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# Integrating Interactive Multimedia Elements to Increase Melioidosis Awareness

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## ABSTRACT

Neglected Tropical Diseases (NTDs) are communicable diseases that prevail in tropical and subtropical conditions which posed an emerging threats to public health. Melioidosis, also known as Whitmore's disease, is an example of NTD which is caused by the bacterium Burkholderia pseudomallei (B. pseudomallei), found in soil and water. Attitudes and level of knowledge about Melioidosis have to be studied to increase public awareness. A range of applications are available from a variety of clinical conditions but none target the niche of neglected tropical diseases specifically Melioidosis. Mobile applications for Melioidosis Awareness (MeliOAPP) using animation and game-based education will offer interactive educational content that will increase public understanding on Melioidosis. It incorporates multimedia elements to effectively educate on Melioidosis and B. pseudomallei bacteria not only to the general public but also to health or microbiological professionals. Based on user feedback on this application, MEliOAPP can help them to understand Melioidosis disease in an interesting and easy way and can increase their awareness of the disease.

**Key words :** Multimedia Elements, Melioidosis, Awareness.

## 1. INTRODUCTION

Neglected Tropical Diseases (NTDs) are a parasitic and bacterial disease that attacks more than one billion people worldwide. NTD are caused by various pathogens such as viruses, bacteria, protozoa and parasitic worms. These diseases pose a threat to public health. One example of neglected Tropical Disease is Melioidosis. Melioidosis, one of the most common examples of neglected Tropical Diseases in diabetics. Difficulty in diagnosing Melioidosis due to the lack of symptoms of the disease; resistance to intrinsic antibiotics for B. pseudomallei bacteria; and high mortality rates associated with infection [1]. Most people have never heard of Melioidosis, and even health professionals are unaware of it. This is due to the lack of dissemination of information to the public through various channels, especially the mass media that rarely provides information on Melioidosis. Also, according to Melioidosis expert Dr. David AB Dance, Melioidosis is not on the World Health Organization (WHO) list of Tropical Diseases [2]. Therefore, we have suggested in this paper a mobile application for Melioidosis disease awareness.

The paper starts with the discussion and overview of Melioidosis diseases and previous mobile application for disease awareness. Then it continues with explanation of the development methodology and followed by system development and evaluation. At the end of this paper, we concluded the effect of multimedia elements which has successfully increase awareness of Melioidosis.

## 2. RELATED WORKS

Melioidosis is an infectious disease affecting humans and animals caused by the bacterium Burkholderia pseudomallei (B. pseudomallei) found in contaminated soil and water [3]. This bacterium is a soil saprophyte and is an easily accessible species of water and wetlands in endemic areas. These bacteria will spread to humans and animals through direct contact with contaminated sources. Such bacteria, including penicillin, ampicillin, cephalosporius, and rifampicin, are resistant to various antibiotics. [4].

To understand public awareness on neglected tropical diseases; the attitudes and level of knowledge about such diseases have to be studied before any solutions or suggestion can be made to increase the awareness. For example, studies on awareness regarding antibiotic resistance by [5] and [6] demonstrate that respondents have several misconceptions and lack knowledge on proper antibiotic use and resistance. High proportion of people use antibiotics without a medical prescription or consultation, while having high trust in the medical personnel. Such base-lines are not very well defined for neglected tropical diseases, inherently so due to their 'neglected' labelling.

Recent advances in technology have enabled the development and utilization of electronic medical software applications for both mobile and desktop computing devices. [7][8]. A range of applications are available from a variety of clinical conditions, including antimicrobials or patient and public infections, but none target the niche of neglected tropical diseases. Augmented Reality (AR) provides a new learning perspective by allowing learners to visualize complex spatial relationships and abstract concepts. Interactive android apps were developed using AR technology with a 3D bacteria display found every time the mobile devices scan an identified object commonly found around us [10], [11]. Users can manipulate the behavior of the bacteria by simulating another condition for the bacteria, and visualize the aesthetic behavior of the bacteria in 3D format [12]. Such approaches may help the public gain a more contextual understanding of the diseases, their symptoms and the regions/periods where/when they can be present.

## 3. METHODOLOGY

In this work, a mobile Melioidosis Patient Awareness Application (MeliOAPP) is developed for users to gain a better understanding of Melioidosis. There is less impact if the application uses only text to display information about Melioidosis. Therefore, graphics, video, audio and animation are used to generate and increase user interest as they use this application. Users can improve their memory and understand information more easily and quickly when exposed to graphics, videos and animations. In addition, the use of audio in the right way will help the user to create imagination and improve their understanding of the disease.

Incremental Development Model was used for the development of MeliOAPP. This method is selected because it needs to be tested and repaired at a small iteration. After each iteration, a regression test must be performed. During this test, imperfect software elements can be quickly identified as multiple changes are made in a single iteration. Therefore, users can respond to features and comment on the product so any necessary or useful changes can be made. Figure 1 shows the Incremental Development used in this study.

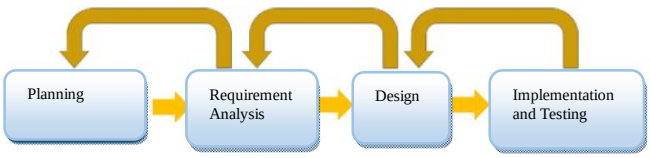


**Figure 1:** Incremental Development Model

In the planning phase, we gathered the information about Melioidosis. Then we analyze the user and system requirement, understand the problem areas and identify the main concept of the application. The design phase encompasses the research, planning, defining and identifying tasks of the application. Once the proposed project is appropriate the project idea is developed based on the system features for example text features of the disease information, the video animation of the disease and the game section. At the final phase, the application will be developed and tested. The application designers will create test cases for modules, integrate and create application system testing. This is to detect system errors, fix the problem and to make sure the application system is working properly. Users can also respond to application features and comment on any changes that may be needed.

## 4. IMPLEMENTATION AND DESIGN

MeliOAPP is divided into two modules: information about Melioidosis and mini games. Figure 2 shows the flow chart of the overall system.

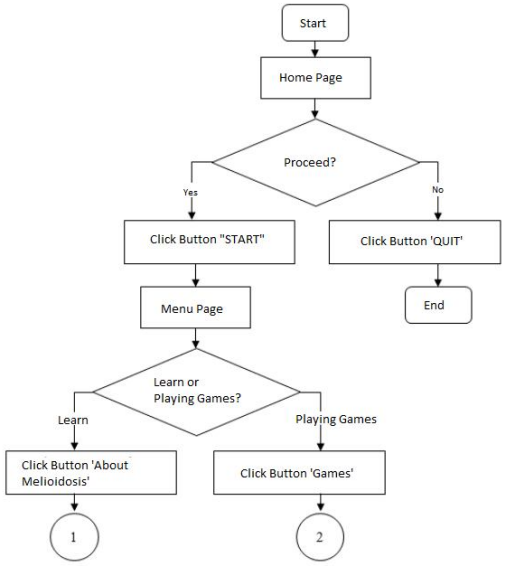


**Figure 2:** System Flow Chart

When a user enters the app menu page, the application system displays two modules, 'About Melioidosis' and 'Games' for user to choose.

### 4.1 Module 1: Melioidosis Information

In this module, there are seven submenus which are ‘What is Melioidosis’, ‘How You get Melioidosis’, ‘Risk Factors of Melioidosis’, ‘Symptoms’, ‘Diagnosis’, ‘Prevent Strategies and Treatment’ & ‘Management’. Figure 3, 4 and 5 show examples of user interface for this module.

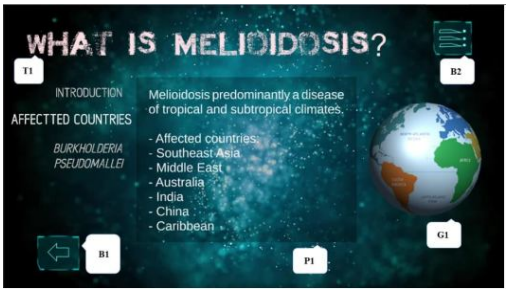


**Figure 3: '**What is Melioidosis' submenu


**Figure 4: '**How You get Melioidosis' submenu

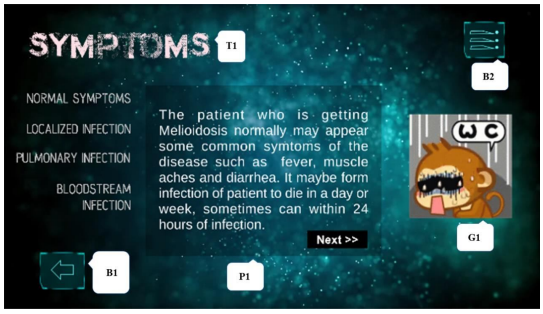


**Figure 5: '**Melioidosis Symptoms' submenu

### 4.2 Module 2: Mini Games

This module is divided into two sections which is Quiz and Level Game. An interactive multimedia element such as animation, graphic, audio, video, and illustration has been applied in this module. The user will have to answer the questions until they win. Therefore, the user will learn and enjoy while playing the games.

#### 4.2.1 Quiz

If the user selects 'Quiz' in the mini-game menu shown in Figure 6, the user will be able to start the quiz game. In the quiz game, the user has to answer 10 randomly selected questions out of the 20 questions provided. Figure 7 shows one of the questions in the quiz game.

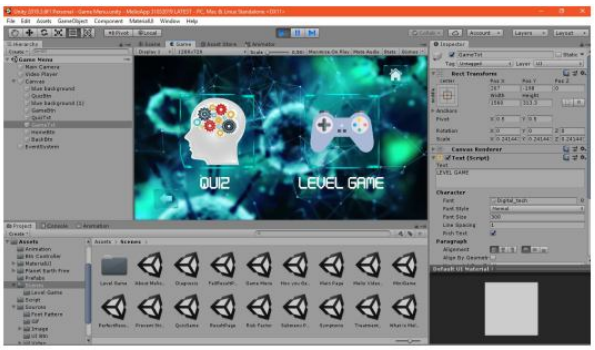


**Figure 6:** Mini Game Menu Interface in Unity


**Figure 7:** The 'Quiz' Interface in Unity

After a user has answered 10 quiz questions, the app will show the result to tell the user the number of questions they have answered correctly. If the user answers all the questions correctly, another page will be shown to the user. Figure 8 shows the interface if the user answers all the questions correctly.

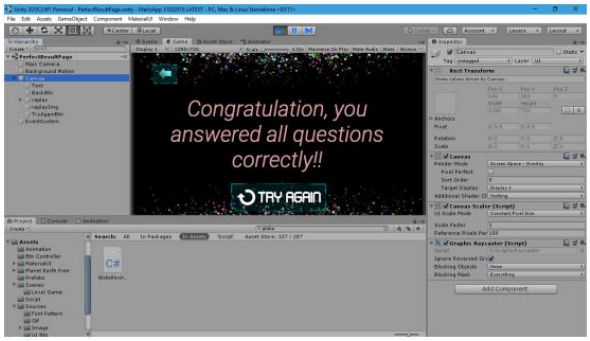


**Figure 8:** The "PerfectScorePage 'scene on Unity

#### 4.2.2 Level Game

There are 3 levels in 'Level Game' namely 'Level 1', 'Level 2' and 'Level 3', as well as a bonus game called 'Survival Mode'. If the user can complete the mission at each level of the game, the MissionComplete scene will be displayed in this app. However, if the user is unable to complete the quest at the game level, a 'GameOver' scene will appear. Figure 9 shows the level game menu, while Figure 10 shows one of the interface levels.


**Figure 9:** Level Game Menu


**Figure 10: '**Level 1' Interface

## 5. RESULT AND DISCUSSIONS

The evaluation process was organized by explaining the objective of MeliOAPP and disseminating the questionnaires to the users. 30 respondents have participated in the survey. Each of the modules has been explained and the user needs to test every module subsequently. After that, users were asked to answer the questionnaire. The purpose of this evaluation is to test the degree of satisfaction of users as well as the usability of the application. Figures 11-16 below show the results obtained from the survey.

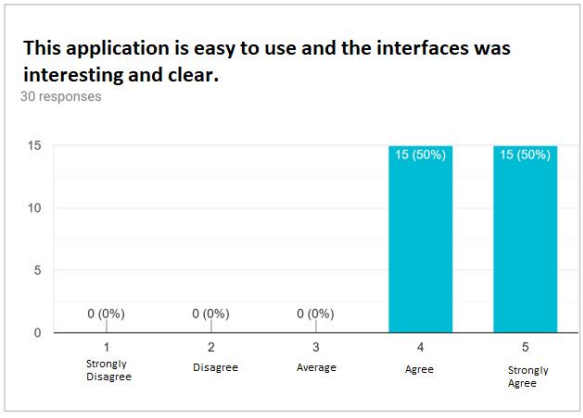


**Figure 11:** 'Easy to Use'

As presented in Figure 11, 50% of respondents agreed that MeliOAPPP is easy to use and has an attractive and clear interface while 50% of other respondents strongly agree with this statement.

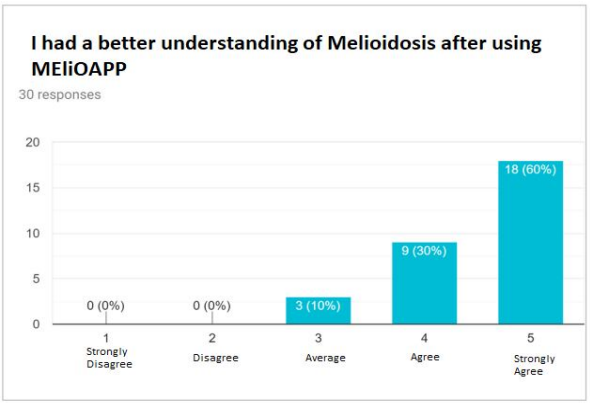


**Figure 12:** 'Better Understanding'

As presented in Figure 12, only 3 (10%) selected moderate for this question. 9 people (30%) agreed that they had a better understanding of Melioidosis after using the Melioidosis Awareness Application, and 18 (60%) strongly agreed with this statement.

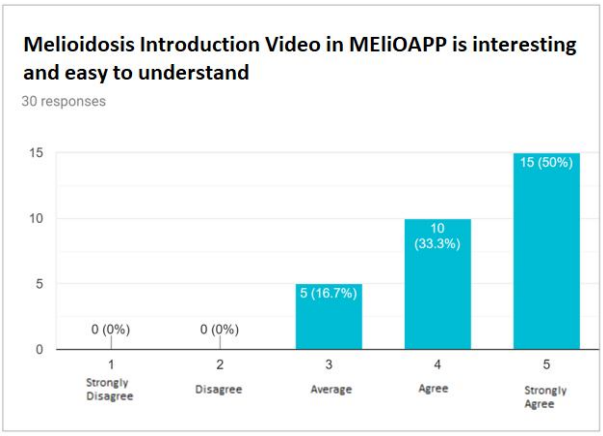


**Figure 13: '**Easy to understand'

16.7% of respondents felt moderate about Melioidosis Introduction Video. 33.3% of respondents agreed that Melioidosis Introduction Video in MeliOAPP is interesting and easy to understand. Meanwhile, 50% of the other respondents strongly agreed this statement (Figure 12).

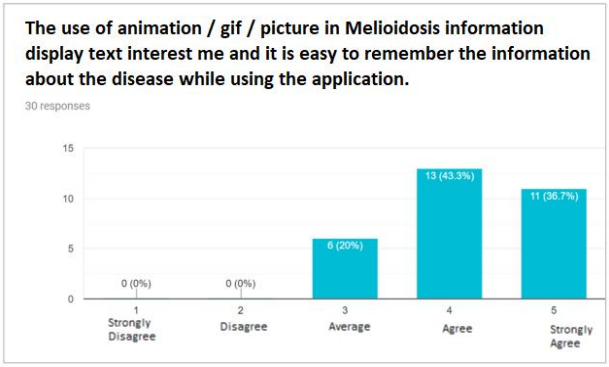


**Figure 14:** 'Use of Animation'

6 respondents (20% respondents) felt that the use of animation / gif / picture in Melioidosis information display attract users with only average effect while 13 people (43.3%) felt that this had a positive effect on user interest and users would be more likely to recall disease information when using the app. Meanwhile, 11 people (36.7%) strongly agreed with this statement.

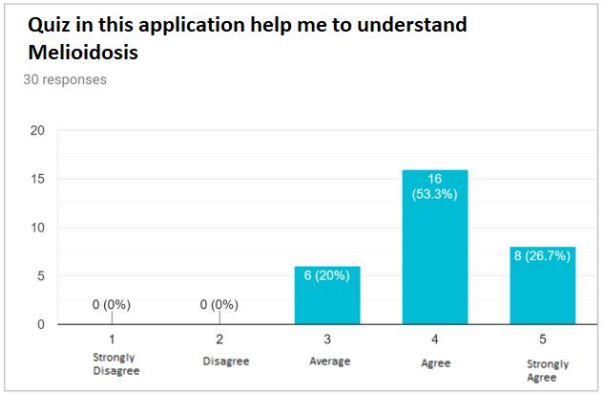


**Figure 15:** 'Quiz - Understand'

6 people (20%) felt that quizzes in the Melioidosis Awareness Application could help them to have better understanding about the disease. A total of 16 people (53.3%) agreed that this quiz help them better understand about Melioidosis while 8 people (26.7%) strongly agreed with this statement.

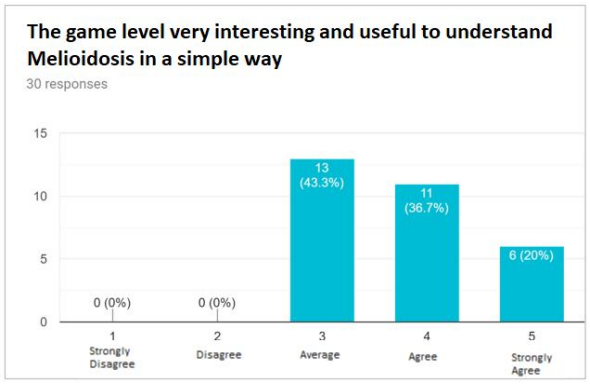


**Figure 15:** 'Interesting and Useful'

In terms of whether the game level is very interesting and useful to understand Melioidosis in a simple way, 43.3% of respondents is ok with the game level, 36.7% of respondents agreed with this statement, and 20% of respondents felt that the game level is very interesting and useful in understanding Melioidosis. (Hamad et al. 2019)

## 6. CONCLUSION

We have implemented interactive multimedia elements such as animation, text, audio, video, graphic and illustration into MeliOAPP. The application has been tested and evaluated to measure user satisfaction. Based on the feedbacks on this application, it shows that the interactive multimedia elements can help users understand Melioidosis disease in an interesting and easy way. This application provides the right and effective information to the user thus increasing their awareness of the disease.

## ACKNOWLEDGEMENT

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