Sijil Pelajaran Malaysia (SPM) English paper as English was not the requirement to enroll in polytechnics. And, now, they who definitely have very low proficiency in English are expected to give lecture in the language? It could be possible but it takes time to train them and they definitely need a lot of help. It would be wise if these lecturers are sent for training before launching the new policy.

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In 2007, after 6 years of improper implementation, the policy changed once again. Among the reasons is the fear that Bahasa Malaysia will lose its power. This is parallel to the argument made by Cummin (2005, p.509) that 'currently, there is massive loss of national language resources because young children are given few opportunities to use and become literate in their heritage language'. However, Bahasa Malaysia will still stand strong even though Science and Mathematics subjects are being taught in English because Bahasa Malaysia is made a compulsory subject for passing the national exams. Thus, children who go to schools are and will definitely study and use this language. After all, the other subjects are being taught in Bahasa Malaysia too.

On the other hand, it is undeniable that the LEP students may be affected by the current policy. They may not have been given enough support. Some measures should be taken by the government to help these students. Based on experience, these students do not have the motivation to learn English. The moment they see or hear English word, they 'shut off'. Thus, when Science and Mathematics are taught in English, this may cause them to 'shut off' to more subjects. This is indeed worrying. Therefore, if the government wants to ensure that this policy works, a support program for the LEP students and teachers teaching these students should be developed.

To illustrate further, a study by Pandian and Ramiah (2004) which shows that 85.2% of the respondents (Science and Mathematics teachers) indicated that they have problems explaining concepts and 81.1% admitted that they switch to Bahasa Malaysia when facing communication breakdown. The problem here could be because while concentrating in equipping the teachers with the language to teach, the needs of the students have been neglected. As there are two levels of proficiency: the basic interpersonal communication skills (BICS) and academic language proficiency (CALP). It is important to understand that in order to perform effectively in Science and Mathematics, students would need to develop CALP which involves language that is context-reduced and highly demanding cognitively (Cummins, 1986). To ensure that the policy is a success, the students need extra language support to help them deal with the content of Science and Mathematics subjects in English.

Should Malaysia go back to the former policy whereby Science and Mathematics are taught in the national language? It is believed that the current policy should stay. If the immersion programmes can work in other countries like Canada and New Zealand, I believe that Malaysia would benefit from the current policy with a proper implementation.

CONCLUSION

The issue of whether the current policy should stay has been decided that in 2012, Mathematics and Science have been reverted to Bahasa Malaysia, except for a few schools that offer DLP (Dual Language Programme) – schools are given choices to teach Mathematics and Sciences either in English or Bahasa Malaysia. It is under the current policy of MBMMBI (Memartabatkan Bahasa Malaysia Memperkukuh Bahasa Inggeris) replacing ETeMS. This paper has looked at how the policy has been implemented and how the various groups reacted to the policy. There are definitely some pros and cons to this issue. However, it still be considered a short time to judge the success of the current policy. It is hoped that with the new policy, the government will look more seriously in ensuring higher students' acquirement of the second language, which is English, into a reality this time.

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THE EFFECTIVENESS OF MACHINE LEARNING IN CHARACTERIZING THE ELECTROMYOGRAPHY SIGNALS

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Abstrak

Nowadays, machine learning (ML) method has been used mostly in the characterization of Electromyography (EMG) signals. The effectiveness of classifying EMG signals has been the interest of many researchers in this modern era. This study aimed to determine the most efficiency ML that have applied in order to diagnose neuromuscular disorders profitably. The supervised learning techniques of ML have been discussed in this study, there are logic-based algorithm, perceptron-based technique, statistical learning algorithms, instance-based learning, SVM, and fuzzy logic. Out of the five reviewed machine learning techniques, k-Nearest Neighbor was showed the highest accuracy in characterizing human movement problem based on the EMG signals obtained during walking. This expected findings of EMG signals are beneficial to medical doctors and specialist in the aspects of diagnosis tools, as the reviewed classification models will classify the individual with movement problem or normal.

Keywords: Machine Learning, Electromyography (EMG) signals.

INTRODUCTION

Machine learning (ML) is one of the types of artificial intelligence (AI) focusing on a computer program which can change with new data. ML is aimed at building a concise model distribution of class labels in terms of predictor features. Most of the researchers are fond of applying ML to analyze, establish, and improve the efficiency of their systems (Kotsiantis, 2007)(Harrington, 2012). In ML, the algorithm is categorized into five types of learning, which are supervised learning, unsupervised learning, semi-supervised learning, reinforcement learning, and learning to learn (Karlık, 2014). Among these algorithms, supervised learning was used in this study, as the input and output data were labelled for classification to provide a learning basis for future data processing. The classification model is developed to evaluate the effectiveness of the significant parameter obtained from the output of the feature extraction procedure.

Accordingly, numerous researchers and clinicians have applied EMG signals widely as a worthwhile method to diagnose neuromuscular disorders accurately (Bosco, 2010). In order to diagnose neuromuscular disorders profitably, the classification model of EMG signals plays an important role in recognizing the abnormalities. Several EMG classification approaches have been reviewed, namely the Bayesian techniques, neural networks, multilayer perceptron, fuzzy approaches, support vector machine (SVM), and neuro-fuzzy systems (Cappellini, Ivanenko, Poppele, & Lacquaniti, 2006). Thus, this research was conducted to discuss the most effective supervised learning techniques of ML, in terms of accuracy in classifying the neuromuscular disorder.

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PROBLEM STATEMENT

EMG is an electrical activity that will be generated when there are instances of muscle contraction. The EMG signal is recorded in response to muscle activity by sensors (Reza, Ahmad, Choudhury, Ariffin, & Ghazilla, 2013) whereby electrical current is produced when the muscles are active. This current is usually proportional to the level of muscle activity. Therefore, muscle activity requires smart monitoring because most human activities are dependent on the state of the active muscle. The EMG signals can be used to detect abnormal electrical activities of muscles that can occur in many cases and conditions. Nowadays, EMG has been well established in clinical application and engineering research. The EMG technique is utilized as a tool in various applications such as in the areas of human movement detection, neuromuscular disorder, exoskeletons for human motion support, speech recognition, and others. Surface EMG (SEMG) is a powerful technique when applied with proper knowledge. Over the past decade, global application of the non-invasive technique of EMG has been tested using SEMG and many approaches employed has solved various problems in the area of ergonomics, biomechanics, kinesiology, and sports (Rodrick, 2005).

The novel machine learning technique utilized for developing advanced EMG signals detection and analysis has become a new insight for many researchers. The machine learning technique is also reviewed as the best method to characterize the EMG signals for the diagnosis of neuromuscular disorder (Yousefi & Hamilton-wright, 2014). Therefore, this study will investigate the effectiveness of ML in classifying the EMG signals analysis. For this research, five classification model has been compared to determine the best ML classification performance, in terms of its accuracy to classify the EMG signals of neuromuscular disorders based human walking.

RESEARCH OBJECTIVES

1. To determine whether ML is effective in characterizing the EMG signals in order to diagnose neuromuscular disorders.
2. To examine the most effective ML in characterizing the EMG signals in order to diagnose neuromuscular disorders.

LITERATURE REVIEW

A decision tree adopts a straightforward concept. It is an expert technique in distilling data into knowledge, which can take a set of unfamiliar data and extract a set of rules. Thus, decision trees are often applied in expert systems to gain a boundless output in a given field (Harrington, 2012). Typically, decision trees were used to classify instances based on the feature values, in which each node represents a feature in an instance to be classified, and each branch represents a value that the node can assume (Kotsiantis, 2007). The auto diagnostic system was implemented using the decision tree algorithm to classify three EMG signals, which are myopathy, neuropathy, and normal. Four decision tree classifiers have been applied, specifically Random Forest, C4.5, Random Tree, and Simple CART to the EMG signals. Among these four classifiers, the Random Forest showed the best accuracy. However, most of the decision tree algorithms are not appropriate to be used with the principal component analysis to select the effective features because it could decrease the classification achievement (Keleş & Subaşı, n.d.).

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The perceptron-based technique is an algorithm based on the notation of perceptron. Typically, it consists of three types of classifiers, namely single-layered perceptrons, multi-layered perceptrons, and Radial Basis Function (RBF) networks [171]. Among these classifiers, the multi-layered perceptrons, also known as the Artificial Neural Networks (ANN) is the most favorite classifier used by previous researchers. The ANN algorithm has shown promising results in analyzing EMG signals in various applications of human gait such as classification, prediction of gait angle, and muscle activation (Wang & Buchanan, 2002)(Hahn, Farley, Lin, & Chou, 2005). The algorithm of ANN was developed as a transformation between the kinematic movement plan and human muscle activation for normal locomotion, in which the parameter used was changed in cadence, stride length, stance width, and required foot clearance (Prentice, Patla, & Stacey, 2001). Furthermore, Wang and Buchanan (2012) had established the algorithm of a neural network to solve the unavailability of accurate muscle activations, and the results showed that the developed model could represent a good relationship between EMG signals and joint movements (Wang & Buchanan, 2002). Besides that, the ANN model was also used as a mapping tool to estimate human balance control during normal locomotion. Bootstrap re-sampling was utilized to enhance the generalization of model accuracy. Hence, results showed that the ANN model was an effective model to evaluate the dynamic stability of the basic measures of normalized EMG activation (Hahn et al., 2005). Cisi and Cabral (1999) had also used the ANN algorithm to validate the proposed model in mapping the EMG signals and joint dynamics in the lower limb muscles and obtained good results in EMG/angles mapping (Cisi & Cabral Jr., 1999).

Ordinarily, statistical approaches are characterized by consuming the fundamentals of the probability model, which provides the probability of an instance belonging to a specific class. Two methods of statistical learning algorithms commonly used are the Linear discriminant analysis and Bayesian network (Kotsiantis, 2007).

The linear discriminant analysis (LDA) is also known as the Fisher discriminant. Former researchers referred to use the LDA classifier as it is easy to design, and fast to train without considering any parameter regularization and is more computationally efficient with lower classification error (H. Huang, A. Kuiken, & D. Lipschutz, 2009). It is also a favorite method because of its simplicity and reliability and presented lower computational cost in evaluating face recognition systems (Feitosa, Thomaz, Veiga, & Xavier, 1999). The LDA classifier has been widely used for EMG signals classification (H. Huang et al., 2009)(AlOmari & Liu, 2014)(Murugappan, 2011). Chen and Wang (2012) had compared the effects of four classification algorithms for offline recognition of hand gestures based on the EMG signals, in which the classification algorithms consist of k-nearest neighbour (k-NN), LDA, quadratic discriminant analysis (QDA), and support vector machine (SVM). Then, the real-time recognition system was implemented referring to the offline result. The accuracy of the implemented system achieved excellent performance, which encouraged its practical applications (Chen & Wang, 2013). Besides that, the linear and non-linear classification techniques were used to improve the pattern recognition control of hand grasps in multiple wrist positions. The LDA attained good performance in improving the classification of hand grasps across different wrist positions. This finding may potentially restore more function to partial-hand amputees than previously available approaches (Adewuyi, Hargrove, & Kuiken, 2016).

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Murugappan (2011) developed the classification algorithm of human emotions based on EMG signals analysis using the LDA and k-NN classifier. Five most dominating emotions such as disgust, happiness, fear, sadness, and neutral were evoked from video clips comprising audio-visual stimuli. The LDA classifier showed the highest accuracy for the sad emotion above the other four emotions. These research findings can contribute to the localization of the frequency range of EMG signals to develop an intelligent emotion recognition system (Murugappan, 2011). Moreover, previous studies proposed a new phase-dependent EMG pattern recognition strategy to classify the user's locomotion modes due to the non-stationary characteristics of EMG signals using LDA classifier. It is the preferred classifier to build a robust EMG signals pattern classifier for locomotion identification, as it is computationally efficient for real-time prosthesis control (H. Huang et al., 2009). LDA classifier also provided an accuracy of 98.56% in classifying eight hand motions based on four EMG signals. It could have claimed that LDA is a robust classifier as its accuracy is more than 90% (AlOmari & Liu, 2014). According to Englehart et al. (1999), a mean of improving the classifier accuracy is by combining the classifier with an effective feature extraction technique. The significant improvement in the performance of the classification of EMG signals is achieved by combining the classifier with dimensionality reduction rather than feature selection, in which the highest accuracy of 93.75% was attained when using a principal component analysis (PCA) and linear discriminant analysis (LDA) combination (Englehart, Hudgins, Parker, & Stevenson, 1999).

Meanwhile, the naïve Bayes classifier is a statistical method as well as an underlying probabilistic model that determines the probabilities of outcomes. This technique is efficient in simplifying learning by assuming that features are an independently given class. Although the algorithms of naïve Bayes calculate the probabilities for the hypothesis, its output is robust to noise and it competes well with other prominent classifiers (Rish, 2001). Hence, it is noteworthy to study the appropriate characteristics of data that may affect the performance of the naïve Bayes classifier. Rish (2001) discovered that the naive Bayes accuracy was acquired from the loss of the feature's information about the output class. Furthermore, the impact of independent assumption on classification can be used to develop better approximation techniques for learning competent Bayesian classifiers (Rish, 2001). Besides that, a way to improve the performance of traditional naïve Bayes classifier was investigated. A new approach of the naïve Bayes model was used for the detection of breast cancer. The findings showed that a weighted naïve Bayes classifier outperformed the traditional naive Bayes classifier (Kharya & Soni, 2016).

The naïve Bayes classification model is also a favorite of most researchers due to its conformity for large variations of data such as the EMG signals. This probabilistic model was developed to capture the mean and covariance of multiple EMG channels to identify movement abnormalities. The naïve Bayes model was combined with the dimensionality reduction technique and the result obtained outperformed classical approaches in terms of prediction of the knee abnormalities (Kohlschuetter, Peters, & Rueckert, 2016). Furthermore, naive Bayes algorithms have also been used for the classification of uncertain data object distribution, due to inexact or imprecise data values. For this purpose, the traditional naïve Bayes model was extended by extending the kernel density estimation method to handle uncertain data. Thus, the accuracy of the naïve Bayes model can be improved (Ren et al., 2009).

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Instance-based learning is also known as lazy-learning algorithms. It requires less computational time during the training process but needs more computation time during the classification process. It does not make any assumptions on the underlying data distribution and does not use the training data to do the generalisation process. Thus, the time for the training phase of the k-NN is very minimal (Thirumuruganathan, 2010). The most straightforward instance-based learning algorithm is the Nearest Neighbour. K-Nearest Neighbour (k-NN) is a non-parametric algorithm and it is very easy to understand. Even so, it works incredibly well in practice and its application is well-designed. Human identification based on gait was investigated by using the k-NN classifier. The experimental result showed an encouraging performance of accuracy of correct classification rate for human identification (Shelke, Deshmukh, Martinfeiez, Mollineda, & Sanchez, 2014). Nevertheless, Beliakov and Li (2012) had explored more efficient techniques to improve the performance of classical k-NN algorithms by modifying its algorithm to increase the acceleration to cope with instruction presented to the k-NN model. Thus, the modification of the k-NN algorithm was reliable for the case of large data sets to work much faster, either for regression or classification tasks (Beliakov & Li, 2012).

Support vector machine (SVM) is a machine learning technique widely used for classification, data analysis, and pattern recognition. The most interesting feature of the SVM is that the number of support vectors selected by the SVM's learning algorithm is usually small. Therefore, the SVM is well suited to deal with learning tasks where the number of features is large concerning the number of training instances. Indeed, many researchers believed that SVM is the best among other supervised learning algorithms (Ng, 2000)(Keerthi & Lin, 2003). Moreover, a new method of multimodal fusion which combines the Gaussian mixture model (GMM) with SVM classifiers was performed for the application of personnel detection. Personnel detection is an important task for intelligence, surveillance, and reconnaissance at the border crossing, and the new multimodal fusion method had improved the robustness of the system over previous approaches (Keerthi & Lin, 2003)(P. Huang, Damarla, & Hasegawa-johnson, 2011).

In analyzing the EMG signal applications, numerous researches had been carried out using SVM algorithms (He & Jin, 2008). SVM has become a potential classifier in developing a fully automatic EMG signals analysis system for use in the clinical environment. Neuromuscular diseases have been identified successfully with the classification accuracy of 100% yielded from combinations of multi-class SVM algorithms with autoregressive (AR) features (Kaur, Arora, & Jain, 2009)[211]. Furthermore, SVM algorithms had performed well in discriminating different types of human activities based on the EMG signals data. As referenced previously, the proposed SVM classifier with AR-based features showed the average recognition results of 92.25% for four human activities comprised of running, standing still, jumping, and walking, which is better than using a traditional SVM classifier. The proposed SVM model provided new choices of features for activity recognition. The research on hand gesture recognition was conducted using the EMG signals data. It was observed that the use of bend resistive sensor and SVM classifier was achieved at the classification accuracy of 93.33%. This finding is appropriate to be used for communication by soldiers (Tidwell et al., 2013).

Fuzzy logic is a generalization of standard logic where the concept is completely true or completely false. Previous researchers are keen to use fuzzy logic classification model to develop prosthetic hands controlled by EMG signals (Arozi, Putri, Ariyanto, & M, 2017). For that study, the fuzzy logic classifier successfully distinguished the hand gripping movements, as it is a simple application and does not require any training data (Cappellini et al., 2006). Also, the wrist joint angle of the upper limb was easily done by using voltage and frequency thru fuzzy logic

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classification technique. Besides that, the fuzzy logic also showed high sensitivity, specificity and accuracy in the measurement of causality in spasticity patients evaluated using SEMG. Other than that, the self-organizing features maps (SOFM) classifiers are also one of the simple classification models that are effective in recognizing the hand signal version of the Korean alphabet from EMG signals pattern (Eom, Choi, & Sirisena, 2002).

METHODOLOGY

This section discusses in detail the proposed classification system as shown in Figure 1 (Nor, Zakaria, Jailani, & Tahir, 2015) below. It consists of four stages which are EMG data acquisition, pre-processing technique, data selection and extraction method, and classification model development.

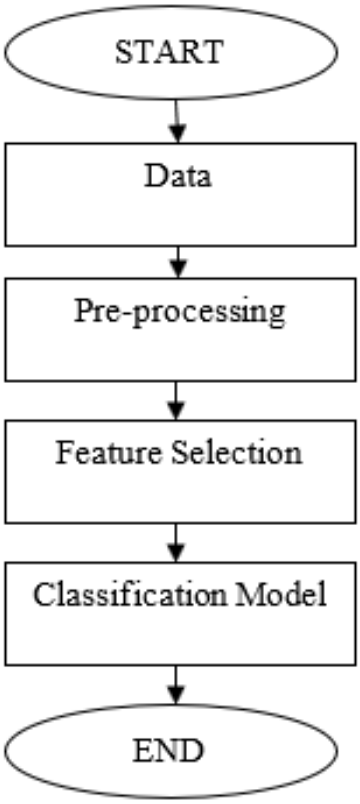

Figure 1 Proposed Methodology

EXPECTED FINDINGS

From the literature review, all classifiers could work sufficiently well in generating the classification accuracy. Overall, the reviews obtained have proven that most of the proposed classifiers were able to classify the EMG signals of neuromuscular disorder by attaining good results, with the accuracy of above 80%. The findings of this study may provide new insights for the diagnosis technology of neuromuscular problems using EMG signals obtained during walking. As stated by former researchers, individual with neuromuscular problems displayed motor impairments in many aspects of the motor function such as stiffer gait, trunk postural abnormalities, and uncoordinated movement. Out of the five reviewed machine learning techniques, k-Nearest Neighbor was showed the highest accuracy in characterizing human movement problem based on the EMG signals obtained during walking.

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Most researchers preferred to use the k-NN classifier to evaluate the performance of the proposed classifier in terms of classification accuracy (Berg Alexander C , Zhang Hao, Maire Michael, 2006) (Saini, Singh, & Khosla, 2013)(Beliakov & Li, 2012). This research will reveal the significance of the EMG signals in the lower limbs and arms muscles that affect walking. It is important and relevant to know all parameters that affect walking in individual with neuromuscular disorder to classify the subjects according to the groups.

CONCLUSION

Based on the review of recent works on the classification of EMG signals, it can be drawn out that the ANN, k-NN, naïve Bayes, LDA, and SVM classifier appeared to be the most studied and exhibited the best performance for this research. Based on previous literature, the proposed classification model had proved easy to apply and interpret, and also achieved good accuracy of EMG signals in order to characterize the neuromuscular disorders. In this present research, classification models reviewed based on significant EMG signals are beneficial to medical doctors and specialist in the aspects of diagnosis tools, as the reviewed classification models will classify the individual with movement problem or normal. Hence, the rehabilitation or therapy plan can be designed with the specific needs of each individual with neuromuscular problems.

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KEBERKESANAN KAEDAH DEMONSTRASI VIDEO DALAM PENGAJARAN DAN PEMBELAJARAN BAGI MODUL "INTRODUCTION TO COMPUTER SYSTEM" DI POLITEKNIK BALIK PULAU

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Abstrak

Kajian ini dijalankan untuk mengenalpasti keberkesanan kaedah demonstrasi video terhadap kefahaman pelajar terhadap amali satu bertajuk pemasangan komponen komputer bagi modul "Introduction to Computer System" (ICS) untuk pelajar "Diploma Digital Technology" (DDT) di Politeknik Balik Pulau. Responden kajian ini daripada pelajar semester satu yang sedang mengambil modul berkenaan iaitu seramai 203 orang. Keberkesanan kaedah demonstrasi dengan video ini dikaji menggunakan Teori Pembelajaran Gagne Sembilan Fasa. Data yang diperolehi daripada soal selidik dianalisis menggunakan perisian "Statistical Packages for Social Science Version 17.0" (SPSS Versi 17.0) bagi mendapatkan skor min dan peratusan bagi setiap item. Keputusan menunjukkan fasa perolehan ingatan kembali mencatatkan nilai min yang tinggi berbanding fasa proses pembelajaran yang lain. Manakala fasa motivasi mencatat nilai min yang rendah. Secara keseluruhannya, kaedah demonstrasi video yang telah diaplikasikan kepada pelajar semester satu di Politeknik Balik Pulau yang mengambil modul ICS telah membuktikan bahawa teknik pengajaran dan pembelajaran ini amat efektif dan membantu meningkatkan kefahaman pelajar dimana para pelajar dapat mengingat teknik-teknik serta prosedur untuk menjalankan amali pemasangan komputer dengan betul dan tepat.

Keywords: Kaedah pengajaran dan pembelajaran, amali, demonstrasi video.

PENGENALAN

Dalam memenuhi hasrat kerajaan dalam meningkatkan ekonomi bagi negara berpendapatan tinggi, Malaysia mensasarkan untuk meningkatkan enrolmen dalam bidang pendidikan Teknikal dan Latihan Vokasional (TVET) dan meningkatkan kualiti latihan secara keseluruhan. Pendidikan TVET berperanan bukan sahaja sebagai satu saluran untuk memproses dan menghasilkan tenaga mahir tempatan, malahan juga sebagai enjin pembangunan negara. Selaras dengan usaha kerajaan untuk mengarusperdanakan TVET, maka satu gelombang besar-besaran untuk menjelaskan bidang TVET perlu dimulakan segera di semua peringkat dan institusi yang wujud dalam masyarakat (Ahmad, Jalani, & Hasmori, 2015). Justeru itu, Kementerian Pendidikan pada masa ini berusaha ke arah menjadikan bidang Pendidikan TVET sebagai pilihan utama pelajar, memandangkan kemahiran dan kepakaran dalam bidang tersebut amat diperlukan ketika negara ini menuju sebagai sebuah negara maju.

Dalam Rancangan Malaysia Kesebelas (RMK-11), kerajaan telah mentransformasikan pendidikan TVET untuk memenuhi permintaan industri bagi membantu pertumbuhan ekonomi negara sejajar dengan permintaan globalisasi dunia. Hasrat dan usaha kerajaan disahut oleh setiap institusi latihan teknik dan vokasional. Setiap institusi pendidikan bertanggungjawab menyediakan individu yang mahir dan berpotensi serta mampu menjejak ke alam pekerjaan dengan yakin dan sempurna. Tenaga pengajar atau guru adalah tunjang kepada sistem pendidikan TVET (Pendidikan, Hanafi, Yassin, & Pendidikan, 2009).

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Oleh itu, para pendidik perlu sentiasa meningkatkan kreativiti kaedah pengajaran, mempunyai ilmu yang tinggi, sentiasa memperbaharui ilmu dan pandai menyampaikan ilmu yang dimiliki dengan menggunakan kaedah terkini seperti menggunakan Teknologi Maklumat dan Komunikasi (ICT) dalam pengajaran dan pembelajaran (Esa, Hassan, Hashim, & Hadi, 2012). Idea dan kreativiti pelajar dapat dikembangkan dengan penggunaan teknologi semasa pengajaran di dalam bilik darjah. Umumnya, Pendidikan vokasional merupakan pendidikan yang berasaskan amali serta menitikberatkan kemahiran yang diperlukan untuk sesuatu pekerjaan. Maka, pendidikan TVET dapat meningkatkan kemahiran diri seseorang pelajar dan memupuk keinginan untuk pembaharuan. Ini adalah kerana, keupayaan sesuatu produk itu dapat melihat secara dekat melalui eksperimen yang telah dijalankan (Hamzah & Nashir, 2018).

Dewasa ini, pengajaran dan pembelajaran dalam bidang TVET banyak melibatkan kerja-kerja amali yang berasaskan hands-on. Kaedah pengajaran dan pembelajaran secara konvensional seperti “chalk and talk” tidal lagi rasional dipraktikkan dalam pendidikan TVET yang melibatkan amali kerana ia merupakan pengajaran sehala dan pelajar tidak dapat melibatkan diri secara aktif semasa pembelajaran. Manakala, penggunaan bahan pengajaran bercetak seperti buku rujukan nota, tidak dapat memenuhi proses pembelajaran bagi yang melibatkan teknik-teknik dan prosedur amali yang betul dan tepat. (E. Becker & Watts, 2001).

Di samping itu juga, Politeknik Malaysia tidak terkecuali daripada meletakkan dasar agar pengajaran dan pembelajaran turut dilaksanakan dalam bentuk blended learning. Perkara ini telah termaktub dalam polisi e-pembelajaran yang telah diterbitkan pada tahun 2012. Politeknik telah menyediakan satu sistem pengurusan pembelajaran (Learning Management System-LMS) yang dikenali sebagai CIDOS. Tambahan pula, Pelan Pembangunan Pendidikan Malaysia (Pendidikan Tinggi) 2015-2025 yang telah dilancarkan meminta supaya semua IPT menjalankan pengajaran dan pembelajaran berasaskan blended learning. Oleh yang demikian, pengajaran dan pembelajaran berasaskan video pembelajaran interaktif merupakan salah satu komponen utama yang boleh dimuatkan di dalam CIDOS kerana ia boleh membantu mencapai blended learning seperti yang disarankan oleh pengurusan Politeknik Malaysia. Maka, penyelidikan ini dijalankan untuk mengkaji kesesuaian kaedah demonstrasi video bagi modul “Introduction to Computer System” (ICS) yang melibatkan pelajar-pelajar kursus DDT semester satu di Politeknik Balik Pulau.

PENYATAAN MASALAH

Kajian Abu Bakar (2009) menyatakan pengajaran yang berunsurkan amali di dalam bengkel atau di dalam makmal memerlukan kemahiran guru yang maksimum untuk mengajar secara manual kepada pelajar. Tambahan pula, guru perlu berada disamping pelajar untuk mendemonstrasikan cara untuk menguasai sesuatu kemahiran itu. Namun kebenarannya, tidak semua guru memiliki kemahiran yang sama dengan pengajaran yang berunsurkan amali ini.

Pengetahuan dan kemahiran yang kurang terhadap penggunaan mesin dan kerja-kerja penyelenggaraan menyebabkan proses pengajaran dan pembelajaran kurang berkesan dan sistematik (Minhat, 2012). Menurut kajian lepas, ramai dalam kalangan guru yang kurang mahir dan kreatif dalam menggunakan kaedah pengajaran yang efektif bagi menyampaikan isi pengajaran tersebut (Buntat, 2010). Tanggungjawab guru kemahiran bukan setakat melaksanakan proses pengajaran dan pembelajaran, malahan juga melibatkan tanggungjawab guru dalam pengendalian bengkel bagi memastikan prestasi pelajar-pelajar meningkat serta cemerlang ketika di dalam peperiksaan.

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Para pendidik yang kompeten perlu mempunyai pengetahuan yang profesional ke arah memaksimumkan kemampuan mereka untuk meningkatkan hasil pembelajaran pelajar. Pengetahuan tentang pelajar, kurikulum, mata pelajaran, pedagogi, ICT, sangat penting untuk membolehkan para pendidik bertidak balas terhadap perubahan keperluan pelajar.

Hasil daripada kajian rintis yang dijalankan ke atas para pelajar semester satu kursus DDT yang sedang menjalankan amali bagi modul ICS mendapati bahawa majoriti pelajar mampu memasang komponen komputer dengan betul namun tidak mengikut prosedur yang telah ditetapkan, dimana kegagalan pemasangan komponen komputer mengikut prosedur yang betul boleh mengakibatkan kerosakan pada komponen tersebut. Data ini diperolehi selepas pelajar menjalani amali satu yang telah ditetapkan. Didapati pelajar mengulang kesalahan yang sama walaupun telah diberi tunjuk ajar beberapa kali. Oleh itu, penyelidik telah menjalankan satu projek di mana para pelajar akan mendemonstrasikan teknik-teknik amali satu yang bertajuk pemasangan komponen komputer bagi modul ICS sambil merekod proses amali tersebut. Pada masa yang sama, para pelajar perlu menerangkan setiap langkah dan teknik yang digunakan untuk menjalankan amali tersebut. Langkah-langkah keselamatan juga menunjukkan keputusan yang tidak memuaskan. Sememangnya proses amali ini mempunyai risiko yang tinggi dan boleh merosakkan komponen komputer sekiranya kurang perhatian. Terdapat juga segelintir pelajar yang tidak mampu menyiapkan amali tersebut dalam masa yang ditetapkan kerana terlupa prosedur yang diajar.

Oleh itu, kaedah demonstrasi video ini dapat melatih pelajar memerhati dan melakukan sesuatu aktiviti mengikut prosedur-prosedur yang telah ditetapkan. Demonstrasi adalah di mana guru membantu dalam pembelajaran dengan menunjukkan cara penggunaan bahan-bahan dan alat, serta cara untuk menyelesaikan tugas-tugas tertentu (Hamzah & Nashir, 2018). Tujuan kaedah demonstrasi dengan video dipilih untuk kajian ini adalah untuk memfokus kepada kelancaran proses pengajaran dan pembelajaran di dalam kelas bagi modul ICS. Hasil pembelajaran bagi modul ini adalah untuk menguasai pengetahuan dan berketrampilan dalam amali pemasangan komponen komputer serta mengaplikasikan pengetahuan dan kemahiran berkenaan teknik pemasangan komponen komputer yang betul bagi menghasilkan kemahiran yang berkualiti.

OBJEKTIF KAJIAN

Objektif kajian ini adalah untuk:

i. Menggunakan kaedah demonstrasi video dalam bidang kemahiran bagi proses amali pemasangan komponen komputer; dan
ii. Mengkaji kesesuaian kaedah demonstrasi video dalam bidang kemahiran bagi proses amali pemasangan komponen komputer menggunakan Teori Pembelajaran Gagne Sembilan Fasa.

BATASAN KAJIAN

Batasan bagi kajian ini adalah:

i. Responden kajian hanya tertumpu kepada pelajar Diploma Digital Technology (DDT) sahaja.
ii. Responden kajian yang dipilih adalah pelajar semester satu yang sedang mempelajari modul ICS di Politeknik Balik Pulau.

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METODOLOGI KAJIAN

Reka Bentuk Kajian

Kajian ini menggunakan rekabentuk kajian kuantitatif. Soal selidik dibina sebagai alat ukur untuk mendapatkan data berdasarkan model proses pembelajaran Gagne (1985). Soal selidik merangkumi aspek yang berhubung dengan demografi responded, serta proses pembelajaran melalui kaedah demonstrasi video semasa menjalankan amali pemasangan komponen komputer bagi modul ICS.

Populasi dan Sampel Kajian

Kajian ini dijalankan kepada 203 pelajar semester satu Diploma teknologi Digital (DDT) yang mengambil kursus ICS di politeknik balik pulau. Semua pelajar semester satu merupakan responden bagi kajian ini.

Instrumen Kajian

Borang soal selidik adalah instrumen utama yang digunakan untuk mendapatkan keputusan kuantitatif daripada responden. Set soal selidik mengandungi 20 item. Item-item soal selidik mengandungi dua bahagian. Bahagian A merujuk kepada demografi responden manakala Bahagian B adalah merujuk kepada proses pembelajaran melalui kaedah demonstrasi video bagi amali pemasangan komponen komputer. Item-item di Bahagian B ini adalah berdasarkan pendekatan model proses pembelajaran Gagne (1985) yang mengandungi sembilan fasa iaitu fasa motivasi, perhatian, jangkaan, perolehan ingatan kembali, pemilihan persepsi, merekod dan penyimpanan jangka panjang, gerak balas/ prestasi, fasa penilaian dan fasa generalisasi. Soal selidik yang digunakan dalam kajian ini menggunakan skala empat mata untuk memperolehi data Bahagian B. Skala pemeringkatan empat mata yang diberikan kepada responden adalah seperti dalam Jadual 1 (Baharin & Magrit, 2011).

Jadual 1: Skala Pemeringkatan Empat Mata (Baharin & Magrit, 2011)

Singkatan	Skala	Skor
SS	Sangat Setuju	4
S	Setuju	3
TS	Tidak Setuju	2
STS	Sangat Tidak Setuju	1

Ujian Rintis

Bagi memastikan kebolehpercayaan terhadap soal selidik yang disediakan, kajian rintis telah dijalankan. Penyelidik melaksanakan kajian rintis terhadap 203 orang pelajar yang dipilih secara rawak. Sampel kajian bagi kajian rintis ini tidak terlibat dalam kajian sebenar yang dijalankan. Hasil kajian rintis memperlihatkan skor bagi Alpha Cronbach adalah 0.8887 dimana kesemua item mempunyai nilai kebolehpercayaan yang tinggi dan kesemua item boleh diterima dalam kajian ini.

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Analisis Data

Keseluruhan data-data yang diperolehi daripada borang soal selidik yang telah diedarkan dianalisis dengan menggunakan SPSS 17.0. Penganalisian Bahagian A adalah berdasarkan frekuensi dan peratusan. Manakala maklum balas responden bagi Bahagian B diukur menggunakan Skala Likert empat peringkat. Kaedah analisis yang digunakan adalah berdasarkan kepada persoalan kajian.

KEPUTUSAN DAN PERBINCANGAN

Analisis Bahagian Demografi Responden

Sebanyak 203 set soal selidik telah diedarkan dan kesemua pelajar telah memberi respon. Kajian ini dijalankan bagi pelajar DDT yang sedang mempelajari modul ICS di Politeknik Balik Pulau. Kesemua responden mengatakan bahawa mereka hanya bergantung kepada video (youtube) untuk melakukan amali pemasangan komponen komputer disamping tunjuk ajar daripada pensyarah. Responden setuju bahawa mereka berminat untuk menjalankan proses merakam video dalam sesi pengajaran dan pembelajaran. Ini terbukti daripada analisis dalam Jadual 5 yang mana 96.7% daripada responden mengakui bahawa mereka berminat menjalankan proses merakam video ini.

Jadual 2: Peratusan bersetuju, nilai min bagi item-item proses pembelajaran melalui kaedah demonstrasi video.

Bil.	Item		Min (SP)	Setuju		Jumlah
A	Fasa Perolehan Ingatan Kembali			S(%)	SS(%)	
	1.	Sesi merakam video membantu saya mengingat kembali konsep-konsep yang dipelajari.	3.93 (0.254)	6.7	93.3	100
	2.	Melalui sesi merakam video, saya dapat memperoleh pengetahuan yang tiada di dalam bahan modul.	3.93 (0.254)	6.7	93.3	100
B	Fasa Merekod dan Penyimpanan Jangka Panjang					
	3.	Proses rakaman video membantu saya mengingati setiap teknik yang digunakan dalam proses memasang komponen komputer.	3.87 (0.346)	13.3	86.7	100
	4.	Saya akan sentiasa menggunakan rakaman video ini untuk masa-masa akan datang bagi mengingati teknik-teknik amali.	2.86 (0.573)	46.7	6.7	53.4
C	Fasa Generalisasi					
	5.	Rakaman video membantu saya untuk lebih mahir dalam proses memasang komponen komputer.	3.90 (0.301)	6.7	63.3	70
	6.	Saya akan menggunakan proses merakam video ini dalam sesi pembelajaran yang lain.	3.14 (0.655)	40.0	20.0	60
D	Fasa Gerak Balas/Prestasi					
	7.	Sesi pembelajaran melalui kaedah merakam membantu meningkatkan prestasi pemahaman bagi topik pemasangan komponen komputer.	3.90 (0.301)	6.7	63.3	70

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	8.	Saya cukup berkeyakinan untuk mengambil bahagian dalam sesi rakaman video.	3.43 (0.507)	40.0	30.0	70
	9.	Saya membuat perancangan yang teliti sebelum menjalankan amali supaya teknik yang digunakan adalah betul dan tepat.	3.48 (0.512)	36.7	33.3	70
E	Fasa Penilaian					
	10.	Saya meneliti skrip perbualan dengan jelas semasa proses rakaman video.	3.14 (0.727)	33.3	23.3	56.6
	11.	Saya meneliti setiap teknik amali semasa proses rakaman video dijalankan.	3.76 (0.436)	16.7	53.3	70
	12.	Saya lebih berkeyakinan dalam menjalankan amali selepas menjalani sesi rakaman video.	3.86 (0.359)	10.0	60.0	70
F	Fasa Pemilihan Persepsi					
	13.	Dalam sesi menghasilkan video, saya dapat membezakan maklumat yang penting dan relevan daripada yang kurang penting.	3.67 (0.479)	33.3	66.7	100
	14.	Lakaran gambarajah membantu saya memahami pembelajaran dengan lebih berkesan.	3.93 (0.254)	6.7	93.3	100
G	Fasa Perhatian					
	15.	Saya bersedia dengan topik yang diterangkan terlebih dahulu sebelum memulakan tugasan.	2.80 (0.407)	20.0	80.0	100
	16.	Suasana persekitaran memainkan peranan penting kepada kaedah merakam video.	3.90 (0.305)	10.0	90.0	100
H	Fasa Jangkaan					
	17.	Saya dapat menyelesaikan masalah yang timbul semasa menjalankan amali.	3.20 (0.407)	80.0	20.0	100
	18.	Saya memberi perhatian yang teliti terhadap penerangan pensyarah supaya dapat menjalankan amali dengan betul dan tepat.	3.37 (0.490)	63.3	36.7	100
I	Fasa Motivasi					
	19.	Proses pembelajaran melalui rakaman video meningkatkan motivasi saya untuk belajar.	3.50 (0.572)	43.3	53.3	96.6
	20.	Saya lebih bersemangat untuk belajar melalui kaedah merakam video.	3.77 (0.430)	23.3	76.7	100

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Jadual 2, menunjukkan peratusan persetujuan mengenai proses pembelajaran berdasarkan model proses pembelajaran Gagne (1985). Setiap fasa diwakili oleh dua hingga empat item soalan. Dalam kajian ini, penyelidik mendapati bahawa proses pembelajaran sememangnya berlaku dengan penggunaan teknologi video dan ini berdasarkan pendekatan fasa proses pembelajaran Gagne (1985), iaitu fasa motivasi, perhatian, jangkaan, perolehan ingatan kembali, pemilihan persepsi, merekod dan penyimpanan jangka panjang, gerak balas/prestasi, maklum balas/penilaian serta generalisasi/pemindahan pembelajaran.

Di bawah fasa motivasi terdapat dua item yang dinilai. Item 1 dalam fasa motivasi menunjukkan sebanyak 100% responden mencatatkan peratusan persetujuan bahawa proses pembelajaran melalui rakaman video meningkatkan motivasi mereka untuk belajar. Manakala, item 2 pula menunjukkan semua pelajar bersetuju bahawa mereka lebih bersemangat belajar melalui media video.

Untuk fasa perhatian pula, kesemua pelajar bersetuju bahawa mereka bersedia dengan topik yang diterangkan terlebih dahulu sebelum memulakan tugasan. Suasana persekitaran juga memainkan peranan yang penting kepada kaedah merakam video serta sesi pengajaran dan pembelajaran yang diikuti. Untuk fasa jangkaan, peratusan yang tercatat adalah sebanyak 100%. Para pelajar menyatakan bahawa mereka dapat menyelesaikan masalah yang timbul semasa menjalankan amali. Kesemua pelajar juga setuju bahawa mereka memberikan perhatian yang teliti terhadap penerangan yang disampaikan oleh pensyarah supaya dapat menjalankan amali dengan betul dan tepat.

Dalam fasa perolehan ingatan kembali, kesemua pelajar, sebanyak 80.0% bersetuju bahawa sesi merakam video ini membantu mereka mengingat kembali konsep dan teknik yang dipelajari. Mereka juga setuju bahawa mereka dapat memperoleh pengetahuan yang tiada di dalam bahan modul. Bagi fasa pemilihan persepsi pula, kesemua pelajar iaitu sebanyak 63.3% bersetuju bahawa mereka dapat membezakan maklumat yang penting dan relevan daripada yang kurang penting. Fasa ini juga menunjukkan bahawa kesemua pelajar bersetuju bahawa lakaran gambarajah membantu mereka memahami pembelajaran dengan lebih berkesan.

Seterusnya, untuk fasa merekod dan penyimpanan jangka panjang, sebanyak 100% pelajar bersetuju bahawa proses rakaman video membantu mereka mengingati setiap teknik yang digunakan dalam proses memasang komponen komputer dan menggunakan rakaman video yang telah dihasilkan untuk masa-masa akan datang bagi mengingati teknik-teknik amali.

Peratusan untuk fasa gerak balas dan prestasi pula menunjukkan sebanyak 70% pelajar bersetuju bahawa sesi pembelajaran melalui kaedah merakam membantu meningkatkan prestasi pemahaman mereka bagi proses amali pemasangan komponen komputer. Manakala 70% pelajar juga menyatakan bahawa mereka cukup berkeyakinan untuk mengambil bahagian dalam sesi rakaman video.

Bagi fasa penilaian, yang juga dikategori fasa maklum balas dan peneguhan item berkenaan para pelajar meneliti skrip perbualan dengan jelas semasa proses rakaman video mencatat peratusan sebanyak 56.6%. Namun, penelitian para pelajar terhadap setiap teknik amali semasa proses rakaman video dijalankan mencatat peratusan sebanyak 70% dan keyakinan mereka dalam menjalankan amali selepas menjalani sesi rakaman video juga mencatat peratusan sebanyak 70%. Ini menunjukkan para pelajar menghadapi masalah dalam menghasilkan skrip perbualan semasa proses merakam video berlangsung.

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Seterusnya, fasa generalisasi pula menunjukkan bahawa 96.6% pelajar bersetuju proses rakaman video membantu mereka untuk lebih mahir dalam proses membentuk sesalur dan pembuluh logam. Manakala 100% pelajar bersetuju untuk menggunakan teknik merakam video ini dalam sesi pembelajaran bagi amali pemasangan komponen komputer.

Hal ini menunjukkan bahawa penggunaan media bukan sahaja dapat menarik minat pelajar mengikuti proses amali, tetapi membantu meningkatkan pemahaman pelajar dan memudahkan pendidik menyampaikan pelajaran. Namun begitu, terdapat juga pelajar mencatatkan peratusan tidak bersetuju terhadap item soal selidik. Hal ini mungkin disebabkan oleh gaya pembelajaran yang berbeza, persekitaran serta suasana pembelajaran dan juga sikap para pelajar yang terlibat dalam projek ini.

Kebiasaannya, para pelajar menghadapi masalah untuk mengingati sesuatu fakta atau teknik dalam proses pembelajaran. Maka, di sini keputusan mendapati fasa perolehan ingatan kembali mencapai tahap yang tinggi dan pembelajaran merakam video ini merupakan mod pembelajaran aktif bagi pelajar. Mereka juga bersetuju bahawa sesi merakam ini membantu mereka untuk mengingat kembali konsep dan teknik-teknik yang dipelajari. Proses ini juga membantu mereka memperoleh pengetahuan yang tiada di dalam bahan modul. Penyelidik bersetuju di sini bahawa sememangnya bahan pembelajaran bagi teknik-teknik memasang komponen komputer tidak mencukupi dan memerlukan penjelasan serta perincian bagi menjalankan amali tersebut dengan betul dan tepat.

Fasa merekod dan penyimpanan jangka pangjang merupakan fasa kedua yang tertinggi di mana para pelajar bersetuju bahawa mereka dapat mengingati maklumat sewaktu menjalankan amali serta sesi rakaman video. Mereka juga setuju akan sentiasa menggunakan rakaman video ini untuk masa-masa akan datang bagi mengingati teknik-teknik amali. Pada masa yang sama, para pelajar dapat memperbetulkan teknik yang salah sewaktu menjalankan amali. Tindakan ini juga dikenali sebagai pembelajaran kendiri yang mana para pelajar dapat memperolehi kemahiran dan pengetahuan secara berdikari serta pengaksesan sumber pembelajaran. Kemudian, diikuti dengan fasa Generalisasi, fasa gerak balas/persepsi, fasa penilaian, fasa pemilihan persepsi, fasa perhatian, fasa jangkaan dan yang terakhir fasa motivasi.

KESIMPULAN

Sistem pendidikan pada hari ini memerlukan pelbagai usaha yang strategik yang berjaya melonjakkan keupayaan dan kemampuan amalannya ke aras kualiti yang lebih dinamik agar dapat mengenepikan halangan pada abad ke-21. Peranan multimedia dalam pendidikan perlu dilihat sebagai satu komponen yang menggerakkan proses pembelajaran dengan lebih berkesan dan berkualiti. Para pendidik memainkan peranan yang penting dalam menyampaikan ilmu agar proses pengajaran dan pembelajaran dapat disampaikan dengan lebih efektif. Kaedah pengajaran demonstrasi video telah membuktikan bahawa pelajar lebih melibatkan diri secara aktif di dalam kelas dan akan mudah mengingati teknik-teknik amali yang telah diajar dengan berkesan.

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Kesimpulannya, kaedah pengajaran pensyarah dapat membantu meningkatkan minat dan pemahaman pelajar sekaligus menjadikan persekitaran yang menyeronokkan dan menarik boleh dibentuk dari segi fizikal dan psikososial. Pelajar yang melibatkan diri secara aktif dan kognitif dengan bahan pembelajaran akan dapat mengingati kembali maklumat yang dipelajari. Pelajar bukan sahaja menerima maklumat secara pasif malah mereka perlu diberi tugasan yang dapat memberi peluang untuk meneroka bahan maklumat selain memimpinnya ke arah pemahaman pembelajaran yang aktif. Dalam proses ini, para pelajar dapat menghubungkait pelajaran kepada konteks yang baru.

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MEASURING THE SATISFACTION OF ISLAMIC CREDIT CARD USERS ON PAYING ZAKAT

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Abstract

The payment of Zakat is obligatory on all Muslims. It refers to committing a fixed portion of one's wealth for the poor and needy in the society. Even there are numerous study have been done on customer preferences of Islamic banking in credit card, but there are less study have been conducted on payment of Zakat via credit cards. Therefore, this study aims to examine the factors such service quality, product quality, image that can influence the customer satisfaction of credit cards on paying Zakat. The questionnaires will be distributed by employing the convenient sampling technique and Statistical Package for Social Scientist (SPSS) is used to analysis the data that will be gathered. The expected results of all the hypotheses have significant relationship on customer satisfaction in paying Zakat by using Islamic credit card.

Key words: Islamic bank, Influence, Credit cards, Zakat

INTRODUCTION

The advancement in technological developments in information technology has lead to the evolution of payment transaction. The evolution of payment transaction transformed the way traditionally when, customers can conduct their activities manually. Electronic payment has become growth for organization to deliver their products and services. At the same time, the customers' satisfaction has been a popular topic in various fields and disciplines (Jahanshahi et al., 2011). It is unquestionable that customers' satisfaction is essential in all styles of businesses as the most effective approach to improve and maintain customer base via attaining high customer satisfaction (Chee, 2014). Chee (2014) also mentioned the effective way of customer satisfaction in his study where by achieving the customer satisfaction, the users of credit cards can increase the performance and retain the customers on paying Zakat via credit cards. According to Ismail et al. (2013) and Hussin, Kassim, & Jamal (2013), they stated that, the ownership of Islamic credit cards was still very low compared to the conventional credit cards despite its offering special features to customers. Thus, it is very crucial to analyse the customers satisfaction on credit cards in order to enhance the paying of Zakat in Malaysia.

PROBLEM STATEMENT

Principally, Zakat institutions are non-profit organisations which are established to manage the Zakat system, particularly in terms of collection and distribution (Abdul Lateff et al., 2014; Wahid et al., 2008). At a glance, the amount of Zakat collections made by each state increases every year (Abdul Lateff et al., 2014). For instance, Pusat Zakat Negeri Sembilan (PZNS) collected RM13.3 million in 2013 which was a 21.8% increase compared to the Zakat collection made in 2012. This is consistent with the increase in the number of Zakat payers (PZNS, 2014).

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Despite the increased amount of Zakat collections in Malaysia, the number of eligible payers who pay Zakat is still low (Abu Bakar & Abdul Rashid, 2010); BH online, 2014). The location of Zakat counters which are far away from the Zakat payers' location, time constraints, traffic jams and limited parking space are the most common barriers for Zakat payers (PZNS, 2014).

However, in Malaysia, the trend of Zakat collection annually showed an increment but it was not in line with the Muslim population which are 61.3% from 30.1 million of Malaysians (Jabatan Perangkaan Malaysia, 2014). At 2014, the statistic of Zakat collection recorded had reached 2.46 billion, compared to the year 2013 which is only RM2.24 billion. This data shows that the Zakat collection had increased more than RM2 million or 8.41% (Ringkasan Laporan Zakat PPZ-MAIWP 2013, 2014). Conversely, total collection of tax in year 2014 was RM134 billion. However, if compared to the tax and Zakat collection, they have a big gap. Eventhough these collection are different, but the total of tax collection can be as bench mark to Zakat collection because Islamic population is high than other religious.

To cater to this problem, the government and SIRCs have executed various incentives such as privatising Zakat institutions and offering various payment facilities such as credit card payment, salary deduction, money order and money post (Saad et al., 2010).

Even there are numerous studies on the factors that affect customers selecting Islamic banks, but according to Uddin et al., (2017) and Ismail et al. (2013), there are still less studies have been conducted on the factors affecting the selection of Islamic credit cards on paying Zakat. Hence, based on that ground, this study attempts to minimize the gap in the study of Islamic credit cards selection criteria on Zakat payment.

RESEARCH OBJECTIVES

1. To examine the relationship between the factors (service quality, product quality, image and reputation and perceived risk) towards the customer satisfaction on paying Zakat.
2. To examine whether Shari'ah compliance mediate the factors (service quality, product quality, image and reputation and perceived risk) towards the customer satisfaction on paying Zakat.

LITERATURE REVIEW

The customer satisfaction is very important in contribute the success because the high satisfaction will indicate the high performance of the banks (Hamzah, Ishak, & Nor, 2015). Apart from that, to maintain the performance of the Zakat, the satisfaction of Zakat payment must be improved in order to encourage the Muslim to pay Zakat effectively (Eza and Mohd, 2011). According to Shariff (2012), providing the best quality services to the customers is the important thing for the business survival. Prakash & Mohanty (2013) believed, the high level of customer satisfactions depend on the quality services that have been delivered and at the same time would contribute the higher performance of the organisations. So, if a product that offered by Islamic banks fulfils the customer's needs and wants, the customer will be considered that the product is quality and acceptable (Jahanshahi et al., 2011). According to a study by (Sahidi, 2013), the role of Zakat institution in providing a service quality to the community is an important factor to attract and encourage entrepreneurs to pay Zakat. He also stated that the service quality is considered as well when an organization meet the customer expectations before and after services.

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Moreover, (Saad et al., 2009) showed empirical evidence that by improving the service quality, compliance towards Zakat will be better. In addition, the image and reputation also is one of the determinants that lead to the customer satisfaction (Hamzah et al., 2015).

Even there are much studies on the factors that affect customers selecting Islamic banks, but according to Uddin et al., (2017) and Ismail et al. (2013), there are still less studies have been conducted on the factors affecting the selection of Islamic credit cards especially on paying Zakat. Therefore, this study attempts to minimize the gap by examining the factors that can affect the people to choose the Islamic credit cards and make the payment of Zakat via credit cards.

RESEARCH FRAMEWORK

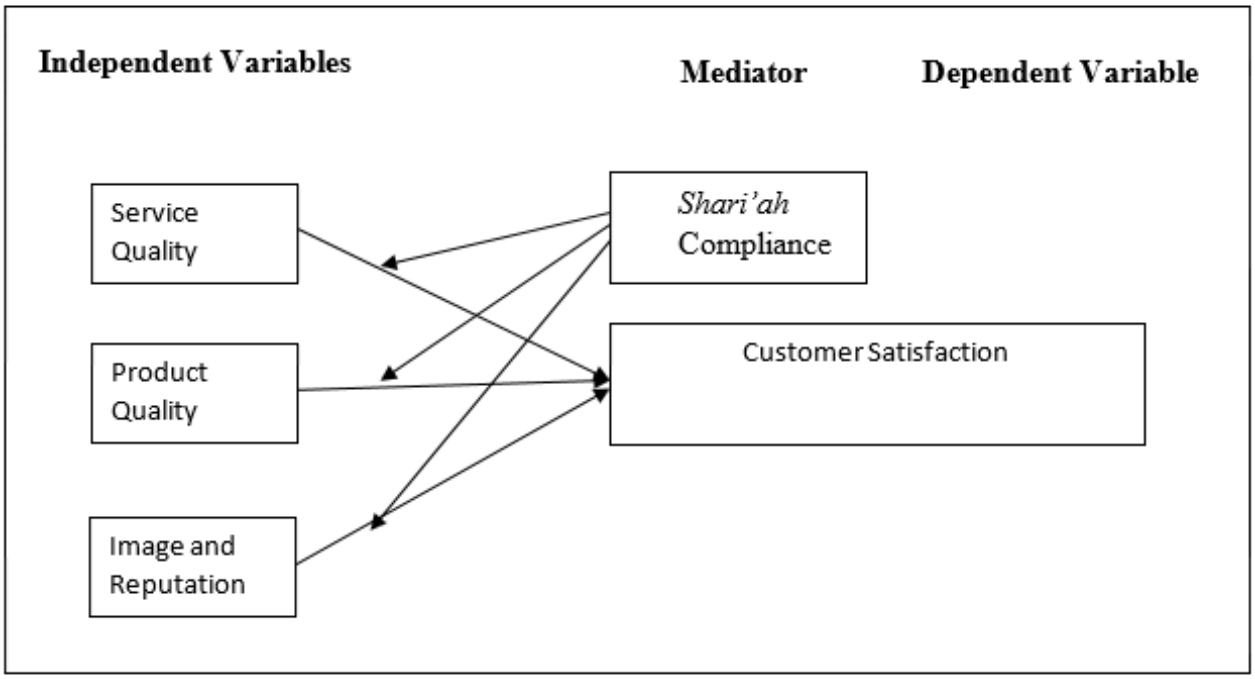

Figure 1: Framework Proposed

METHODOLOGY

This study primarily focused on the Zakat institutions in Malaysia. This study will be conducted by quantitative method. The target population focused on the customers of credit cards in Malaysia. Respondents were selected by convenience sample due to the restriction of Malaysian banking law and legislation (BAFIA, 1989) where the customers list of banks are very private and confidential and cannot be exposed to the public. According to Krejcie & Morgan (1970), the size population that unknown or cannot be defined should be 384. So, the sampling size for this study is 384 respondents. Statistical Package for Social Science (SPSS) Version 22.0 is used to analyse the data that gathered.

DATA COLLECTION METHOD

For the primary data, this study used a survey approach and distribute the questionnaires to the respondents by employing the convenient sampling technique. The respondents were asked to answer the questionnaires based on a Likert-type scale, that ranged from 1= ‘strongly disagree‘, 2= ‘disagree‘, 3= ‘neutral, 4= ‘agree‘, and 5= ‘strongly agree’.

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The secondary data was referred in order to support the primary data. The example of secondary data that was referred in this research include newspapers, journals, internet, and books. All these measures were adopted from past research and adapted for the purpose of this study.

EXPECTED FINDINGS

Enhancing service quality is now considered the most important step in gaining a competitive edge in the market (Al-alak el al., 2011). Bashir (2012) also opined that the customer intention often depends on the quality of services offered. Therefore, understanding and meeting customer requirements have now become the basis of quality activities (Ahmed et al., 2017). In addition, Lew et al., (2012) and Bashir (2012) said that product quality also is a critical determinant of consumer satisfaction. Hamzah et al. (2015) indicated in their study, the demand for excellent quality products and services are expecting with the increase in customer buying capacity.For instance, nowadays customer are more conscious about the usage of the Islamic credit cards. Not only this credit card is interest-free, but there is no profit charges if full payment is made before the due date. With Islamic credit cards, customers will also be able to pay Zakat online(Yaakub, Ramli, & Muhamed, 2015).

Several studies have emphasized the relevance of image and reputation in selecting the product (Kaabachi & Obeid, 2016; Srouji et al., 2015; Hao et al., 2013). When the organization meets the need of customers according to his desire than there is an intangible increase in the image and reputation of an organization and people will have more intention on the organization (Akhtar et al., 2016).

Based on Rahmawaty (2016), Shari'ah compliance is proposed to enhance the understanding of customers' satisfaction. This proposition is also agreed by Dali (2014) and Dali and Yousafzai (2012), which mentioned that in the context of Islamic banking, religiosity plays a major role in affecting customers' choice of credit card for Zakat payment. So that, Khattak & Rahman (2010) and Nurdin (2010) said, when the customer satisfied, the tendency of Islamic banks to attract and retains the customers are very big. Therefore, the result will be expected that all hypotheses will have the significant relationship.

CONCLUSION

Nowadays, there are a lot of choices in terms of online or offline payment methods available to Zakat payers in Malaysia. With the advancement in payment mode, there are no more reasons for Muslims to escape Zakat. Credit card is believed to be able to overcome most of the constraints in Zakat payment such as distance, time and parking problems.

The findings of this study also revealed that credit cards are among the most preferred e-payment systems among the institution's customers. Even though the amount of Zakat collection and the number of payers are low compared to the offline method, there has been a gradual improvement. In addition, the authors believe that payment via credit cards can be considered as one of the factors which contribute to the boost of Zakat collections in Malaysia and other non-profit organisations since by using credit cards payment offers various benefits to both the payers and the recipients.

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Besides that, this study will contribute the benefit to the banks in order to improve the service quality, product quality, enhance the image and reputation thus enhance the customer satisfaction on the credit cards and attract the people especially for the Muslims to use credit cards for paying Zakat. Therefore, the bank manager should know the needs and wants that demands by the customers.

Last but not least, since the study in this area is very limited, this paper is hoped to shed light to the body of knowledge especially in terms of Zakat and credit cards. In addition, this paper provides input for other non-profit organisations especially in utilizing e-tools such as credit cards to increase the collection of payment.

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