**Research title: Innovation to reduce mosquitoes (MOSSKEYTO)**

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## Abstract

This research aims to create innovations that reduce the spread of mosquitoes. by creating innovations in 2 forms. Model 1: Learning-enhancing media (MOSSKEYTO) is a website to promote learning. with content and activities to educate about mosquitoes The information has been converted into Thai language from Mosquito Habitats Resource Library that children can easily access. where learners can measure their knowledge before and after studying When used in the experiment with 35 primary school students, it was found that the students' knowledge increased an average of 77.19%. Model 2: Innovative plant pots that reduce the spread of mosquitoes The device was designed using the principle of mosquito trap in combination with plant pots. Polylactic acid plastic was used to test and collect mosquito data by collecting data twice a week for a period of 1 month. It was found that the device was able to collect 252 mosquito larvae. From the results of the study, innovations to reduce mosquitoes can reduce the spread of mosquitoes. However, we are just a small part that invented methods to reduce the spread of mosquitoes. If we receive cooperation from communities or organizations in applying mosquito reduction innovations, it can reduce the spread of mosquitoes in large numbers and leading to a decrease in the rate of dengue fever patients.

Keywords: mosquitoes, pots, plastic PLA, dengue

## Introduction

Mosquitoes are insects found all over the world but are found predominantly in tropical and temperate regions. There is biodiversity, with many genera spreading all over the world and some with a limited or endemic distribution (Theteetal.,2013). Information of dengue hemorrhagic fever patients before and after coronavirus 2019. It was found that the number of patients in the past 5 years is from 2016-2020, the rate of dengue fever patients is still high every year. We classification of dengue patients by age group The highest morbidity rate was children aged 10-14 years. (Communicable Disease Control Group Trang Provincial Public Health Office,2020) they're group of elementary school students(Grade 4-6). Coronavirus 2019 prevention measures make everyone stay at home. Children do various activities during the day while at home such as learn potted plants etc.

It's very important. We creating innovations to reduce mosquitoes to raise awareness of self-protection. Innovation to reduce mosquitoes is a media that promotes learning that creates knowledge and understanding. Refer to the Mosquito Habitats Resource Library (Globe.gov) and Planting pots that reduce the number of mosquitoes spread. It replaces the typical plant pots that are a breeding ground for mosquitoes. It can reduce the amount of mosquito spread and ultimately reduce the rate of dengue fever patients.

## Research questions

1. Can media to promote learning "MOSSKEYTO" make students gain knowledge and understanding?
2. Can planting pots reduce the spread of mosquitoes?

## Hypothesis

1. Students have increased knowledge after using website "MOSSKEYTO"
2. Plant pots to reduce mosquitoes can attract mosquitoes to lay eggs and reduce the amount of mosquitoes spread.

## Materials and methods

1. Sketch up program
2. PLA plastic
3. 3D printer

4. Notebook
5. Yeast
6. Sugar

## Method of operation

### Part 1 Learning-enhancing media (MOSSKEYTO)

Learning-enhancing media (MOSSKEYTO) is a website to promote learning with mosquito educational content and activities. The information has been converted into the Thai language by the Mosquito Habitats Resource Library. It easy for children to learn.

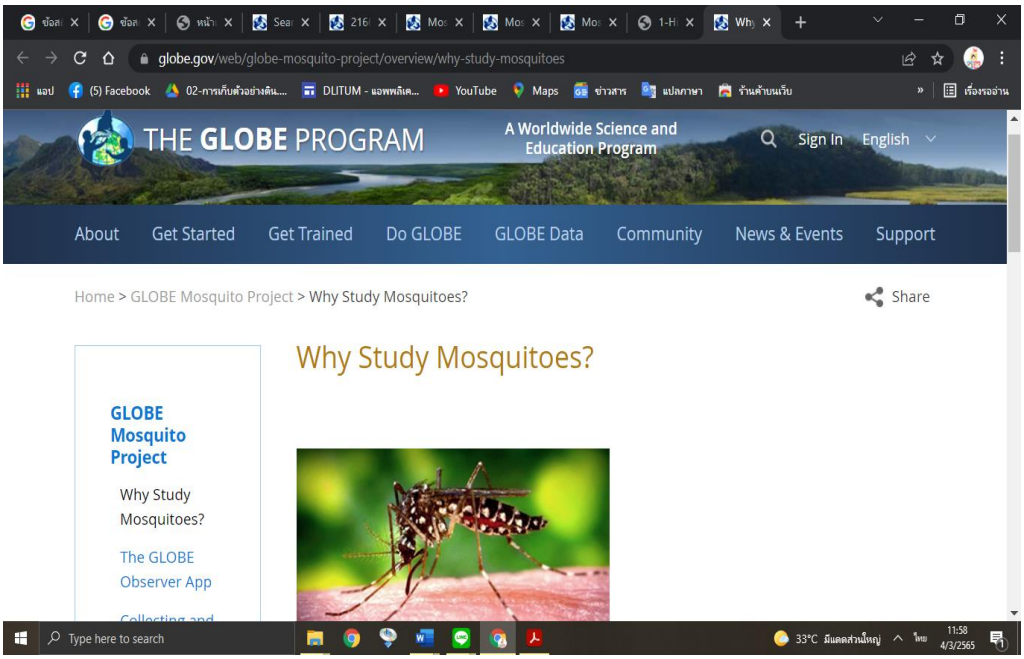



**Figure 1 shows the learning resource GLOBE**

### Part 2 Designing a Website Flow Chart

Design a basic website flowchart. The work plan makes it appropriate for the age range of the target audience. (elementary school student group or Grade 4-6 )

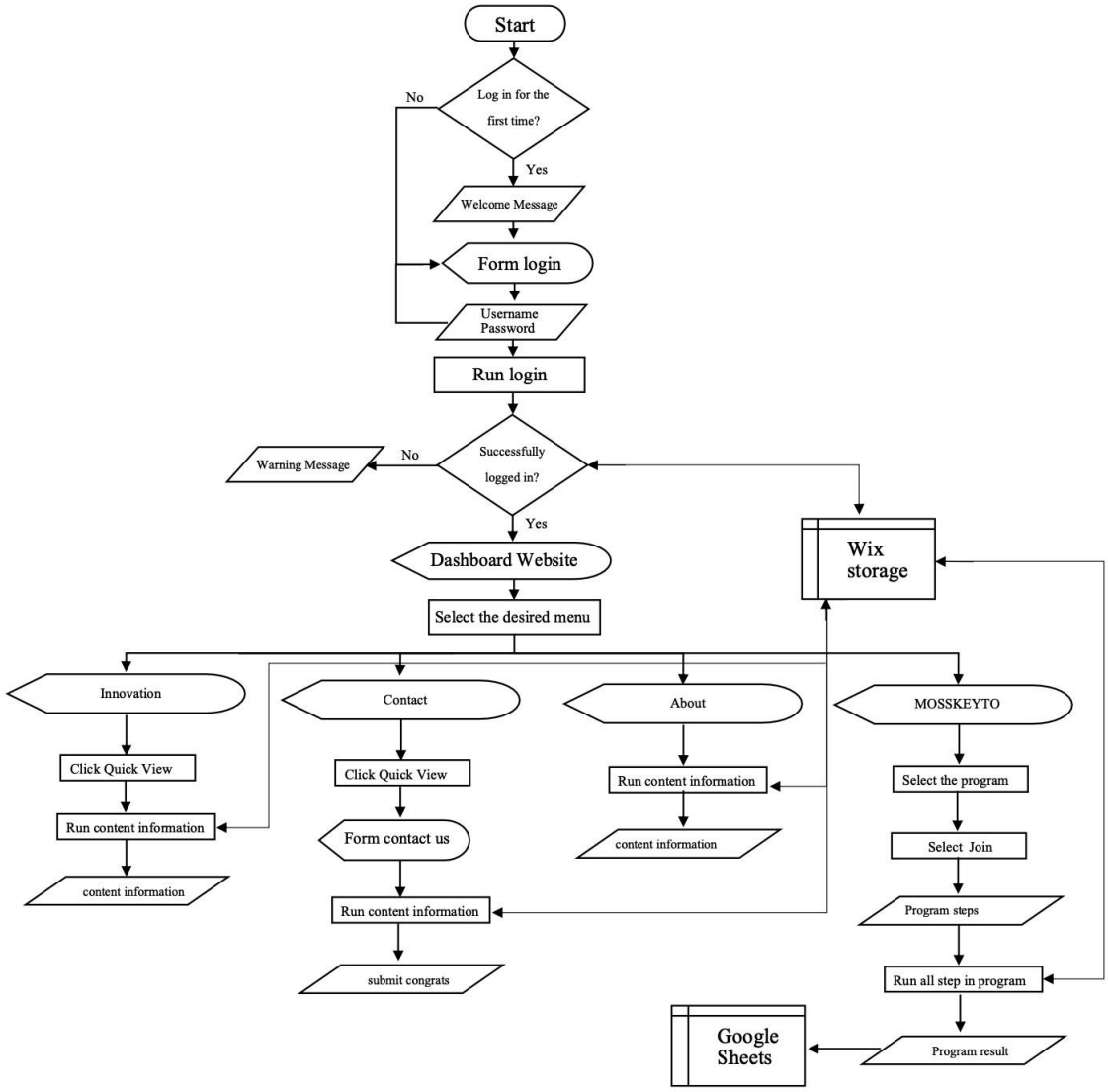



**Figure 2 shows Website Flow Chart**

## Part 3 Create learning materials

Design and select resources from the Mosquito Habitats Resource Library. The information has been converted into the Thai language by the Mosquito Habitats Resource Library so that children can easily access it. Draw cartoons to make them interesting. Create pre-test and post-test to test your cognition. After the assessment results, students with a very good knowledge level of 80% or more will receive a certificate of approval.

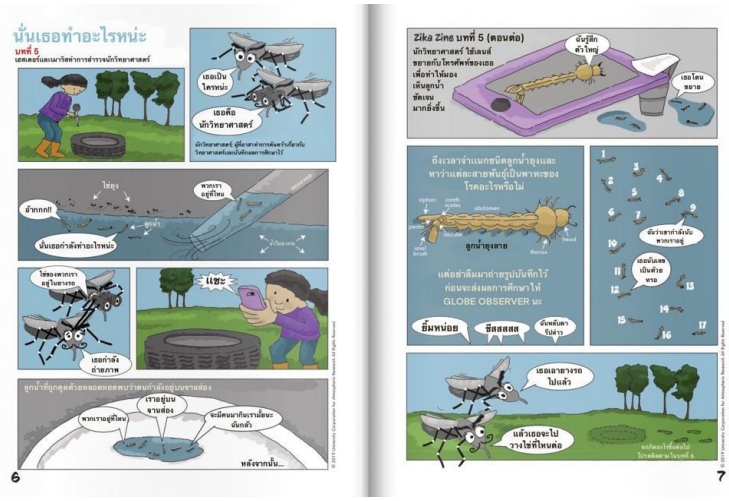



Figure 3 shows learning materials.

## Part 4 Website Development

1. We design our website with wix.com.
2. Design and edit templates, decorate websites
3. Organize and publish the website to the public.


Figure 4 shows Website

## Part 5 Check the website operation

Test the website and check its functionality.

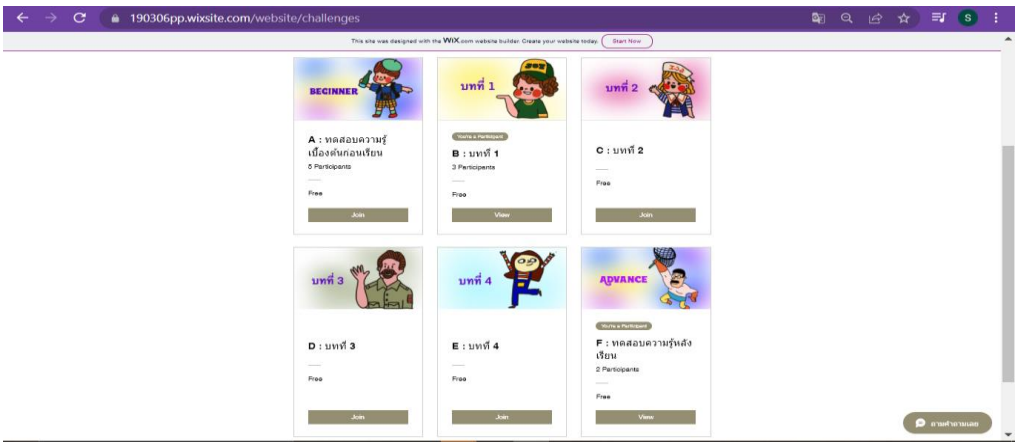



Figure 5 shows pre-test on Website

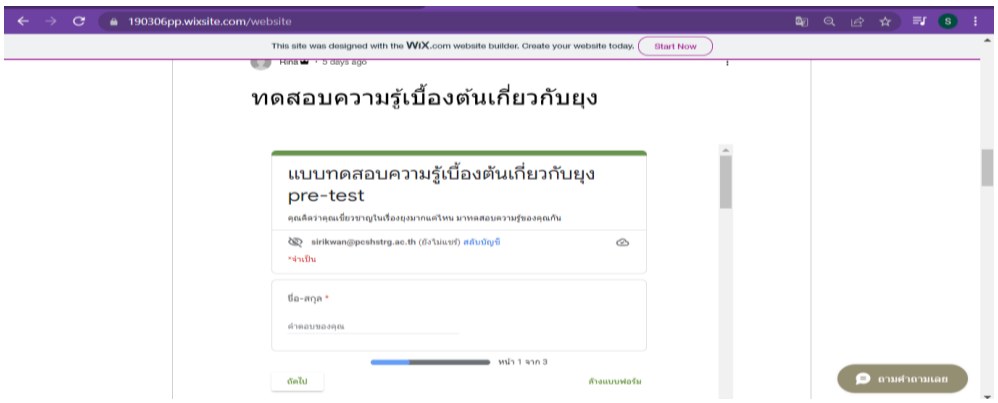



Figure 6 shows learning materials


**Figure 7 shows certificate**

**Part 2** Plant pots to reduce mosquitoes

**Chapter 1 Determining the study point**

This research was conducted in the area of Princess Chulabhorn Science High School ,Trang, Bang Rak Sub-district, Mueang District, Trang Province, located at latitude 7.552996, longitude 99.558417. We collect 3 samples.


Figure 8 show **Determining the study point**

**Part 2 Designing innovative pieces**

Design work using Sketch up program and printing with a 3D printer.. The plant pot is made of polylactic acid (PLA) plastic. It is made from natural materials and is

biodegradable within 6 months. It is the main structure of the innovation workpiece. and the mosquito crawl test. Twice a week for a month It was found that the device was able to collect 252 mosquito larvae. The components are 3 main parts:

Part 1 Area for planting plants.

Part 2 Piece for draining water from watering plants.

Part 3 Area for pots used for mosquito trapping

This innovative design is based on the working principle of mosquito larvae trap according to GLOBE method as shown in Figure 9.


**Figure 9 show Designing innovative pieces**

**Chapter 3 Installing the device**

planting pots composed of

Part 1 Area for planting trees

Part 3 The bottom of the planting pot in the pot used to trap mosquitoes, put a mosquito lure. (a mixture of yeast, water, and sugar to produce the carbon dioxide used to lure mosquitoes) . After that, assemble the parts together. and can bring this mosquito-reducing pot to hang in various areas as appropriate for the user.

**Figure 10 shows the position of hanging the pot to trap the mosquito specimen.**

**Chapter 4 The working principle of innovation**

1. **Color** of innovative pieces Designed to be black or dark. Due to the opaque area, mosquitoes lay more eggs than the bright area.

2. **Humidity** Humidity is one of the factors that affect mosquito lures. This moisture is obtained from the trees that are planted and the water used to plant the trees.

3. **Carbon Dioxide** Derived from the decoy at the bottom of the pot, obtained by mixing the lure of water, sugar and yeast, is one of the factors used to lure mosquitoes to lay their eggs.

4. **Characteristics** of pot design to look concave This makes it difficult for mosquitoes that fly into the pot and get out.

5. **Check** the 3rd part of the pot used to trap mosquitoes. At least twice a week for 1 month to monitor the presence of mosquitoes According to the principles of GLOBE as follows

**Step 1** – Identify potential mosquito breeding sites Let you find water sources - either natural water sources or created water sources. which may contain mosquito larvae Name and photograph the breeding grounds.

**Step 2** - Sampling and Counting You can use a cup, syringe, or other container to collect the sample and count the mosquito larvae.

**Step 3** - Specify the type of mosquito larvae, select a sample of mosquito larvae. Let's take a close-up photo to identify the species. This procedure requires specialized equipment such as a microscope or a macro lens attached to a Telephone camera.

**Step 4** - Dispose when done. We will ask you to empty the water or cover the water source with a lid or net. If possible, to eliminate mosquito breeding sites. to observe the number of mosquito larvae and eliminate mosquito larvae By changing the water and lure in the 3rd part of the pot.

**Step 5** Gather information from observations. and record information about the presence, extent and distribution of mosquito-borne diseases with the GLOBE Observer Mosquito Habitat Mapper Protocol.

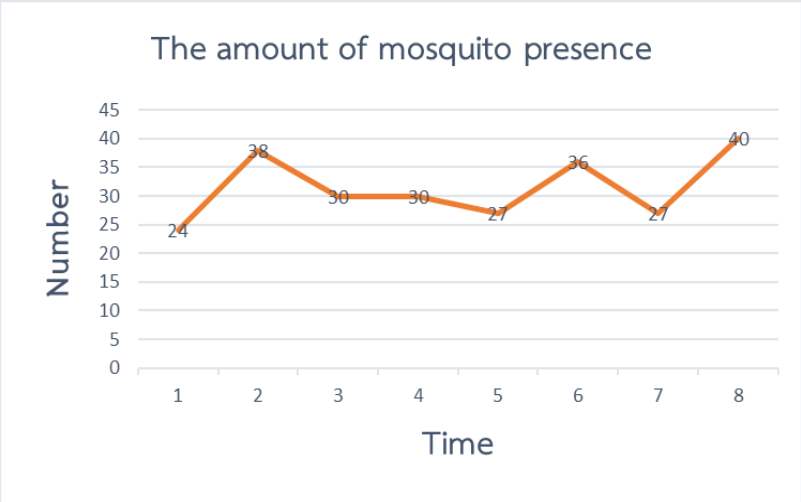
**Results**

Innovative plant pots that reduce the number of mosquitoes spread. The device was designed using the principle of a mosquito trap in combination with plant pots created with

Polylactic acid (PLA) plastic. The data was collected by 3 data sets twice a week for a period of one month. It was found that the device was able to collect 252 mosquito larvae.

**Table 1: Data collected for the presence of mosquitoes for 1 month**

| Time | pot'1st | pot'2nd | pot'3rd | Sum |
|---|---|---|---|---|
| 1 | 6 | 7 | 11 | 24 |
| 2 | 13 | 16 | 9 | 38 |
| 3 | 8 | 12 | 10 | 30 |
| 4 | 13 | 11 | 6 | 30 |
| 5 | 7 | 9 | 11 | 27 |
| 6 | 11 | 13 | 12 | 36 |
| 7 | 6 | 6 | 15 | 27 |
| 8 | 12 | 15 | 13 | 40 |
| Sum | 76 | 89 | 87 | 252 |




**Graph 1 The graph shows the mosquito population sampling data.**
**every 2 times a week for 1 month.**

(MOSSKEYTO) is a website to promote learning with mosquito educational content and activities. The information has been converted into the Thai language by the Mosquito Habitats Resource Library so that children can easily access it and learners can measure their knowledge before and after studying. When used in the experiment with 35 primary school students, it was found that the students' knowledge increased on average by 77.19%.

After using innovative (MOSSKEYTO) for students (Banmodtanoy School). They have pre-test of 9.77, an SD value of 3.48 and post-test of 17.31, a SD value of 2.58. ($P < 0.05$ )

**T-Test**

[DataSet0]

**Paired Samples Statistics**

| | | Mean | N | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 1 | PreTest | 9.7714 | 35 | 3.48177 | .58853 |
| | PostTest | 17.3143 | 35 | 2.57558 | .43535 |

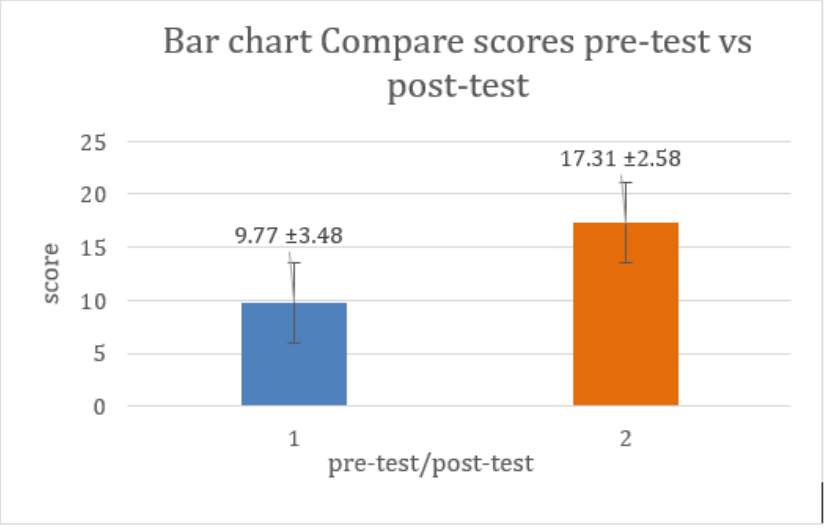
**Paired Samples Correlations**

| | | N | Correlation | Sig. |
|---|---|---|---|---|
| Pair 1 | PreTest & PostTest | 35 | .887 | .000 |

**Paired Samples Test**

| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference Lower | Upper | | | |
| Pair 1 | PreTest - PostTest | -7.54286 | 1.68633 | .28504 | -8.12213 | -6.96358 | -26.462 | 34 | .000 |

Figure 11 shows the analysis of pre-test and post-test results by SPSS program.




**Graph 2** Bar chart Compare scores pretest vs post-test

## Discussion

This innovation that reduce the spread of mosquitoes by creating innovations in two forms. Learning-enhancing media (MOSSKEYTO) is a website to promote learning with mosquito educational content and activities. The information has been converted into the Thai language by the Mosquito Habitats Resource Library so that children can easily access

it and learners can measure their knowledge before and after studying. When used in the experiment with 35 primary school students, it was found that the students' knowledge increased on average by 77.19% A total of 23 students received a certificate of proficiency due to their very good level. The second form is the creation of innovative plant pots that reduce the number of mosquitoes spread. The device was designed using the principle of a mosquito trap in combination with plant pots created with Polylactic acid (PLA) plastic, and was used to test and collect mosquito data by collecting data twice a week for a period of one month. It was found that the device was able to collect 252 mosquito larvae.

## Conclusion

This is Innovation to reduce mosquitoes. The real benefit is that learning support media (MOSSKEYTO) can create explicit knowledge and self-defense guidelines for learners, and planting pots to reduce mosquitoes can reduce the spread of mosquitoes. However, We are just a small part of the development of ways to reduce the spread of mosquitoes. If there is cooperation from the community or organizations in applying mosquito reduction innovations, It can reduce the spread of mosquitoes in large numbers and lead to a reduction in the rate of dengue fever patients.

## Acknowledgement

We would like to thank our supervisor Mrs.Phatchara Pongmanawut and Mrs.Sirikwan Nuputhi. We are grateful to Assoc. Prof. Dr. Mullica Jaroensutasinee, Walailak University Dr.Thanathip Limna , Prince of Songkla University and Mr.Ugrit Chammari , Rajamangala University of Technology Srivijaya Nakhon Si Thammarat Campus for teaching us how to collect data . We thanks Trang Provincial Public Health Office and Banmodtanoy School for data. We thank our parents and friends for loving, educating, caring and supporting us during conducting this project.

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# International Virtual Science Symposium

# Optional Badges

**I am a Collaborator**

This project made us learn to plan work systematically. Teamwork Coordinate learning and information with various agencies such as Trang Provincial Public Health, Ban Modta Noy School, Walailak University, Prince of Songkla University, Rajamangala University of Technology Srivijaya Nakhon Si Thammarat Campus. We learn to live with others in different situations. being both the giver and the receiver at the same time**.**

**I make an Impact**

Information of dengue hemorrhagic fever patients before and after coronavirus 2019. It was found that the number of patients in the past 5 years is from 2016-2020, the rate of dengue fever patients is still high every year. We classification of dengue patients by age group The highest morbidity rate was children aged 10-14 years. (Communicable Disease Control Group Trang Provincial Public Health Office,2020) they're group of elementary school students (Grade 4-6). Coronavirus 2019 prevention measures make everyone stay at home. Children do various activities during the day while at home such as learn potted plants etc. It's very important. We creating innovations to reduce mosquitoes to raise awareness of self-protection. This innovation consists of "MOSSKEYTO" and "Planting pot to reduce mosquitoes". "MOSSKEYTO" is a media that promotes learning that creates knowledge and understanding. Refer to the Mosquito Habitats Resource Library (Globe.gov) and Planting pots that reduce the number of mosquitoes spread. It replaces the typical plant pots that are a breeding ground for mosquitoes. It can reduce the amount of mosquito spread and ultimately reduce the rate of dengue fever patients.

**I am a Stem Professional**

We work with scientists from leading universities. To provide guidance in the work of the correct approach to the research process and to support the analysis and interpretation of results according to statistical methods:

**S-Science**

Learn how to collect mosquito samples. According to the GLOBE methodology, the methodology was studied from GLOBE.gov collecting information about mosquitoes in Mosquito Habitats Resource Library Assoc. Prof. Dr. Mullica Jaroensutasinee, Walailak University

**T-Technology**

Create a learning page named MOSSKEYTO as a learning resource about mosquitoes for elementary school students using WIX.COM. Create learning resources for students to access GLOBE information more easily in Thai format by Dr.Thanathip Limna , Prince of Songkla University

**E-Engineering**

Designing a mosquito repellent pot using the program Sketch up to create a template for printing with a 3D printer. Using eco-friendly PLA filament, PLA plastic is made from natural materials and is biodegradable within 6 months. Mr.Ugrit Chammari , Rajamangala University of Technology Srivijaya Campus (Sai Yai)

**M-Mathematic**

It is planned to calculate the number of mosquitoes that can be captured in order to predict the mosquitoes that can be eradicated in the future. and analyze the score pre-test,post-test The SPSS program was used to analyze the significant difference at the 0.05 level.

**I am an Engineer**

We design mosquito repellent pots to meet the environmental problem of reducing mosquitoes by using innovative mosquito repellent pots. The details of the design improvements to solve the problems that arise is to create a mosquito-reducing pot, taking into account the mosquito lure factor so that mosquitoes lay eggs but are difficult to fly back out. to reduce the number of mosquitoes in the community The design method is as follows:

**The working principle of innovation**

1. Color of innovative pieces Designed to be black or dark. Due to the opaque area, mosquitoes lay more eggs than the bright area.

2. Humidity Humidity is one of the factors that affect mosquito lures. This moisture is obtained from the trees that are planted and the water used to plant the trees.

3. Carbon Dioxide Derived from the decoy at the bottom of the pot, obtained by mixing the lure of water, sugar and yeast, is one of the factors used to lure mosquitoes to lay their eggs.

4. Characteristics of pot design to look concave This makes it difficult for mosquitoes that fly into the pot and get out.

5. Check the 3rd part of the pot used to trap mosquitoes. At least twice a week to monitor the presence of mosquitoes According to the principles of GLOBE as follows

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Step 3 - Specify the type of mosquito larvae, select a sample of mosquito larvae. Let's take a close-up photo to identify the species. This procedure requires specialized equipment such as a microscope or a macro lens attached to a cell phone camera.

**I am a Data Scientist**

1. Analyze problems in the community Data courtesy of the Communicable Disease Control Group. Trang Provincial Public Health Office, 2020 is Dengue problem caused by mosquitoes According to a survey of dengue hemorrhagic fever patients before and after the 2019 coronavirus epidemic, it was found that the number of patients in the past 5 years is from 2016 - 2020. Dengue incidence rates continue to be consistently high every year. If dengue patients were classified by age group The highest morbidity rate was Children between the ages of 10-14 years is an elementary school student.

2. Analyze test results pre-test/post-test from using MOSSKEYTO learning media for students of Ban Mod Tanoi School, Kantang District, Trang Province, using SPSS program to

analyze the data with t-Test: Paired Two Sample for Means at a significant difference at the 0.05 level.

**I am a Stem Storyteller**

We make a MOSSKEYTO because It is alearning media that creates knowledge and understanding. Comprehensive about mosquitoes Both the differences of each species Life cycle phase. Method of disposal using modern media. able to interact Practice skills in a fun way According to Globe.gov, the Mosquito Habitats Resource Library collects mosquito-related information. We translated the source material from English into Thai to make it easier for elementary school students to access the resources. and measure their comprehension from pre-test and post-tests. (After using innovative media to reduce mosquitoes), It was found that 35 primary school students had a mean pre-school knowledge of 9.77, an SD value of 3.48, and an average post-media knowledge of 17.31, a SD value of 2.58. at P= 0.00 < 0.05 (Sig.) therefore it can be concluded that Test results before and after using innovative mosquito reduction media were significantly different at the .05 level showing that innovation to reduce mosquitoes Learning promotion materials make students more knowledgeable. After creating learning materials (MOSSKEYTO), then We share knowledge by forwarding it to a group of friends through online media channels. Uploading invitations to Story IG, posting public solicitations on Facebook, and sharing per post for a wider publicity and information dissemination to other primary schools for use in cognitive enhancement and how to protect themselves from mosquitoes for children.