UNIVERSITI TEKNOLOGI MARA | Pusat Asasi

CREATIONS de UiTM

MEGA INNOVATION CARNIVAL 2020

For Knowledge and Humanity

PROCEEDING BOOK

6 - 8 MARCH 2020

CENTRE OF FOUNDATION STUDIES
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CREATIONS de UiTM MEGA INNOVATION CARNIVAL 2020: PROCEEDING BOOK

Editor: Megat Mohd Izhar Sapeli, Nur Izzati Hannah Razlan, Siti Rudhziah Che Balian, Hariati Ibrahim @ Musa, Jebakumari Selvarani Ebenezer, Mohd Norazri Mohamad Zaini, G. Nagamany Govindan, Najwa Rawaida Ahmad @ Ahmad Fauzi

Preface

CREATIONS de UiTM: Mega Innovation Carnival 2020 is one of Centre of Foundation Studies UiTM Kampus Dengkil's very own national level innovation competition & exhibition that showcases creativity and innovation skills among students.

Organized by the Centre of Foundation Studies, UiTM Cawangan Selangor Kampus Dengkil, the event was held on the 6th -8th March 2020, just before the Covid-19 pandemic. Held in conjunction with STEM, Fiesta de Asasi and Asasi Open Day, this program was opened to the public and was not limited to the community around Klang Valley only, but to all, around the country to provide them with the exposure and experience with a variety of exciting and entertaining innovations.

There were over 100 competing innovation projects from Malaysian pre university and secondary school students as well as over 100 Asasi UiTM students' innovation project showcases. There were two categories of competition which were Category A: Pre-University, and Category B: Secondary School. There were various awards to be won; Diamond, Gold, Silver, and Bronze for both categories.

Moreover, selected manuscripts were given the privilege to be included in this proceeding book as a record of publication. We congratulate all the participants.

Dr. Siti Rudhziah Che Balian

Chairperson

CREATIONS de UiTM: Mega Innovation Carnival 2020

Foreword

Assalamualaikum w.b.t and Salam UiTM di Hatiku

Considering the importance of innovation as the driving factor in reaching the national development agenda, I am delighted to present to you the *Creations de UiTM Mega Innovation Carnival 2020: Proceeding Book* with the theme 'For knowledge and Humanity'. This innovation competition is organised by the Innovation, commercialization and industry linkages management committee in conjunction with Fiesta de Asasi and Asasi Open Day, a mega program that showcases the students' creativity and innovation skills from all foundation, matriculation and secondary school students over the country.

A University is a key source of knowledge, and the Creations de UiTM: Mega Innovation Carnival 2020 is the right platform for the Centre of Foundation Studies in particular, among the communities of higher education, where the participants can discuss, share knowledge, experience and research findings on current issues, challenges and strategies to empower innovation and STEM education among students.

It is my hope that through this program, the Centre of Foundation Studies, UiTM Dengkil will be recognized as a learning institution that specializes in innovation and STEM education, the hub to nurture students around Malaysia to be more creative, innovative and competitive.

I am sure that with the collaboration of academic and non-academic staff and students, the goals we aspire to accomplish will in time translate into a milestone of which we can be proud of. My utmost gratitude to each of you for taking the interest and contributing your time and effort in making this mega project to materialize.

Professor Dr. Saifollah Hj. Abdullah

Director

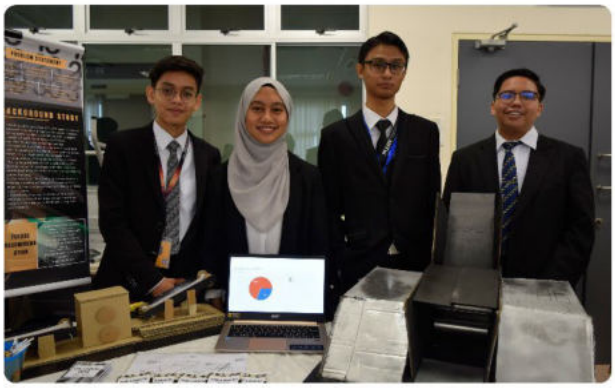
Centre of Foundation Studies

Universiti Teknologi MARA (UiTM)

Cawangan Selangor, Kampus Dengkil

Synopsis

CREATIONS de UiTM is the first-ever national level innovation competition organized by the Centre of Foundation Studies, UiTM Cawangan Selangor Kampus Dengkil. This competition involves 200 young inventors and students from 40 different institutions; foundation centres of public universities, matriculation centres and secondary schools around Malaysia. This project is also a platform for the participants to enhance their knowledge through exhibition from invited agencies and sponsors such as Yayasan Inovasi Malaysia, Futurise, PETRONAS and others. In addition, visitors' awareness on innovation can be enhanced by listening to talks from the experts. Visitors at Mega Innovation Carnival have the opportunity to join other activities such as Batik Canting, Arduino and Robotic Workshop and other interesting activities.



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Allocate: Smart Waste Management Trash Can

Nadhirul Atiq Ruzali, Mifzal Salihin, Fadhlin Jeslina Ismail, Khairina Atiqah Khairil Hizar*

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ABSTRACT

The overflow of solid waste in Malaysia has become an issue at an alarming rate. According to Solid Waste Management and Public Cleansing Corporation (SWCorp) deputy chief executive officer (technical) Dr Mohd Pauze Mohamad Taha, said that the recycling rate in Malaysia last year is only 17.5% despite introducing the waste segregation programme, which highlights how serious food wastage is in the country [2]. Most waste is sent to landfills and incinerators without properly managed and processed, contributing towards environmental issues factors. This becomes our problem statement. In solving this issue, we proposed a solution where consumers can turn the waste produced daily harms our planet into something useful and in turn reuse and reduce the resources consumed. We have developed a smart recycling can consisting of a multipurpose function to aid waste separation such as glass crusher and paper shredder integrated into the can to make recycling fun and effortless for users. Instead of a regular recycling bin which sophisticates waste separation, our innovation which focuses on easy use for consumers, would encourage and teach people from all walks of life to adopt recycling as their daily habit. We have set a few objectives as a guideline for our innovation. These objectives include reduce and decrease the amount of solid waste produced by the nation, to eliminate the need for landfills and incinerators, promote and engage the community to practise sustainable living through a practical and easy method of waste disposal, to establish an efficient waste management and disposal system at any location, and to implement and promote the "net zero" movement to the society. Civilians' groups are the main target of our commercial potentials using this product. These groups can drop their waste easily where the trashcan is readily available publically. In conclusion, this project will further be improved to be adapted for household use to increase efficiency of solid waste management.

Keywords: Solid waste; management; separation; trashcan

1. INTRODUCTION

The overflow of generated solid waste has resulted in most world issues such as climate change and pollution of different aspects. Economically, governments have to allocate a specific budget in managing these wastes such as providing waste disposal facilities to the public and support landfill operations. The increasing amount of waste produced has also contributed to poverty, proportional the reduction of resources available. It is clear how the ignorance of waste management that may have been looked at lightly by the community in the past has left a massive impact in the now. In tackling this issue, an

effective way is to curb from where it all started, which is when and how the waste was disposed of initially. The suggested solution would be separating waste according to selected categories, generally recyclables and organic waste, to ease the process waste management and thus reducing the cost and energy invested in this process. However, people have a lackadaisical attitude when it comes to waste management and recycling due to complications namely insufficient time, inaccessible or inconvenient facilities provided and lack of knowledge and awareness regarding waste management. Combating this requires applying a practical solution where it engages the community to separate waste in an easy way. The objectives are:

i. To reduce and decrease the amount of solid waste produced by the nation.
ii. To combat environmental issues such as climate change and pollution.
iii. To eliminate the need for landfills and incinerators that contribute to environmental and economic issues.
iv. To promote and engage the community to practise sustainable living through a practical and easy method of waste disposal.
v. To establish an efficient and dynamic waste management and disposal system at any location namely housing areas, academic institutes, public districts and industrial regions.
vi. To implement the "net zero movement to the society, where the total resources or energy used is roughly equal to the amount of renewable resources or energy that can be created, at any household [1]."

SWCorp deputy chief executive officer (technical) Dr Mohd Pauze Mohamad Taha revealed these figures at a forum on waste management at the Academy of Sciences Malaysia here yesterday. He said in 2018, Malaysians generated a whopping 38, 142 tonnes of waste per day, an increase from 19, 000 tonnes of waste a day in 2005. "If you compare 2005 and 2018, the amount of waste generated has increased tremendously," he said, attributing it to a population boom and the inclusion of commercial waste in the 2018 survey. According to Dr Mohd Pauze, 44.5% of the waste collected was food waste, followed by plastic waste (13.2%) and diapers (12.1%). However, he said the composition of waste was changing, with the latest statistics showing plastic making up 20% of waste. Dr Mohd Pauze said this data for municipal solid waste did not include construction and manufacturing waste. "More than half of the waste generated is sent to sanitary landfills," Dr Mohd Pauze said, adding that approximately 40% of waste was recyclable. "Malaysians have a lackadaisical attitude when it comes to recycling and waste management." He said the recycling rate was low, at a mere 28%, but SWCorp hoped to increase it to 30% by 2020. He said that while the country prepares to introduce a circular economy framework by 2021, Malaysians could greatly reduce the rubbish they generate by segregating their waste [3]."

Our team was inspired by how the environment is society's responsibility to take care of, nonetheless how big or small the action done by each individual might be. Throwing trash away has been something common and everyday practise, but how it's done can affect the environment. If we can persuade the community to dispose of solid waste properly, environmental problems would be reduced significantly to help build a better nation.

2. INNOVATION DEVELOPMENT

The main function of this innovation is to make waste separation more efficient and practical to every household, to prepare waste according to its respective categories for further processing such as recycling and composting, as well as to transform useless waste to produce new forms of resources and energy. To make this innovation adaptable at any situation or locations, various models of this smart trash can will be introduced and customised according to its purposes given with specialized, different set of features for each model. However, each model will work and operate on the same basics.

Initially, the prototype comes with 3 compartments: one for glass bin, plastic and aluminium bin and waste bin each on top of the lid of the innovations are equipped with machines to suit their function such as a glass shredder on the glass bin and paper shredder on the paper bin. However, consumers can choose to purchase each bin individually where it is much more convenient to work around on space and placed anywhere in the house. The smart trash can will be It functions to dispose waste in an orderly fashion and to maximise space for further storage. In addition, it separates the types of solid waste that exists on every household. After solid waste has been organised according to its respective categories, it will go through some processes following up the customised built-in features of each trash bin model. Since we emphasize good waste management practice in every household, we have created and produced this smart trash can which is family friendly.

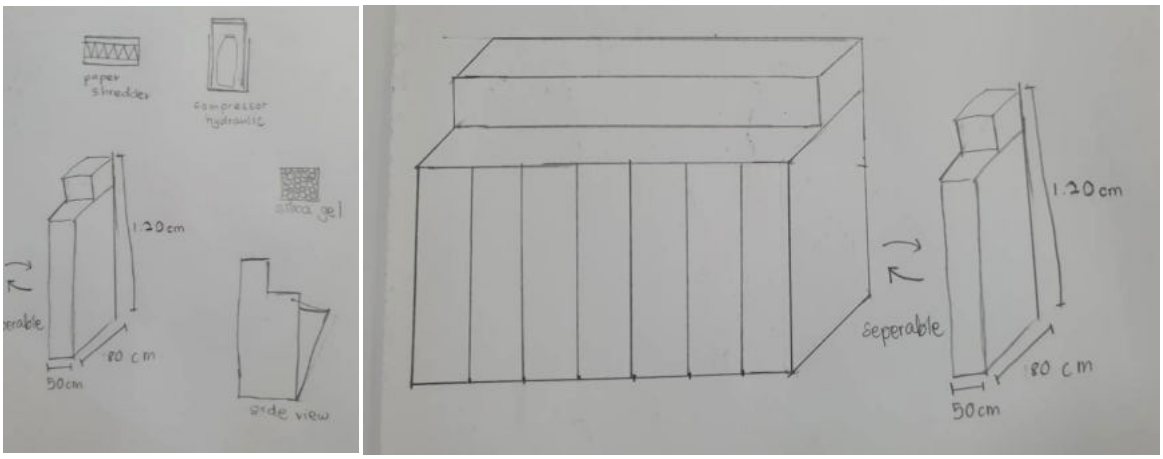

Figure 1: The front view and side view of the smart trash can

3. COMMERCIAL POTENTIAL

It is an urgent need for a smart trash can that provides an efficient solid waste management system both household and industrial. Solving the issue of solid waste overflow in this country from an early stage can eliminate the need for the already established solid waste management systems introduced by the government such as incineration sites and landfills, resulting in a highly cost budget to support and operate the systems. In addition to that, these solid waste management systems contribute to environmental issues such as groundwater pollution, biodiversity change, and air pollution due to the

release of greenhouse gases. The community's health will also be affected as the chances of contracting diseases increase with an unhealthy environment. More money and funds must be allocated to combat these problems. With the implementation of Allocate nationwide, the government can cut costs as producing these innovations are small-scaled and efficient in comparison to other waste management systems available as of now.

This innovation can also produce income for both the household community. Solid waste has no value once it is mixed up without being separated into their respective categories and types. It will take time and energy to seperate them once they are mixed. For recyclables, consumers can send the already separated waste to recycling stations and receive payment according to the weight of waste.

Our multipurpose trash can that is cheap and efficient provides a greater alternative than the regular recycling can. This is because our trash can which is relatively 'smarter' than the regular recycling dustbin can help improve waste management and educate students at a large scale. Furthermore, it can reduce the amount of labour put in separating waste and at the same time generate electricity which can be used by everyone.With the addition of glass and paper shredder on the trash can, the waste can be cut up into pieces which provides ample space for storage making the trash can space friendly and viable.The product is also marketable as climate change and waste disposal is getting more attention and concern from the public and the government.

Besides, our innovation can also help to overcome improper waste management in the country which can lead to many dangerous diseases if left the way it is right now. What we aim from our product is to explore and discover new ways to help reduce the amount of waste product while maintaining a substantially low price of production.

4. CONCLUSION

The potential of Allocate is beyond our imagination, as humans evolve towards a better future, they have a lack of interest in this small yet important part of life. Each waste is precious as it can give life to other resources but will hold no value without proper management. By initiating the project "Allocate", it can enhance waste management efficiency and eliminate the factors that contribute towards environmental issues. In the long term, energy, time and cost invested into waste management can be reduced significantly and can be directed to solving other world issues. With this machine perhaps everyone can actually make a change just like in the old days people always say that "in for a penny, in for a pound", we start small and we will sure end big. If people actually use the machine perhaps we can live in a better world not only for us but for the future generation. Towards a better future!

ACKNOWLEDGMENT

A big appreciation for our acting advisor Cik Raihan Zainuddin as our acting advisor for making our dreams slowly turn into a reality, and fully dedicating her time and energy advising this project. We would like to give our biggest thanks to the people at UM Zero Waste Campaign for inspiring us with this

innovation and educating us about solid waste separation at source and its importance, namely Prof. Dr. Sumiani Yusoff, Ms. Shakirah and especially Ms. Mairuz. We would also like to thank PASUM for supporting us and sponsoring us to go to this competition.

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Klever Kicks a Smart Assistance Shoes for Blind

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ABSTRACT

The world is sometimes can be seen as a cruel and dangerous place for people with disabilities especially people that have lost their eyesight and becomes blind. As blind people are not able to see anything and they need some kind of device that can help them to walk and do other things in their daily life like normal people. The traditional device that has been used by blind people for many centuries is a stick to predict the obstacle near them according to (Strong, 2009)[8]. As research keep being developed, the assistance device for the blind people keep changing, in order to improve the effectiveness of the device. Our problem statement for this project is that, blind people sometimes become careless even though they are using traditional assistance device such as stick and this can lead to the great danger to their life. According to Direct Researcher, Christopher Hogan, from 2001 to 2004, on average, 40 blind people were hospitalised as the result of pedestrian accident (Hogan, 2008)[6]. Even though this issue can be considered as minor issue among our society, but it can be much worse in the future. In order to prevent and handle this issue, we invent a technological shoes, given name, "Klever Kicks". Basically, this shoes has two main purposes of its existence. Firstly, this shoes is able to assist the blind people whenever they are walking and secondly, this shoes is going to generate electric energy whenever it's user are walking. Technically, this shoes has two main mechanisms to make it become a functional device. The first mechanism act as energy producer which it is responsible as energy producer that can convert the kinetic energy into electric energy. The second mechanism of Klever Kicks is the ultrasonic sensor mechanism. The sensor mechanism is basically the most important component in this project which it can predict the obstacle or wall that is closed to the user by emitting a buzzer sound. The innovation of Klever Kicks can be seen as a unique and very effective product as we are using simple Arduino Board and it can convert the kinetic energy into electric energy by the help of piezoelectric effect. Klever Kicks is expected to become a high demand product as it is a product that can increase the effectiveness of assistance device for blind people with the help of technological device. This project is predicted to give public awareness to the society that it is important to develop the technology that are clean and do not contaminate environment as the Klever Kicks can generate electric energy without using any hazardous fuel. As the optimistic generation, it is important for us to make research and develop clean energy technologies that are safe to environment and future.

Keywords: Blind people; assistance device; ultrasonic sensor mechanism; arduino board

1. INTRODUCTION

Nowadays, electricity is the main power in our daily life. As we can see electricity is used widely in every country. There have been several technological breakthroughs by many brilliant people throughout history regarding electricity. It has come from being discovered as a small current to being transformed into useful power to run daily activities. One of the most famous scientists that innovates the usage of electricity is Thomas Edison [4]. Before the electricity was discovered, human tends to work harder to do something like carry the big and heavy items, light up the campfire, set up the fire for cooking and much more. With this discovery, all the human power is less used as the electricity help their daily life. You can do so much things with electricity as you wish.

As the world changes by time, people always busy with their works. Some of them always want improvisation in their daily life to make their life easier. For example, bread toaster, coffee maker, computer and much more. Because of the busy routine, they might not have a time to think about something not important. Sometimes, they do not even have the will to exercise as they are already tired and not in a good mood when they come home after an exhausting day. This pose a negative routine in their life. It becomes worst as some of they always forget to charge their smartphone overnight. Other than that we have observe problem among the blind people which have difficulties to do their daily activities. So, as we observe the problems around us, we have decided to innovate the multiuse shoes named "Klever Kicks".

This shoes is so special because it can generate electrical power from our movement. The principle is just like the dynamo. By this electrical energy, the user can use it as power bank and the best part is the user do not have to charge it as it can generate the energy by itself. Not only that, we also include the set for a blind people with sensor infront of the shoes. So, our objective of designing this shoes is, to give people motivation to people to exercise daily. Other than that, to make people life easier especially the busy person who do not have time to charge their gadgets. We also want to help the blind people to make their life easier.

2. INNOVATION DEVELOPMENT

Generally, this project has two main purposes, which it can act as an energy producer and a walking assistance for blind people. The idea and concept of this project came from the advancement of typical shoes or sneakers that we are using in daily life.

Firstly, the mechanisms and concept that we are using to idealize the idea of walking assistance for blind people is that we are using the Ultrasonic Sensor (Figure 2) that act as a detector to prevent the blind people got hit by something or barrier that are closed to them. Next, we are using Arduino Nano (Figure 2) as a motherboard that are responsible as a connector to the whole components of sensor's mechanism. Buzzer 5V (Figure 2) is used to emit sound whenever the Ultrasonic Sensor is getting closer to the barrier. All of these components need to be connected to the Arduino Nano so it can function as a part of mechanism.

Secondly, for the energy producer part of the shoes, we connect the Piezo plate (Figure 1) in series. Then, the LED light, diodes, capacitor, lipo battery is connected to each other in a electronic circuit. After that, the complete electronic circuit is connected to the Piezo plates. If all of the energy producer mechanism is completely connected to each other, it is able to convert the kinetic energy into electrical energy by walking. Lastly, the complete energy producer mechanism and sensor mechanism (Figure 3) is merged to become a device called, "Klever Kicks".

3. COMMERCIAL POTENTIAL

The innovation of Klever Kicks came from the idea of the production of sensor-based assistive devices specifically for visually impaired people for the reason that there is small amount of instruments to help these physically disable individuals. Using the C and C++ programming in our Arduino board that use variety of microprocessor in it board design. Our innovation is to use sustainable energy to charge our smart shoes using the piezoelectric effect of piezoelectric transducer to generate energy for our ultrasound sensor-based shoes.

In 2010, visual impairment has become a major global health issue with 82% of it are cases of all blind individuals with age above 50 years old. The blind and visually impaired person, specially are revealed to experience high risk in road traffic according to [7]. Consequently, this shows that Klever Kicks can penetrate the market of disabled assistive devices as the rise in trend of an independent lifestyle further due to the high demand of assistive devices that further fuels the market growth according to [5]. Moreover, the affordable price and simplicity as well as the compelling design of our product will further increase the probability of a positive outcome from this product. Besides that, we also aim to infiltrate the renewable energy market in developed and developing countries as the rise in stringent government regulations regarding climate change according to [1].

Overcoming the vast gap between the demand and the availability of assistive devices will be a challenge in this modernization era. Throughout the years, the demand of a new device for disabled individuals has increased significantly as new diseases and other causes such as drug abuse, stress and alcohol emerge in this 21st century. We are creating a smart assistance shoes using these materials (refer Table 1). The product is design specifically for blind people and visual impairment society.

Table 1: Estimation of costing Klever Kicks

No.	Item	Quantity (Set)	Price per Unit (RM)	Total (RM)
1.	Pezo Electronic Plate	3	6.00	18.00
2.	Capacitor	1	3.20	3.20
3.	Diode	5	1.00	5.00
4.	LiPo Battery	1	55.00	55.00
5.	Charging for LiPo	1	12.00	12.00
6.	Breadboard	1	5.00	5.00
7.	Arduino Nano Board	1	26.00	26.00
8.	Shoes	1	120.00	120.00
			TOTAL	244.20

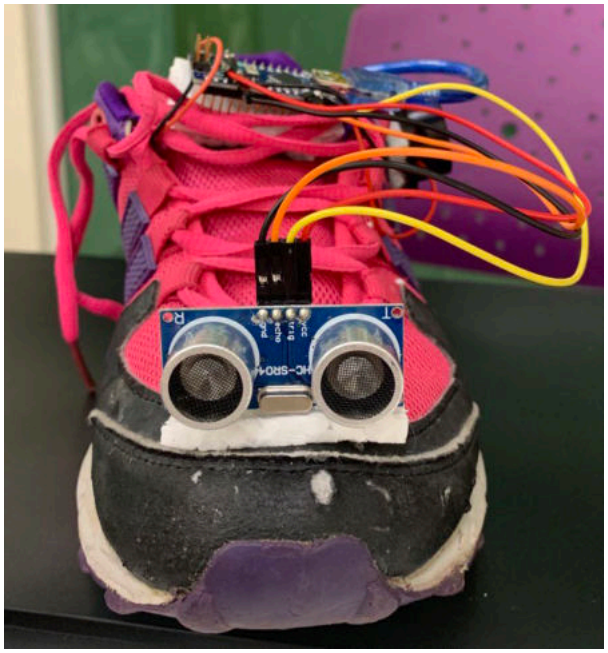

Figure 1: Innovation Prototype of Klever Kicks

4. CONCLUSION

Conclusively, our product can ease blind people to going through their daily life easily as they walk near things or people, the sound detector will ring. So that, they do not have to worry as they will hit things or people nearby if they use their blind stick because we already made the Klever Kicks. Not only that, every single steps will produce kinetic energy, then our product will convert it to electric energy which is people can use it to charge their gadgets. Usually if people go to hiking, there is no plug to charge their gadgets. As for that, people do no need to worry because the Klever Kicks will solve the problem as people can charge their gadgets through the shoes. Automatically, this will boost up the spirit to exercise more as they will have no problem to going through their daily life.

As the technology breakthroughs by many brilliant people regarding the electricity, we can endorsement our product by adding the massage at the footwear. We can use the electric energy that produced by every single steps, to turn the massage machine at the footwear. So that we can reduce the feet sore whenever we walk for a whole day. In the future, we can use the waterproof materials such as nylon and polyester fabrics for the shoes. Thus, the shoes will not get wet whenever the rains fall and the users will feel more comfortable. Unquestionably, it can avoid the damage for all the materials that been use in the shoes.

ACKNOWLEDGEMENT

This innovation project was requiring a great deal of work, analysis and dedication. Nevertheless, implementation would not have been possible without the support of many people and organisations. We therefore wish to extend our heartfelt gratitude to all of them. First and foremost, a special thanks to Universiti Teknologi Mara (UiTM) Kampus Dengkil for their logistical support and for fulfilling the

essential guidance concerning projects implementation. In addition, we are also grateful towards the involvement of UiTM as they provide provision of expertise and technical support in this project. Without their superior education and encounter the Project will not come to a success and this support play a major role. Moreover, we would like to express our sincere thanks towards volunteers and researchers who devoted their time and knowledge in the implementation of the project. Nevertheless, we express our gratitude toward our families and colleagues for their kind co-operation and encouragement which help us in completion of this project.

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DISTRICT 4.0: A Self-Learning and Peer-Learning Website for Students

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ABSTRACT

Students strive for success and never stop trying their best to gain more knowledge day by day. A way of gaining knowledge is attending to lectures, and tutorial classes as scheduled. But there are more than one way that are proved to be more effective to students which are self-learning and peer learning. Thus, this paper explains on the effectiveness of self-learning and peer-learning as the alternative to the conventional way of learning. Peer learning occurs among peers from similar social groupings, who are not professional teachers, helping each other to learn and in doing so, learning themselves. However, it is not easy to find the right and perfect peers. Hence to overcome this problem, an educational website consists of several features including study partner finder, academic videos and notes is created. This paper examines the usefulness of this educational website as it is created to serve as a platform to the students to find their perfect study partner and to reach their alumnus with just few simple clicks. In addition, the website also functions as a one-stop centre for the students to access video lectures, audio books, and lecture notes shared by their peers. Furthermore, this paper also elaborates on how the website can generate revenues from marketing advertisement and YouTube posting. Lastly, this paper proposes recommendations for the website as the way forward.

Keywords: Self-learning; peer-learning; educational website; online learning

1. INTRODUCTION

Hermann Ebbinghaus, a German Psychologist who pioneered the experimental study of memory found that when no attempt is made to retain learning, information gathered is lost over time [1]. Further research supports Ebbinghaus' claim as research findings show that when not applied, learners forget over half of what they "learnt" within an hour, and over 75% of information within a week of the learning intervention. With learner attention spans being incredibly short and information overload causing learners to disconnect, traditional classroom is perceived not to be effective enough.

Peer-learning and self-learning provide alternative to learning in traditional classroom. Students learn a great deal by explaining their ideas to others and by participating in activities in which they can learn from their peers. They develop skills in organizing and planning learning activities, working collaboratively with others, giving and receiving feedback and evaluating their own learning. Peer learning

is becoming an increasingly important part of many courses, and it is being used in a variety of contexts and disciplines in many countries [2].
Based on research, peer learning offers myriad of advantages. Firstly, peer learning is established on experiential learning which then guide the betterment of the learner's cognitive and affective development throughout their studies [3]. Secondly, peer learning can be carried out by trying various ways of learning in order to acquire pedagogy strategies and to accommodate new learning techniques to each and every students. Thirdly, when students cooperate on their subject learning, they can unfold the understanding on why the options they take must be made in the best context as they shall be responsible in managing their own learning by doing active academic engagement [4]. Next, peer learning supports the integration of students both academically and socially in the same institution to achieve the objective of empowering peer support and social engagement by creating one learning community [5]. Peer learning guarantees that learners can evolve analytical behaviour while still remain to be achievement-oriented and results driven [6].

On the other note, as for self-learning, it will retain students from not being afraid of failure and being isolated since they will not be exposed to other learning styles which differ in their speed and comprehension, several of them are too quick and only applicable for smart students [7]. Moreover, self-learning lead learners to avoid over-reliance in a studying period because such attitude will undermine their own intelligence in engaging future challenges and risks [8]. Furthermore, self-learning also ceases the likelihood of learners need to consider the differences of ideology and views that form part of the challenge of studying in groups [9]. Lastly, self-learning promote personal growth which stems from the individualistic values but still managed to to grasp the real meaning of learning, rather than by searching different methods of learning [10].

In studying these findings, we recognised that through the power of technology, we could widen the appeal of peer-learning and self-learning and make its benefits accessible to everyone to create a better balance in students' learning experiences by creating an educational website called District 4.0.

2. INNOVATION DEVELOPMENT

The District 4.0 website consists of several significance and essential features that make it a complete one-stop centre for the students to immerse into the fun of learning online. As the students themselves, the developers of the website have listed down a number of features that they think are crucial for the website to achieve targeted goals. These are the features:

StudyBuddy

StudyBuddy is a feature in District 4.0 website which helps the students to seek their preferred study mates among them by just filling up the required details such as the subjects that they excel and the subjects that they still need enhancement by the help of other students. The participating students may instantly view an online spreadsheet beside the StudyBuddy registration form button in order for them to pick their study mates based on their performance in academics which recorded on the list.

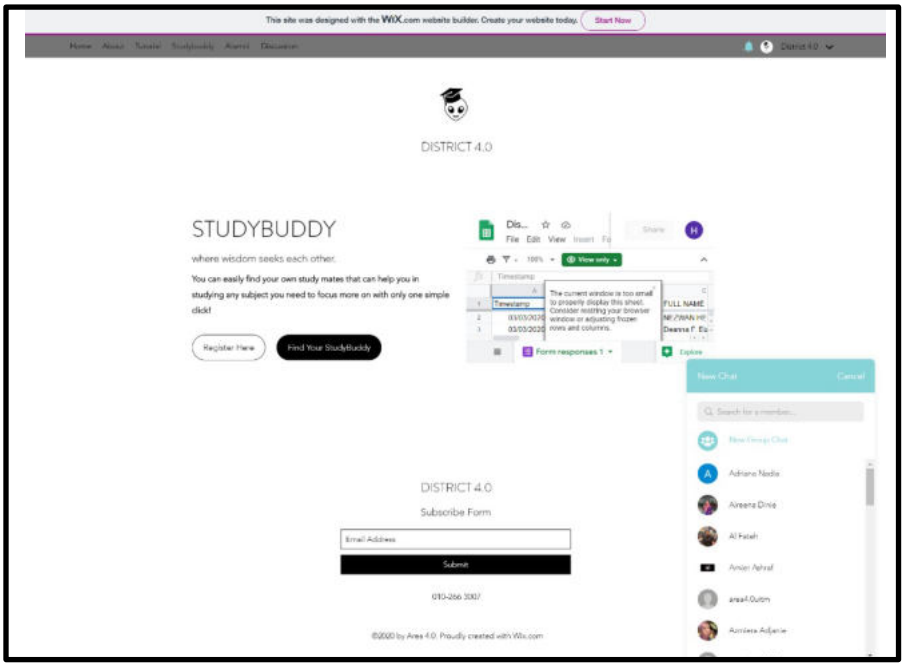

Figure 1: StuddyBuddy feature

Notes

Making and reading notes are one of the most effective ways in helping students with their studies. However, students often find it difficult to make their own notes most probably due to the lack of time that they have. Thus, a section that is equipped with notes is incorporated into the website as one of its features. In this section, the notes published are a hundred percent made by students themselves, so the concept of peer learning is still being uphold. By having this feature, students can just browse through the notes published in the website and download it for future reference. Therefore, students do not need to fret about not being able to make notes as they can find it easily in District 4.0 website.

Academic Videos

Most students show tremendous results in their studies when they are actively engaging with their peers. Students find it easier to grasps on the information explained by another fellow students. As a result, in District 4.0 website, we included a section in the website that is based on tutorial and learning videos. For the videos, the developers with the help of lecturers will hand picked the students that will be recorded to present certain topics or subjects. Hence, the videos are all explained and taught by students themselves. By doing so, students are able to learn wherever and whenever they want with just a click away.

Discussion

Many students throughout their years of studies require constant engagement in the form of questions and discussions. Through these engagements, students can deepen their understanding on certain subjects while identifying any problems. In response, we created a platform that allows students to have discussions

or inquiries regarding their academics. Students can post topics to which others can reply to it. The topics and discussions posted will be ensured for relevancy and suitable for all audience.

Alumni

The last feature is a section that connects current pre-university students with students in degree programs from various universities using online platforms such as Instagram and email. Students can consult and ask questions to prepare themselves for their upcoming degree studies. Students can gain useful insight into the undergraduate life by receiving valuable tips and advice from their seniors.

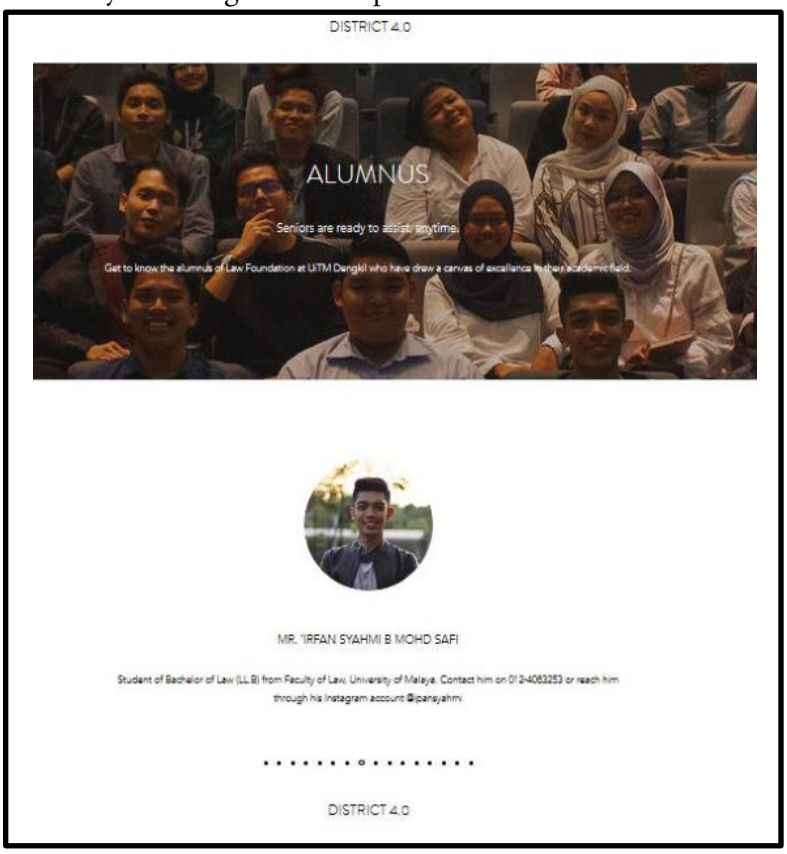

Figure 2: Alumni feature

3. COMMERCIAL POTENTIAL

Various peer teaching programs have cropped up at universities around the world in the past few decades, promoting the notion of peer-assisted learning. Nearly every institute of higher education in the world provides peer tutoring opportunities for struggling students and teaching assistant positions for advanced students [10]. However, this innovative District 4.0 website is taking a step further where it offers virtual one-stop centre to get such opportunities. The feature of 'StudyBuddy' for example, makes the website unique in providing a platform for the students to find their perfect study partner with just few clicks.

It is to be highlighted that District 4.0 website was created not only to help students with their academics but to generate revenues as well. Advertising by way of affiliate marketing and YouTube posting are among the strategies on how such revenues can be obtained. In advertising by way of affiliate marketing, certain products will be promoted to the website's subscribers and viewers by providing a link that the viewers can click on to purchase the advertised products. Thus, split sale or commission through the selling of the product that was advertised will be procured.

As for the YouTube posting, all the learning videos from the website will be uploaded to the website's YouTube channel. The content will be promoted on social networks like Instagram and on the website as well. Therefore, when the number of the website's users increases, the number of views for the website's YouTube videos will accumulate as well in which revenue can be earned through advertisement. It is safe to say that the sustainability of the website is partially depending on such generated revenues.

4. CONCLUSION

The District 4.0 website is established with the intention to help students to utilize the usage of technology in education. It is interesting to note that even though the website is still a prototype, but it has caught the eyes of many including educator and students from other institutions during an innovation exhibition held in March 2020. Taking one of the feedbacks, converting the website into a mobile apps is one of future planning of this project. This is because, mobile apps have the ability to work offline. Although mobile apps might require internet connectivity to perform tasks, they can still offer basic content and functionality to users in offline mode. Another future planning is a collaboration with educators to add an additional feature to the website. This feature will add value to the website because the students will not only can reach their peers and alumnus, but also their educators in this one-stop centre website. In light of the ongoing situation with COVID-19, the website will definitely be one of the mediums for educators to carry out Open and Distance Learning (ODL) with the students. In conclusion, District 4.0 website makes self-learning and peer-learning possible for everyone in an effortlessly fun way. It is undeniable that this website is a solution to a better learning experience as the students are having more learning options as compared to conventional way of learning.

ACKNOWLEDGEMENT

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Vibrating Rod VBR-01

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ABSTRACT

From a person with sight disability point of view, the simplest thing can be deemed as a challenge to them. One of the common everyday acts the unsighted deemed as challenging is crossing the roads. Thus, this innovation is designed to help the visually impaired to cross the roads safely by using their sense of touch instead of only relying on their sense of hearing. For this innovation to serve its purpose, the visually impaired have to hold on to the rod attached to the pole of the traffic light and wait for it to vibrate as a signal to cross the road. The commercial potential of this innovation is that it is user-friendly, reasonably priced and very beneficial to the disabled. In short, this advancement may assist with facilitating their burden to walk across the street more safely without the assistance of anybody.

Keywords: Visually impaired; vibrating rod; cross the roads

1. INTRODUCTION

Traffic lights, otherwise called traffic signals, traffic lights, traffic semaphore, signal lights, stop lights, redlights (In the Southern United States), robots (in South Africa, Zimbabwe and different places of Africa), and traffic control flags in specialized parlance, are flagging gadgets situated at street convergences, person on foot intersections, and different areas to control streams of traffic. The first ever automatically controlled traffic signal in Chicago was first invented in the 1910's by an American inventor named Ernest Sirrine. His traffic signal utilized two non-lit up show arms masterminded as a cross that turned on a hub, as indicated by Inventor Spot. The signs said "stop" and "proceed". By 1912, the first electric traffic light that uses red and green light was invented by Lester Farnsworth Wire, a police officer in Salt Lake City, Utah, according to Family Search. Yet somehow the "first electric traffic signal" credit goes to James Hoge. In 1917, William Ghiglieri copyrighted the first automatic traffic light which utilizes 'red' and 'green' followed by William Potts (1920), who added the yellow 'caution' light. Early traffic signals utilized a scope of hues to pass on directions, however the framework that has stayed with us is generally founded on that of the railroad, where red, which has the longest wavelength of any shading on the unmistakable range, flagged an admonition, or "Stop."

Some of the many advantages a traffic light control system offers could include moving cars safely to help them avoid collisions with cars and people. We assist in movement and help to maintain an orderly flow

by giving certain cars the right of way and not others [1]. They are valuable systems that not only improve vehicles but also pedestrian traffic as it is efficient and safe. In most situations, such devices eliminate common types of accidents such as broad-sided collisions [4]. They play a crucial and vital role in our daily lives when it comes to safety [1].

In all of this, signal timing is something that plays a very important factor. It is what actually makes this function and provides safety in the flow of traffic for people. There are three main types of signal timing that include fixed timing, actuated timing, and timing coordinates. Fixed timing uses the same present time intervals which do not change depending on the volume of traffic. Actuated timing uses a detector which can adapt itself to different volumes of traffic. Coordinated timing helps minimize random starting and stopping, helping traffic flow and creating a traffic jam less likely to occur [1].

Blind people have trouble crossing the road junctions without the help of others or when there are traffic congestions. This disability prevents them from crossing the roads safely. Therefore, we have come up with an idea that could not only aid them when crossing roads but also save their lives. 'The vibrating rod' was innovated to be placed at the designated traffic lights that are connected to the traffic light system. The 'rod' will sense the colour change of the traffic lights and vibrates when it turns red to alert the holder when to cross the road safely. The inability to witness any change in the surrounding sets them back from participating in normal and daily activities. This not only brings their motivations down, but they are more wary about the things that go around them. As a visually impaired person, they go through a lot of challenges in life. Through this innovation, we would like to ease one of their burdens when they are travelling by foot to nearby places [1].

2. INNOVATION DEVELOPMENT

The originality of this innovation comes from the problem statement stated above as we encounter blind people having difficulties while crossing the road. This innovation is meant to lessen their burden in crossing the road and ensuring their safety. It is a simple innovation that is low in cost as it is only an additional feature to the original traffic light. The idea of this innovation is designed so that it can be beneficial not only for the visually impaired but also for everyone.

How does this innovation operate?

i. The rod is attached to the pole of the traffic light and the sensor is connected to the traffic light system.
ii. They need to hold onto the rod while waiting for their turn as the rod will vibrate when it is safe for them to cross.
iii. The sensor will stimulate the vibration system located in the rod to signal the holder when the traffic light turns red that indicates the holder may cross the road safely.
iv. The most common situation is the box junction, as the traffic light turns red, the rod will vibrate after a few seconds to make sure there is no vehicle passing through.

This rod allows the visually impaired pedestrians to be confident while crossing the road as they do not have to rely only on their hearing senses. They will not get confused by the sounds in the surroundings and focus on the task at hand instead.

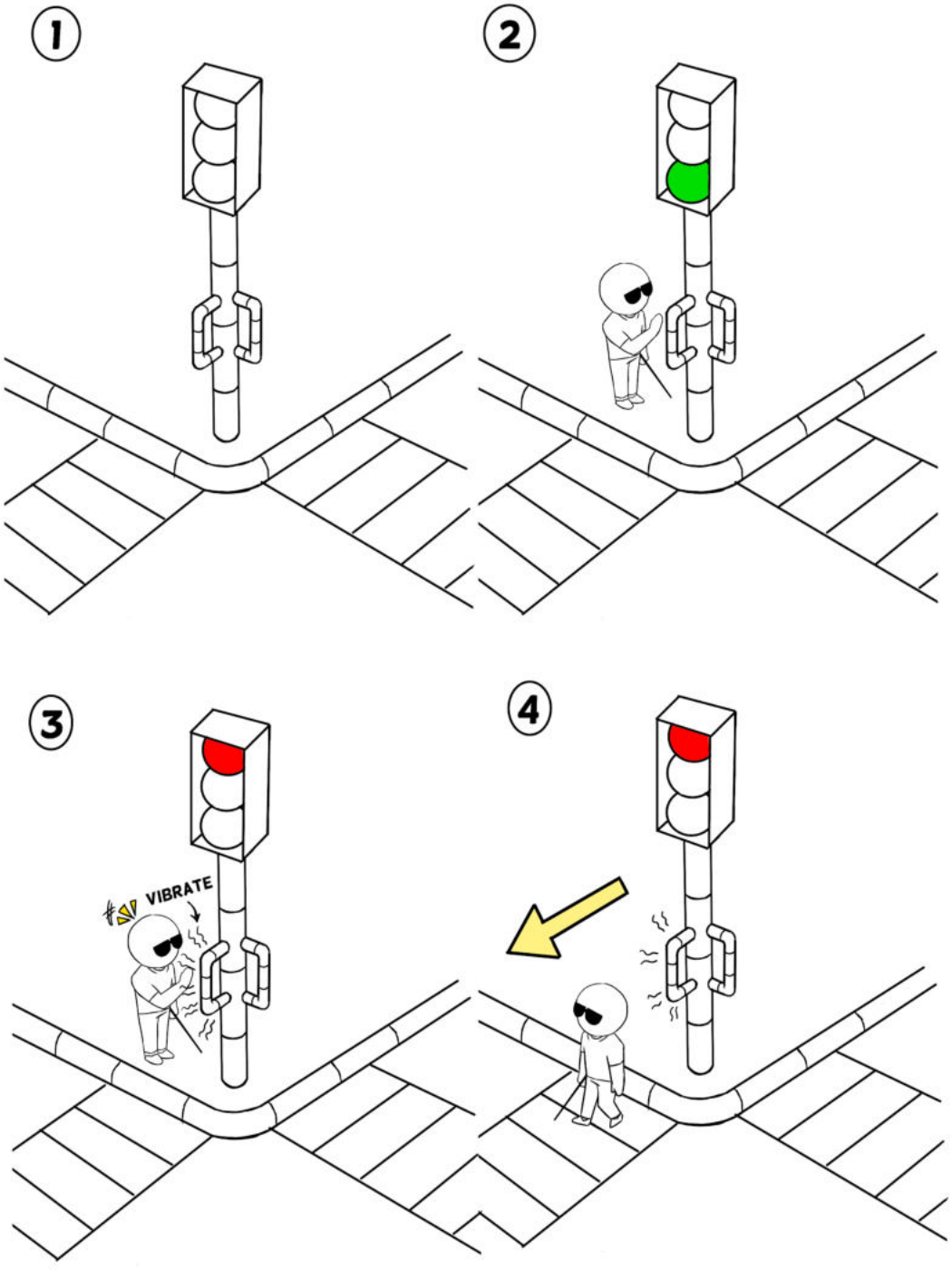

Figure 1: Innovation illustration

3. COMMERCIAL POTENTIAL

As the traffic light becomes more indispensable, developing its function will expand its functionality or use all over the world especially in improving the safety and making it easier for the disabled group. This innovation has high potential in the aspects of technological advancement, market, economy, legal and social impact.

In the technological aspect, it can be produced as a very useful product that benefits the disabled as it uses simple technology and a low consuming cost. Despite this innovation may seem complex to outsiders, it is actually very user-friendly for the disabled as it does not require the user to do anything other than to grab hold of the rod and be on high alert for when the rod vibrates. This innovation also has little to no possibility of bringing harm to the environment as it is a mere additional feature to the existing traffic light.

Aside from the technological aspect, the importance of this product in the market aspect is also significant with its function. Due to this innovation has not yet seen the light, the probability of this innovation being in high demand is great after entering the public market as it benefits the minority. The main reason that can be observed from this innovation other than as an aid tool for the disabled, this innovation can also become a major factor in reducing the rate of traffic accidents regarding the disabled. Countries with a high rate of visually impaired citizens such as India and China will gain the most benefit from this innovation in lowering the rates of accidents involving the visually impaired. Moreover, in the economic area, this innovation can bring in a lot of income if it manages to break through the international market as the traffic light system is used in most if not all developed countries across the globe. This opens a whole new door in the development of traffic lights and gives our beloved country, Malaysia a chance to be the first and main supplier to other countries.

Last but not least, we plan to commercialise this product and possibly do a collaboration with PPK Technology Sdn. Bhd which is Malaysia's very own indigenous high-tech undertaking since 1985 designing, constructing and producing the Intelligent Traffic System. Approvement and agreement by the government, of course, would make this innovation become legal and safe to be applied across the country. This is to ensure the possibility of this creation to go further and will be used on every traffic light.

The vibrating rod innovation does not require a complex mechanism, thus the cost to obtain the materials to construct the rod solely depends on the current price of the desired metal which is stainless steel, on the market. The price is estimated to be about RM 450 that includes the stainless steel pipe (30 cm), the vibration system and service.

Table 1: Estimation of vibrating rod marketed price

No.	Material	Estimated price (RM)
1.	Stainless steel pipe [10]	300.00
2.	Vibration motor and electrical components [8-9]	100.00

Table 2: Estimation of vibrating rod prototype

No.	Material	Quantity	Price per unit (RM)	Total price (RM)
1.	PVC pipe	2 sets	5.10	10.20
2.	Vibration motor	2	5.50	11.00
3.	Arduino uno board	1	36.00	36.00
4.	LED	6	0.70	4.20
5.	100 Ohm resistor	6	0.10	0.60
6.	Jumper wire	3	8.00	24.00
7.	Bread board	1	4.00	4.00
			TOTAL	90.00

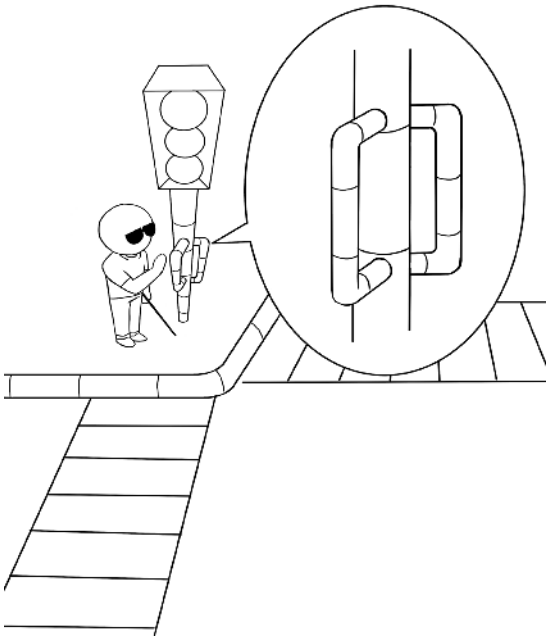

Figure 1: Innovation prototype

Coding

The purpose of this coding is used inside our prototype to demonstrate how it will function in real life. However, it can only be used for the prototype as in reality, we would suggest it to connect with the traffic light system itself. Coding system by using arduino uno board.

```
const int motorPin1 = 3;
const int motorPin2 = 2;
const int motorPin3 = 4;
const int motorPin4 = 5;
int red = 8;
int yellow = 9;


int green = 10;
int red2 = 11;
int yellow2 = 12;
int green2 = 13;
void setup()
{
  pinMode(motorPin1, OUTPUT);
  pinMode(motorPin2, OUTPUT);
  pinMode(motorPin3, OUTPUT);
  pinMode(motorPin4, OUTPUT);
  pinMode(red, OUTPUT);
  pinMode(yellow, OUTPUT);
  pinMode(green, OUTPUT);
  pinMode(red2, OUTPUT);
  pinMode(yellow2, OUTPUT);
  pinMode(green2, OUTPUT);

}

void loop()
{
 {
  digitalWrite(motorPin3, LOW);
  digitalWrite(motorPin4, LOW);
  digitalWrite(red, HIGH);
  digitalWrite(yellow, LOW);
  digitalWrite(green2, HIGH);
  digitalWrite(yellow2, LOW);
```

```
 digitalWrite(red2, LOW);
 digitalWrite(motorPin1, LOW);
 delay(500);
 digitalWrite(motorPin2, LOW);
 delay(500);
 digitalWrite(motorPin1, HIGH);
 digitalWrite(motorPin2, HIGH);
 digitalWrite(green, LOW);
 delay(5000);
 digitalWrite(motorPin1, LOW);
 digitalWrite(motorPin2, LOW);
 digitalWrite(yellow2, HIGH);
 digitalWrite(green2, LOW);
}
 delay(1000);
{
 digitalWrite(motorPin1, LOW);
 digitalWrite(motorPin2, LOW);
}
 delay(100);
 {
 digitalWrite(yellow2, LOW);
 digitalWrite(red, LOW);
 digitalWrite(yellow, LOW);
 digitalWrite(green, HIGH);
 digitalWrite(red2, HIGH);
 digitalWrite(motorPin3, LOW);
 delay(500);
 digitalWrite(motorPin4, LOW);
 delay(500);
 digitalWrite(motorPin3, HIGH);
 digitalWrite(motorPin4, HIGH);
 delay(5000);
 }
 {
 digitalWrite(motorPin3, LOW);
 digitalWrite(motorPin4, LOW);
 }
 delay(1000);
 {
 digitalWrite(red, LOW);
 digitalWrite(yellow, HIGH);
```

```
 digitalWrite(green, LOW);
 delay(1000);
 }

}
```

4. CONCLUSION

In conclusion, this innovation may help to ease their burden to cross the road safely without the help of anyone. In the future, this vibrating rod could be improved so that this disabled group may travel without worrying about their safety. This should be attached to all the traffic lights and additional features such as a camera to enhance the efficiency of the pole. Different sounds can also be installed to make it easier to differentiate which road to cross. Safety criteria such as a sponge or soft material to be wrapped around the rod are needed so that it is not harmful, especially towards children. Furthermore, a smaller and shorter height of this innovation that is equipped with interesting sounds that would interest children to hold up to the rod instead of running while waiting for their turn to cross the road.

ACKNOWLEDGEMENT

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Familelle: Genetic Inheritance Card Game

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ABSTRACT

Genetic discoveries have become powerful tools in improving quality of life. The knowledge about gene allows us to explore details of all living organism at molecular level. Such understanding leads to enormous potential in various aspects of human life. In secondary school, students are required to learn heredity and variation in science and biology subject. They are introduced to various terminologies such as gene, allele, genotype, phenotype, homozygous, heterozygous and others. Some students even struggling to relate the meiosis process with genetic inheritance. As temporary solution for this problem, students tends to memorize all terminology without understanding the whole concept. Famillele is a combination of family and allele which describing the game clearly. This game requires basic understanding of selective human characteristics using Mendelian monohyrid inheritance. In this game, three type of cards will be distributed to every player. They are mission card, family card and blank card. A total of 40 cards will be distributed evenly among all players. A set of familelle has 5 cards consisting of father, mother and 3 baby cards. Each mission card is describing a family with missing members. The players are required to reunite all the familelle member. The first player to complete a set of familelle wins the game!

Keywords: Mendel; allele; monohybrid & genetic

1. INTRODUCTION

Genetic deals with heredity and variation. It allows us to understand existence of life at all level of complexity from molecular to population level. Genetic inheritance involves discrete heritable units passed on by parents to their offspring. It is sometimes reappeared after skipped generation. Heritable feature is called character with variant for the character is a trait. In Simple Mendelian inheritance, trait can be affected by genes with two different alleles at one time where one is dominant than the other. The term simple Mendelian inheritance obey two laws: the law of segregation and the law of independent assortment.

Law of segregation states that the two alleles separate from one another during gamete formation and end up in different gametes. Law of independent assortment on the other hand states that two or more genes that alleles located on different homologous chromosome assort independently of other pair during gamete formation [1].

Genetic discoveries have become powerful tools in improving quality of life. The knowledge about gene allows us to explore details of all living organism at molecular level. Such understanding leads to enormous potential in various aspects of human life. In agriculture, this knowledge is used to produce better crops with high drought tolerance and better nutritional properties that would benefit farmers worldwide.

In secondary school, students in form 4 and 5 is required to learn heredity and variation in science and biology subject. They are introduced to various terminologies such as gene, allele, genotype, phenotype, homozygous, heterozygous and others. They must be able to identify dominant and recessive allele in human, as well as illustrate inheritance pattern using genetic diagram with expected genotype and phenotype ratio [2,3].

Many educators feel that teaching complex concepts and vocabulary in genetics inheritance usually discourage many students. These challenges could probably due to unseen processes since it involves genes on chromosome. Some students even struggling to relate the meiosis process with genetic inheritance. As temporary solution for this problem, students tends to memorize all terminology without understanding the whole concept. Effectively, educators should devote more effort to help students to independently learn and solve problems [4].

Consequently, this card game is developed focusing on heredity using human characteristics. Card game showed to be more effective in understanding topics in biology compared to traditional teaching method [5]. Apart from that, individuals can learn more within a group than when they are alone [6]. Several traits carefully choose to be used in Familelle: genetic inheritance card game. They are earlobe pattern, existence of Widow's peak and blood group. Both earlobe pattern and existence of Widow's peak obey simple Mendelian inheritance. Free earlobes and Widow's peak are dominant to attached earlobe and no Widow's peak. Blood group display multiple allele as well as codominance. Blood group A and B is codominance while O is recessive.

2. INNOVATION DEVELOPMENT

An observation was made in form 4 classes during learning heredity and variation. It is observable that explaining to students are very excruciating to most teachers. Hence, arranging classroom activities becomes more challenging. For this reason, Famillele genetic inheritance card game is developed to help teachers in conducting classroom activities that are inexpensive, fun and enlightening.

Familelle

Educational card game: Familelle uses three selected human characteristics (Ear lobe, Widow's peak and blood group) with dominant and recessive characteristics stated, students need to reunite the Familelle based on the description given. This game requires basic understanding of Mendelian monohyrid inheritance where each allele is segregated in one gamete at the end of meiosis. Familelle is develop in two languages; English and Malay to fit in Malaysia's education environment depending on selected

language used in teaching science subject in school. In this game, there are three type of cards which are mission card, family card (father, mother & baby) and blank card. A total of 40 cards will be distributed evenly among the players. A set of Familelle has 5 cards consist of father, mother a 3 baby cards. Each mission card is describing a family with missing members. Mission card have two level of difficulties (beginner and expert). This will allow more excitement in problems solving for different students' need. The players are required to reunite all family members based on the clues written in the mission card. However, players need to aware of the genotype and phenotype of all the family members. Makes sure they are correct! The first one to complete a set of Familelle wins the game!

A set of the Familelle cards consist of the followings:

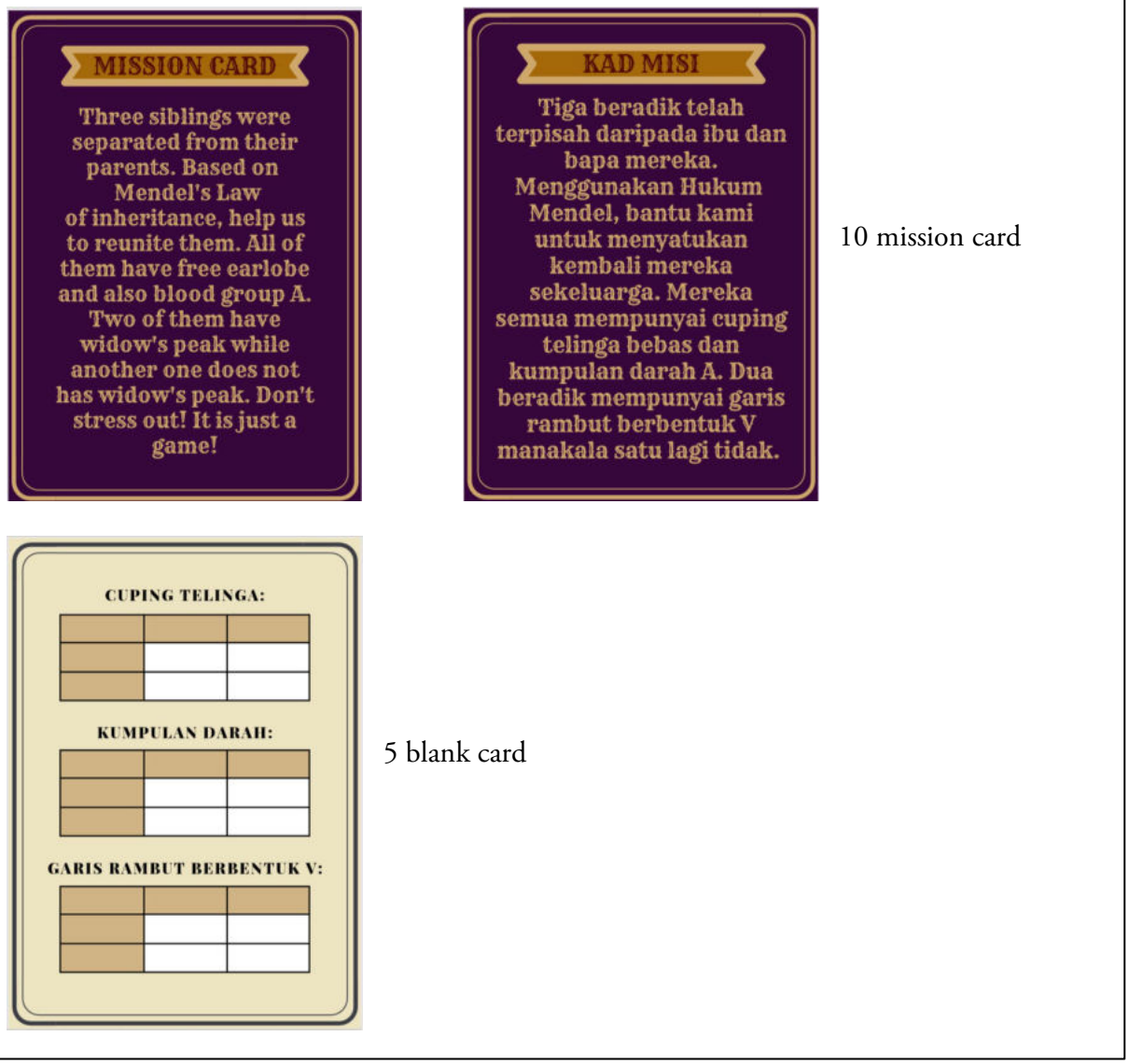

Figure 1: Total number of mission and blank card included in a set of Familelle

Figure 2: Total number of family card comprises of father's, mother's and baby's card included in a set of Familelle

Learning Outcome

Our aim for this game activity is to convey the followings learning outcome. After playing this game, students can:

- Differentiate between homozygous and heterozygous [2,3]
- Draw a correct punnet square [3]
- Identify dominant and recessive characteristic in human [2,3]
- Illustrate inheritance using genetic diagram [2,3]
- Predicting genotype and phonotype ratio [2,3]

Warm Up Questions

Prior to beginning of the game, we encourage teachers to divide students into groups randomly. Next, set of warm up questions asked to students as reflections upon their understanding of heredity and variation. They will have a bit of struggle and probably need to discuss in the group to find the answer. However, they will have the key concepts as they begin playing. They need to be introduced to three (3) traits used in this game as follows:

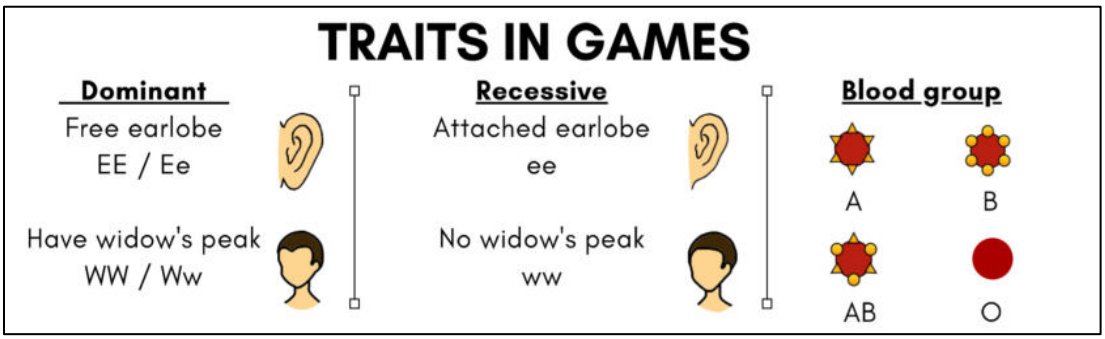

Figure 3: Three human traits used in Familelle with degree of dominance respectively

Then, students need to write down genotype and phenotype of heterozygous and homozygous individual of one desired trait. Give some time for students to think and discussed in the group. Until everyone gets the right answer. Next, ask them to draw a genetic diagram to illustrate a cross between two individuals written before including phenotype and genotype ratio.

Set Up

All family card is distributed to all player with one mission card and one blank card.

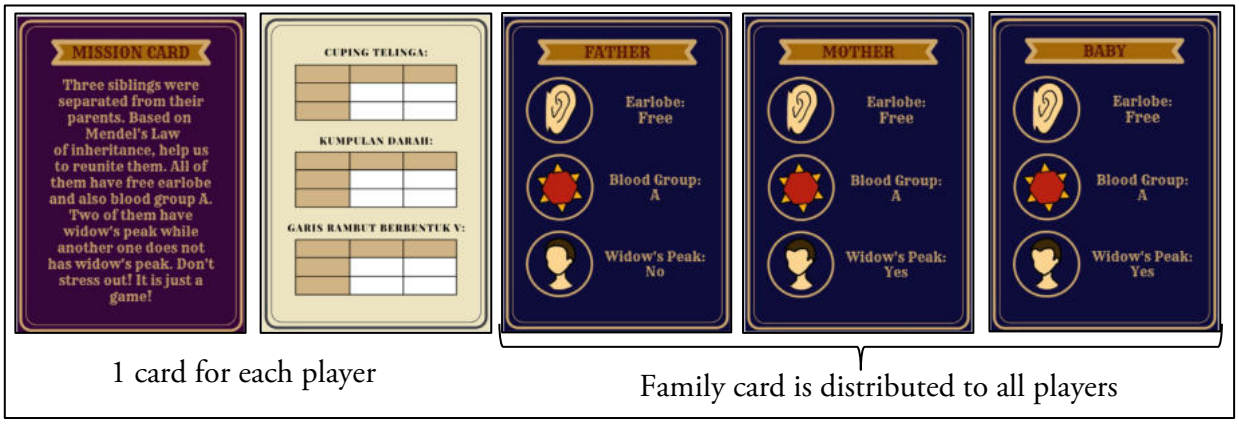

Figure 4: Schematic set up of Famillelle

Playing and winning

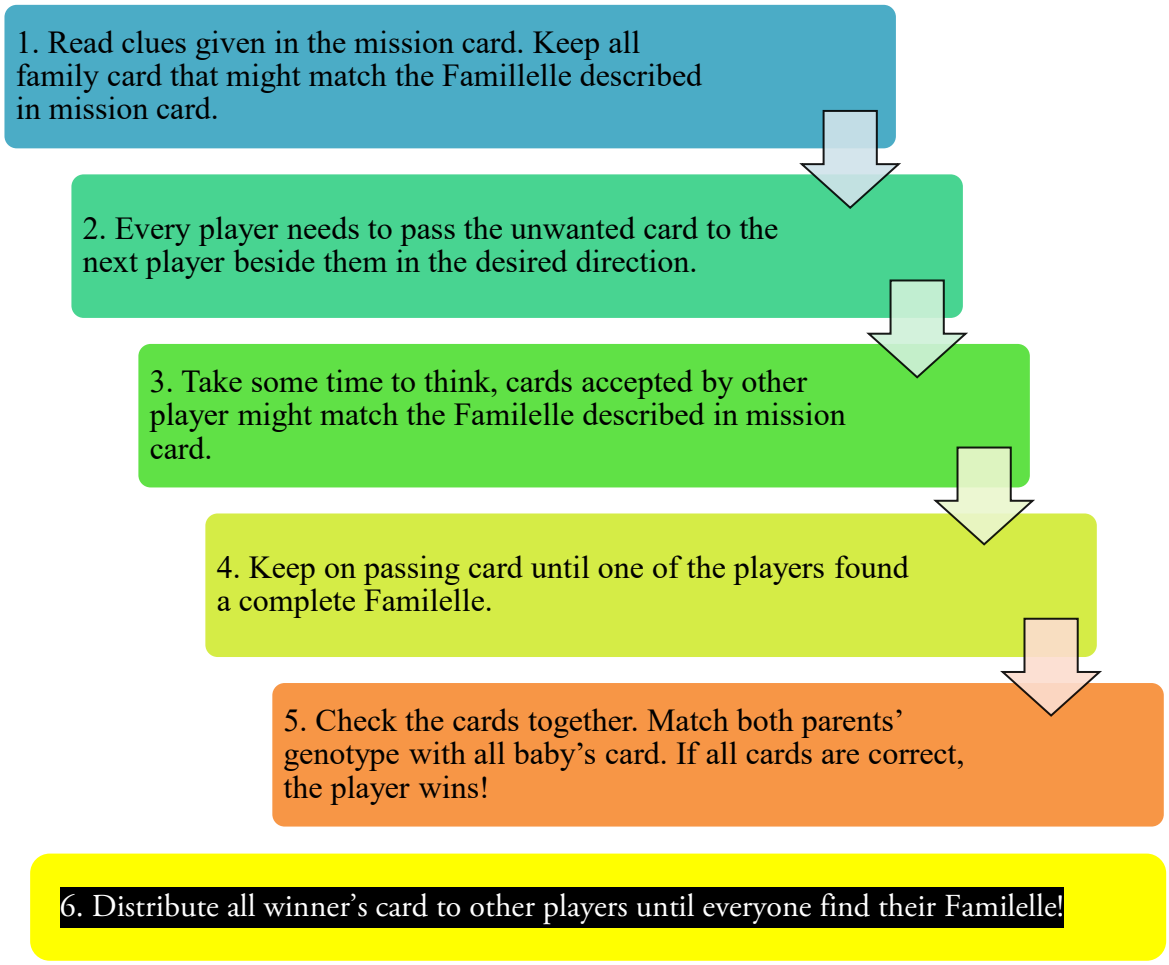

Figure 5: Instruction to play Famillelle until one winner is recognized

3. COMMERCIAL POTENTIAL

Familelle provides fun, low-cost, and educative classroom activity. It includes two level of difficulties to fit in two different background of target students; science students form 4 and biology students form 5. Other than that, it is develop in two languages to suit different language used at various schools or institutions. A preliminary was conducted in a tuition centre with form 5 science students. The session has turned into a very interesting revision for them since genetic inheritance was taught during form 4. All students give very supportive feedback and would suggest using Familelle as classroom activity. Undeniably, Familelle can provide effective learning strategy and suitable for schools (government, international etc), pre-university institution, or even tuition centre.

4. CONCLUSION

Various study in teaching biology or general science highlight the effectiveness of hands-on activities with student engagement in learning process [7,8]. We have described a guideline in using Familelle to encourage students to interact in a small group and challenge each other to win. A test should be conducted to evaluate students' performance using Familelle compared to traditional method.

ACKNOWLEDGEMENT

We would like to thank Biology Unit, Centre of Foundation Studies UiTM for allowing us to develope Familelle. We would also like to express our deep gratitude for generous support from Smart Learning Tuition Centre for full cooperation in participation our preliminary study towards form 5 students.

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GeneX Learning Kit

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ABSTRACT

Gene expression to produce protein is divided into transcription and translation. Messenger RNA (mRNA) is transcribe from a sequence of the DNA strand that acts as a template in a process called transcription. The process in which the base sequence on the mRNA is used to synthesize amino acids sequence is called translation. GeneX Learning Kit is designed to provide hands on learning tools for students to interact and discuss in group guided by instructor. Student are able to simulate the process of gene expression by controlling the DNA sequence, mRNA strand, tRNA, ribosomes, and amino acid sequence. It can accommodate 5-6 students at maximum per group. The GeneX Learning Kit is light weight, and portable, suitable to accommodate learning process in classroom. It is equipped with game-based activity for better facilitative communicative engagement in learning protein synthesis. This kit is suitable to be used in a classroom and as laboratory practice during learning genetic expression. The interactive and competitive nature of playing the GeneX Learning Kit provides a fun and meaningful learning experience not confined to the traditional learning method. Therefore, learning and practicing the process of gene expression will become interesting and entertaining.

Keywords: Transcription; translation; protein synthesis; genetic expression; educational kit

1. INTRODUCTION

The deoxyribonucleic acid (DNA) contains genetic information which encodes specific trait by dictating the protein synthesized or, in some cases, ribonucleic acid (RNA) is functioning as RNAs instead. The process of gene expression into proteins is divided into transcription and translation. The process in which the DNA is used as a template in producing messenger RNA (mRNA) is call transcription which later is the mRNA is transported from the cytoplasm to the nucleus. The nucleic acid; DNA and RNA use different nucleotide bases which may causes obfuscation to sometimes happen. Adenine (A), Guanine (G), Cytosine (C), Thymine (T), and Uracil (U) are the five nitrogenous bases. DNA used A, T, C, and G whereas RNA used A, U, G, and C. These differences may cause confusion among students. The other process so called translation is to synthesize amino acids base on the nitrogenous base sequence of the mRNA. Translation on the other hand is to synthesize a sequence of amino acids based on the nitrogenous base sequence in mRNA. An amino acid is coded by three nitrogenous base sequence called codon. By using the mRNA codon table, one can translate the codon sequence of the mRNA to its respective amino acid.

Gene expression also involves numerous proteins, enzymes as well as other RNAs. The transcription is divided into three substages known as initiation, elongation and termination producing a pre-mRNA. The pre mRNA then undergoes modification in eukaryotic cell to making it a functional mRNA. Once transcription is completed, translation proceed which also divided into three stages known as initiation, elongation and termination.

Teaching and learning protein synthesis have always been an issue not only among students, but also among teachers [1]. Findings showed that inability to relate concept of protein synthesis and misconception are the main cause of teaching and learning difficulties among teachers and students respectively.

Therefore, in order to increase students' interest and understanding, a creative approach must be taken. A study was found that learning by games creates fun learning experience which help student further develop their curiosities and interest in a particular topic [2]. Narrowing down into learning protein synthesis, another study by Mensch and Rubba in 1991 used CPVC pipe, polypropylene rope etc as a hand on model to develop students' positive attitudes towards biology and deepens their knowledge [3]. Later, another study by Sphren in 1993 suggested a teaching method using Lego and later the idea is improvised by another study by Mark in 2002 [4][5]. In 1995, Rode proposed a simulation using students' themselves acting as elements needed during protein synthesis [6]. The simulation requires a minimum of 21 students at one time with a tedious material preparation needed.

In a recent study in 2018, learning protein synthesis through board games provides a symbolic representation of the process in which the students played the roles of the molecule and simulate its process [7]. This provides meaningful learning towards the students. Many approaches have been introduced by science instructors to improve learning efficiency on gene expression into protein [8]. Therefore, this kit is developed to help instructors in conducting efficient 21st century learning in the classroom.

2. INNOVATION DEVELOPMENT

The GeneX KIT can accommodate 5-6 person per group. It is suitable to be used in a classroom and as laboratory practice. It uses simulation of a cell undergoing protein synthesis step by step to enlighten students understanding and creating visualisation for easy memorizing.

GeneX Kit

Instructor's set is equipped with magnetic models that stick to whiteboard. Models include DNA strand, mRNA strand, RNA polymerase enzyme, complete labelled of ribosome, tRNA and amino acid molecules. Since GeneX Kit uses simulation approach, it consists of all elements needed in transcription and translation. It includes erasable board with printed figures, an mRNA strand, tRNA, amino acid and DNA sequence card.

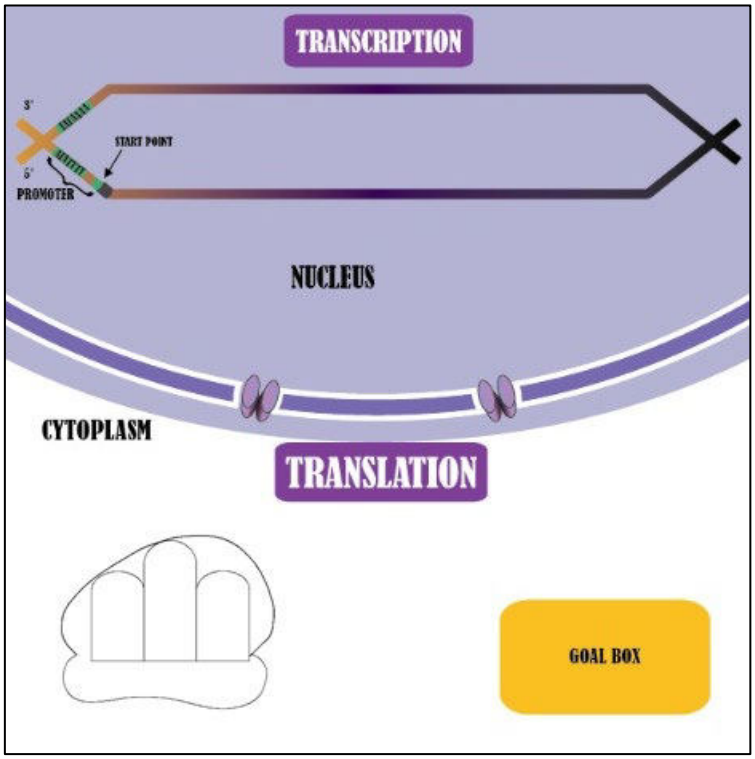

Figure 1: An erasable board illustrating a cell showing an unwinding DNA strand with 3'-5' direction labelled within nucleus. Structure of ribosome with three unlabelled sites outside of nucleus (cytoplasm) and a goal box; to be used for game-based exercise

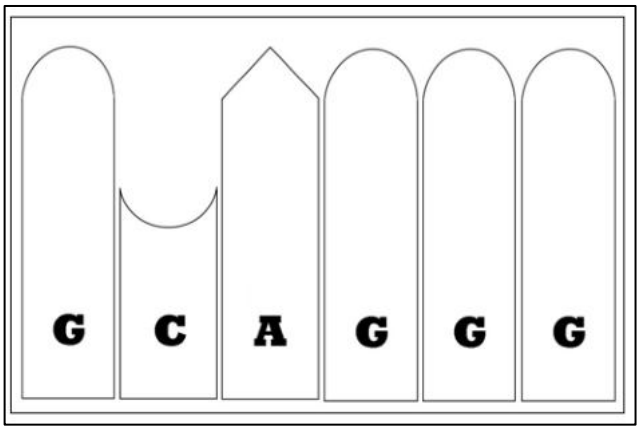

Figure 2: A total of 15 transparent DNA card with different base sequence. Each card represents 2 complementary codon which will contribute to two amino acid sequence

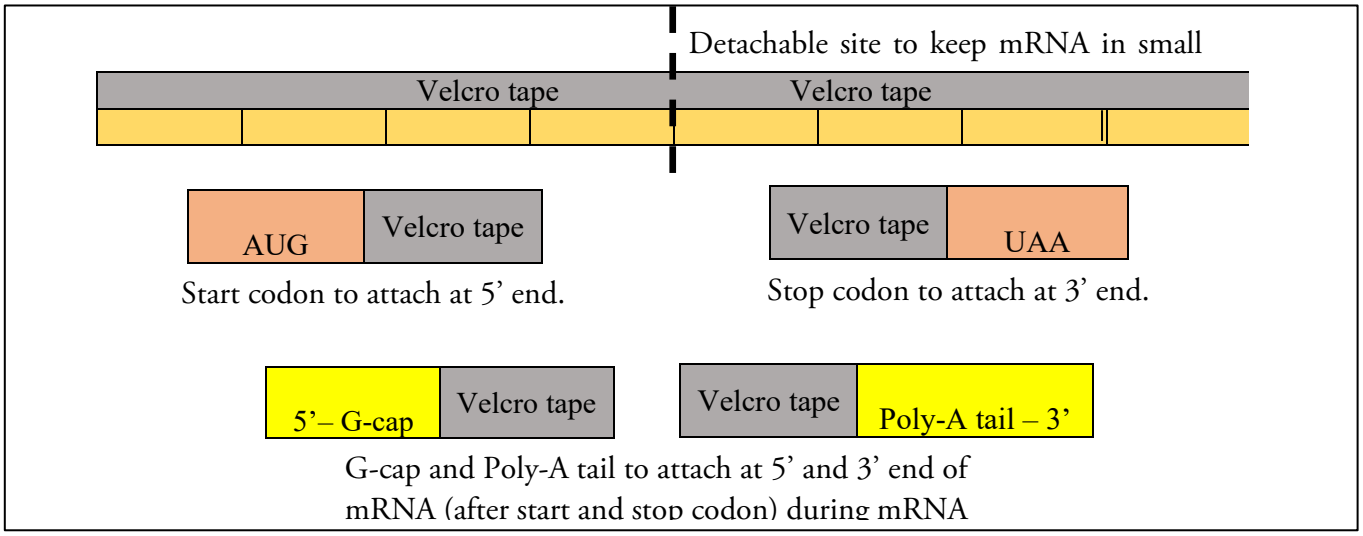

Figure 3: An mRNA strand with Velcro tape to attach to each other as well as to other transcription and translation elements. Erasable mRNA strand has 8 blank box for students to write RNA bases complementary to DNA sequence on DNA card

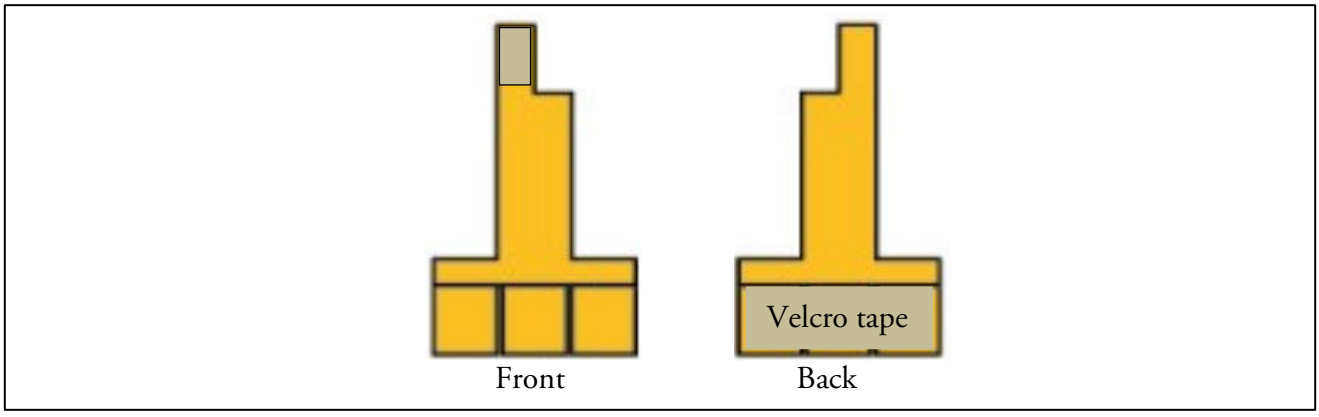

Figure 4: A total of 9 tRNA in a set of GeneX kit. Blank box in front to write three anticodons complementary to mRNA in 3'-5' direction. Velcro tape at the back is used to stick to mRNA

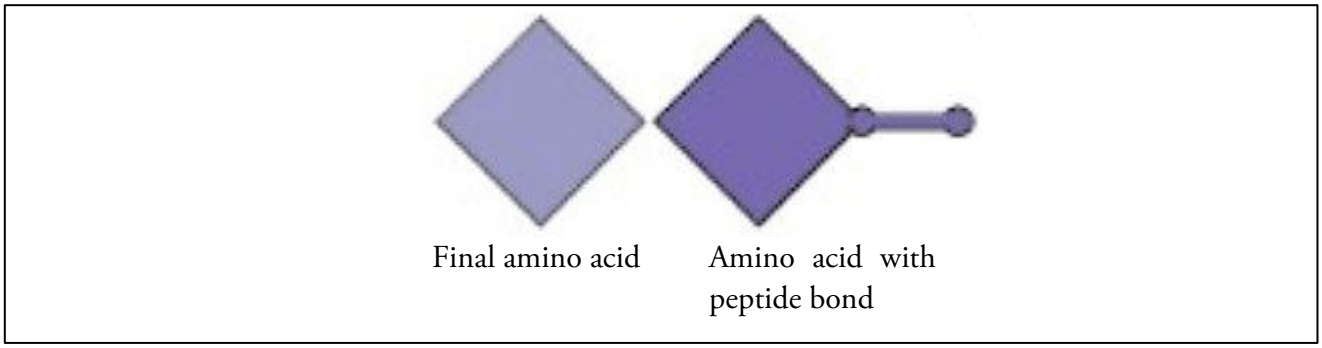

Figure 5: Two different amino acid with Velcro tape at the back to stick to tRNA and to other amino acid. All amino acids are erasable for students to write specific amino acid that match to codon based on codon mRNA table. 8 amino acid with peptide bond and one final amino acid included in a set of GeneX

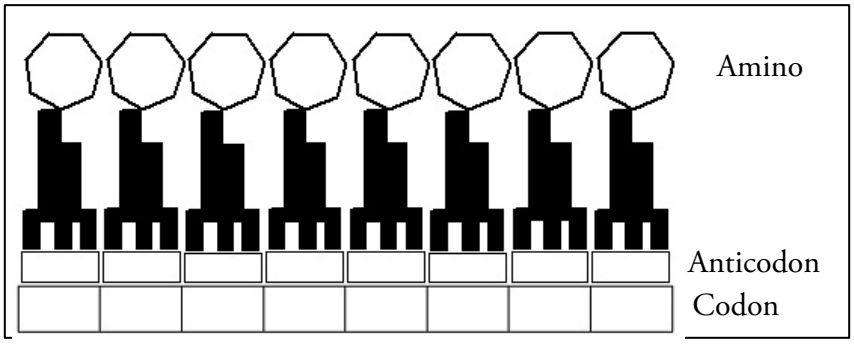

Figure 6: GeneX sheet for students to write down their own codon, anticodon and amino acid sequence as an exercise after simulation

Learning Outcome

Our aim for this simulation activity by students is to convey the followings learning outcome. After using this demo kit, students are expected to:

- Explain transcription process with its stages.
- Explain translation process with its stages.
- Match complementary base pair correctly.
- Translate codon into amino acid using mRNA codon table

Warm Up Session

Prior to beginning of the game, it is encouraged for instructors to divide students into groups randomly. Next, instructor will explain all transcription and translation process using traditional method such as chalk and board or by video animation. Other than that, Instructor may use GeneX Demo Kit to help instructor to explain clearly to students with students' engagement activity included. Students may have a bit of struggle and probably need to discuss in the group to connect protein synthesis process step by step. However, they will grab the key concepts as they begin the simulation using GeneX Kit.

Set Up

Shuffle all DNA card and place 4 cards on 3' – 5' strand which is the DNA template strand.

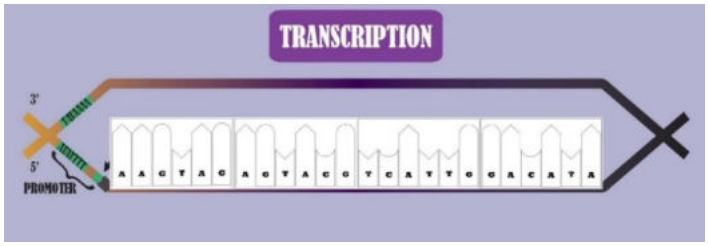

Figure 7: Board set up before simulation of protein synthesis begin

Simulation and Discussion

GeneX kit is designed to enhance students' group discussion using simulation and game-based approach. Students can try to run the all processes on their own using this kit as explained by instructor using **GeneX Demo Kit**. All transcription and translation process are very specific to each stage. Students may have to write down some elements on the erasable board. The simulation can be done few times for clearer understanding with different DNA sequence since DNA card is shuffled every time.

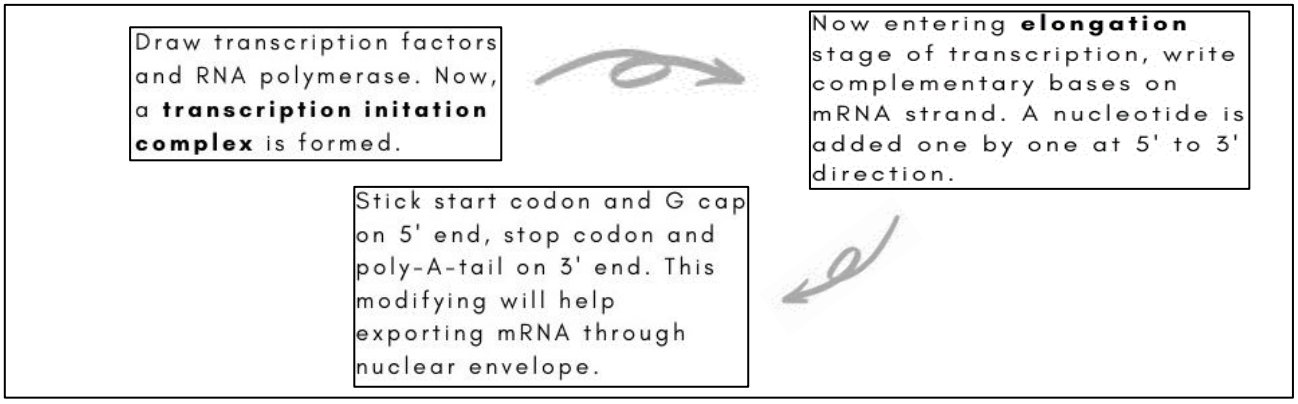

Figure 8: Simulation of transcription process using GeneX Kit

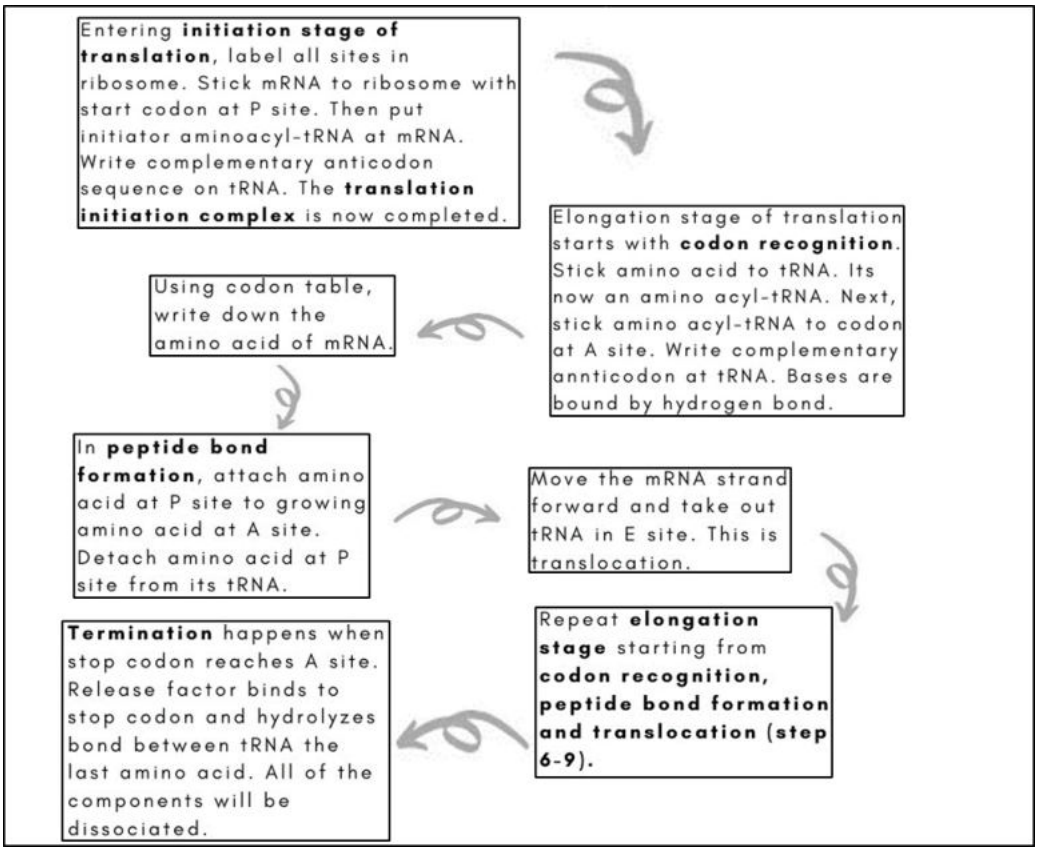

Figure 9: Simulation of translation process using GeneX Kit

Game-Based Exercise

For more excitement, GeneX sheets is included as a game-based exercise. Students' can play protein race. They can shuffle all 15 DNA cards again, transcript and translate the gene to protein sequence by writing the correct answer into their own GeneX sheet. The first player who can translate the right amino acid sequence will put the GeneX sheet in the goal box win the race.

3. COMMERCIAL POTENTIAL

GeneX kit provides fun, low-cost, and educative classroom activity. It includes simulation and game-based learning approach to fit in two different learning style of target students. A preliminary was conducted in a foundation centre to 15 students. The session has turned into a very interesting revision for them since protein synthesis was taught in the beginning of their semester. All the students give very supportive feedback and would suggest using GeneX kit as classroom activity and laboratory practice instead of traditional method. Undeniably, GeneX kit can provide effective learning strategy and suitable for all foundation centre and A-level institutions, schools with pre-U course, and matriculation college.

4. CONCLUSION

Challenges of the 21st century learning demands a creative approach to provide students with understanding as well as self-motivating to learn. GeneX KIT is developed to help instructors conducting the learning genetic expression process in fun and entertaining way to fit with the students' demand. Increasing the student's understanding on protein synthesis to boot. This kit has high potential to be a useful tool used in various schools, matriculation college as well as any foundation studies centre in Malaysia.

ACKNOWLEDGEMENT

We would like to thank Biology Unit, Centre of Foundation Studies UiTM for giving a full support for us to develop this kit and conduct preliminary study case among the students.

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B.B: Interactive Busy Vocab Box

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ABSTRACT

The four language skills (reading, writing, listening, speaking) are often considered to be the main determinant of second language proficiency. In addition to those skills, there is one other feature of second language learning that can be considered important, that is vocabulary. However, unlike the other major skills, vocabulary acquisition for ESL learners are mostly self-taught. Learners are often expected to acquire vocabulary through reading, rather than being explicitly taught [1]. A survey conducted among undergraduates of a foundation program found that they are primarily concerned with not having a sizable vocabulary, suggesting that ESL learners are aware of the importance of vocabulary to help them be more proficient in English. It is also clear that ESL learners require targeted strategies for them to successfully build a sizable vocabulary. One such strategy is by building up on root words using affixes. This is the fundamental idea behind the design of the B.B-Interactive Busy Vocab Box (BB Vocab Box). The combination of root word expansion and tactile learning strategy could help students retain the new words better. This portable box has the potential to help ESL learners engage in active learning activities by providing a tactile experience. Though at first glance the product may be deemed more suitable for young leaners, adult ESL leaners can also benefit from its novel design and approach. The contents chosen for the BB Vocab Box adhere to the CEFR guidelines and can be tweaked to fulfil the varying needs and learning objectives of its users, be it the parents, teachers or learners themselves. Thus, the BB Vocab Box is able to provide a structured guide to vocabulary expansion, while also empowering learners to personalise their learning experience.

Keywords: ESL learners; vocabulary size; tactile learning; CEFR

1. INTRODUCTION

In the tertiary learning environment, it is crucial for learners to possess a certain level of proficiency as they often need to interact with materials that are considerably more difficult than what was used in schools. The more difficult the materials, the better their proficiency needs to be, especially in terms of reading and writing. One way for ESL learners to improve their proficiency is by expanding their vocabulary size. However, most ESL educational systems are structured to put more emphasis on grammar rather than vocabulary, deeming grammar requires more effort to teach while vocabulary can be self-taught. Unfortunately, most adult ESL learners consider vocabulary acquisition as one of the

greatest challenges that they have to face when learning English [2]. Most are have also not been explicitly taught how to acquire vocabulary when they were in school, leading to an increased difficulty in expanding their vocabulary to cope with the demands of tertiary learning institutions. For example, the vocabulary size of most Malaysian undergraduates is inadequate, hindering them in their academic progress, especially in terms of understanding academic texts [3,9]. Therefore, vocabulary learning should also be emphasised and no longer be considered secondary to the other language skills.

In addition to vocabulary building not being focused on explicitly in the education system, there is also a significant lack of materials to support vocabulary building. Educational modules, classes and games, centre more on the development of the four major skills. Even when the educational materials and tools are made specifically for teaching vocabulary, the intended users are usually young children, not adult learners.

The BB Vocab Box is created as a response to the issues stated above. The main objectives of this product are to introduce a strategy for vocabulary learning, provide an enjoyable and active learning experience as well as offering a learning tool that can be personalised to meet specific learners' needs.

Vocabulary Learning Strategies

A commonly used strategy for learning new words is by having a list and memorising them. The list usually comprises of high frequency words or words that are commonly used in speaking and writing. However, as this list can be extremely long, ranging from hundreds to thousands, it is unrealistic to expect learners to simply memorise it. A much more effective strategy is by applying the affixation system to vocabulary learning [8].

Most English words are actually related to one another through a common root word. The use of affixes (prefix and suffix) helps learners to create new words and improve their vocabulary size [7]. Learning the affixation system also helps learners with grammar. For example, the word *eat* is a verb (action word). By adding the suffix *-er* to it, learners get a new word (*eater),* that falls under a different word class (noun). Other than that, the affixation strategy also allows learners to change the definition or meaning of a word. For example, the meaning for *happy* can be changed simply by adding the prefix *-un*, to get the word *unhappy.*

Tactile Learning Style

The BB Vocab Box is designed to incorporate the tactile learning strategy (e.g. activities are hands-on and requires physical movements). Although some early feedbacks deem the product to be more suitable for younger learners, adult ESL learners can still reap the same benefits. A research conducted among a group of undergraduates at a Malaysian private university found that the preferred learning strategies are tactile and kinaesthetic [4]. Although the current trend in education focuses more on online learning and the use of mobile apps, the simplistic design of the BB Vocab Box can still attract learners' attention.

Furthermore, the use of mobile apps and online tools caters more to visual and auditory learners. Although it seems to be more appealing, adult ESL learners actually show a preference for physical and hands-on activities [4]. Thus, the use of BB Vocab Box can provide them with the learning experience suitable for their preferred learning style.

CEFR Word Level

The Common European Framework of Reference for Languages (CEFR) considers vocabulary size as one the most reliable tools to measure proficiency [5,6]. Using this framework, learners can be separated by levels, from beginner to advanced, based on the standardised size of their vocabulary. As such, in order to align the content of the BB Vocab Box to the requirements of CEFR, the list of word is developed using the information obtained from an online database (**https://www.englishprofile.org/wordlists**). The database provides a comprehensive list of words based on the levels of CEFR (A1-C2). The researchers then chose suitable words from the A1-A2 levels (beginner), B1-B2 (intermediate) and C1 (advanced) to be used as the content material for BB Vocab Box.

2. INNOVATION DEVELOPMENT

This one of a kind vocabulary learning tool consists of two activities for word building, the Vocab Tree and the Vocab Tower. The tree and tower design were chosen to represent vocabulary building. Both activities require the participants to choose a particular root word, then adding suitable prefix and suffix to it to build a new word. The early prototype of the BB Vocab Box made use of easily sourced materials like boxes, small circular magnets (to attach the Vocab Tree to its base), sticker paper for the Vocab Tower word list, colour paper for the Vocab Tree word list, toy building blocks for the Vocab Tower and felt cloth to make the Vocab Tree and for other decorative purposes.

In order to make the box portable, all the component was designed to fit within the box. The Vocab tree is detachable from its base, for easy storage. There is also an instruction manual (inclusive of a list of possible answers and scorecard) for the users. Figure 1 shows the prototype of the BB Vocab Box and the instruction manual.

Figure 1: BB Vocab Box and instruction manual

Figure 2 and Figure 3 shows the design of the Vocab Tree and Vocab Tower respectively.

Figure 2: Vocab Tree

Figure 3: Vocab Tower

While the components make use of the root word vocabulary growth method and tactile learning, the difference lies in the target users. The Vocab Tree is meant for beginner to intermediate level learners and is limited to pairing one root word with various suitable prefix and suffix. It features root words from the A1, A2 and B2 level. The Vocab Tower on the other hand, is meant for more advanced level learners as the root words are more challenging (CEFR B2, C1 and C2 level) and there is an option for using multiple root words at once and connecting these words via shared prefix or suffix.

The BB Vocab Box also has a manual to explain the gameplay, a list of possible answers (newly created words) based on the root word and affixes used as well as a scorecard to add an element of competition if the product is used by multiple users at the same time. Parents and teachers can also use the suggested word list and scorecard to monitor their children or students' progress.

3. COMMERCIAL POTENTIAL

One of the main appeals of the BB Vocab Box is its compact size and easily sourced materials. As every component of the Vocab Tree and Vocab Tower can be stored in their respective compartments, users can easily bring the box everywhere. Separate pieces of the BB Vocab Box (e.g. toy building blocks) are also easily replaceable.

In addition, the words chosen for use with the BB Vocab Box may be customised and personalised to suit learners' needs. Young learners or those with lower proficiency can use words within the A1 and A2 level in CEFR and gradually increase the level of difficulty until they reach C2. This is a feature lacking in most interactive and educational products in the market, which typically cater only to specific age groups or a specific level of proficiency.

In comparison to other similar products (e.g. busy books, vocabulary games) which can be sold

anywhere from RM25 to RM50, this product is considerably cheaper. Table 1 shows the estimated cost to manufacture one BB Vocab Box.

Table 1: Estimated manufacturing cost of a BB Vocab Box

No.	Item	Quantity (Set)	Price per unit (RM)	Total price (RM)
1.	Box	2	0.80	1.60
2.	Magnet (small)	6	0.35	2.10
3.	Felt cloth (pack)	1	2.00	2.00
4.	Toy blocks (medium)	1	7.00	7.00
5.	Double sided tape	1	0.70	0.70
6.	Colour paper	5	0.29	1.45
7.	Sticker paper	5	0.18	0.90
			TOTAL	15.75

4. CONCLUSION

The main objective behind the creation of the BB Vocab Box is to provide an engaging tool for learners to increase their vocabulary size. Although acquiring adequate vocabulary size is important for ESL learners, it should not be considered to be the only criterion to determine proficiency. Nevertheless, it should still be given importance equal to the other major language skills. The BB Vocab Box helps learners to learn the of root word expansion method and improve their vocabulary through the use of affixes. The design of the current prototype is quite basic, which is something that can be improve on in the future. The future versions of the BB Vocab Box will retain its design concept but be further developed to provide better learning experience for the users. Another update to the design is to provide several packs of root words and affixes, categorised using the CEFR levels.

The product has not yet been extensively tested. However, the feedback has been favourable so far. Users who have tested the products have reported that the vocabulary learning method introduced by the BB Vocab Box is interesting and helpful in getting them to think about the way the learn vocabulary. As the product requires active participation from its users, it is hoped that they will be able to retain the newly created words which will help them improve their vocabulary size.

ACKNOWLEDGEMENT

This product was first showcased at the 2nd ASiD Innovation and Creativity Day 2019 (AICD 2019) back in July 2019 and managed to win the bronze award. The event had sparked interest in the researchers to continue on with its development. We would like to extend our most sincere thanks and appreciation to Puan Norashikin Binti Mohd Mokhtar, Puan Nor Hafizah Binti A Hamid and Puan Nurul Safiah Binti Mohamed Yusoff, the current and former lecturers from the Centre of Foundation Studies UiTM Dengkil, who had helped conceptualise the BB Vocab Box and build its early prototype.

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3'S Biometric Fingerprint Lock System of a Briefcase

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ABSTRACT

Nowadays, the term wireless communication technology has developed rapidly in our country, as it becomes the most important mediums of transmission of any information through the air without requiring any cable or other electronic conductor wires from one device to other devices. A biometric fingerprint is a high technology that applies identity of a person. A transducer that change a biometric treat of a person into an electric signal. During traveling or working, people often use a padlock to lock their luggage or briefcase. They can accidentally break the padlock, forget the password from padlock or their belongings might easily steal by thieves without being noticed. There are less security and lack of safety while using a manual padlock. This project was studied to figure out these problems using smart, simple and secure biometric fingerprint lock system. The first objective of study is ensuring a safety to users personal belonging. The second objective is promoting the smart fingerprint system at affordable price and lastly to create a simple but friendly smart fingerprint system. An arduino set is setup to make it works with a sensor of fingerprint scanner is connected together and coding is arranged inside a briefcase. The government parties, civilians' group and managers in banking sectors are the main target of our commercial potentials having this product. These groups carry their briefcase to keep the confidential documents, personal belonging or money plate inside it securely. In conclusion, to enhance this biometric lock better a GPS tracker with high heat resistance and auto lock system will be developed in future. Nevertheless, the creativity skill in dealing with a new approaching in innovation can be enhanced and also develop the critical thinking skill to solve problem in science, technology, engineering and math (STEM) learning as guided by Malaysia Education Ministry.

Keywords: Biometric; fingerprint; GPS tracker; auto lock system; arduino

1. INTRODUCTION

Nowadays, the term wireless communication technology has developed rapidly in our country, as it becomes the most important mediums of transmission any information through the air without requiring any cable or other electronic conductor wires from one device to other devices. This technology becomes famous and competes days by days in many devices such as smartphones, printers, cordless telephone, GPS, WIFI, satellite television and wireless computers. A biometric fingerprint is a high technology that applies identity of a person. A transducer is a device that changes a biometric treat of a person into an

electric signal. Currently, it becomes a high technology that applies the global positioning system (GPS) tracker when using it.

In general, a biometric fingerprint lock is a locking system with fingerprints biometric verification. Technology of biometrics implements the unique patterns of physical or behavioral traits of users for authentication or identification [1]. Basically, four systems or modules works with the biometric system such as the sensor module, feature extraction module, template database and matching module. With biometric scanners on smartphones and other devices becoming more prevalent, as well as a growing number of services calling for high security and good customer experience, traditional methods of authentication (e.g., passwords and PINs) are increasingly being replaced by biometric technology [1,2]. People who use passwords or PINs have some flaws such as are easily forget, lost or could be stolen their password. As a second solution, biometric fingerprints technology offers a system for an individual or single user to identify his authentication or identification based on biometric traits. The system is difficult to lost or forgot by the user. Biometric traits can trace the individual through his body by using the fingerprint, finger-vein, iris, voice, face, and so on [1,3]. In common biometric system produce authentication via the enrolment stage and verification stage [4,5].

The system of biometric widely used for the civilian and military parties [6–9] because of their specific properties possessed by biometrics in a few areas such as compliance with the law, frontier restriction, homes user in biometrics, and economic sector. Furthermore, the biggest country liked United States, United Kingdom, Australia and China utilized the biometric recognition systems in the law enforcement [1]. The Department of Defense and the FBI started using Next Generation Identification (NGI) in 2011 on the United States' generation of biometric system to perform and apply fingerprint, face, iris, palm data, and their facial recognition program became fully functioning in the end of year 2014 [10].

The fast technology in smart phones industry globally helps the biometrics technology to widely utilize in the market [11]. During business traveling or daily working, a person usually uses a padlock to lock their luggage or briefcase. He or she can accidently break the padlock, forget the password from padlock or their belongings might easily steal by the thieves without being noticed. Less security and lacks safety while using a manual padlock are the main problems might be faced out during handle it. This project was studied to figure out these problems using smart, simple and secure biometric fingerprint lock system. The fingerprint lock is invented to replace a simple padlock to help people in taking care their belonging or briefcase. The first objective of study is ensuring safety of users personal belonging. The second objective is promoting the smart fingerprint system at the affordable price and lastly is creating a simple device but friendly smart fingerprint system. This study is invented a biometric fingerprint lock system on a briefcase application. In addition, a low price is offered to public and simple mechanism compared to the other security devices as a main novelty of this project. The projects also use an inductive magnet to lock the briefcase and can be applied to other many devices too such as locker, door, luggage and traveling bag.

2. INNOVATION DEVELOPMENT

It is designed to be use by all people to keep their personal belonging or confidential document in this briefcase. As for example, the bank managers can use this briefcase in the extraction of money plates. The students or teachers for example can carry the briefcase at work or school to keep their books and laptops safely. The design of briefcase and its size are most attract to users to use and carry this briefcase. The product can reduce the backpain of the teachers when they carry the bag. The briefcase can be designed in the trolley bag to easily push or pull the bag as a briefcase bag. The application of this briefcase can be widely used by the people in general as for work, travel, shopping and business trip. This thing can increase the secure of the document because only certain people can open this briefcase because of biometric fingerprint lock system. Next, how the component of this system is function? Firstly, this system uses Arduino uno board that act as the brain of this system. Then, we use electromagnet as the lock of this system. This electromagnet will be functional if we connect it to a power supply. Thirdly, we use relay to break the circuit as our finger is put on the fingerprint sensor. In addition, we also use a fingerprint scanner to detect and notify personal identification or fingerprint and deliver the input to the Arduino system in order to access this briefcase.

3. COMMERCIAL POTENTIAL

We are creating a low-cost budget biometric lock system using these materials (refer Table 1). This product is design to all people that need a tool that can secure their confidential document or things that are valuable in affordable price. Firstly, we need to buy a suitable briefcase with a reasonable price so that we can save the money. The size of the bag is not too big and too heavy when we want to carry it. The space inside the briefcase can be used to keep the books, money, clothes and others personal items. Next, the magnet that is placed in the system is an electromagnetic lock. It is placed as a key or lock to access and open the briefcase. We try to use one magnet to be set up together with an Arduino system. Later, we also have a single battery of 12 V to generate the function of this briefcase. An Arduino Uno Board is bought at the cheap price through online shopping market because we try to keep the product in a low-cost budget. The function of this board is very important to make sure the fingerprint identification can be traced and utilized by the user. Therefore, we studied and did some research on how to run the Arduino Uno Board from the internet. We agreed to run the board by using the original of Adafruit_Fingerprint by Limor Fried/Ladyada from the research we done. Then, we attempted about 10 times the system Arduino by changing and refer the coding given by Adafruit Fingerprint in the way to make it success accessing the briefcase. The purpose of this coding is very important to keep our fingerprints information into the Arduino uno board. Our project produces the sensor from fingerprint to lock, open and run the system in the briefcase. The fingerprint can trace and identify the person information to access and open the briefcase. If the wrong information taken during opening the briefcase, it cannot be opened. The system of Arduino is not complete without the fingerprint scanner. We got the scanner from the shop which sold the scanner from the punch card box system. We tried first test whether it is function or not. The scanner size is small and can fit in the board. Besides that, a relay is used as a switch to run the whole circuit consists of the wires, battery, magnet, scanner and uno board. The circuit is on when the switch is completely off or touch all the elements and otherwise the circuit is off when the switch is on. It means

that the switch is break of disconnected to the other elements in the board. The switch works with both electric and electromagnet from the magnet. The wires are used to connect the point of elements in the circuit inside the briefcase. Figure 1 shows the price comparison between the ordinary biometric lock system briefcase in the market and our product itself. From this comparison, we can say that the range of price getting bigger gap around RM2000 range because may be due to the different materials of items and types of briefcase. Even though, we used a low-cost budget for materials and briefcase, the product from this study still can apply the fingerprint system in a good way and condition.

Table 1: Estimation of costing biometric fingerprint lock system

No.	Item	Quantity (Set)	Price per unit (RM)	Total price (RM)
1.	Briefcase	1	120.00	120.00
2.	Magnet	1	80.00	80.00
3.	Battery 12V	1	5.00	5.00
4.	Arduino Uno Board	1	30.00	30.00
5.	Fingerprint Scanner	1	80.00	80.00
6.	Relay	1	5.00	5.00
7.	Wire	7	3.00	21.00
			TOTAL	341.00

Figure 1: Innovation prototype

Table 2: The real market price of fingerprint briefcase

Market Price	Market Price
RM 2336.80	RM 341

4. CONCLUSION

In conclusion, our product offers a system that is user-friendly, affordable and top-notch safety protection. At lower price, the users now can rest easy as their various devices from briefcases to safe are well protected with our system and their valuables are secured for safekeeping. The system's functionality that is coded according to the owner's biometric precognitive part, which is in this project, is the owner's fingerprints. The mechanism of this system firstly detects the fingerprint using the biometric sensor and if it is matched with the coded fingerprint, it will then unlock the briefcase. As for future recommendation and improvement, we are planning to add GPS tracker to our products. This enable our clients to track the movement of their briefcase in perhaps extraction of money plates or even in to detect the location of the briefcase after theft case. Thus, our client able to plan the route of extraction in detail and also retrieve backs their stolen briefcase. If they unable to do so, they can leave it to police's hand along with the tracker to locate the briefcase. Next recommendation and improvement that we are planning to do is to implement the system on other various types of gadgets or other places that require safety protection. As an example, we can implement this system to doors, drawers and suitable things that require safety protection. Then we can widen the diversity of biometric sensors from fingerprint sensors to other, maybe retinal scanners or facial recognition sensors. The purpose we change the fingerprint sensors is because if our clients involved in an accident that somehow affects their fingerprints, the briefcase will stay locked although we will provide a spare key for each of our products. The spare key will be useful in times that if our fingerprint sensors unable to detect our clients' fingerprint. We believe that with our product recommendation and improvement, our product will breach through international markets and somehow compete fairly with other innovation ideas.

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The Innovation of Rehal NEO Visual Disabled-Friendly

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ABSTRACT

Rehal Neo is one of the innovations inspired by the original rehal available in the market. It is created for everyone especially for the disabled including the blinds to give convenience for them to read al-Quran. In the Quran in Surah Al-Qamar, stated that the Quran is a reminder for all mankind.

وَلَقَدْ يَسَّرْنَا الْقُرْآنَ لِلذِّكْرِ فَهَلْ مِن مُّدَّكِرٍ

With the creation of Rehal Neo, it will be easier for the visually disabled groups to place their al-Quran while reading it. This is because the Braille al-Quran is physically heavy, thick and big compared to the normal *cited* al-Quran. The design of Rehal Neo which is flexible, made with lightweight materials, is portable for the OKU groups to handle and carry around since the design is made similar to a briefcase. Moreover, Rehal Neo has the added values which the making of Rehal Neo uses the electronic component combined with a hinge that will simplify the uses of the rehal by only pushing the button to automatically open the briefcase into rehal shape and push the button once again to keep it back close as a briefcase when the are not in-used. This is contrary to the original available rehal in the market since the original one is usually heavy, making it hard for the OKU groups to carry them around everywhere. The results of this innovation are giving a big advantage to all types of groups, not only for the normal people but also for the OKU groups including those who are visually disabled.

Keywords: Rehal Neo; innovation; OKU; visually disabled group; lightweight; portable

1. INTRODUCTION

In general, a rehal is an X-shaped foldable book rest used by Muslims to hold holy books for reading at home or in a mosque (Jim and Karan, 2018). Placing holy books such as Al-Quran on the table in your home, or somewhere on a low plane is so offensive and disrespectful as a Muslims. We should at least put the holy books above the knee level. So, it can be said that rehal is really crucial to be used for a Muslim as a symbol of respect during recitation.

However, we found that society nowadays is not really exposed to the use of rehal and it is eventually forgotten from time to time. It might be due to some physical factors of the rehal itself, as the shape of the rehal itself does not give a strain to the users- normal and disabled. But this Rehal Neo comes with other alternatives to solve these problems, where there are some innovations- Arduino and servo mechanism, so it will get a special place among society in the near future since people nowadays demand high on technologies and will ease the disabled people in their daily life.

Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices. In our innovation, Arduino is used to build up the coding and coded for the automatic-opening mechanism which applied to our Rehal Neo. At the same time, servo, which is an automatic device that uses error-sensing negative feedback to correct the action of a mechanism (Wikipedia, 2020) is used to move the rehal foot so that it can open automatically.

The combination of the Arduino's mechanism and feedback from the servo itself have improved the physical function of a traditional rehal. Hopefully, with these innovative features, it helps to achieve the main objectives of this project which is to help and improve the disabled people on their education system in daily life.

2. INNOVATION DEVELOPMENT

Rehal NEO was designed to be used by all people but we give priority and focus on people with disabilities as they can use it in daily braille reading. Furthermore, this product can be easier to be kept on the shelves neatly and more organized as Rehal NEO can be folded into a box-shaped like a briefcase and has a handle for easy carrying. As an example, OKU people with visual disabilities can bring this Rehal NEO everywhere easily whenever they want to use it for their daily learning sessions. This thing can help people with visual disabilities because it has an innovative mechanism that allows automatic opening.

Next, how is the component of this system functioning? First, this system uses the Arduino uno board that acts as the microcontroller for this rehal. This Arduino board will be connected to the servo motor (L.Louis,2018). Then, the Arduino code used for controlling the servo motor. This combination will be functional if we connect it to a power supply. Thirdly, this rehal has a push button that will help to the automatic opening of this rehal. When it's button is pushed, the information is sent to the Arduino uno board and controls the servo motor in order to open this rehal. Pictures below is the pictures of product's development:

Figure 1: The first prototype of Rehal Neo

Figure 2: The testing process of Rehal Neo opening mechanism

Figure 3: The participation of Rehal Neo in KSTI at UiTM dengkil and won gold

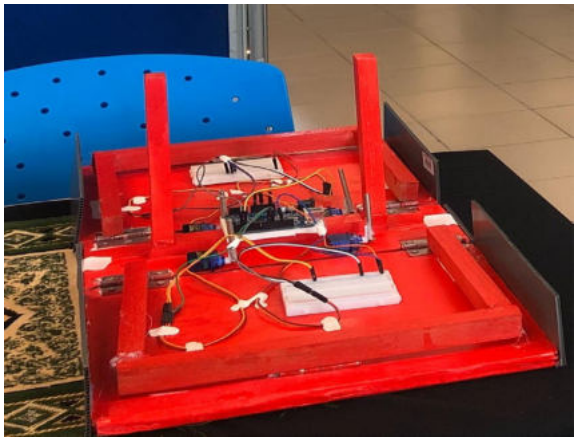

Figure 4: The product of Rehal Neo during the Creation De UiTM

Figure 5: The size comparison between the first prototype of Rehal Neo and the real product

Figure 6: The participation of Rehal Neo at Creation De UiTM and won gold

3. COMMERCIAL POTENTIAL

Based on the data from KPM, in 2019 there are 88,419 students with special needs (OKU) that require special education and Selangor is the highest state with students with special needs with 15,127 students

(KPM,2019). Therefore, in order to cater the massive number of students, the ministry of education (KPM) will provide 1,109 classes of special Integrated Education Programme (PPKI) to about 7,591 students ' special Needs (MBK) throughout the country this year. Minister of Education, Dr. Maszlee Malik said the total involved 421 PPKI nationwide that would be an access to easier education and close to the MBK area. According to this, the performance expansion involved an allocation of RM54 million (Sinar Harian, 2019).

Therefore, by the increased number of schools for special needs students (OKU) it is clear that Rehal Neo could be the most significant product to be used to help the learning session for the schools due to its reasonable and considerate price per product. For the real product, we estimated to sell this product with a starting price of RM 55. The price of RM 70 could be explained by the integration of the special design body of Rehal Neo that roughly cost RM 45 that consists of 1mx1m HDPE sheet, 4 door hinges and few wooden blocks. As for the electronic part of Rehal Neo, it would cost around RM 25 by the usage of 1 Arduino Uno, 1 push button and 4 GT5kg servo to make the automated movement of this product. Although this product is slightly more expensive as compared to the traditional Rehal, we need to be clear that this product is a learning aid for the special needs student and due to this factor this product could be considered very significant as the learning aid for special needs students.

4. CONCLUSION

In conclusion, our product innovation could manage to help every human in this world especially the OKU community since we are actually focusing on the OKU group's welfare by supporting the pure intention of our former Education Minister, Dr. Maszlee Malik to protect the OKU community's right in education and in the meantime to enhance the students welfare in Malaysia. The idea for innovation of regular rehal into Rehal Neo are made specially with the thoughts of giving comforts to the physically disabled people. The system's functionality aided by electronic components such as servo and arduino improve the movement to open the Rehal Neo from a briefcase into a usable rehal. The mechanism of this system works when a button on the side of the Rehal Neo is pushed, the coded information will be sent to the servo and arduino to help the Rehal Neo to function and will automatically open. Since we are using the mechanism of electronic components in order to function our product, the consumers will be given a 6 month warranty to get a free repair if there are minor faults occur on the product. The recommendation and improvement that we are planning to do is to be able to widen the space or to make more space in the briefcase so that the users will be able to keep their book or small belongings like stationeries in there. We are also planning on selling a next-6-month warranty after the previous free warranty expired. This is because if a fault occurs after a 6 month warranty, it will be more costly to buy a new rehal or to pay for the repair if there are minor faults that occur more than once after the first six month of purchasing. The reason we are suggesting this is to obtain our consumers' trust. We are hoping that the success of our product would be able to protect the rights of the physically disabled people and could increase their confidence level in education and also not to forget to give convenience to the students out there to study.

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Tajwino Shortcut to Expert Tajweed Al-Quran

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ABSTRACT

These days, most Muslims are not practical in the study of tajweed to have a proper recitation of al-Quran. This is because of less encouragement in the study of tajweed rules and uninteresting teaching-aids to help this study. Hence, this is where the innovation of Tajwino based on the UNO card game will play its role in helping Muslims to have better approach in studying tajweed as it makes teaching and learning process much more fun. The first objective of this study is to enhance and memorise Tajweed rules easily. This product focuses on '*Nun Sakinah* and *Tanwin*' rules which is the basics rule for everyone to know in order to recite al-Quran which are Ikhfa' Hakiki, Izhar Halqi, Idgham Maal Ghunnah, Idgham Bila Ghunnah and Iqlab. However, this product also can help in studying the rules of Mad Wajib Muttasil, Mad Jaiz Munfasil, Idgham Mislain Syafawi, Ikhfa Syafawi,Izhar Syafawi, Qalqalah Kubra, Qalqalah Sughra ,Mad Silah Tawilah,Mad Silah Qasirah, Mad Lin, Mad Iwadh dan Mad Aridh Lissukun. These are the other rules which can be played in Tajwino as it functions as a wild card. Tajwino will act as an interesting teaching aid that is suitable to be used for all people regardless of age. Therefore, the second objective of this product is to act as learning materials especially for teachers. Moving forward, parents can also use this product as way to attract children in studying tajweed rules. The process of learning while playing will supposedly be much easier and efficient if it was collaborated with a game that build up the mind.

Keywords: Tajweed rules; teaching aid; teaching and learning

1. INTRODUCTION

Nowadays, it is common for teenagers either children were exposed with the gadgets that is not good for their brain development. Therefore, the Tajwino 'Game Card' innovation has been designed specifically to draw their attention to learning and improving their skill of tajwid. This game card is inspired by UNO cards which is one of the most popular game cards among children and adolescent.

The main purposed of this game card produced is to help individuals, especially students to practice the law of tajwid. Besides that, this innovation also aims to create an effective and fun learning environment when combined with games. Past studies have proven that playing while learning can have a more effective effect. Apart from that, some research has mentioned that play is also important for healthy brain

development. This research shows that plays help develop brain development by stimulating the formation of nerve cells. Through learning the Quran, the results of the theory or basics of tajweed learned can be strengthened and practiced by playing this Tajwino card. In addition, students can spare their free time with something more benefit and useful things.
Basically, this game card is played by the concept of tajwid rule where various tajweed rules are introduced in this game using the *hijaiyyah* letter. This games also give some exposure to the students about tajweed rule that becomes forgettable in this era due to the development of technology which can change their mind.

In Islam, tajweed al-Quran plays a very important role in the recitation of the Quran. Learning the law of tajweed is 'Fardhu Kifayah' where if no one has learned it among a group, then all of them are called sinners. If the reader does not know the laws of tajweed until exchange of letters and lines will bring the implications of change the meaning of the verses of al-Quran. If this happens, it will clearly cause sin and 'haram'.

2. INNOVATION DEVELOPMENT

Initially, this project was started on a small scale, which only produced prototypes where game cards were produced using coloured paper only. After realizing its usefulness that can give a quality impact and also the spirit to participate in the KSTI competition in 2019, this project continues by improving the game cards produced using thicker and quality paper. In terms of design and size of the card has also been improved to make it more suitable. This aims to add charm to this game card to better fit the style in the current era.

Figure 1: Prototype

Figure 2: First version

Figure 3: Latest version

This card designed with two games of tajweed. The fact that this game comes with 2 games which is the player can play 2 games using all those cards, we call it 2 in 1. Student will not get bored while playing the games because they can choose between 2 games to play. Second game or side game called 'Tajwino Fast Speed' where in this game the player need to more focus because the game is quite challenging as it requires critical thinking ability in identify the rules of tajwid. It is not just fun to play but the students will get input while having fun but it can be a leaning kit about tajwid rule that can attract them and preserve the tajwid rule for the next generation.

3. COMMERCIAL POTENTIAL

We are inventing the game card that are using some of these materials (refer table 1). This product is design to all people especially the students that are currently studying Tajwid and al-Quran. This are beneficial for them to memorise the reading skill of al-Quran, tajweed and improve their reading of al-Quran by using this game card.

This tajwino card will be introduced and marketed at the primary and secondary school at affordable prices. The price for this set of game cards is RM18. This game card can be used as one of the teaching aids in the teaching and learning of the Quran.

Materials	Quantity	Price per unit
Card + Design	1	RM15
Box	1	RM3
	Total	RM 18

4. CONCLUSION

In conclusion, our product offers an alternative way to all people out there especially muslim to expert tajweed al-Quran. Thus, since we added on the card how to pronounce all of hijaiyyah letters, people starting from early age of 4 can use our product as a beginning before studying tajweed al-Quran. At affordable price, people can have their own Tajwino which consist of game cards and also a book that inform them the rules of the games and the list of Tajweed. Studying the Al-Quran tremendously important for Muslim especially for the day of resurrection. From Uthman Bin Affan RA, Prophet Muhamad SAW said , 'The best among us are the one who study the Al-Quran and teach it. That was the core objective why we worked hand in hand to innovate and produce this product.
The recommendation and improvement that we are planning to do in future is to generate QR Code and improvise our product because as we can see nowadays, human life continue to improve comparable with modernization and development of technologies that are growing rapidly. So, it is suitable if this product continues to be introduced in the form of QR Code. Therefore, people can just install from play store and scan the QR Code to start playing the game. We believe that with this product's recommendation and improvement, our product can help people to improve and expert in tajweed al-Quran and reach through international markets and compete fairly with other innovation ideas and products.

ACKNOWLEDGEMENT

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Plastic Waste into Reusable Bricks for Green Building and Landscaping Materials

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ABSTRACT

Today's world is seeing an increase in waste that is causing damage to the earth. The earth is exposed to the extremely polluted environment if the waste is not properly managed. The main objective of this innovation is to reduce the current plastic waste that is rising rapidly throughout the years while producing a material that can be use in the landscaping and construction industry. This work uses Polypropylene (PP) which is a type of thermoplastic that can easily be found in plastic waste. It can be re-moulded and recyclable to create other materials which in this case a prototype plastic brick. The plastic brick was processed to mix with other materials as fillers. These include waste rubber powder, and calcium carbonate ($CaCO_3$). From previous research papers and articles, it is found that these fillers can significantly improve the properties of polypropylene (PP). In this study, coconut ash was added to strengthen the bricks. Therefore, it is concluded that, these plastic bricks have the potential to meet market needs to replace standard clay bricks. To support the government's call for recycling of waste, this innovation has the potential to help reduce plastic waste, resulting in a product that can be categorized as a green technology product.

Keywords: Polypropylene; calcium carbonate; bricks; landscaping; coconut ash

1. INTRODUCTION

Over the years, the number of natural pollution cases are increasing significantly. The air, water, and surroundings, all of them were polluted by the behavior of irresponsible human being. This situation threatens our earth a lot and we must act to provide a more suitable place for all the living things to live on. The most common cases are water pollution. Materials such as metals, plastics, bottles, glass, poly bags, chemicals, batteries, etc. are called non-biodegradable substances always being thrown in the water, causing harm to the environment.

The main objective of this work is to develop an efficient way to effectively utilize the waste plastic which is great threat for the ecological balance. Plastic has numerous uses; plastics do pose disposal problems. The motive being reduction of environmental related hazards from plastic. Next, to reduce the water pollution, all the harmful substances to the water needs to be recycled, not being thrown away like

that. In our study, we will be discussing about how to recycle plastic bags into a useful object; that are bricks. Bricks are commonly made of clay-bearing soil, sand, and lime, or concrete materials.

To fully make use of plastic waste, thermoplastic known as polypropylene (PP) is used. PP is mixed with calcium carbonate ($CaCO_3$) to act as fillers. When heat is applied to Calcium Carbonate ($CaCO_3$), it will decompose. These plastic bricks have a great potential to be marketable and have high demand in construction and landscaping industries. Hopefully, plastic bricks can become the great challenger with the industry of clay bricks-making.

2. INNOVATION DEVELOPMENT

To fully make use of plastic waste, thermoplastic known as Polypropylene (PP) is used as it is one of the most common thermoplastics that can be found. PP is completely recyclable and can be moulded to be used in other materials. It is the lightest polymers among a variety of plastics and has excellent chemical resistance to acids, alcohols, and bases. Most importantly, PP has good resistance to environmental stress cracking [9]. PP is mixed with Calcium Carbonate ($CaCO_3$) to act as fillers. Instead of extracting $CaCO_3$ from limestones which can increase the cost of making the bricks, we decided to extract $CaCO_3$ from eggshells. This can greatly reduce the cost of making the bricks while still using the properties of $CaCO_3$ which can increase both impact strength and flexural modulus (stiffness) [11]. When heat is applied to Calcium carbonate ($CaCO_3$), it will decompose to produce carbon dioxide (CO_2) which does not support combustion [10]. Thus, the addition of $CaCO_3$ can act as a good filler that can contribute to flame retardant property.

$$CaCO_3 \rightarrow CaO + CO_2$$

Waste rubber powder can also contribute as a good filler as it enhances the properties of PP [12]. With all these excellent properties that are added to our plastic bricks, we believed that it is a good alternative to clay bricks. Besides that, coconut ash is added to strongly 'hold' the bricks.

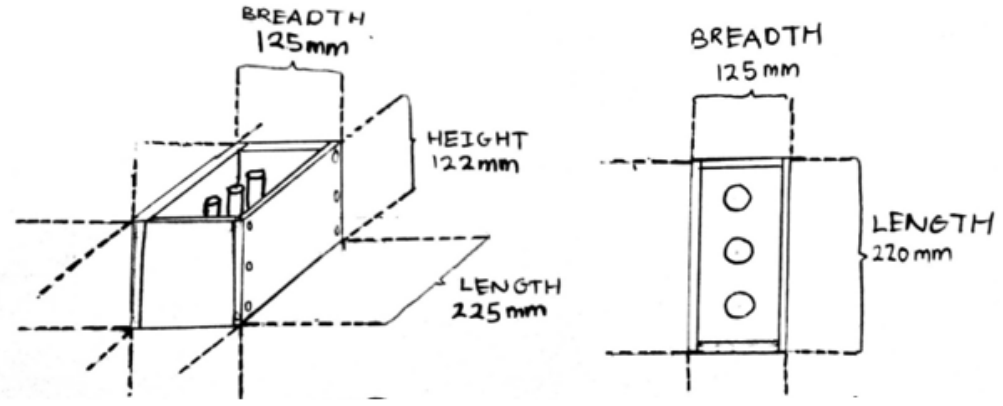

Figure 1: Prototype mould

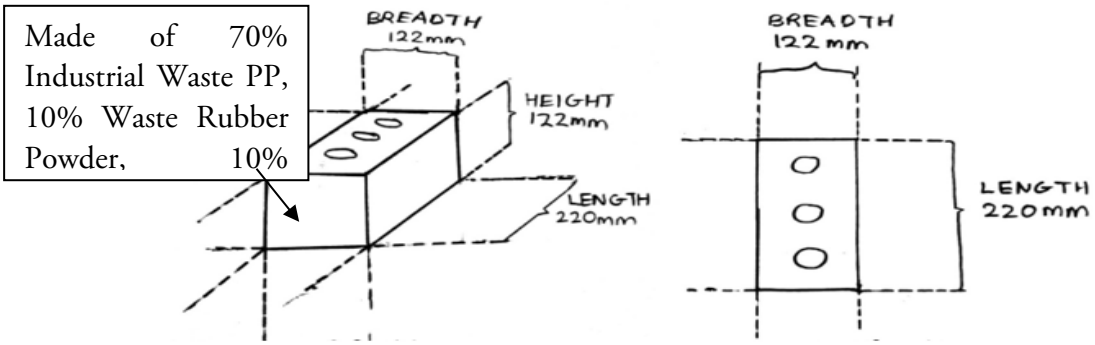

Figure 2: Plastic brick

Figure 4: Plastic melter

Figure 3: Example of 3 holes brick

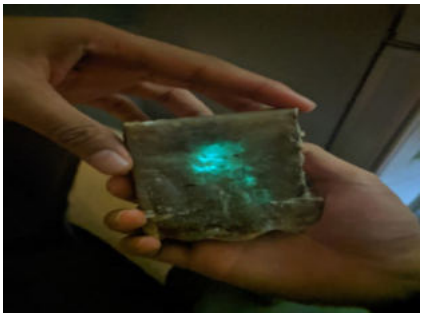

Figure 5: Sample of bricks

Figure 6: Sample of brick in mould

Figure 7: Mixed of calcium carbonate from egg shell and coconut ash

3. COMMERCIAL POTENTIAL

By creating the plastic bricks from the plastic waste, it become an initiative to make sure human reduce the plastic waste that is released to the environment. Based on research on 2015, it is calculated that 275 million metric tons (MT) of plastic waste was generated in 192 coastal countries in 2010, with 4.8 to 12.7 million MT entering the ocean [1]. This show how critical the plastic waste that made by humans' hand. Thus, it is believed that this innovation has a great potential to be marketable and have high demand in landscaping industries as it is not just can save the environment, but it also can fulfil the market of landscaping's materials. As can see in this half of century, the application of green building/landscaping become necessary and obligatory specification in the construction field. Green building is the criteria that focusing on increase the efficiency of resource use – energy, water, and materials – while reducing its impact on human health and the environment during the building's lifecycle. As example, the Green Building Index (GBI) is introduced in Malaysia. The Green Building Index (GBI) is Malaysia's industry recognised green rating tool for buildings to promote sustainability in the built environment and raise awareness among Developers, Architects, Engineers, Planners, Designers, Contractors and the Public about environmental issues and our responsibility to the future generations [2]. Thus, the idea of plastic bricks is an ideal material that can fulfil the criteria of green building in developing better surrounding. As to adapt with this rule, developers must find out anything that low in cost and high in quality. It is believed that plastic bricks can become the great challenger with the industry of clay bricks-making. By comparing them with their physical matter, it seems that plastic PP (polypropylene) have more advantages than clay. By comparing both of their specific heat capacity, PP got 1250 J/kg°C while clay got 1381 J/kg°C [3]. It means that PP will consume less preparation time than clay and fewer heat energy needed for make the plastic bricks. In the terms of thermal conductivity, PP seems have less thermal conductivity [4] that clay [5] and we can say in the future usage plastic bricks is better insulator than clay, thus it means the future user does not have major problem in temperature of the inner building. In addition, plastic bricks only use the waste material that easily can be found from the tyre, plastic waste and eggshell. It can simply say that the usage of plastic bricks is more economic than the clay bricks. As conclusion, plastic bricks just not solve the environment problems, but it can also become crucial in the civil and construction department if its usage is commercialized. If a clay brick is sold with RM 2.60 per piece (based on ewarehouse.my) [6], it only needs less than RM 1/pc as a capital of plastic bricks preparation and RM 1.50 is the reasonable price for plastic bricks.

Table 1: Compositions of bricks prepared [6]

Sample Brick	Composition in weight (%)	Density (kg/m^3)
Plastic Brick	70% Industrial Waste PP, 10% Waste Rubber Powder, and 10% $CaCO_3$	599.32
Clay Brick (Commercialized)	100% Clay Brick	1791.63

Table 2: Results of the compressive test on the bricks sample [6]

Sample Brick	Clay Brick (Commercialized)	Plastic Brick
Length of Brick, L (mm)	225	220
Breadth of Brick, B (mm)	110	122
Area of Brick, A (mm^2)	24750	26840
Load at Failure, P (N)	900000 (9.03 Tons)	170000 (17.06 Tons)
Compressive Strength, P/A(N/mm^2)	3.636	6.333

4. CONCLUSION

In conclusion, this work can effectively convert plastic waste into useful bricks that can be use in the building and construction industry. These prototype plastic bricks does not only help decrease the problem of plastic waste going into landfills and causing environmental pollution, but it also managed to reduce the cost of making bricks while still possessing properties of a standard brick. From the compression results, the prototype plastic brick that is made of 70% PP, 10% waste rubber powder,10% coconut ash and 10% $CaCO_3$ managed to have a greater compressive strength when compare to a standard brick made of clay. However, there are many other fillers in the market that can help improve the properties of these plastic bricks other than $CaCO_3$ and waste rubber powder. More experimentation must be done with different functional fillers as it might improve the properties of these plastic bricks. A good functional filler would have low cost, safe, inert, stronger than the polymer and readily available world-wide. Furthermore, the use of extruder can ease the making of these plastic bricks rather than heating the plastic waste manually.

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Flos Potentia

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ABSTRACT

Flowers are always regarded as a symbol of love, beauty and gift of nature. People often use flowers to portray their feelings and happiness. In such events like weddings, graduations, and valentine's day, people express their appreciations towards loved ones with bouquet of fresh flowers. However, these flower bouquets only last for a certain period of time. Therefore, a product named Flos Potentia is introduced to preserve the freshness of the flowers and make them last longer. The list of ingredients tested to make this product are water, paracetamol, glycerine, eggshells and distilled water. The eggshells are boiled and extracted by using distilled water which produced a new solution called hyaluronic acid. Therefore, there are two main solutions considered to preserve the freshness of the fresh flowers which are glycerine and hyaluronic acid. Next, five containers of constant size are used to place the flowers with the solutions, where these five different solutions are tested to get the best results. The experiment took about two to three weeks where the best preservation for the flowers turns out to be the handmade hyaluronic acid, followed by glycerine with boiled water, glycerine with warm water, paracetamol with water, and lastly, water.

Keywords: Flower; preserver; glycerine; hyaluronic acid; paracetamol

1. INTRODUCTION

Flowers play an important part in human's life as they are used to portray feelings and happiness. Fresh flowers are commonly used compared to artificial flowers due to its natural properties such as their smells, colours, textures and structures. However, fresh flowers have a short lifespan when they are cut off from the plants. Therefore, a product named Flos Potentia is introduced to overcome this problem. The list of possible ingredients tested to make this product are water, glycerine, eggshells, distilled water and paracetamol. However, after some extractions and separation processes, there are five different solutions used to test the freshness of the flowers. They are handmade hyaluronic acid, combination of glycerine and boiled water, combination of glycerine and warm water, combination of water and paracetamol and finally plain water. In order to avoid unnecessary factor that might affect the correct result, five containers of similar size have been chosen and used to fill in the solutions. The time taken to proceed this experiment is between two to three weeks. This experiment needs a prolonged observation, where the

changes of the flowers are recorded every three days. Based on the observation and results from the experiments, it was found that the handmade hyaluronic acid gives the best preservation to the flowers.

2. INNOVATION DEVELOPMENT

The production of this product is simple and it is made of only several ingredients. Even so, these ingredients produce solutions with suitable properties to preserve the flowers. Figure 2.1 to Figure 2.5 show the list of ingredients used in this research.

Figure 2.1: Water

Figure 2.2: Plant glycerine

Figure 2.3: Distilled water

Figure 2.4: Eggshells

Figure 2.5: Paracetamol

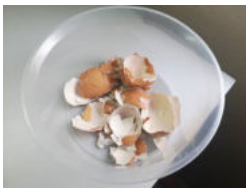
In order to prove the effectiveness of the ingredients, these ingredients have been extracted and separated into five main solutions which consist of handmade hyaluronic acid, glycerine with boiled water, glycerine with warm water, paracetamol with water, and water. Throughout this research, red rose is chosen for the experiment. Figure 2.6 and Figure 2.7 show the red roses and container used to fill in the solutions.

Figure 2.6: Red rose

Figure 2.7: Container

The method of the experiment is simple and easy to proceed. Before that, the process of making the hyaluronic acid by using eggshells are first discussed in Table 2.1.

Table 2.1: Steps in making the hyaluronic acid

Step	Process
Step 1: Crack the shell of the eggs. Pour the egg white and yolk into a container. Store the egg white and yolk in the refrigerator for future use.	
Step 2: Wash the inside and outside of the egg with warm water. Remove all remaining yolk and egg membrane. Place the egg shells in a plastic bag. Close the bag. Push on the shells from the outside of the bag. Crack the shell into small pieces.	
Step 3: Boil distilled water in a cooking pot. Fill the cooking pot halfway to avoid spillage when boiling. Distilled water is used to maintain the purity of the hyaluronic acid. Put the cracked egg shells into the boiling water. Place a cover on the cooking pot. Boil the egg shells and water. Top up water as necessary.	
Step 4: Grind the shells using pestle and mortar until smooth.	
Step 5: Pour the liquid through a fine strainer into a glass Mason jar. The strainer removes the egg shell particles. Store the hyaluronic acid solution in a glass Mason jar. The solution contains a large amount of hyaluronic acid.	

Next, the process of the experiment is discussed. Firstly, five red roses that are freshly cut from their plants are chosen. In this experiment, these fresh roses are cut together with their stems for about 16 cm long. After the roses have been cut, the mixtures or solutions for the preservation process are prepared. After the solutions are ready, the roses are placed into the containers that are filled with the prepared solutions. The roses are left in the mixture for two to three weeks. Starting from day one, the changes of the roses which includes their colour, petals and stems are recorded every three days.

The research methodology of this product are presented in the following steps.

Step 1:	Cut the stem of red roses diagonally for about 16cm long.
Step 2:	Prepare five mixtures or solutions for the roses which includes handmade hyaluronic acid, glycerine with boiled water, glycerine with warm water, paracetamol with water, and water.
Step 3:	Place the roses into the container and left for two to three weeks.
Step 4:	Observe and check the differences of the roses which includes their colour, petals and stems.

Following that, five different solutions of the experiment are given in the following figures.

Figure 2.8: Hyaluronic acid

Figure 2.9: Glycerine with boiled water

Figure 2.10: Glycerine with warm water

Figure 2.11: Paracetamol with water

Figure 2.12: Water

3. COMMERCIAL POTENTIAL

The target market for this product are housewife, woman, florist, wedding planner, and event organizer. The cost for one bottle of handmade hyaluronic acid of 100 ml is around RM5.

4. CONCLUSION

In order to choose the best preservatives for the fresh flowers, an experiment have been conducted by using five different types of solutions. The solutions include handmade hyaluronic acid, glycerine with boiled water, glycerine with warm water, paracetamol with water, and water. After three weeks, it was found that handmade hyaluronic acid gives the best preservation to the flowers since the colour, petals and stem of the red rose remain fresh and bright.

ACKNOWLEDGEMENT

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Parto Vacuum Cleaner

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ABSTRACT

Environmental pollution is a serious problem that threatens the survival of mankind. One of the activities that can reduce environmental pollution is by recycling waste materials. Recycling is the method of regaining, reprocessing, and reusing the waste materials that would be thrown away. The most commonly recycled materials include paper, glass, plastic, and metals. Using various types of waste materials, a simple, small size, battery operated and user-friendly portable vacuum cleaner was designed. This vacuum cleaner is suitable to be used by children to educate them about cleanliness and also by adolescents and adult especially when the cleaning involves the tiny surfaces or holes. The vacuum cleaner, Parto Vacuum Cleaner main components include an axial fan, dust compartment, sucker tube, and 9V DC. Since the construction of the Parto Vacuum Cleaner is simple, children can even do it by themselves (DIY method). Parto Vacuum Cleaner is an effective, simple and low-cost vacuum cleaner suitable to be used when cleaning tiny surfaces or holes has the potential to be patented and commercialized.

Keywords: DIY method; vacuum cleaner; DC battery; waste material

1. INTRODUCTION

Environmental pollution is a serious problem that threatens the survival of mankind. One of the activities that can reduce environmental pollution is by recycling waste materials. Recycling is the method of regaining, reprocessing, and reusing the waste materials that would be thrown away [1]. The most commonly recycled materials include paper, glass, plastic, and metals [1,2]. Using various types of waste materials, a simple, small size, battery operated and user-friendly portable vacuum cleaner was designed.

A vacuum cleaner is a common cleaning tool and has been invented year by year in reducing energy for the cleaning process [3]. Vacuum cleaners have a variety of sizes and models, from large to small model battery-powered, which are usually used in homes as well as in industry [4]. The various types of commercial vacuum models including hand-held vacuum cleaner, stick vacuum cleaner and upright vacuum cleaner [5, 6], and the present vacuum cleaner are quite expensive and have a high maintenance cost [7]. This paper suggests the use of DC battery using waste materials in designing the portable vacuum cleaner and friendly user.

2. INNOVATION DEVELOPMENT

Product Description

Parto Vacuum Cleaner main components include an axial fan, dust compartment, sucker tube, and 9V DC. An Axial Flow Fan is used to generate suction pressure to suck the garbage, dust or dirt [8].

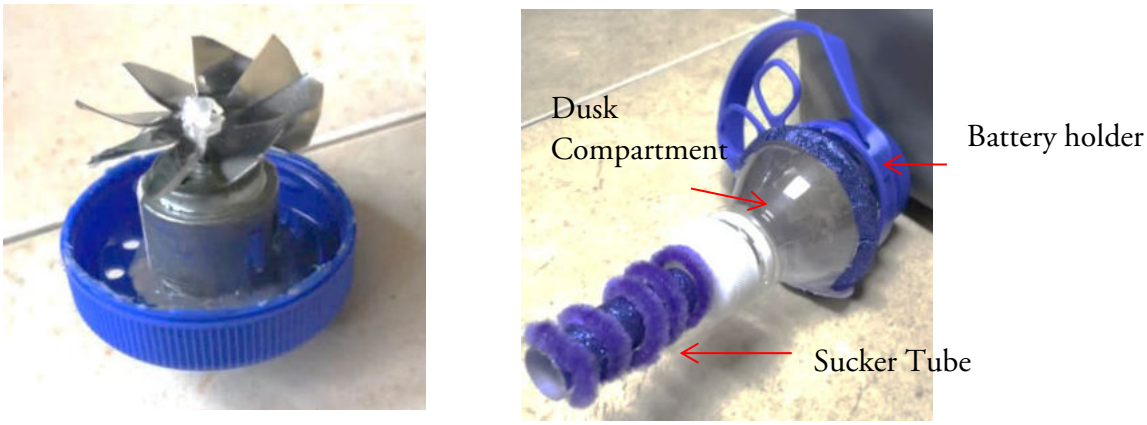

Figure 1: (a) Axial fan **(b)** Parto vacuum cleaner design

The materials including waste materials used to construct the Parto Vacuum Cleaner are as follows:

(a) (b) (c) (d) (e) (f)

Figure 2: (a) 5.5 Liter bottle **(b)** 1.5 Liter bottle **(c)** Biscuit tin **(d)** 9V battery **(e)** Battery socket **(f)** Filter net

Product Preparation

There are some important steps of designing Parto Vacuum Cleaner as shown below.

Figure 3: Preparation of parto vacuum cleaner

Working Principle

When the Parto Vacuum Cleaner is switched ON, the axial fan blades turn at its axis, the suction pressure is produced [8] whereas airflow is created with a high flow rate for sucking the outside dust into the vacuum. The ambient air pushes dust into suction mouth since the pressure inside the vacuum is lower than outside pressure.

3. COMMERCIAL POTENTIAL

This simple technology product is very useful in everyday life such as to clean study table in shorter time, to remove dust from toys for children and also to suck dust on devices like laptop. It is surely can go pretty much anywhere you need it to and still work as you intend for it to. In other word, this product has the potential to be patented and commercialized due to friendly user which suitable for being used at home, office, school and even in car.

4. CONCLUSION

Parto Vacuum Cleaner is an effective, simple and low-cost vacuum cleaner suitable to be used when cleaning tiny surfaces or holes has the potential to be patented and commercialized.

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Feed Formulation in Chicky Crunch Production

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ABSTRACT

It is essential to provide chickens with feeds that can contribute to their optimum health to bread a healthy chicken. However, some of the commercial chicken feeds available in the market have issue with their Halal status. The ingredients might contain enzymes that originated from the swine's stomach. Besides that, harmful chemicals such as roxarsone are added as the food additives because the feed's formulation lacks in nutrients. These two issues are the major concerns in the commercial chicken feeds. Thus, a new formulation of chicken feed, "**Chicky Crunch**" is introduced to overcome problems in the commercial chicken feed. The main ingredients in Chicken Crunch are made up from the waste materials such as palm kernel cake, rice bran, eggshell and bitter bean weed. Palm kernel cake is a good source for protein while rice bran and eggshell are the source for the carbohydrate and calcium, respectively. Apart from that, nutrients from bitter bean weed offer a good immunisation boost for the chicken. Hence, these ingredients will nourish the chicken with all the diets needed. The process of making the Chicky Crunch involves the blending of all the materials, kneading the blended materials and drying under the sun. The chicken feed was then tested to a group of chicks to see their growth's effect. The well-fed chicks grew healthier after a few weeks. In conclusion, this new feed formulation brings a solution in creating an alternative chicken feed that is free from harmful chemicals, rich with indispensable nutrients and most importantly contains Halal materials.

Keywords: Chicken feed; palm kernel cake; waste material; halal; nutritious

1. INTRODUCTION

The broiler industry in Malaysia is growing rapidly to keep the demand for the chicken's meat every year. Based on the statistic from the Department Veterinary Services, the production of chicken's meat in Malaysia is increased from 1664.9 million in year 2017 to 1707.6 million in 2018 and it is expected to keep increasing in year 2020 [1,2]. However, the broiler industry faces a heavy challenge because of some issues related to the chicken feed.

In Malaysia, a lot of issues had arisen regarding the Halal integrity of chicken feed. To build a Halal supply chain from animal-based product, the source of the animal feed should be Halal first, besides having proper slaughterhouse and proper segregation. In September 2017, a newspaper in Malaysia,

Harian Metro posted about the use of enzyme originated from the swine in chicken feed. Meanwhile, a research done by Khattak et al., in 2011 shows that pepsin or protease enzymes can be extracted from the swine's stomach [3,4]. These enzymes are needed to be added in poultry feed to increase the protein content in feed. The commercial chicken feeds in Malaysia do not specified in detail the type of enzymes used in the production. Hence, it arose a suspicious thought among the buyers and weaken the Halal integrity of the livestock to be commercialized for their poultry meat and eggs.

The ingredients in commercial chicken feed consist of 19-17% of protein from animal protein, 5% of fibre from corn, soybean, or other types of grains, minerals and additives [5]. The additives used in chicken feed is synthetically produced from few types of chemical, including a harmful chemical [6]. The function of the additives is to boost the chicken muscle and improve the pigmentation in meat because the formulation of chicken feed lacks in nutrients. But the use of harmful chemicals, such as roxarsone, might led to the negative side effect to those who consumed the chicken's meat.

In addition to that, the raw ingredients for animal feeds including the feeds for chicken are imported from abroad. In 2015, Malaysia imported about 3.5 million metric ton corn from Argentina to support the broiler industry. However, the process needs a high cost of budget to keep sustained [7].

Therefore, to overcome these problems, a new chicken feed is produced by using a healthy and Halal materials. The product is branded as Chicky Crunch which uses a special formulated feed that made up from Halal and low cost of materials. Chicky Crunch provide full nutrients needed for chicken.

2. INNOVATION DEVELOPMENT

The formulation of Chicky Crunch is developed from palm kernel cake, rice bran, eggshell and bitter bean weed. The percentage of these mixtures in the formulation of Chicky Crunch are fixed to 33.3 % of palm kernel cake, 33.3% of rice bran, 16.7 % of eggshell and 16.7 % of bitter bean weed. Figure 1 shows the images of the materials used in the product formulation. Palm kernel cake, rice brain and the eggshell are the waste products. The palm kernel cake is the by-product produces during palm kernel crushing process. It is a good source for protein and high in fibre. Meanwhile, both rice bran and eggshell are used as the source for the carbohydrate, fibre and calcium. On the other hand, bitter bean weed is a non-edible fruit. People do not consume bitter bean weed because of the bean size is too small. However, it has ample of nutrients and vitamins that needed in chicken feed.

Figure 5: The images of (a) palm kernel cake (b) rice bran (c) bitter bean weed (d) eggshell

The steps in processing Chicky Chrunch is shown in Figure 2. It begins with the blend of all the materials using a mixer, followed by the addition of tapioca starch until the mixture formed a doughy texture that could be easily knead by hand. After kneading, it was then placed on aluminium foil to dry under the sunlight until the doughy texture was no longer sticky. The mixture was then compressed to form a pellet.

Figure 6: The flowchart shows the process in producing Chicky Crunch

3. COMMERCIAL POTENTIAL

Chicky Crunch has a potential to be commercialized as an alternative to the commercial chicken feed in market because the cheap production cost and the materials used are rich with nutritional values, free from chemicals and Halal. The commercialization of Chicky Crunch will benefit the broiler and poultry industry in Malaysia.

4. CONCLUSION

In conclusion, providing a healthy chicken is an aspect that holds an important role in producing a healthy chicken's meats and eggs for human diet. However, the breeding of a healthy chicken does not depend solely on their hygiene routine, but it also coming from the goodness of the foods that they took. It is essential to provide chickens with feeds that can contribute to their optimum health. Thus, Chicky Crunch could be a good alternative as chicken feed because it formulated with a highly nutritious and Halal ingredient.

ACKNOWLEDGEMENT

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AUTO-MAT DRYER

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ABSTRACT

Home accidents cases in Malaysia are contributed by falls on the same level that due to slipping, tripping and stumbling. Home injury mainly happened because of not fully dried foot that led to slipping. The standard foot mat used at home is not user friendly because it can lead to slippery. One of the main problems the inconvenient foot mat is always in wet condition. Therefore, an invention named AUTO-MAT Dryer is introduced as an alternative way to upsize the drying capability compared to standard foot mat. The main components of AUTO-MAT Dryer include nichrome, polyvinyl chloride (PVC), rubber sheet, fans and 12V DC. This foot dryer is designed by adding axial fan, heating element powered by electric and activated by a mere of touch and pressure. This foot dryer is able to minimize the home injury caused by slipping and falling. The AUTO-MAT Dryer is an effective, simple, low cost and has a potential to be patented and commercialized.

Keywords: Foot dryer; home injury; economical; slippery

1. INTRODUCTION

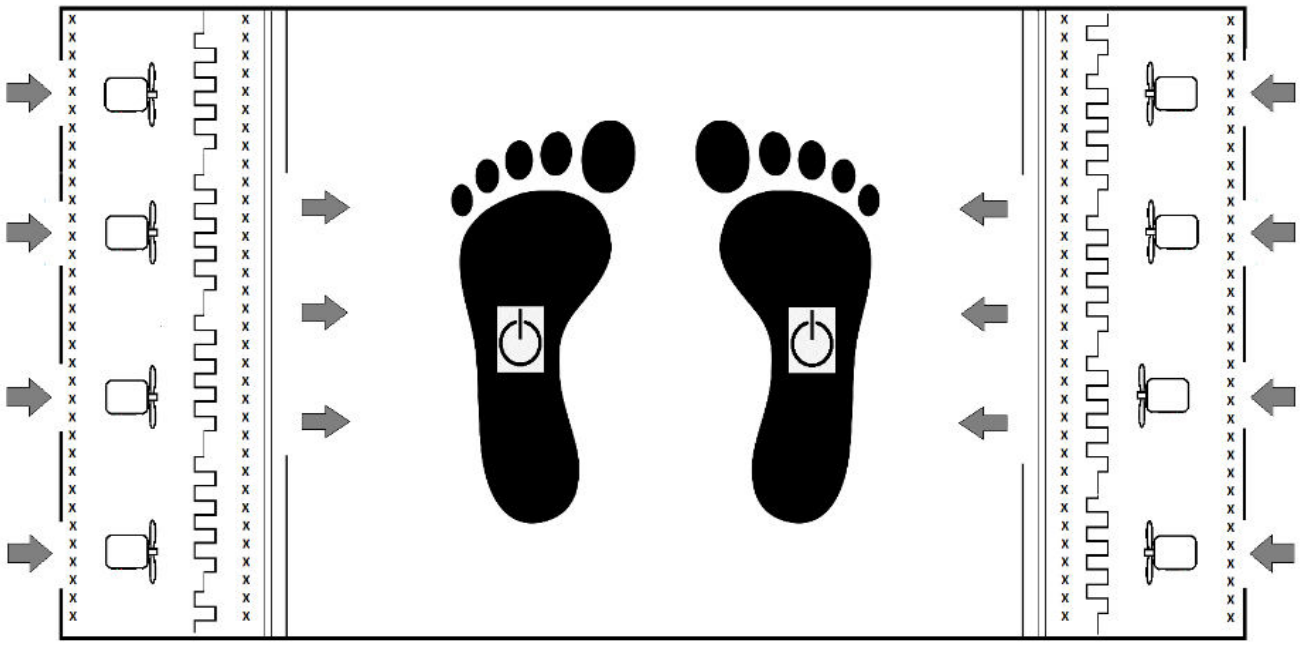
Home accidents are second to road as a place for injury and morbidity that may be fatal. There were 13,401 cases of such kind of accidents reported and 0.3% (44 of the cases) are deadly [1]. One of the most common causes of accident at home is slippery [2]. Slipping and falling can lead to serious and sometimes permanent injuries, especially for children and the elderly [3-4]. The Occupational Safety and Health Administration (OSHA) estimates that slip trip and fall accidents is higher compared to car accidents [5-6].

The most common hazards at home that can cause slips and falls include unconditional foot mat. Therefore, to overcome this problem, an innovation development which is AUTO-MAT Dryer is designed with modern looks and innovative features, safety and style with this foot dryer. Foot dryers come with a sensor to start the dryer, which then blows out hot air. This foot dryer take about 50-60 seconds are most efficiency comparatively standard foot mat.

2. INNOVATION DEVELOPMENT

Product Description

AUTO-MAT Dryer main components include nichrome, polyvinyl chloride (PVC), rubber sheet, axial fans and DC motor.



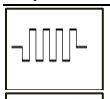
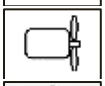
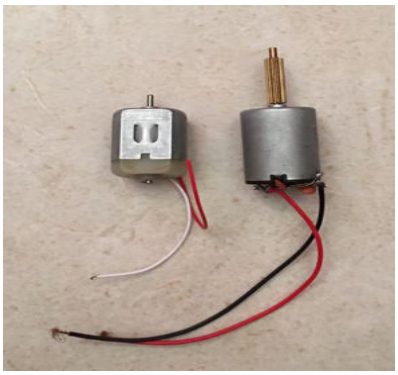
Symbol	Component
	Nichrome : Heating element
	Fan
	Switch/Sensor

Figure 1: AUTO-MAT dryer schematic diagram

The materials used to construct the AUTO-MAT Dryer are as follows:

(a)



(b)

(c)

(d)

(e)

Figure 2: (a) Polyvinyl chloride (PVC) pipe **(b)** DC Motor **(c)** Axial fans **(d)** Nichrome **(e)** Rubber sheet

Working Principle

This AUTO-MAT Dryer works by DC motors that functions to spin blower in a horizontal arrangement and hot air is created by heating element (nichrome) will flow out. This foot dryer is activated by a touch or pressure sensitive sensors that located at the middle of the mat.

3. COMMERCIAL POTENTIAL

This product is made for community especially household, elderly homes and public places such as mosque and hospitals. Has a potential to be patented and commercialized.

4. CONCLUSION

AUTO-MAT Dryer is a solution in countering home injury caused by falling and slipping. This is an innovative product and has a potential to be patented and commercialized.

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"THEFTPROOF"

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ABSTRACT

Nowadays, theft incident often occurs in Malaysia. Thieves are now using many methods to steal things including snatching, scams and even pickpocket. The items most often targeted by thieves were purses, smartphones and car keys because they are easy to carry and easy to hide. Because of that, 'Theftproof' was innovated to prevent these incidents from happening. 'Theftproof' have a very convenience shape and size where the size is tiny, and it comes with various shape. Its shape can give confusion for everyone who sees it because it looks like ornament that fit well with the items it attached. It has two parts which one of them will be attached on the precious belongings of the users; one more part will be attached on the users. If they are being apart for more than five meters for instance, the 'Theftproof' will make an alarming sound to show that the item is missing or be taken away. Thus, the users can notify it and can take action faster so that their precious item will not be stolen. The people around the stolen item can also take action by stopping the thief from going too far. We believe that our project, 'Theftproof' will get a high demand in national and international market because of its characteristic that is user-friendly and multi-purpose. 'Theftproof' can be applied on so many items including the user's children. It is one of the needs in our society because everyone loves their belongings and do not want to lose them. Thus, 'Theftproof' can minimize the society's worries by notify the users and give an early warning. Furthermore, this project can enhance the creativity skill and developed the innovation of technology to solve the problem in STEM study as encouraging from Malaysia Education Ministry.

Keywords: Theftproof; small size; pickpocket; various shape; alarming sound

1. INTRODUCTION

Nowadays, theft incident often occurs in Malaysia especially for those living in city. Thieves are more active these days in engaging their illegal activities without fear of being arrested for stealing things. Moreover, thieves are now using many methods to steal things including snatching, scams and even pickpocket. The items most often targeted by thieves were purses, smartphones, car keys and also handbags that women used to carry all of their valuable stuffs. These items are often their main target because of their small nature, easy to carry and easy to hide. Whereas the targeted places have always been the place filled with people such as shopping malls, mosque and even RNRs. This would not only disrupt

the economy of the victims but could also give a side effect such as traumatized with the event that happened.

Because of that, 'Theftproof' was innovated to give a solution for the problems that arise. One of the objectives of this project is to prevent the special belongings of the users being stolen. As stated above, the thieves have been more creative in stealing. They try to use many ways so that their attempt to steal without people notice succeed. Most cases of robbery and snatch theft are carried out by certain individuals who are constantly eyeing the opportunity to commit a crime when they have the space to do so [3]. But, with the innovation of 'Theftproof' their silent steal will not succeed as the items they stole will make an alarming sound. This sound eventually will tell others that something is not right happening at the moment. The people around the stolen item can approach them and try to stop them from going too far.

Other than that, this innovation can also prevent someone from being traumatized with their losing items. In today's world, everything is on the tip of our fingers. Many special items are in small size such as handphone, car keys and purses. All of these small items keep many important matters in there. For example, purses contain money, credit cards, debit cards and not to forget, identity cards in there. The losing of a purse means the losing of all the important matters in there too. People may get traumatized when their identity had been stolen or framed by the thieves. Small items mean big chance for the thieves to steal it without the users notice. So, 'Theftproof' can prevent these terrifying incidents from happening.

The innovation of 'Theftproof' technology came with many kinds of motivation. It can be observed by looking forward to the theft cases that are unstoppably happening nowadays. It gives various sides effects to the victims including emotional disrupt. They may experience feelings of helplessness. A 2016 Identity Theft Resource Center survey of identity theft victims sheds light on the prevalence of this emotional suffering caused by identity theft. 74 percent of respondents reported feeling stressed, 69 percent reported feelings of fear related to personal financial safety, 60 percent reported anxiety, 42 percent reported fearing for the financial security of family members and 8 percent reported feeling suicidal [1]. Not only that, the victims may Limit their social life or work life, or changing their lifestyle, by not going to places like where the crime occurred or being afraid to go out altogether, because of unease or fears of revictimization [2]. Therefore, our concern towards the society's safety also motivated us to invent 'Theftproof'.

2. INNOVATION DEVELOPMENT

Thieves are now using many methods to steal things so, as a way to avoid these occurrences, we decided to make a pair of devices called 'Theftproof'. This pair of devices can prevent any loss of personal belongings or robbery by emitting a loud sound to alert and notice the person that their belongings have been stolen or lost. This will reduce the rate of robbery and thief will no longer has the chance to steal people's belongings. 'Theftproof' is said to be different from other anti-lost device or device tracker because of its small size and unique shapes which is very handy and attractive. This will cause people to mistakenly see the devices as phone accessories and does not care about the purpose of the devices. Moreover, 'Theftproof' does not need any wi-fi or data connection to avoid any problems regarding

internet connections. It has two devices connected through bluetooth by an application that is installed in the smartphone. 'Theftproof' uses a small lithium battery which can be replaced each year so the device can last long until it is broken. There is also an application that helps 'Theftproof' works more easily and effectively. The application is not that complex compared to some other previous applications as there are only few options and controls available. For example, user's information, 'Home' option, devices volume and security passcode.

The way 'Theftproof' works is, one of the 'Theftproof' device pair will be applied or attached on smartphones, wallets, laptops or any valuable belongings, while another one will be attached closest to the user such as watch, clothes, necklaces or even bracelets. This is because 'Theftproof' uses the concept of transmitting and receive which will cause the device to emit sound if both of them are far away from each other and out of some specific range. For instance, if the devices are being apart for more than 3m, 'Theftproof' will make an alarming sound to show that the item is missing or taken away from the user. Other than that, 'Theftproof' also will have a 'Home' option which able the user to set a desirable radius in their house to keep the devices stay silent. This will prevent any annoying repeated sounds when one device is located at the living room while another is located in the room upstairs even though there is no stealing or danger in action.

The application is first installed in the user's smartphone after having the 'Theftproof' device. After that, the user needs to fill in their information such as name, email address, some security questions and country. Then, the user is asked to set the house radius such as single or double storey house, the house area measurement and any house compound or backyard area measurement. Therefore, these will make sure that the house area is included as the devices safe area. Lastly, the user can explore more on the device setting such as increasing the volume to maximum, desirable range between 1 meter until 5 meter or add an extra security passcode on the device to make sure that no one can change the settings and user information.

3. COMMERCIAL POTENTIAL

Nowadays, theft incident often occurs in Malaysia especially for those living in city. Thieves are more active these days in engaging their illegal activities without fear of being arrested for stealing things. Moreover, thieves are now using many methods to steal things including snatching, scams and even pickpocket. The items most often targeted by thieves were purses, smartphones, car keys and also handbags that women used to carry all of their valuable stuffs. These items are often their main target because of their small nature, easy to carry and easy to hide. Whereas the targeted places have always been the place filled with people such as shopping malls, mosque and even RNRs. This would not only disrupt the economy of the victims but could also give a side effect such as traumatized with the event that happened.

Because of that, 'Theftproof' is innovated to help those people or society to be alert with their precious belongings. As stated above, the item that is the most targeted by the thieves are mostly small items that is easy to carry and easy to hide such as purses, smartphones and even car keys. These small items not

only can be an easy target, but also an easy item to be forgotten. For instance, people always forget to pick up the car key they left on the table after eating at a restaurant. This situation opens the opportunity for the thieves to do their work. By using 'Theftproof', all of the problems can be settled down. The users only have to follow a simple instruction and the device is ready to use.

'Theftproof' come with two devices, one will be attached on the items that is always be with the users such as clothes and one more will be attached on the precious belongings of the users. Once the devices are on place, one application can be installed to control the functionality of this device. Both of the devices will not make any sound if they are still in the range area (safe area). For example, in the radius of 5 meter from each other, this device will not make any alarming sound because they are still in a safe area. If the device is being apart for more than 5 meters, it will make an alarming sound to inform the user that their belongings had been stolen. As a result, the user will be alert with the sound and make a move to find the missing items. The people around the thieves can also take action by stopping them or asking them why these items make sound unstoppably. The thieves will feel uneasy and distracted with that kind of situation. By this, the user can find their items faster than they have to wait for the authorities to arrest the thieves.

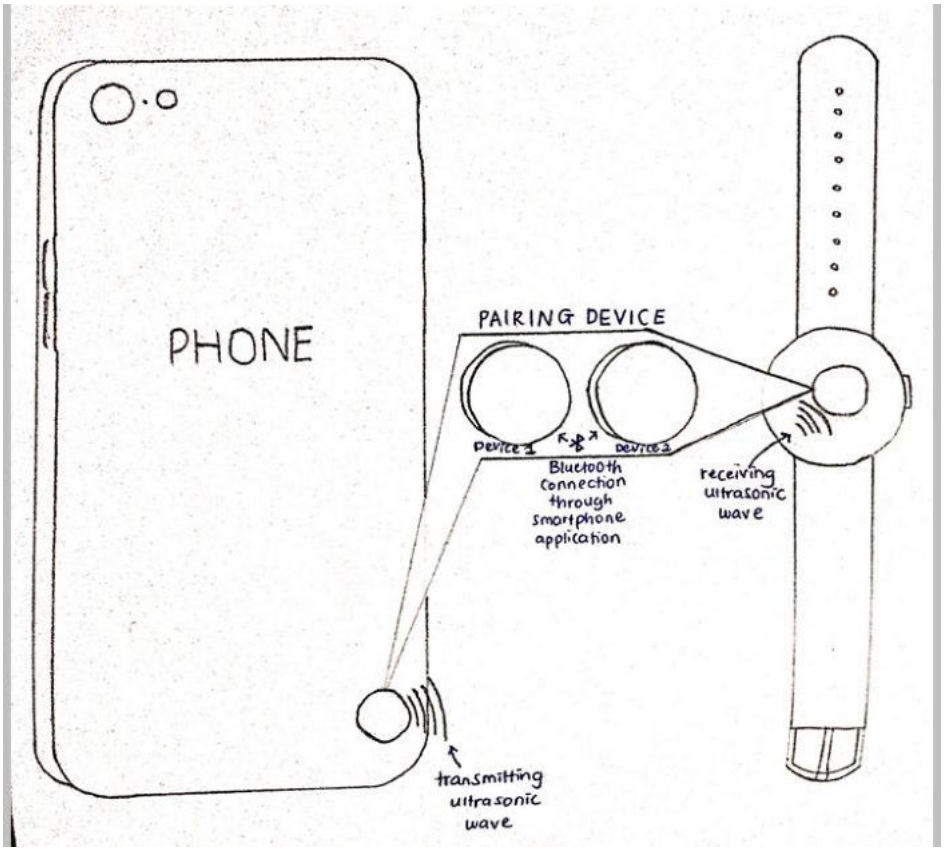

Figure 1: 'Theftproof' sketching

In addition, the user can set this device in home mode if the user is at home. By doing this, the devices will not make any sound no matter how far the user goes. We believe that 'Theftproof' will get a high demand once it enters the national market or global market. It has an affordable price as the target market cover a wide range of people in our society. 'Theftproof' have a very convenience shape and size where the size is so small, and it comes with various and attractive shape. When we talk about shape, its shape can give confusion for everyone who see it because it looks like ornament that fit well with the items it attached. It is also user-friendly where the users do not need any force to carry it along with them everywhere, they go. Other than that, it is also multifunction because instead of applying it on items, the users also can apply it on their children. As we can see in nowadays' world, parents sometimes get unnoticeable with the disappearance of their child especially in crowded place due to their business of work or even when they are shopping. But, with the help of 'Theftproof', they will be noticed by the alarming sound that their child is not around them.

On the other hand, every single person in this world loves on their belongings and do not want to lose them. As it will be needed by the society, the selling of 'Theftproof' in the market expected to increase exponentially. The producing cost of this 'Theftproof' is inexpensive and we believe that the community will have no problem with the selling price. The price is reasonable and affordable. If the selling is recorded graphically, we can increase our country's economic and it is not impossible to put this product in the global market since it is a very productive product.

Table 1: Estimation of costing Theftproof Device

Items	Price (RM)
Bluetooth	10.00
Lithium battery	5.00
Cover	10.00
Total	25.00

4. CONCLUSION

In conclusion, 'Theftproof' can help in preventing theft incident from increasing. It is due to its function that can notify the users when their belonging being apart from them in radius of 3m by making an alarming sound. This function will help the users to make a fast action as they know that their belonging was taken by others. Furthermore, 'Theftproof' will always on and being function as it do not have the power button. This function is an advantage for the forgetful users as the they did not have to be concerned to always make sure the 'Theftproof' to be on. For future recommendation and improvement for our project, our team has come up with several ideas to improve this 'Theftproof'. The first idea is to add the GPS tracker together with this 'Theftproof'. This will help the users to identify the theft's location. By knowing the theft's location, it will help the users to make more fast action as they can just go to the theft's location for getting back their belonging. Other than that, they can also just make a report to the police or other authorities about the location of the theft. This can help the police and authorities in catching the theft faster. The second idea is we want to add some adding value to the

'Theftproof' by adding setting for volume of sound. The users can set the volume of sound for every range of radius of their belonging being far from them. As example, the users can set the range of sound to be louder if the belonging is being apart for 3 meters than when the belonging being apart at 2 meters. By having this function, the users can differentiate either the theft are far from them or not and help them to know exact distance between the theft and them. The third idea is to come up the 'Theftproof' with solar panel on it. Amorphous silicon will be added on the surface of the 'Theftproof' and being used as photovoltaic. By adding this solar panel, it will help lower the cost for the users as they do not need to purchase battery for the 'Theftproof' constantly. With the usage of the solar panel, the 'Theftproof' will also be considered as environmental-friendly. By this idea of improvisation planning, it can increase the 'Theftproof' marketing value. The variety of uses and idea can attract the new buyers. It can also hit the international market and compete with other innovation.

ACKNOWLEDGEMENT

The success and final outcome of this project required a lot of guidance and assistance from many people and we extremely privileged to have got this all along the completion of our project 'Theftproof'. All that we have done is due to such supervision and assistance and we would not to forget them. Without their help, we are not being able to finish this assignment. First and foremost, we would like to express our gratitude to Universiti Teknologi Mara (UiTM) for organising an innovation competition and exhibition. We really feel thankful as we can participate in this competition and make a new experience from this competition. Furthermore, we would like to express our special thank of gratitude to Madam Nur 'Ain Hamdan, our supervisor in this project for provided us an opportunity to do the project and gave us guidance during the completion of this project duly. We extremely thankful for contribute us such a nice support and guide us although she has a really busy schedule. We really appreciate her patience in this matter. Without her, we will not be able to complete our assignment and also this paper of research. The next person that we would like to extend our gratitude is our parents. They gave such a moral support when we felt down and told us to be patience. They also advised us to face all of the problems bravely and not running from it. We also feel thankful for their valuable comment suggestions on this project which gave us an inspiration in improving this project. With their encouragement, we were able to finish this project on time. We also feel grateful to each other as a group member as this project cannot be completed without the effort, co-operation and encouragement of each of us. We thank all the people for their help directly and indirectly to complete our assignment. Last but not least, without their help, advice and guidance throughout this project, we would not be able to finish this idea of innovation on time.

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Cycle 2 Compost: Cycling-Based Compost Machine

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ABSTRACT

Malaysians produce 38,000 tons of waste every day, where more than 45% of the waste generated comprises organic and food waste. Ironically an average Malaysian household waste about RM225 of food a month and this contributes to the high composition of waste generated. It is a major concern because disposal of food waste to landfill contributes significantly to climate change and environmental pollution. In order to tackle this issue, we have set a few objectives as a guideline for our innovation. These objectives include to utilise organic waste technology (anaerobic composting and digestion processes) in technical and economic aspects, develop a more efficient composting system for the people in any housing area, reduce food waste by making a product using it and ensure a healthy lifestyle to the user. In developing the product, we proposed that we created a composter that is attached to a stationary bicycle. Instead of a regular compost bin that required the user to mix and aerate with a trowel or a composter that had a crank to turn the internal mechanisms to process the waste, our composer would require the user to cycle which will turn the mixing shaft and aerate the waste. The marketability elements of this innovation include an ease in home-processing the compost, environment sustainability due to the lack of electricity use and encourages a healthy lifestyle through cycling. Through this project, it is hoped that the objectives set are achieved. We hope to help with the ongoing issue of food wastage and provide a sustainable alternative instead of throwing organic waste when it is in fact a valuable resource.

Keywords: Food waste; compost; compost machine

1. INTRODUCTION

Problem Statement

Malaysians' daily food waste is equal to the quantity of food that can be consumed by 12 million people. One of the ways to reduce food waste is by composting the food waste to make organic fertilizer. However, there are some problems that discourage people from producing compost from food waste such as lack of time, insufficient or lack of equipment such as compost bins and/or machines to compost the food waste,

and the consistency of people's effort to do it. So, what is the solution to make composting easier for people to do it and get to overcome the problems above?

Objectives

I. To utilise knowledge of environmental conservation, waste disposal, integrated waste management and biological treatment for organic waste.
II. To utilise organic waste technology (anaerobic composting and digestion processes) in technical and economic aspects.
III. To develop a more efficient composting system for the people in any housing area.
IV. To reduce food waste by making a product using it.
V. To ensure a healthy lifestyle to the user.

Innovation Motivation

"About 8000 tonnes, nearly 60 percent of waste that is being generated, is avoidable food waste," Mohd Pauze Mohamed Taha, Deputy CEO (Technical) SWCorp, told Channel NewsAsia. This shows that more than half of food waste is not supposed to be at the landfills. "Meaning that if there was proper management, proper consideration in our handling of resources, this amount of waste could be reduced," Dr Mohd Pauze said.

Based on the statement above, we believe that what drives our innovation is the need to divert and reduce waste transported to landfills by separating them at the source, then converting it into compost where it can be reused. In order to produce compost and encourage so at a domestic level, building an economic and practical composter must be proposed, which is what we aim to do through our innovation.

We were also inspired by UM Zero Waste Campaign, in which we have collaborated with in taking part in their volunteering program. Through this volunteering program, we learned knowledge of environmental conservation, waste disposal, integrated waste management and biological treatment for organic waste. Much of University Malaya's organic waste was separated at its source and has been converted into compost. We were inspired to promote this good habit as a way to reduce food waste at a small scale and instill awareness amongst the general public.

2. INNOVATION DEVELOPMENT

The main idea of this innovation is to not only to reduce the operating cost of the composting machine due to energy consumption, but also to engage the community in the habit of a healthy lifestyle through cycling. This alternative to manual mixing by hand can prevent muscle cramps due to long periods of mixing. The machine does not depend on the use of electricity therefore does not pollute the environment. Plus, operating the machine through cycling adds an exercising element which can lead people into a healthier life. The prototype will consist of a standard composting machine with a stationary bicycle that will act as the motor for mixing and processing the organic waste into fertilizer.

The machine will have two plastic cylindrical compartments, first is where immature compost is loaded and processed and the second is where processed compost is stored. Each compartment has a hatch, one above the first compartment to fill the machine with organic waste and below the second compartment where compost is harvested in a harvest tray. Inside the machine is a spiral-shaped, metal shaft that mixes and aerates the organic materials. A small wheel of a stationary bicycle will be attached to the shaft with a rubber belt. As the person pedals the bicycle, the wheel rotates and transfers energy to the shaft through the belt. This causes the mixing shaft to rotate as well and in turn, process the organic waste inside the machine into compost. An average person can cycle at least five minutes a day to keep the composting in check. The ingredients needed to produce the compost are brown materials (carbon-based Exp: sawdust and wood pellets) and green materials (nitrogen-based Exp: vegetable and fruit scraps, leaves and grass). The first compartment is filled at most, two-thirds full with the ingredients to avoid obstruction of the mixing shaft. The machine has a capacity of about 40 to 60 kilograms of organic waste. The compost inside the machine needs about a month to mature if mixed regularly to keep the temperature inside the machine at optimum for the waste to break down. Pedaling for at least five minutes is sufficient to maintain optimum conditions for the composting process.

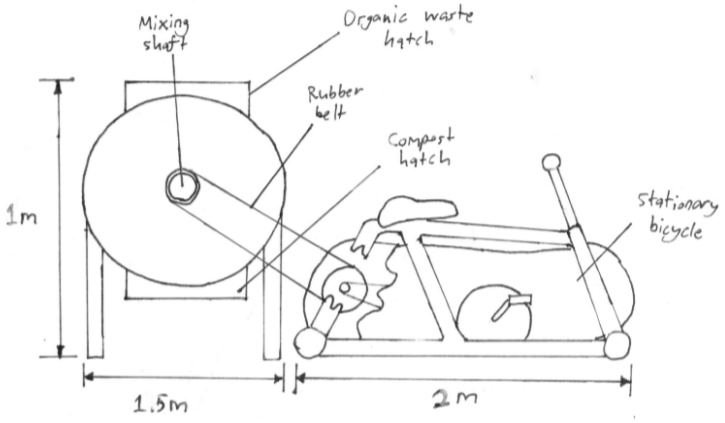

Figure 1: Front view of composting machine

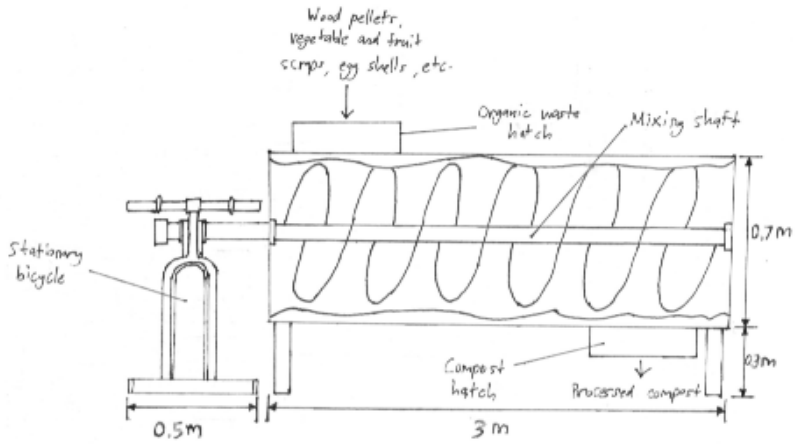

Figure 2: Side view of composting machine

3. COMMERCIAL POTENTIAL

The need for a composter that fits the needs of users is absolutely crucial in tackling the issues of massive food wastage in Malaysia. This is because a composter with a good selling point can encourage the general public to take on the issue of severe food wastage, in our case, by composting and essentially reusing and returning nutrients and chemical energy stored in food to the ecosystem. It is also a benefit for people who do planting as a pastime, where they do not have to spend up to RM25-RM40 for organic fertilisers when they can use the waste available at home. At the same time, people can also reduce their expenses.

Currently in the field of composting, compost bins and compost machines are readily available. Most compost bins look like a regular trash can, but they are most often equipped with an air-tight lid to prevent bad odour from escaping. Usually to prepare compost using these bins require the user to stir using a trowel or a small shovel in order to aerate the food waste. For the Bokashi method of preparing compost, a special additive is added called Bokashi powder. On the other hand, compost machines are machines that operate on electricity to mix and stir the food waste. They usually are applied on a large scale—for the food and beverage industry which produces massive quantities of food waste daily—and not suitable to be applied at home.

Referring to the paragraph above, as of now, a lot of composters/compost bins in Malaysia are either stirred manually or are industry-scale compost machines, which are unsuitable for small-scale, at-home waste-to-compost conversion. What people need is a more practical way to stir and treat food waste, without having to use too much labour. At the same time, we aim to create a machine as sustainable and environment-friendly as possible. Being low-cost is also a concern, as we want to provide the most reasonable option as possible. Considering that there is an urgency for better food waste management, providing a good alternative to simply throwing away leftovers and other sources of food waste is important in order to encourage sustainable food waste management amongst the public, and it starts at home.

What Makes Our Product Marketable

Our composter provides ease in mixing and producing the compost. This is because it can reduce the amount of labour put into preparing the compost. Instead of mixing by hand, the user only needs to cycle for no more than five minutes daily in order to turn the mixing shaft which mixes and aerates the compost.

Our composter also provides a more sustainable option for composting. It does not require any electricity to be put into it, thus reducing the amount of energy to make the compost. Most compost machines are electric-powered, which means our composter is far more sustainable.

Aside from composting and gardening, our innovation can also promote an exercising habit, since it requires cycling to turn the machine and mix the compost every day. This is an important aspect in order to combat many major health issues in our country, one of them being obesity. It is considered an attractive factor to people who would want to exercise in the comfort of their homes.

4. CONCLUSION

There is a lot of potential in this machine due to its usefulness in a lot of aspects. This device can convert household waste such as leftover food and scraps of wood into compost which in turn can be reused as organic fertilizers. This machine can increase productivity because little energy and time is required in order to operate the machine and make compost at a small scale as opposed to making compost using hand-operated tools. In the long run, this machine will save a lot of money as it does not depend on electricity, and it can also save money from being spent on fertilizers which can be costly for smaller-scale users. Plus, issues around muscle cramps in hand-operated composter has been tackled by this device because this device is operated like a bicycle. This also encourages people to engage in healthy activities (i.e. cycling). If enough people use this machine, it can bring an impact to the environment as it reduces the amount of domestic waste sent to landfill areas.

ACKNOWLEDGMENT

We would like to give our biggest thanks to the people at UM Zero Waste Campaign for inspiring us with this innovation and educating us about solid waste separation at source and its importance, namely Prof. Dr. Sumiani Yusoff, Ms. Shakirah and especially Ms. Mairuz who became the advisor for this innovation project.

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With all due respect, thanks to our parents for giving encouragement, enthusiasm, and invaluable assistance to us. Without all this, we might not be able to complete this project properly. We would like to thank Prof. Dato' Dr. Jamil Maah, Director of PASUM, for giving us the opportunity to undergo our project. We also want to express our deepest thanks to Ms. Raihan as our Club Advisor and Puan Rohayatimah, Head of the Mathematics Division, that have helped a lot in making the project successful.

Finally, we thank everyone who helped us in various ways, directly or indirectly, to realise our vision.

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Hygienic Travel Soap from Dabai Fruits Oil

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ABSTRACT

Dabai fruit (*Canarium odontophyllum*) is an exotic fruit founded in Sarawak and have been locally known by its richness in nutritional values. Dabai fruits is prominent among locals due to its high level of antioxidants which contributes to the development of health and beauty. In this research, pure oil of Dabai was successfully extracted from its fruit through Soxhlet extraction process. The pure Dabai oil was then used in saponification process in the process of making travel soap. Dabai oil was further analysed using ATR-FTIR for identification of flavonoid compound. Dabai travel soap is invented for the purpose of hygiene and avoid continuous reinfection between users. The Dabai soap is fabricated like small ball size, dissolve during handwashing and leave no residue. In result, single use soap will prevent spreading of diseases. This also to create portable and user-friendly soap for people to enhance frequent hand-washing culture. The usage of Dabai oil in inventing Dabai travel soap is also to replace palm oil in saponification process. The travel small ball soap is invented to improve the coverage area during hand-washing activity as compared to paper thin soap which has been invented previously. Travel small ball soap is easier to use since it can be roll in between fingers to make sure hand-washing process is more effective to kill all microorganisms on the hands surface area.

Keywords: *Canarium odontophyllum*; travel soap; antioxidants; antimicrobial

1. INTRODUCTION

Canarium odontophyllum which commonly known as "Dabai" and 'Sarawak olive' is abudantly found in Sibu, Malaysia [1] (Chua et al. 2015). In Malaysia, *Canarium odontophyllum* have been identified as the most popular one compared to the other three Canarium species [2] (Azrina et al. 2009). Dabai is white in colour when not matured and purplish-black when it is ripe. Dabai fruit is found to be a very good source for high energy, protein and fat, as well as minerals such as calcium, magnesium, phosphorus [3,2,4] (Voon and Kueh 1999; Azrina et al. 2009; Faridah et al. 2009). [5] Chua & Nicholas (2009) stated that kernel of Dabai fruit contains high percentage of protein and fat meanwhile the skin part is high in moisture and ash. Dietary fibre in dabai fruit is mainly insoluble dietary fibre. Moreover, Dabai fruits exhibited high antioxidants such as phenolic acids, flavonoids and anthocyanians. Phenolic compounds have been found to be very beneficial for chronic diseases such as cancer, heart disease and

diabetes and possessed excellent anti-inflammatory, cholesterol-lowering, plague-reducing and anti-microbial agents [6] (Azlan et al. 2012).

Bar soap does seem to be self-cleaning, but the bar can still hold bacteria. Bar soap has become one of the source of continuous reinfection because bars of soap does not usually dry all the way between uses, especially on the bottom, leading to an accumulation of bacteria, fungi, that can be passed from person to person during usage. Next, liquid soap was recommended over bar soap, but this create unnecessary problem during travel where liquid soap may leak due to pressure on the flight. Therefore, a single use soap in solid form might solved both problems, no transmission of disease or bacterial residue and no leaking in a bag.

2. INNOVATION DEVELOPMENT

This research aims to invent a single use travel small ball soap from pure oil of Dabai oil (Figure 1.0). The single use travel small ball soap of Dabai is a hygienic travel soap exhibited antimicrobial properties which will help in the preventing of diseases spreading. This research also aims to provide an alternative to replace palm oil in the saponification process for making soap. With the invention of user-friendly small ball soap, the travel small ball soap of Dabai aims to create awareness of people to do frequent handwashing to prevent spreading of infected diseases.

Travel small ball soaps consists of an ionic surfactant which can be used in conjunction with water for washing and cleaning. It is portable, cheap, and easy to use. Many people use paper soap—paper-thin soap sheets—as an alternative to bar and/or liquid soap. This is due to the fact that it is easy to carry, store and use especially for travel, but quickly dissolves in water without leaving behind residual soap scum in a soap dish or on a sink as typically seen with wet soap bars or dripping soap dispensers. The small ball size soap invented in this research is mainly to improve the coverage of paper-thin soap which has been invented previously. Travel small ball soap is easier to use since in can be roll in between fingers to make sure hand-washing process is more effective to kill all microorganisms on the hands surface area.

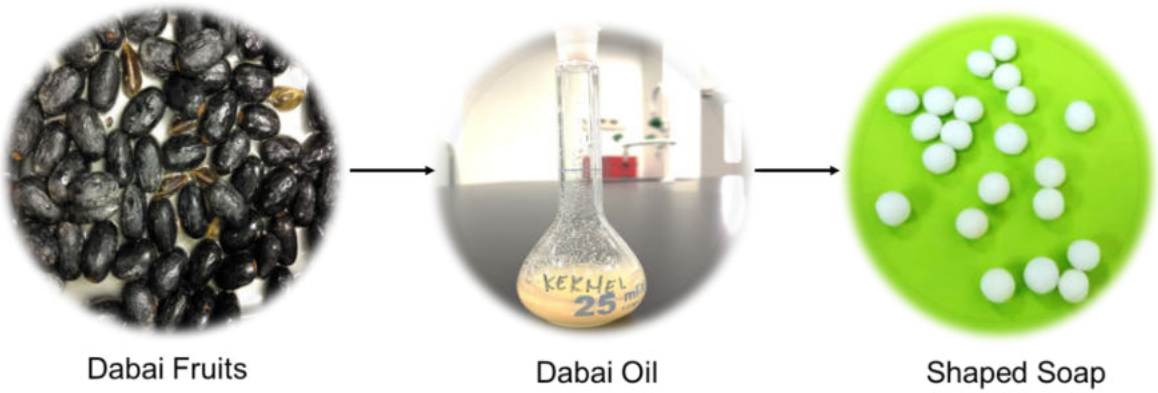

Figure 1: Preparation of small ball soaps from Dabai fruits oil

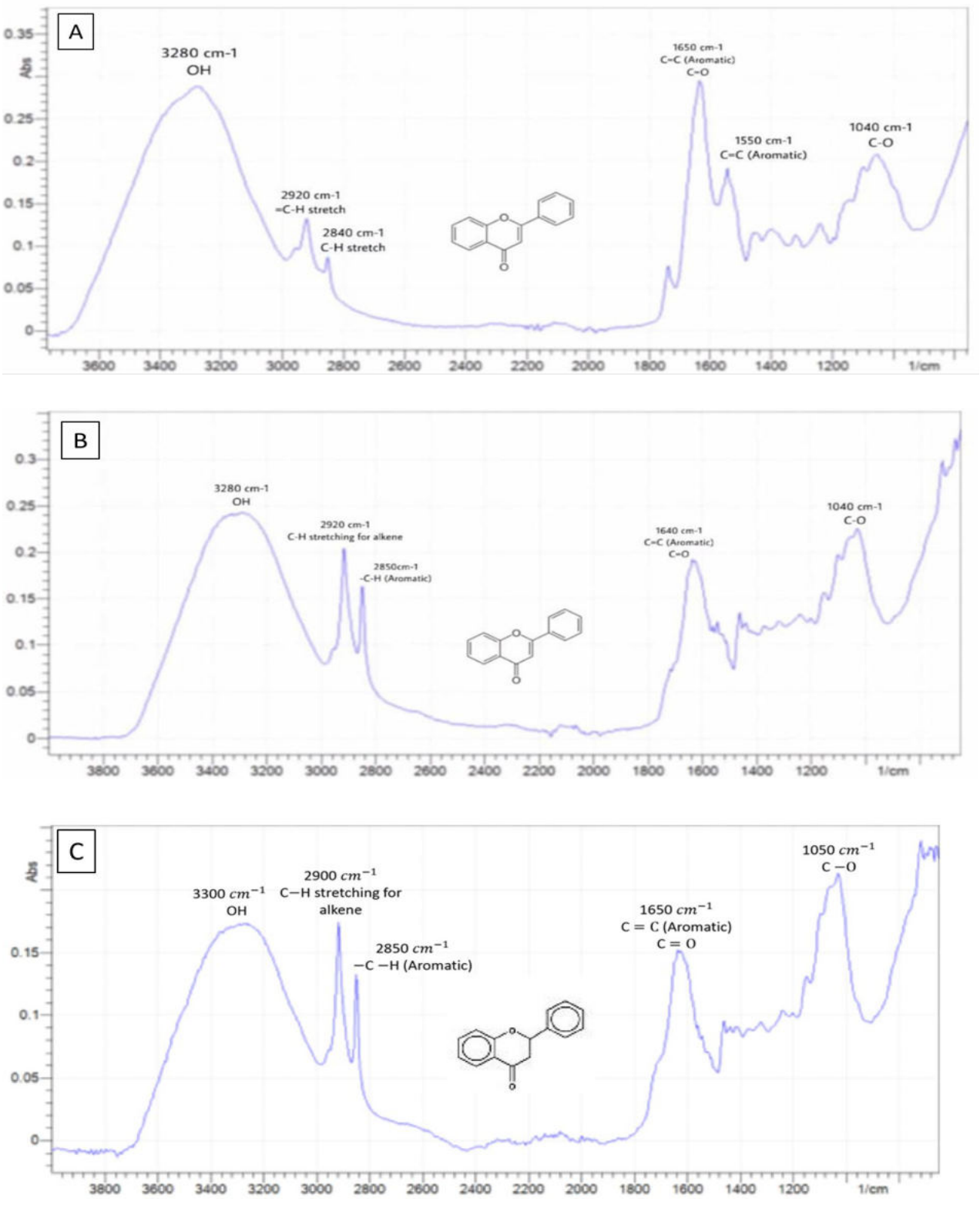

Figure 2: ATR-FTIR spectrum of Dabai: **(a)** Kernel **(b)** Skin **(c)** Pulp. These spectrums indicate the presence of flavonoid compound which has antioxidant properties that is beneficial to the skin

3. COMMERCIAL POTENTIAL

Hygienic Dabai travel small ball soaps are simple, easy to use, user friendly and has antioxidant properties for skin. This hygienic travel soap serves as a tool to provide a solution for travellers to maintain their hygiene environment during travelling.

4. CONCLUSION

The invented travel soap will be the first travel small ball soap using pure oil from Dabai fruit which exhibited antimicrobial properties and contain antioxidant compound (flavonoid). This travel small ball soap is single used, user friendly, easy to carry and more effective as compared to thin paper soap (previously invented) as it covers high surface area during hand-washing process.

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Amosectkit

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ABSTRACT

Insects such as flies and mosquitoes are such an annoyance to everyone. It causes discomfort towards people and one of the main sources of diseases such as malaria, dengue and cholera. Common insect repellents that we often see on sale are electronic and aerosol which are not eco-friendly. For example, aerosol contains chlorofluorocarbon (CFC) that are harmful to the environment and community. In fact, most electronic insect repellents are sold at higher price in the market. Hence, this project was studied to solve these problems by replacing hazardous insect repellent with safer and eco-friendly insect repellent which is "Amosectkit" that consists of insect repellent gel, spray and bracelet. The first objective of this project is to conserve the environment and ensuring environmental sustainability. The second objective is promoting the insect repellent kit at affordable price and lastly is creating a handy and travel-friendly insect repellent kit. The three items in Amosectkit are eco-friendly and non-toxic as they are made from mixture of natural ingredients that was proven effective to repel flies and mosquitoes such as lemon, lemon grass, oregano and basil. Moreover, this kit also contains refill so that it will be easy for users to refill once it used up. This product is targeted to be used by everyone. For instance, outdoor lovers can take this kit with them while camping, hiking or travelling while non-outdoor lovers can still use this kit inside their home. In conclusion, the future development is to produce a formulation that could enhance the longevity of the repellents using advance laboratory equipment. Nevertheless, improvements in terms of packaging into a more creative shapes and sizes are necessary in the future to meet the interests of consumers.

Keywords: Insects; diseases; eco-friendly; environment; repellent

1. INTRODUCTION

Insects are known to be vectors for pathogen that causes diseases such as malaria, cholera and dengue. Nowadays, the cases of the diseases that caused by insects such as mosquitoes and flies are rapidly increasing. For example, malaria that caused by Anopheline mosquitoes have been recorded to cause an estimated of 219 million cases globally and results in more than 400 deaths each year [1]. Other than that, dengue that are transmitted by Aedes mosquitoes are the most frequent parasitic infections that causes about more than 3.9 billion people in over 129 countries are at risk of contracting it with an

estimated 96 million symptomatic cases and estimated 40,000 deaths every year [1]. These problems are concerning and need to be catered to prevent it from becoming a lot more severe.

In general, the insect repellent are made to cater this problem. However, a long-term applications of synthetic insecticides can caused hazardous residues to accumulate into the environment which affects the ecosystems and human health. The synthetic insecticides such as aerosol spray insect repellents are not eco-friendly and the chemical substances inside it which is chlorofluorocarbon (CFC) have bring harms to the environment as it can cause to the thinning of ozone layer. Furthermore, there are various chemical substances in the insect repellent that could bring harms not only to the environment but also towards humans such as DEET, cyfluthrin, and permethrin [2]. In instance, DEET or N,N-Diethyl-metatoluamide is a common substances that used in insects sprays, wipes and in clothing repellents and are highly effective at repelling mosquitoes [2,3]. Even though DEET is very effective to repel bugs , studies have shown that it could harm human health. Large doses of DEET have been linked to skin blisters, seizures, memory loss, headaches and many more [2]. In addition, it also a persistent environmental contaminant that breaks down slowly in the soil and contaminated the groundwater. It have been detected in groundwater, surface water and also drinking water. Therefore, this project were made to cater the problem and at the same time saving the environment and humans health.

This project which called Amosectkit is an insect repellent kit that contains gel , spray and bracelet that are eco-friendly, non-toxic and are easy to handle. These repellents work by deterring insects such as flies and mosquitoes that find the smell of gel and spray unappealing. This repellent product is made from a mixture of basil and lemongrass that contains active compound that could repel certain insects. For instance, the active compounds that can repels flies and mosquitoes in basil are linalool, estragol, geraniol and methyl eugenol [4,5]. Furthermore, in lemongrass, the main active compounds that repels insects are Geranial (α-citral) and neral (β-citral) but other compounds, such as geraniol and citronellol, which are known repellents, are also present in small amounts [6].

This product is invented to replace hazardous insect repellent with safer and eco-friendly insect repellent to save the environment and at the same time protects the human's health. The first objective is to conserve the environment and ensuring environmental sustainability. The second objective is promoting the insect repellent kit at affordable price and lastly is creating a handy and easy product that could be carry anywhere and everywhere. This product is targeted to be used by everyone. In addition, a low price is offered to public and are eco-friendly which consists only herbs such as basil and lemongrass. This kit is very useful as it has three component which is spray, gel and bracelet. Furthermore, it also contains refill as it will be easy for the users to refill once it used up. This product could as well bring comfort to people as they can protect themselves from insects everywhere they go without bringing big aerosols and other stuffs that is hard to handle.

2. INNOVATION DEVELOPMENT

It is designed to be used by all people in the community and suitable for all ages. This product is also convenients, travel-friendly which can be used anywhere such as home, picnic and even during camping. As for example, college students can keep their window open without any worries by the help of Amosectkit to get rid of those mosquitoes as well as can leave their ventilation in the room running smoothly.The product is safe because it is 100% natural made from a mixture of basil,lemon and lemon grass extract based on our research and we guarantee it can repel dangerous insects away. Our research shows that a scent in the extract that we derived is hated by insects. So, as basil, lemon and lemon grass extract as our main ingredients for this kit, we made a 3 in 1 kit which consists of insect repellent spray, gel and bracelet. The gel can be leave open by the window or in areas that tends to have mosquitoes meanwhile the spray can be sprayed to our skin or surroundings and the bracelet we can wear to defend ourselves from being a victim of mosquitoes. We provide various way of application in the kit to use the product. The consumers do not have to worry about dangerous chemical issues or allergic issues because our product is made up of authentic natural herbs which is safe to be used by everyone.

3. COMMERCIAL POTENTIAL

We are creating a low-cost budget and chemical-free product naturally extracted from a mixture of basil,lemon and lemon grass and turned into a kit with multi-pupose application by using these materials (refer Table 1). It is easy to be refilled as the refill is already provided in the kit. This product is designed for the Malaysian public sphere as a convenient and affordable insect repellent kit.

Table 1

No.	Item	Quantity (Set)	Price per unit (RM)	Total price (RM)
1.	Bassil leaves	1 packet	4.20	4.20
2.	Lemon essential oil	10 drops	6.00	6.00
3.	Lemon grass essential oil	10 drops	6.00	6.00
4.	Agar-agar tali	1	2.15	2.15
5.	Travel kit	1	5.00	5.00
6.	Knitting thread	1	2.00	2.00
			TOTAL	25.35

Figure 1: Innovation prototype
Market Price: RM 30.00

4. CONCLUSION

In conclusion, our insect repellent are eco-friendly, non-toxic, affordable and travel-friendly. They are free of dangerous DEET which are friendly and kind on sensitive skin. Other than that, many people can use natural organic repellents even in the presence of children, as they are free of such harmful chemicals and good for the human body. The future development for our product is this travel-friendly product has multi-function that can protect someone from dangerous insects wherever they go. The recommendation is we want to provide the ready-made ingredients for our product users to do their own insect repellent at home. For example, adults can simply make repellents by combining essential oils with water or carrier oils, such as coconut or soybean oil, to either use as a room spray or apply topically. Nevertheless, we recommend that this product will need adult's helps as we need to use lab equipments to make this product. We also recommend not to leave the kids and young adults to do it by themselves without adult's supervision.

On the other hand, the improvisation planning is we want to improvise our product into a lot more creative shapes, sizes and various types of smell. Next, we also want to provide a patch test as some people may find that their skin reacts to essential oils, so it is important to do a patch test on a small area of skin first. This is because we really take consideration of everyone's wellbeing and ensure product safety. We believe our future recommendations and improvements on our products will lead us to achieve our initial objective which is to provide harmful insect repellent for everyone.

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i-Thaharah

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ABSTRACT

Fiqh Thaharah is a topic about cleanliness consisting of extensive discussions on the subtopics *thaharah haqiqiyah* which discusses on cleanliness from excrement and *thaharah hukmiyyah* which discusses on cleanliness from *hadas.*[1] Observing *thaharah* or 'cleanliness' is an obligatory upon every Muslim, thus considered as one of the pillars of Islam. Only with clarity and great understanding on the subject would ensures a Muslim the validity of the acts of 'ibadah (worship). Nevertheless, confusions and obscurity within the matter of *hukum* or laws concerning *Fiqh Thaharah* are still exist among Muslims. Religious studies are usually delivered by teachers to students in classes with a traditional way of lecture and a least engaging manner whereby students lack active interaction of the topic during classes. This causes a lack of interest in a student's viewpoint as the passive interaction bores them and results in their difficulty of understanding the topics. Therefore, 'gamification' method needs to be integrated into the teaching and learning processes in order to help students and serves as an alternative to enhance understanding of the topic. This method could also assist in clarifying the topic to the public. Thus, i-Thaharah is an innovation on board games that concentrate on the understanding of *fiqh* knowledge based on *Fiqh Thaharah* in accordance to *as-Shafi'e* sect. A new product generated as a medium of education to heighten players' understanding in the topic of *Fiqh Thaharah*. The product objective is to provide public exposure about *Fiqh Thaharah* according to *as-Shafi'e* sect. Besides that, the product introduces an interactive way of teaching and learning the topic. Furthermore, it provides a way of evaluating a person's mastery on the topic in a more casual manner through educational games or also known as edutainment and becomes another alternative of preaching Islam to the public, in particular to Muslims. Hence, this product becomes an alternative medium in learning a particular issue of *thaharah* as it is produced in a form of a user friendly interactive game.

Keywords: Innovation; gamification; pendidikan islam; *fiqh thaharah*

1. INTRODUCTION

Understanding *Fiqh Thaharah* starts from the definition of its principle. *Thaharah* in terms of language translates to clean and free from various uncleanliness either in tangible form (*hissi*) or in the form of a spiritual sense. While the term *thaharah* indicates an action that is required to be done in order to fulfill the obligation of worship. For instance, the action that becomes a requirement to perform *solah* or other

acts of worship with such requirement is to perform ablution (*wuduk*) to those without ablution, or to bathe and cleanse to those required to bathe and cleanse so that excrement from the clothes, body and place be cleansed before performing acts of worship [10].

The subject of *Fiqh Thaharah* or cleanliness is a compulsory topic to be learned and understood by Muslims. The clarity of a person's understanding about the principles of *thaharah* and issues within the topic ensures the validity of their acts of worship. An act of worship becomes unacceptable and impermissible without the correct requirement of *thaharah* according to its principles. However, schools and higher institutions only use books as a medium for learning which does not spark interest in students while they learn about the topic. This should be improvised in order to create a better approach for a more challenging sector of education with information and knowledge readily available in the 21st century besides ensuring that learners are able to master the subject well. A systematic approach that is compatible throughout the passage of time should be considered so that the future generation would not study and gain knowledge with an outdated manner.

'Gamification' is an effort to attract and stimulate the motivation of a student to master a difficult topic. Generally, the 'gamification' approach in education is concentrated around the theory of constructivism that is a theory which supports learning based on the student or also known as student-centralization. The theory encourages students to be actively involved and experience learning through hands-on activities. Student engagement in the learning processes indirectly helps to improve their memory and understanding of the subject for a long period of time [7].

Besides, a young student would generally feel excited and have a lot of fun learning while playing. If teaching processes could be combined with game activities then students are inclined to be learning more as games naturally consists of various components to motivate students such as an objective, a conflict, rules, a winner, interaction during game-play and obstacles made in the game [11].

In most cases, the perplexity about the principles of *Fiqh Thaharah* still exists among the general publiC [12]. This is due to the traditional setting of religious education in various educational institutions that lacks interaction of the student to engage their interest in learning. According to Jasmi [9], teachers of Islamic Studies in national secondary schools throughout peninsular Malaysia discovered that teachers who lack in teaching skills, those with their teaching methods that lack of creativity, and those who prefer to approach students using the 'chalk-and-talk' method as well as being centered around textbooks proved to become the main issue to students' lack of engaging in studies provided reasons that the teaching method has become outdated in modern times [9].

Therefore, the innovation of i-Thaharah aims to introduce a new method that provides interactive learning and teaching process about the topic of *Fiqh Thaharah*. This approach is an alternative method to the traditional way of learning. Other than that, the approach would contribute to providing exposure and understanding of *Fiqh Thaharah* according to *as-Shafi'e* sect that becomes the main reference of Islam in Malaysia to the general public. i- Thaharah could also provide better apprehension of the topic in a

more casual manner through edutainment as well as becoming another way of preaching Islam to the society and thus providing basic knowledge of Islam to all.

2. INNOVATION DEVELOPMENT

Various methods of teaching and learning had been applied to various schools and higher education institutions. 'Gamification' methods in education had been vastly used to help students' understanding in topics. The 'gamification' of i-Thaharah is a new product that had been produced as a medium to aid in a better teaching method for educators in the leaning and teaching processes. 'Gamification' is a concept that introduces a topic in the form of games and it functions as a method that applies the elements of playing board games to learning a certain topic that creates a joyful ambiance for the learner. Researchers had provided various definitions to the method of 'gamification' and mostly implies it with the similar concept involving any form of game adaptions. 'Gamification' is defined as a process of adding games or any game-like elements to something (such as a task) so as to encourage participation (8). 'Gamification' can also be elaborated as the practice of making activities more like games in order to make them more interesting or enjoyable (6).

The idea to create such a product comes after an evaluation of general understanding of *Fiqh Thaharah* among students. Most problems that students frequently faced are issues of cleanliness from *hadas* and excrement, the allotment of blood, *tayammum* and *istinjak*. One of the factors contributing to the issue is the depth of understanding and consciousness of the students' obligation to take care of their self-cleanliness that comes from being the main requirement before implementing their prayers. Therefore, awareness and consciousness of the importance of compulsory cleanliness must be instilled among students. Hence, our team, the author and a few researchers have discussed about the creation of the new innovation in the form of a game that could be used in Malaysia's education system as the discussion of *thaharah* had been a subject taught in various levels of education either in primary schools, secondary schools and higher education institutions.

The development of a gamified i-Thaharah is a concept with similarities to a 'snakes and ladders' game is based on throwing dices to begin the game and play. The 'gamification' of i-Thaharah is equipped with a set of board game that has boxes printed on it with labels and meanings associated with the topic of *Fiqh Thaharah*. Moreover, four additional boxes are printed to serve as a placement for the cards labeled *nasib*, as well as question cards with varying difficulty in the game that are *mukhafafah*, *mutawassitah* and *mughallazah*. The cards *mukhafafah* refers to the cards containing the easiest level of questions, *mutawassitah* refers to the cards containing a medium level difficulty of questions while *mughallazah* refers to the cards containing the most difficult level of questions. Each card is provided with answers in accordance to the books written by honorable educators of *as-Shafi'e* sect such as Mukhtashar al-Muzani fi furu' al Syaafiiyah, Al-Fiqh Al-Manhaji 'Ala Madzhab Al-Syafie, Al-Majmu' Syarh Al-Muhadzdzab, and Raudhatul Tholibin, in order to provide accurate answers for the questions in the game.

Figure 1: i-Thaharah board game set

Figure 2: Colorful pieces along with the game

Figure 3: Questions cards

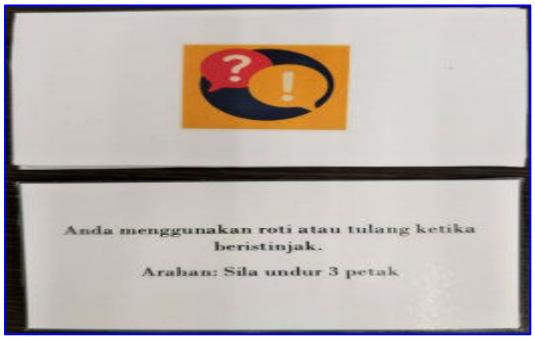

Figure 4: Nasib cards

The game recommends at least two to four players. Each player is represented by the colorful pieces or tokens. Players should throw the dices beforehand to determine each of their positions. The player of dices with the highest number of throws starts first, then the second player and the rest of the players follow through in a descending number of throws. A player or another individual is assigned to read the question cards and the answers provided in the game. Players should answer the questions provided in the cards in accordance to the level of difficulty in the mind test box of the board game set. If the player fails to answer each question, they have to move three boxes backwards. If a player fails to answer three consecutive questions, they have to move to the 'jail' box. A player in the 'jail' box is prohibited from their turn to play until all players have finished their turn. A player who landed on the *nasib* box must obey the orders written on the *nasib* card. Each player who finishes the game has succeeded in mastering the topic and has a deeper understanding of the topics in *Fiqh Thaharah*.

Figure 5: The awards won for i-Thaharah in innovation competitions

3. COMMERCIAL POTENTIAL

The 'gamification' of i-Thaharah has a high commercial value especially in the sector of *Pendidikan Islam* education as the contents in the game is based on books written by honorable educators in *as-Shafi'e* sect such as Mukhtashar al-Muzani fi furu' al Syaafiiyah, Al-Fiqh Al-Manhaji 'Ala Madzhab Al-Syafie, Al-Majmu' Syarh Al-Muhadzdzab, and Raudhatul Tholibin. Besides, the game is based upon the basic but most important knowledge in establishing whether an act of worship is valid or null according to Islamic principles. As an illustration, an act of worship like *solah* done without the correct requirements of *thaharah* according to the necessity of Islamic principles becomes null and is not considered as an act of worship.

Hence, it is true that an absolute clarity of understanding *Fiqh Thaharah* is compulsory to each worshipper of Islam in order to be ensured of the validity of his worship. It is in line with this *Hadith* : "The Messenger of Allah, peace and blessings be upon him, said, "Purity is half of faith, and the praise of Allah fills the scale. Glorification and praise fill up what is between the heavens and the earth. Prayer is a light, charity is proof, and patience is illumination. The Koran is a proof for you or against you. All people go out early in the morning and sell themselves, either setting themselves free or ruining themselves." [5]

Based on researchers studies, the method of 'gamification' within the scope of Islamic studies has reaped many results and provides a market for sales nowadays. However, most 'gamification' of Islamic studies in the market specifies more towards topics such as *tajwid*, *sirah*, *zakat*, *faraid*, *halal*, *munakahat*, Arabic Language, *umrah, hajj* and *wakaf*. Meanwhile, the 'gamification' of *Fiqh* topics specifically in *Fiqh Thaharah* is not found in the market yet although this knowledge is the most basic essential of all requirements for acts of worshiping.
Therefore, based on a sense of responsibility and a concern towards the necessity of understanding *Fiqh Thaharah*, the 'gamification' of i-Thaharah was created to assist in easing the process of teaching and learning on all levels of educational institutions. This is because most teaching and learning processes in the field of Religious studies especially *Fiqh Thaharah* is conducted in a traditional setting that needs to be improvised with flexible, innovative and efficient features in order to help students to adapt with the content of the information and receive it well.

Hence, the gamified i-Thaharah focuses the product to various levels of educational institutions for example, kindergartens, primary schools, secondary schools and universities and colleges in Malaysia. The gamified i-Thaharah produced is corresponding to the learning and teaching processes of the 21st century which produces exemplary students with elements in accordance to the National Education Philosophy or *Falsafah Pendidikan Kebangsaan*.

4. CONCLUSION

Corresponding with technological advancements in the digital era, the implementation of 'gamification' is greatly encouraged. This is due to the current generation preferring a more casual and solid approach with educational methods. 'Gamification' had greatly helped many educators and students in education.

It is even implemented in accordance to students' interests as well as the demands of an education sector that is well developing. Moreover, the elements of 'gamification' is simple and flexible to be integrated in education.

In regards with that, the approach to gamify i-Thaharah brings positive results in a student's cognitive development. It could improve their logical skills and help them to think out of the box while playing the game. i-Thaharah is not solely a board game as it is packed with knowledge about *Fiqh Thaharah*. Discussions about *Fiqh Thaharah* is of utmost importance to be understood by every Muslim. This is because a clear understanding of the topic provides a sense of confidence for those performing their worship duties without doubt and skepticism. So, knowledge relating to *thaharah* is applied in the game.

This 'gamification' of i-Thaharah not only helps students and educators but could also provide understanding of the topic to all Muslims as this game can be played by all ages. In order to further develop the game in the future, efforts had been made to improvise the concept of this game made by the researchers, such as dividing various levels of difficulty for the questions in the game like beginner, intermediate and advance with easy, medium and difficult questions each. Besides, the production of a manuscript or a questions and answers book about all of the topics for discussion regarding *Fiqh Thaharah* that is the divisions of excrement, divisions of *hadas*, divisions of water, *istinjak*, ablution (*wuduk)*, bathe and *tayammum.* This can aid the general public to learn more about *thaharah*. The gamified i-Thaharah can also be developed in a form of online application or (Apps). online users who are interested in the game are able to download the app into their smart phones and can play the game online with their friends and family. In conclusion, it is clear that the 'gamification' development approach could provide interest to Muslims so that everyone emphasizes the need to acknowledge *Fiqh Thaharah*.

ACKNOWLEDGEMENT

The idea of developing a gamified i-Thaharah starts from the team of researchers' observations on the need to provide a new medium of teaching *fiqh* subjects especially *Fiqh Thaharah* which is a crucial element in providing validity of an act of worship. However, efforts would not have produced results without a platform to further work and test on the idea.

Therefore, we express out greatest appreciation and gratitude to our employer Universiti Teknologi MARA (UiTM) for organizing the innovation competitions that provides a chance for our efforts on this innovation to be highlighted. The gamified i-Thaharah had participated in two innovation competitions organized by Center of Foundation Studies in UiTM that are the Innovation Competition and Exhibition, Creations deUiTM 2020 dan 2nd ASiD Innovation & Creativity Day 2019. Besides that, UiTM also sponsored the participation of the research such that the monetary incentive provides motivation and eases the funds of researches to present the idea to the general public. Appreciation is also extended to fellow colleagues, lecturers in Center of Foundation Studies in UiTM, Dengkil campus, Selangor who provided ideas and lend helping hands to develop the gamified i-Thaharah as well as students who provided feedback on the game that could be used for future developments.

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Istihalah: White Wine Catalyst

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ABSTRACT

This research touches on the field of istihalah. In this era of globalization, all kinds of situations could happen when we are out of the country. As Muslims, situations of halal and haram would be of high concern. For example, one is out of the country and requires vinegar or a drink but is then only presented with an alcoholic drink (wine). Istihalah is the process of conversion from something haram to halal. With the istihalah method, our product would be the solution, which changes the wine to vinegar and a consumable drink. One of our main objectives is to widen this field with the help of science and technology, furthermore, encourage innovation among the young generation like us. Since there have not been any previous findings regarding this topic, our product would be the very first product to fully remove a haram substance from a compound, thoroughly changing something haram to halal, thus, produce vinegar from white wine in applying the concept istihalah. Muslims, especially in non-muslim countries, would no longer have issues regarding the problem stated and reduce time and money in solving it. This is because istihalah converts white wine to vinegar through a natural process which is oxidation. Regarding this as scientific research, we would be having experiments to make sure our hypothesis is correct, accepted and relevant as well as to test out its abilities. With visits to 'Pejabat Mufti Wilayah Persekutuan', we were able to categorize our product as either istihalah sahihah or fasidah. Collaboration with Universiti Sains Islam Malaysia (USIM) along with fellow researchers has been done to fulfil madhabs requirements needed for this experiment such as the FTIR Machine, an electronic pH meter, and an electronic shaker. When all the information and data are collected, this thesis is then produced.

Keywords: Istihalah; oxidation; white wine; vinegar; haram; halal; conversion

1. INTRODUCTION

As developments occur around the globe, the lives of Muslims are also changing. The phrase “istihalah” is a method of changing a non-halal substance to a halal substance through various natural processes. In this project, we focus on the conversion of white wine (non-halal) to vinegar (halal). The seemingly erroneous conversion has been accepted by major Sunni maddhabs such as Malik and Hanafi. When and why would this conversion take place? In a situation where a Muslim needed vinegar but they are only provided with white wine. We believe these situations would happen regularly in cooking and extreme situations where Muslims needed a drink but there’s nothing in reach except for white wine. Therefore,

the main objective of the study here is to solve the problem faced by the Muslims. We aim to produce fully functioning products with it being innovative with current technological advances. We also strive to provide a choice even in the most difficult situation. Apart from that, the objective of this study is to also expand the field of istihalah and to explore its wide potential. Thus, these objectives mark the aim of our study.

As stated above, our study is still in its early stages of innovation. Therefore, there's a lot of questions rather than answers. With the help from our fellow researchers, we have uncovered most of them. First, is the conversion possible? The conversion of white wine to vinegar seems very incredulous, to make sure of it, an experiment had been done on three batches of white wine with three copy of each; a total of 9 flasks of white wine. The flasks are covered with gauze to give way to oxidization but also to prevent spills.

Why oxidization? Based on the research that had been done from reliable sources, the conversion of white wine to vinegar will only take place if the white wine is fermented. The agent of fermentation is the bacteria present in the air and the oxygen itself. By exposing white wine to the air, fermentation will happen and hopefully, the conversion will take place.

The hypothesis is proven to be true when 28 days later (and still counting). There has been a difference in the chemical levels. This has been detected by our ATR-FTIR machine (Fourier Transform Infrared Spectroscopy). The results can be seen in the figure below.

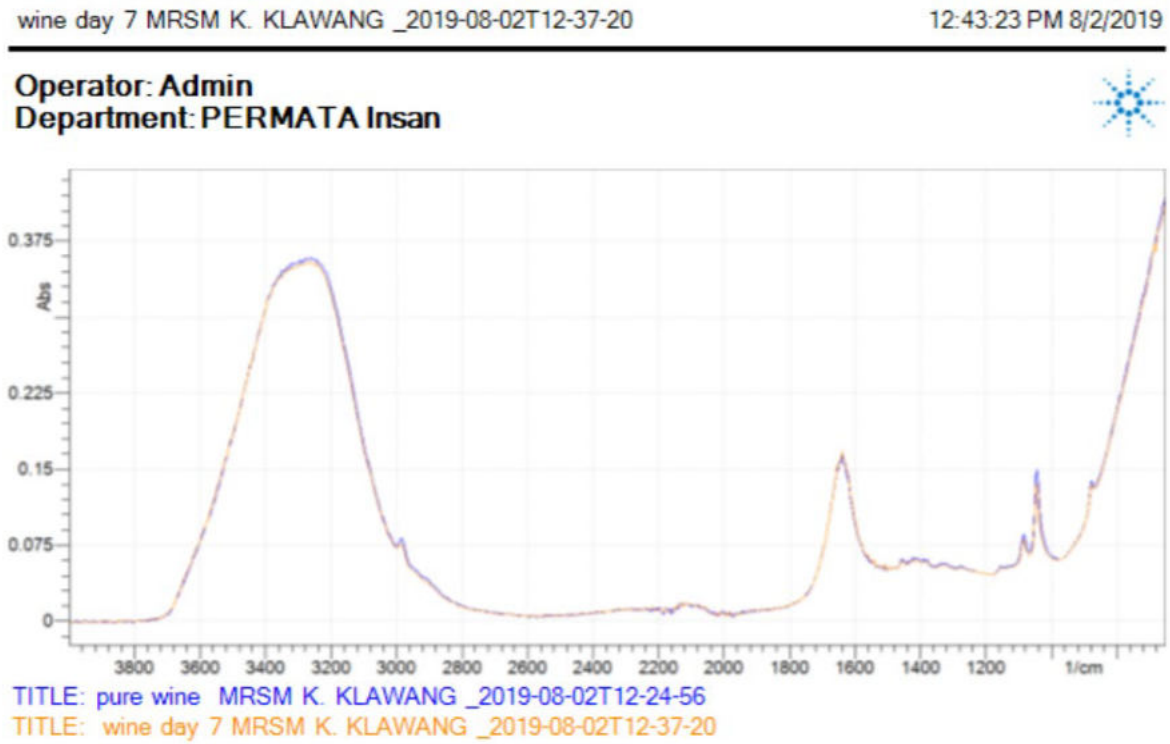

Figure 1: Comparison of pure white wine and 7-day oxidized wine

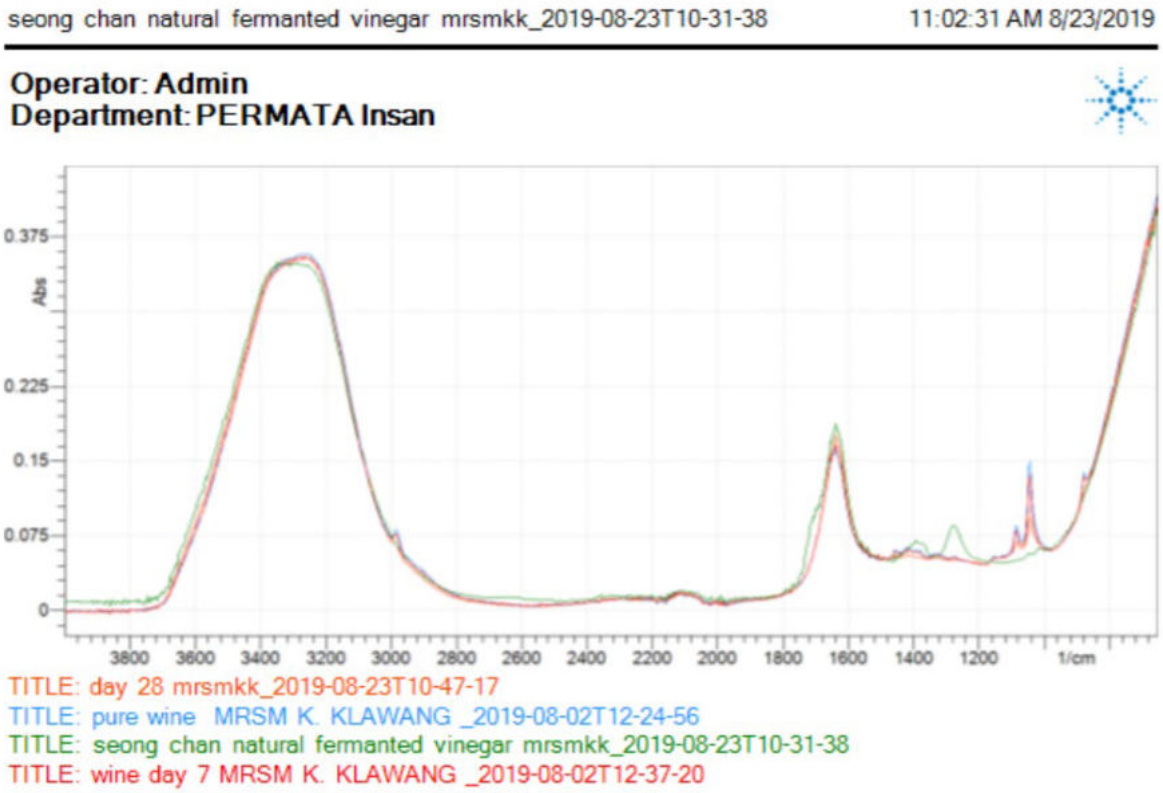

Figure 2: Comparison of pure white wine, 7-day oxidized white wine, 28-day oxidized white wine and vinegar

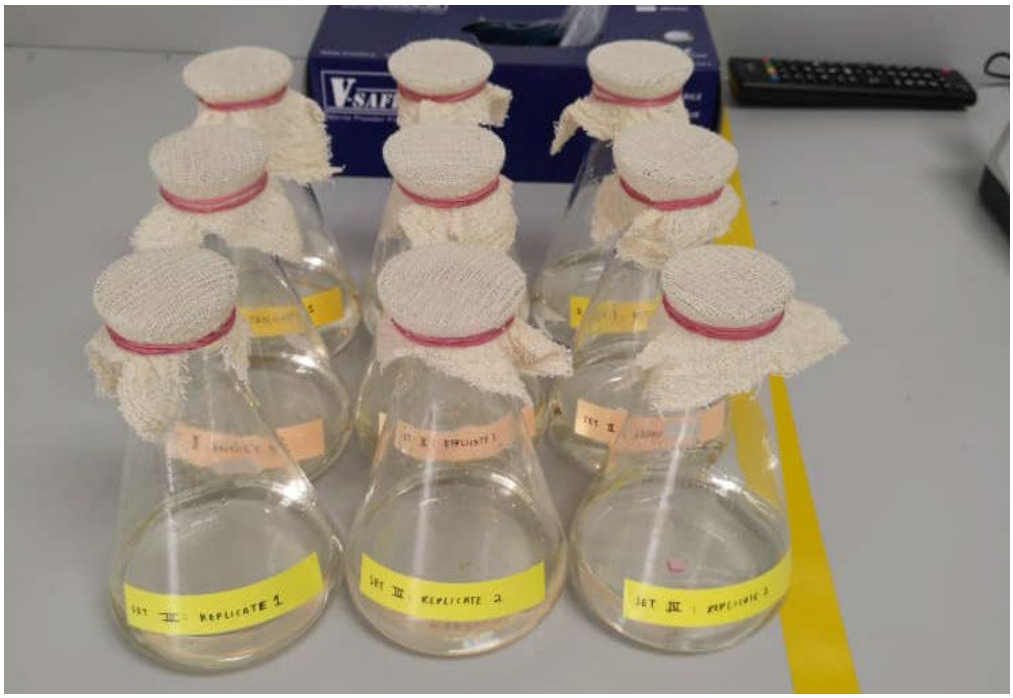

Figure 3: Nine conical flask containing white wine which will be oxidized

Figure 4: ATR-FTIR machine used in this study

Regarding figure 1, not much difference could be seen between the pure white wine and the 7-day oxidized wine. However, as the time is prolonged, differences could be seen between for the results. With the results, it sparks hope for this study.

2. INNOVATION DEVELOPMENT

From the experiment that had been done, one thing for sure, the time taken for the results to show is quite long. A variable that can be manipulated. We wanted the chemical reaction take lesser time but to produce the same results. The results are also expected to not have side effects. Thus, to quicken the time taken, we have settled to use a catalyst. In regards that products will be consumed, a biological catalyst such as bacteria has been chosen. Hopefully, the results will be as expected.

3. COMMERCIAL POTENTIAL

We believe the white wine catalyst can be commercialized widely and it will make profits. If it is being sold in markets that demand such products. As stated in the Abstract and objectives, the targeted market is international Muslims and the culinary arts.

For international Muslims, we can see that they face different kinds of difficult situations in everyday life. It varies from their own safety to the food that they consume. With the white wine catalyst, they will be able to solve at least one from the 99 problems that they face. They won't have to worry if they'll consume white wine with the help of our product. Before we dive in into the next targeted group, some questions asked, "why only white wine?". Other than the fact that conversion to vinegar can happen from just white

wine, white wine is used widely but they are in fact haram. In this context, using it widely doesn't make it halal. Therefore, we tackled the closest problem to us.

For the second targeted group, the culinary arts. The potential of this group as a targeted group has only been discovered as if recently. We didn't realize that white wine plays a big role in cooking. In cooking, they would use white wine to make the meal taste more flavorful. This makes some of the Muslims hesitant to consume the food. From there, we see our product can be so much more. Unfortunately so, we haven't fully confirmed its potential.

4. CONCLUSION

This study is far from its destination but for now, we can conclude a few things. The conversion of white wine to vinegar can be useful to society. It can serve its purpose as an alternative and provide a choice for Muslims all around the world. We believe that modern problems require modern solutions. Some of the problems can be settled by this brainchild.

For our other objectives, where we strive to widen the field of istihalah with the help of innovation, can be achieved only with the help of the community. Society. Knowledge wouldn't be known unless it is spread by the people that received them. In hopes that this study will help people all around the world, we also hope that society would contribute it trying it and spreading it.

We also have future planning that shall be stated here. Firstly, we envisioned the end product to take the form of a pill. This is because it can be easily used. It would be soluble in white wine and allow the conversion to happen. With the form of a pill, it is also easy to store them and be brought everywhere. Just slip a packet of it in the pocket of your jeans and you're good to go.

Secondly, we also envisioned the product to have a visible reaction. This means that we want the chemical reaction to be visible to the naked eye. By seeing the reaction, maybe some fizzle, the consumer will be more convinced that the reaction has took place and it is now safe to consume the product. For now, these are the missions that we want to achieve.

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We wouldn't be here for each other, so it is a blessing to be paired up for this study. With the effort from all four of us, we hope for the best of our study. May our effort be blessed by Allah SWT.

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Oleo Cocos

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ABSTRACT

Some people tend to pour the used grease and cooking oil directly down to their kitchen sink drain. These things will accumulate inside the drain pipes, which caused a plumbing problem. When the grease and oil interact with water, it will coagulate and attaches itself to the interior of pipes. Over time, the deposits can restrict water flow and eventually clog the drain that will block the entire pipe system and could lead to the water overflowing out of the sink. Regarding this problem, superhydrophobic and superoleophilic materials such as modified raw cotton, natural fiber material, organic adsorbent and nanotubes have a significant role in treating the oil spillage. Activated carbon is one of the organic sorbents used as an absorber to trap oil spills due to its high surface area, low density, good chemical stability and environmental friendliness. Therefore, an invention named '*Oleo cocos*' is introduced as the solution to this problem. In this study, the activated carbon was formed from waste coconut shells by carbonisation process and ground to powder form. The powder was then tested for the adsorption efficiency in a simulated drainage system. The activated carbon from coconut shells has demonstrated an effective adsorption capacity. Thus, this product can be used by the community for daily routine to prevent the clog in the kitchen sink which can reduce the cost for plumbing maintenance. Thus, this product is a new invention to solve the problem in our community by using household waste.

Keywords: Coconut shell; activated carbon; cooking oil; absorber

1. INTRODUCTION

Fats, cooking oil, and grease are a critical component of household waste that always been poured down the sink and drains without proper disposal. This problem will lead to sewer clogs by thickening in the piping system and then lowering the flow of water from the sink to the drain or even stop instantly the flow of it. In addition, the burden of contamination in the runoff of storms in the city will also affect the quality of water reception as well.

Therefore, to overcome this problem, an innovation development which is superoleophilic material as an adsorbent has been widely explored for the separation of contaminants. This is due to their characteristic

properties which provide a high surface area, high porosity and good surface reaction [1, 2]. One of superoleophilic material is an activated carbon which are suitable as an adsorbents, catalysts and catalyst support that can be made from a variety of raw materials such as wood, coconut shell, corn cob and charcoal [3, 4]. The usage of waste materials as low cost adsorbent is suitable for adsorption of certain contaminant from aqueous solution as well as can reduce the cost of waste disposal [5]. Choosing the right production methods, such as cheap raw materials, carbonization temperatures and carbonization times will reduce production costs [6, 7].

Activated carbon is known to remove the oil and grease from water by adsorption process. Adsorption is a physical process in which impurities adhere to hard surfaces [8]. Carbon is chemically activated, creating more sites for adsorption and increasing its adsorption capacity [8]. During the adsorption, the oil is favourably attracted to the materials surface while absorbents incorporate the oil into the body of the materials [9, 10]. The use of agriculture sources is absolutely environmental friendly, biodegradable and non-toxic [11].

According to the all properties of activated that has been previously mention, hence coconut shell has been chosen to form an activated carbon which used to absorb oil from the fatty food and grease oil that always been poured into the sink. The activated carbon from coconut shell was prepared by carbonization process in an inert condition. The triggered of this product is for housewife and other place which has waste oil. Besides, the most innovation motivation is to prevent sink and drain from any clog that might occur from the oil spill and save the cost of maintenance.

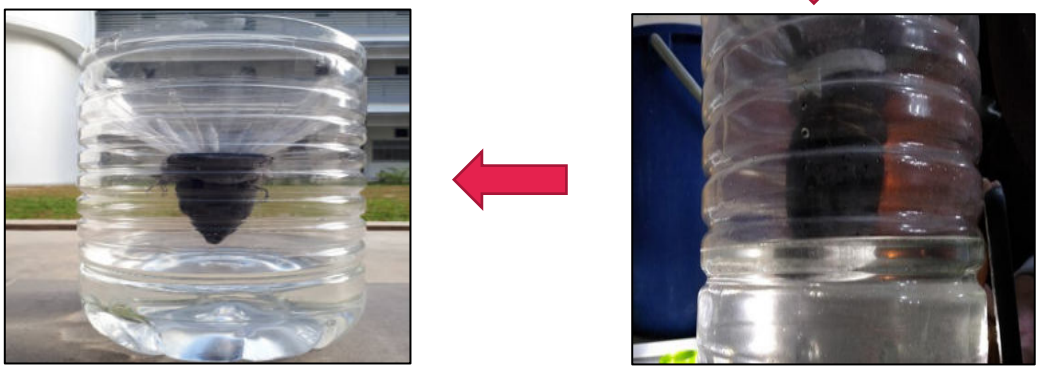
2. INNOVATION DEVELOPMENT

This product is designed to be easy to use at anywhere and non-toxic. Theoretically the product work by crushing the coconut shell into small pieces and undergo carbonisation process. Then the activated carbon formed from the coconut shell was stored in the desiccator. The ready activated carbon as shown in Figure 1 can be used to absorb oil from the oil spill, sink and drain. The Figure 2 showed the flow of the experiment, Figure 3 compare the result obtained with and without the propose invention and Figure 4 revealed the mechanism on how the product work.

Figure 1: Activated carbon formed from waste coconut shell

Coconut shell was crushed

Coconut shell was processed activated carbon



The resulted of oil waste with using activated carbon

The activated carbon was inserted in tea beg and attach to simulation sink

Figure 2: The flow of the experiment

The resulted oil waste without using activated carbon

The resulted of oil waste with using activated carbon

Figure 3: Comparison on the resulted oil result obtained with and without the propose invention

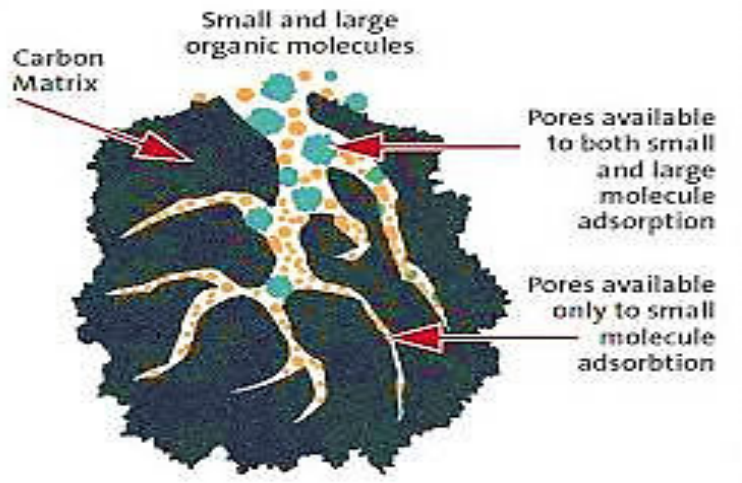


Figure 4: Mechanism on how the activated carbon adsorb.

3. COMMERCIAL POTENTIAL

This product is made for the community especially, household that always faced the problem plumbing system. This product is also environmentally friendly, cheap and easy to use. The needs of this product are expected to increase among the housewife since the washing of kitchen tools is daily a routine.

4. CONCLUSION

This product is an alternative to solve the problems of the community especially households that always faced the problem plumbing system. This product can be used to reduce the grease and cooking oil from entering the drain or sink during washing. The uniqueness of our product is natural, economically and green technology. This product can be improved by using other waste materials and recommended to be applied for industrial scale.

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Organic Pest Repellent

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ABSTRACT

The public's interest in environmentally sound pest control methods and the pest group's resistance to pesticides have recently driven the search for pesticides. In the home and city environment, parasites are mice, birds, insects, and other organisms that share their habitat with humans to feed and damage items. This pest control is carried out by exclusion, subtraction, physical removal or chemical means. Some pesticides not only harmful to cancer but also to human health, but can also harm wildlife. Therefore, an alternative organic pest repellent has been developed by using organic materials which were cinnamon and clove oil in order to make movement of insects outside the source of odor without direct contact and direct contact. The organic pest repellent (cinnamon and clove) was extracted using methanol solvent. The filtered extracts were then evaporate using centrifugal rotary evaporator to get the paste. This paste was mixed with a small amount of methanol. The results showed that, an ant is move away from the food that has been sprayed with organic pest repellent in the surrounding plate of food. This product is environmental friendly and chemical free for the usage in the household.

1. INTRODUCTION

People are increasingly concerned about the effects of pesticides on humans and other organisms, and many pests have developed resistance to some of the most commonly used pesticides. Some pesticides not only cause cancer and other health problems in humans, but can also harm wildlife [1, 2]. Many countries have set a maximum residue limit for pesticides in food and animal foods [3]. General interest in pesticide-safe pest control methods and the increase in insecticide resistance in pest populations has led to research on insect repellents in recent years [4].

Pest control is a regulation or management of species that are designated as pests, which are members of the animal kingdom that affect human activities. In a home and urban environment, parasites are rats, birds, insects, and other organisms that live with humans that feed and destroy goods. This pest control is carried out by exclusion, subtraction, physical removal or chemical means [5].

All of these factors lead to increase interest in non-chemical and environmentally friendly pest management methods [6]. This category can also be called non-chemical "organic" pesticides because the product is derived from soil, plants or even animals. The use of natural pesticides is one way of "organic"

treatment and reducing your carbon footprint. In general, natural pesticides are more environmentally friendly. Natural pesticides work better in the long run because pests tend to be less resistant. This means that over the long term, these pesticides are more effective than pests developed resistance. However, some natural products may be less effective than synthetic products. This largely depends on the ingredients used in organic pesticides.

In pest management, the true goal of repellent is to create an odor barrier to prevent an arthropod into potential host areas such as "safe zones" to reduce confrontation between insects and guests [7]. It is a fact that most pests do not like strong smells and will disappear from them. Therefore, cinnamon and clove has been used as an organic pest repellent which is environmental friendly and chemical free. Cinnamon or its scientific name *Cinnamomum verum* is actually a tree and the bark is used as a spice. It may not be a scientifically proven fact, but many homeowners succeed in getting rid of ants with cinnamon [8]. Cinnamon derives its strong taste and aroma from the various compounds used by the plant specifically to repel attacks from insects and fungi. These versatile chemicals are not harmful to most mammals but cause specific deaths for many fleas, fungi and bacteria [9].

Meanwhile, cloves are essentially aromatic dry buds from plants called *Syzygium aromaticum* which are dark brown, spicy and nail-shaped. Cloves also have insect repellent properties, especially for flies and mosquitoes [11]. Dried cloves can be used as an insect repellent because even if the oil dries, the spicy smell of cloves repels pests such as ants, flies and moths due to distinctive scent is not noticed by humans, but insects [10]. Dayan et al. also reported that clove oil is an effective fast-acting insecticide on arthropods, army worms, leaf lice, and mites [12]. Clove oil-based insecticides are much safer than commercial insecticides and can be used in the home without fear of insecticide poisoning.

2. INNOVATION DEVELOPMENT

This product is designed to be easy to use at anywhere and non-toxic. The raw sample of cinnamon and clove has been cut into small pieces and dried in oven for 24 hours. Then, the dried sample will be grinded using blender to turn it into powder form. A 10 g powder samples were soaked overnight in 100 mL methanol. Each residue as filtered and the filtrate was extracted using centrifugal rotary evaporator in order to get paste product. The paste is mixed with 30 % methanol and the ratio was varied to get the optimum dosage in 10 mL of repellent spray. The product was tested with two pieces of biscuit which one of it was sprayed surrounding with organic pest repellent meanwhile, the others is not. Figure 1 show the flow of experiment and Figure 2 show the results comparison of two pieces biscuit with organic pest repellent and without pest repellent.

The cinnamon and clove were dried overnight in oven.

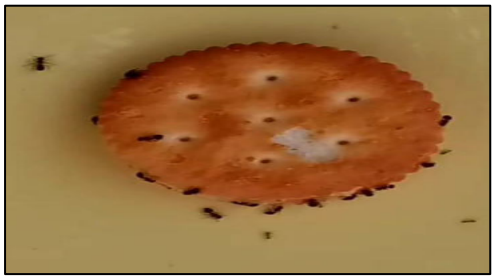
The cinnamon and clove were crushed to fine powder

The product was evaporated using centrifugal rotary evaporator

The extraction oil of cinnamon and clove

Figure 1: The flow of experiment

The biscuit with organic pest repellent



The biscuit without organic pest repellent

Figure 2: Comparison the use of organic pest repellent and without pest repellent

3. COMMERCIAL POTENTIAL

This product is made for community especially housewife that always faced the pest problem and for home gardening to avoid the pest from damage the food and vegetables. This product has a potential for commercialization since it is environmental friendly and easy to use.

4. CONCLUSION

This product is an alternative to solve the problems of community especially household that always faced the pest problem and for home gardening. This product can be used to prevent the pest especially ant or flies from gathering near the food. The uniqueness of our product is easy, economically and green technology. This product can be improved by using other organic materials and recommended to be applied for industry scale.

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The authors would like to express appreciations to the Office of The Deputy Vice Chancellor (Student Alumni &Affairs) for financial support and UniSZA Sciences and Medicine Foundation Centre (PUSPA) for facilitating the research and those who are directly or indirectly involved.

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