



Erudite Survivor: Usability Testing of a Gamification-based Mobile App for Disaster Awareness Among Children

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ABSTRACT

Numerous peer-reviewed studies describe designs for a mobile application for children based on gamification and catastrophe awareness. However, few articles give extensive evaluations of their solutions' usability for end users. The purpose of this study is to present the usability assessment findings of a mobile app aimed at raising children's catastrophe awareness in Malaysia. The study includes 12 target users to test the usability of the Erudite Survivor mobile app prototype. The test evaluation contains a pre-test, post-task and post-test questionnaire (Post-Study System Usability Questionnaire). The primary sections of this Post-Study System Usability Questionnaire are Overall Satisfaction, System Usefulness, Information Quality, and Interface Quality. The Post-Study System Usability Questionnaire revealed the following mean scores: Overall satisfaction (2.09), System Usefulness (2.03), Information Quality (2.06), and Interface Quality (2.25). Users of the prototype were satisfied with the application because the score was near to 1. This application's capacity to teach children about disaster awareness might be viewed as the initial step toward a future improvement of gamification-based disaster education among Malaysian children.

1. Introduction

Gamification involves using game design elements for non-game purposes [1]. It has been successfully applied in various fields like environment, health, employment, commerce, and education [2,3]. In education, gamification has proven to be valuable for enhancing students' motivation, participation, involvement, and interest in learning [4,5].

Serious games have demonstrated considerable potential and advantages in the field of disaster risk reduction [6]. Prior studies, such as those by Arinta *et al.*, [7], Kimura and Kawamoto [8], and Manalang *et al.*, [9], have explored the utilisation of gamification to enhance disaster awareness in Indonesia, Japan, and the Philippines, respectively. Arinta *et al.*, [7] developed a mobile application that employs gamification elements to educate rural communities on proper disaster preparedness, focusing on floods. Kimura and Kawamoto [8] integrated gamification into their e-learning system, presenting a disaster safety manual in a visual novel format and assessing users' knowledge

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retention. Manalang *et al.*, [9] created Kidzaster, a web-based learning system that imparts knowledge of natural disasters to Philippine students. All three studies highlight the effectiveness of gamification in disaster preparedness education, enhancing the learning experience, improving accessibility to disaster-related information, and fostering user engagement. This applies not only to adults but also to children, who should be educated about disasters from an early age. Despite the presence of several studies investigating the use of gamification to raise disaster awareness in neighbouring countries, research on gamification and disaster preparedness in Malaysia, particularly in the context of children's learning and relevant natural disasters, is limited.

There is a lack of disaster awareness among the Malaysian population, particularly among children who have not experienced major catastrophes resulting in significant losses of life and infrastructure [10]. Neighbouring countries like Indonesia and the Philippines face constant threats from disasters and Malaysia should not be complacent [11,12]. Future projections indicate that the east coast of Malaysia will experience increased rainfall, rising sea levels, and recurrent flooding by 2050 [13]. Natural disasters have the potential to cause not only short-term challenges but also long-term impacts on the nation. Khattak *et al.*, [14] highlighted the vulnerability of Malaysia's energy security to natural disasters, which is critical for the country's sustainable development. Therefore, preparations must be made and the importance of children's roles during disasters should not be underestimated [15]. Gamification has the potential to address this issue [16].

2. Methodology

2.1 Prototype Design

To develop the application, Android Studio is used as the integrated development environment (IDE) alongside the Flutter framework, which is based on the Dart programming language. Android Studio was chosen due to its comprehensive set of tools that enable efficient app construction, debugging, and optimisation. This IDE offers extensive features, including code editing, testing, and debugging capabilities. Additionally, Flutter was selected as the framework of choice because it provides a rich collection of pre-built user interface elements called widgets, along with configurable animations and themes. This empowers developers to create highly personalised and visually cohesive user interfaces across multiple platforms.

Users were asked to test the homepage screen upon starting the app. In the homepage, users can decide their next course of action. If the users want to learn more information on disasters, they can click on the Disaster Information button to access the Disaster Information section. Besides accessing other pages, users can also pause and resume the background music in the homepage by clicking the button with the speaker icon at the bottom of the screen. Additionally, users can also change the language used in the app (Figure 1).

To assess the efficacy of the application in achieving the project's objective, conducting usability testing is imperative [17]. This testing aims to evaluate the app's performance in enhancing disaster awareness, users' perception of it, and identifying areas for potential improvement. The usability testing process encompasses several tests carried out by the participants, including a pre-test questionnaire, prototype testing, and a post-test questionnaire. The pre-test serves as a preliminary assessment of the users' skills and knowledge before engaging with the app. The post-test, on the other hand, measures the users' skills and knowledge after utilising the app.