

# Experience in Developing a Courseware to Inculcate Awareness Towards Disaster Risk Reduction Among Schoolchildren

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## ABSTRACT

Rising concern over climate change has substantially affected our daily lives. After Hurricane Harvey, the focus on global flood disaster has shifted to Asian region as exceptionally deadlier rainfall has killed at least 1200 people in 2017. Malaysia constantly faces this calamity on annual basis which caused serious social and economic impacts. Within the context of vulnerability, children are severely exposed to physical and psychological effects. Therefore, it is imperative to educate schoolchildren on awareness for flood disaster safety and resilience. The advent of courseware in the domain of disaster management has been well received due to its capability to educate children on preparation and mitigation for any catastrophes. Grounding upon AGILE technology, a courseware entitled “Jom Siap Bersama Si Kelip” has been developed for educating schoolchildren living nearby to hydropower dams in Peninsular Malaysia. This courseware aims to educate schoolchildren on flood disaster and what to do in the event of a flood. It is foreseen that this courseware will build a sense of confidence and control in handling moments of crisis amongst the targeted schoolchildren should any occurrence of flood disaster in the future.

**Keywords:** Multimedia courseware, disaster risk reduction, resilience, empowerment

## I BACKGROUND

Despite various proactive steps being taken, the issue of rising global temperatures continues to be alarming largely due to human related greenhouse gases emission. It is predicted that there is a potential increase in the changing rainfall-driven flood risk due to warmer future climate (Hirabayashi et al., 2013; Milly et al., 2002). Eventually, this weather trend will put hundreds of millions of people at risk throughout Southern Asia including Malaysia. Many governments in this region have dutifully built physical infrastructure to protect the citizens from water as well as formulating appropriate disaster management plan to be activated during emergencies.

Knowledge and skills related to community-based disaster risk management (CBDRM) amongst the vulnerable community are pertinent to prevent or minimise the consequences of natural disasters (Salajegheh and Pirmoradi, 2013; Tanwattana and Toyoda, 2018). Therefore, it is imperative to enhance the resilience of the affected community in order for them to better anticipate, mitigate, prepare and cope with the occurrence of unprecedented events. Hence, the community are empowered to not only control the hazard but also to better manage it as well (Lopez-Marrero and Tschakert, 2011). It is envisaged that resilient community will be able to recover or bounce back after an event.

In order to build a resilient community, all categories of vulnerable people should be given the education and awareness on flood disaster. It is widely accepted that children are the most vulnerable group when disaster strikes (Mudavanhu, 2015). Thus, adopting current teaching and learning methods, it would be appropriate to educate them through scenario-based exercises which will eventually raise their awareness on flood disaster. In this paper, we document our experiences in developing a courseware to educate and inculcate awareness towards flood disaster among schoolchildren. This paper is organized as follows: in Section 2, a review of related studies is made. Then, we outline the objectives and scope of the paper in Section 3. The adopted methodology is discussed in Section 4, and the development of the courseware is explained in Section 5. Section 6 discusses the overall experience and concludes the paper.

## II LITERATURE REVIEW

Training of the disaster responder and society have become critical elements for catastrophic preparedness. According to Kang et al. (2013), it is very challenging to carry out the disaster risk reduction (DRR) education because disaster cannot be reproduced. Furthermore, it is also difficult to emotionally engage with the schoolchildren with disaster situation, as they have not experienced it. Empowering schoolchildren to prepare and act during crisis or disaster is crucial in forming resilient community which lives in the vicinity of hydropower dams owned by the national power

utility, Tenaga Nasional Berhad. The Bertam Valley incident at Cameron Highlands on 23<sup>rd</sup> October 2013 which caused several casualties and destruction of properties has been the game changer of how dam owners, authorities and public started to perceive disaster management in Malaysia.

Putting schoolchildren vulnerability at the forefront will decide the nature of required engagement to inculcate awareness of what need to be done if a flood disaster struck at any moment. Various training methods have been adopted for DRR purposes such as group discussion, demonstration, conference, excursions, role playing as well as learning while doing (Ghoorchian 2006, Ratiani et al. 2011). However, it is acknowledged that multimedia courseware has been interesting and attractive for schoolchildren learning process (Morozov and Markov, 2000).

Digital literacy in the current Fourth Industrial Revolution (IR 4.0), is crucial to complement existing teaching pedagogies. Compared to traditional teaching approach, multimedia courseware would be appropriate to stimulate sensory of schoolchildren in many ways (Dai and Fan, 2012). Therefore, in disseminating critical information pertaining to DRR, multimedia courseware is able to merge texts, graphics, audios as well as animations to captivate the attention of schoolchildren. Multimedia courseware promotes active and independent learning with minimal supervision from teachers (Bongalos, 2006).

The development of courseware should not only fulfil the needs of teaching but consideration must be made to ensure it provides meaningful contexts for the subject (Singh and Mohamed, 2016). With increasing digital tools can give more adaptive to students as the millennial generations more engaged with the technologies. Preparing before the disaster happened can train the feeling about how to keep themselves protected when disaster happened and how to escaped from the affected area (Wahyudin & Hasegawa, 2017). Previous research said that through the repeated training simulation practices, disaster responders would be able to increase and maintain their social skill until actual disaster happened (Wahyudin & Hasegawa, 2016).

The intended courseware should be able to improve the knowledge and provide self-efficacy to the schoolchildren on individual physical protection and response skills during the outbreak of a flood disaster. This will help the target audience to better understand how, where and why flood occurs and this understanding leads to empowerment to reduce and mitigate the effects and consequences of flood disaster. Hence, such multimedia courseware should be able to allow the students to actively

engage and express their personal reflections on the subject matter (Singh and Mohamed, 2016).

### III OBJECTIVE & SCOPE

This project embarks on the development of a courseware is called "Jom Siap Bersama Si Kelip". This courseware centres on a firefly mascot (Si Kelip) and consists of two modules, namely the educational module and the quiz module. Briefly, this project aims to achieve the following objectives.

1. To gather requirements for developing a courseware to inculcate awareness on flood disaster and safety procedures.
2. To develop a courseware targeted to schoolchildren that inculcate awareness on flood disaster and safety procedures.
3. To test and evaluate the courseware

For the case of Cameron Highlands, a customized initiative known as Community Based Training and Awareness Program (CBTAP) has been introduced since May 2015. As part of the program, this developed courseware is aimed at schoolchildren between the ages of five and eleven, living in areas surrounding the hydroelectric dams managed by Tenaga Nasional Berhad (TNB). The courseware is in Malay language as to serve the demography of the targeted users. It is worth to note that all content of the courseware is based on the flood safety procedures outlined by Tenaga Nasional Berhad.

### IV METHODOLOGY

The AGILE methodology was adopted for the development of this courseware where a working product is released gradually, each with small, incremental changes. At each iteration, the product is reviewed and tested by the stakeholder. There are five phases in the AGILE methodology, namely (I) Analysis, (II) Design, (III) Development, (IV) Implementation and (V) Evaluation. In this paper, phase I, II and III are discussed under this subsection, while the remaining two are discussed in the following subsection.

#### A. Analysis

The project began with understanding the problems to be solved and defining the scope of the courseware. The team drafted a list of functional and non-functional requirements which are essential in the courseware. These requirements are tabulated in Tables 1 and 2 respectively. There are several definitions on both functional- and non-functional requirements. However, we generally define functional requirements as behaviour of the courseware when an input is provided. Non-functional requirements can be defined as constraints or restrictions on the system design.

These include performance, usability and error-handling.

**Table 1. Functional Requirements**

No.	Requirement		Priority
<b>1</b>	<b>Play animation</b>		
	1.1	User is able to play animation	Mandatory
<b>2</b>	<b>Pause animation</b>		
	2.1	User is able to pause animation	Mandatory
<b>3</b>	<b>Stop animation</b>		
	3.1	User is able to stop animation	Mandatory
<b>4</b>	<b>Replay animation</b>		
	4.1	User is able to replay animation	Mandatory
<b>5</b>	<b>Attempt quiz</b>		
	5.1	User is able to attempt quiz	Mandatory
	5.2	User is able to view current score	Mandatory
<b>6</b>	<b>View final score</b>		
	6.1	User is able to view final score	Mandatory

**Table 2. Non-functional Requirements**

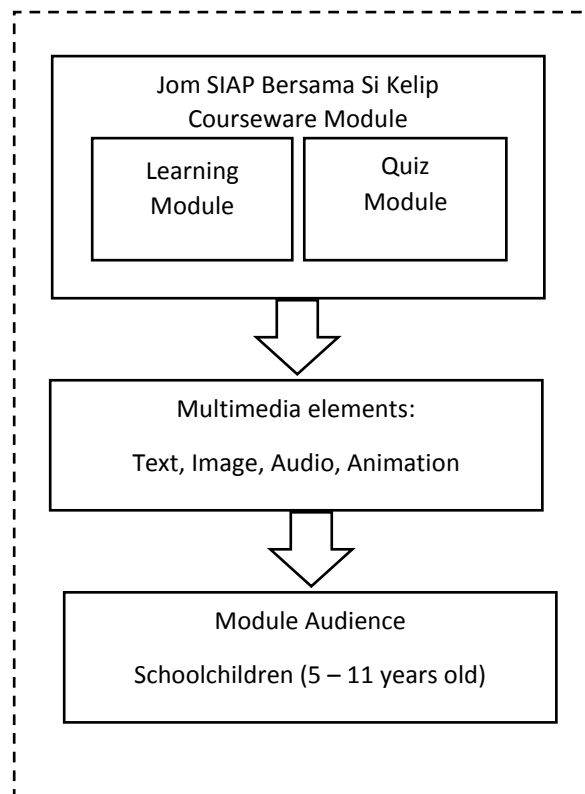
No.	Requirement		Priority
<b>1</b>	<b>Usability</b>		
	1.1	Courseware is suitable for audience	Mandatory
	1.2	Courseware is easy to use	Mandatory
	1.3	Courseware interface is interesting	Mandatory
<b>2</b>	<b>Reliability</b>		
	2.1	Courseware is responsive	Mandatory
<b>3</b>	<b>Error handling</b>		
	3.1	Pop-up notification when courseware is non-responsive	Mandatory
	3.2	User is able to cancel or wait for courseware to run again.	Mandatory
<b>4</b>	<b>Performance</b>		
	4.1	Courseware is responsive	Mandatory
	4.2	Courseware response is fast	Mandatory

## B. Design & Development

After both functional and non-functional requirements were identified, the next step was designing the conceptual model of the courseware and its interfaces.

The courseware consists of two modules, which are education module aimed to teach schoolchildren on flood disaster and safety, and a quiz module to gauge their awareness on the subject matter. The conceptual model of the courseware is as illustrated in Figure 1.

To make learning an interesting and impactful experience, we introduced “Si Kelip” as the central figure in this courseware. This courseware also goes along with an easy-to-remember tagline – “Jom Siap” which means “Let’s Get Ready” in Malay language. A screenshot of “Si Kelip” and the tagline is shown in Figure 2.



**Figure 1. Courseware Conceptual Model**



**Figure 2. Si Kelip and Tagline**

## V IMPLEMENTATION

As stated in Section 4(B), this courseware consists of two modules. The educational module lets the schoolchildren to learn on the various factors that cause to flood to occur. This includes natural causes such as heavy downpour, and human causes such as

incessant logging and clogging of drains and rivers due to rubbish dumping. The courseware also emphasizes on safety procedures to be taken before, during and after the occurrence of flood. A screenshot of the education module is shown in Figure 3.



Figure 3. Educational Module

The quiz module aims to assess the schoolchildren’s awareness and understanding on flood disaster and, flood preparedness and safety procedures. The quiz module is designed to make quiz attempts personalised experience whereby the quiz starts by asking the child’s name. The child can then answer the quiz, which covers aspects such as factors which cause flood and the safety procedures before, during and after the flood occurs. When the child finished attempting the quiz, a feedback is given instantly. The final score of the quiz will also be displayed once all questions have been answered. The child can then choose to return to the courseware homepage, or re-attempt the quiz to score a better mark. A screenshot of the quiz module is shown in Figure 4.



Figure 4. Quiz Module

The courseware was used to gauge schoolchildren’s awareness on flood disaster and flood safety during the Sultan Mahmud Hydroelectric Dam Open Day on May 4, 2017.

Schoolchildren from 22 schools as well as the public were given the opportunity to test and evaluate the courseware, as shown in Figure 5.

This courseware will further be implemented to raise awareness on flood disaster and safety procedure among schoolchildren in Malaysia.



Figure 5. Courseware Implementation.

## VI EVALUATION

Questionnaire were distributed to 30 respondents during the courseware roll-out. Of that 30, 17 (56.7%) are female while 13 (43.3%) are male. All respondents are schoolchildren between ages seven and 11years old.

The questionnaire aims to gather feedback and evaluation on aspects such as usability and performance of the courseware.

In terms of usability, 29 (99%) of the respondents strongly agree that the courseware is user-friendly. The remaining respondent felt that agree that the courseware is user-friendly. All respondents strongly agree that the courseware is interactive and easy to navigate. In terms of colours used, 18 (60%) of the respondents strongly agree that he colours used are appropriate.

All users agree that the system was robust and 100% of all respondents agree that the system was responsive. Overall, 100% of the respondents are satisfied by the courseware.

## VII DISCUSSION & CONCLUSION

Research done shows that the usage of multimedia courseware has brought many benefits in improving the effectiveness in the processes of educating schoolchildren on DRR particularly on flood. Courseware is an important tool in varying the methods for Community Based Training and Awareness Program. The use of courseware for this particular community empowerment initiative can help strengthen the schoolchildren’s understanding. It can also increase their computer skills. It is interesting to note that almost all respondents found that the developed courseware is user-friendly and this is critical as they managed to navigate it successfully with minimal instructions from facilitators. As the learning process is interactive using touch-screen devices, it is expected that the schoolchildren will improve their communicative and creative skills. This research on schoolchildren’s perceptions towards application of

courseware in relations to DRR would be useful as a basis for the building of the complete courseware covering all natural disasters, which are prone to happen in Malaysia. It is suggested that schoolchildren be trained to use touch-screen devices effectively. However, due to time limitation, only 30 respondents were considered for this preliminary study. It is envisaged that a comprehensive usability test will be conducted with larger crowds during another Community Based Disaster Management Program at Cameron Highlands in the near future. Further research is suggested on the opinions of teachers on the use of courseware to educate schoolchildren on flood disaster. Views and the perceptions of schoolchildren on the needs of a multimedia courseware for empowering and strengthening their resilience towards disaster should be given serious consideration by our Deputy Prime Minister's Office, Ministry of Education and National Disaster Management Agency. It is hoped that the development of courseware for the educating schoolchildren on DRR is given due consideration by the relevant stakeholders.

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