ORIGINAL ARTICLE

A Two-Way Interactive Teaching-Learning Process to Implement Flood Disaster Education in an Early Age: The Role of Learning Materials

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ABSTRACT

Introduction: Mainstreaming disaster education at the school level has been seen as an initiative in disaster risk mitigation to promote sustainable public awareness, however, the challenges to ensure an effective knowledge transfer has widely been highlighted. Educators who are lacking disaster education background always find it difficult in knowledge delivery and trigger learners' curiosity in disaster learning. Therefore, this study aims to evaluate the effectiveness of knowledge transfer in disaster learning among school children by using two different learning methods with the same learning module. **Methods:** Two different learning methods, i.e. a customized learning kit and PowerPoint teaching slide were used in this pre-post intervention study. The prototype of the customized learning kit was developed based on the psychosocial development of children that emphasized the importance of "children play" in early childhood education. A total of 337 elementary school children around Klang Valley were randomly recruited and grouped into experimental and control group. **Results:** Both groups showed significant improvement in the disaster-related knowledge level after undergone the knowledge transfer intervention by using different learning methods. **Conclusion:** With the same learning module utilized in this study, the output highlighted that an effective knowledge transfer intervention could be achieved via a two-way interactive teaching-learning process. Even though the learning materials showed little influence while implementing an effective knowledge transfer, the efficiency of knowledge acquisition that triggers learning interest among learners are crucial factors in marking the sustainable learning at an early age.

Keywords: Disaster Education, Children, Knowledge Transfer, Interactive Learning

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INTRODUCTION

A natural disaster is becoming serious issues acknowledge worldwide due to the global climate gradually change over the coming decades and beyond in the future, which then worsens the natural disaster impacts on human health and escalate the economic damages. Disaster risk reduction (DRR) is an approach that aimed at reducing the damages caused by catastrophic disaster by understanding, analysing, managing the disaster risks and thus reducing community's vulnerability (19, 31). At the global level, the catastrophic impacts of disasters have led countries to prioritize DRR as part of the national sustainable development strategies (19).

Disaster preparedness and awareness among the average of Malaysian community nowadays are still at low level which then leads to a lack of preparedness to encounter disaster occurrences (20, 5, 9). This will result in them to not fully prepare either mentally or physically to face the hazard from disaster in the future. The level of awareness towards disaster could be influenced by the old perceptions nurtured for decades that Malaysia was rarely to experience catastrophic disaster events such as a massive earthquake or volcanic eruptions. Thus, it has made the community felt safer and fortunate than the neighboring countries as it relatively spared the community to experience the devastating effect from disaster more often due to the strategic locations (21).

United Nation has encouraged the engaging of children and youth in disaster risk reduction and resilience building through several efforts such as the development of the action guidelines which is used to offer specific advice on practicable implementation, and people-centered approach to support and engage children in disaster risk reduction and resilience-building (33).

Moreover, during a World Tsunami Awareness Day organized by UNDRR was held in New York was attended majority students. During the event, they were called for more educational programs on disaster risk reduction that could involve children and youth (36). This emphasized the priority and strive to involve young children in disaster education and to fully integrate disaster education in school curricular as well as to initiate prevention culture at an early age.

Disaster knowledge could be enhanced through such effective disaster risk communication which is implemented as one of disaster mitigation in disaster management (22). It was beyond the government setting and the assistance from professional or private sectors, but also needs a consistent effort involving every level of community to fully engage in DRR. A variety of knowledge transfer approaches should, therefore, be adopted to foster disaster awareness among children at an early age (8, 40). Both formal and informal training for disaster knowledge transfer has been advised to start from school to create a sustainable disaster education at the community level (21, 13).

Mainstreaming disaster education at the school level has been seen as an initiative in disaster risk mitigation to promote sustainable public awareness (34, 35, 37, 38). Even though integrating disaster education among school children at an early age is a promising approach to ensure sustainable disaster risk education, the challenges of an effective knowledge transfer has widely been highlighted. Educators who are lacking disaster education background always find it difficult to interact with learners in delivering the knowledge and trigger their curiosity in disaster learning. Moreover, the non-structural mitigation measures were being under-developed and eventually caused the low level of preparedness in the community, which results from the structural measures of flood mitigation which were often over-emphasized in the country (16). Even though Malaysia government have organized awareness program with the aims to assist to improve the level of preparedness, aid response and the recovery activities, most of this disaster learning program are one-off or ad hoc practiced at school or community level, where reliance on PowerPoint teaching was widely seen (9).

Since the importance of disaster education is widely acknowledged globally, other countries have seen practicing different pedagogy and prepare different learning tools to ensure disaster education is sustainably implemented. For example, disaster lessons have been known to integrate into Geography and Science classes in Australia, New Zealand, and Iran to recognize hazards, climate, and environments (8). The Caribbean, on the other hand, conducted the extracurricular program as preliminary testing specifically in disaster awareness promotion among children by using an interactive way of teaching and learning (Disaster Awareness Game-DAG). The tools were included lectures and a board-game method relevant to disaster management (3).

Japan, take proactive steps ahead by making compulsory at school crucial practices such as emergency planning, safety inspections, and evacuation drills. For example, the Ministry of Education, Culture, Sport, Science, and Technology of Japan has produced a teaching material, such as *Let's Learn about Survival and Safety* (2001) which practiced in grades 1-3, hence an interactive disaster learning help prepare for practical implementation and continuous throughout schooling (39). Moreover, Philippine also has launched a children's book on disaster preparedness entitled "Handa Ako". The book was designed as simple and easy to understand a type of book that is containing information on disaster awareness and preparedness (26).

The Sendai Framework for Disaster Risk Reduction (SFDRR) stressed that education should be prioritized to achieve a long term and sustainable disaster resilience outcome (30). The learning module was developed following the goal of this framework to strengthen the learner's learning capacities in disaster risk reduction contexts by preventing new and reducing existing disaster risk through the implementation of integrated and inclusive in terms of education. Therefore, this study aimed to evaluate the effectiveness of disaster learning's knowledge transfer methods among school children by using two different learning tools, i.e. a customized learning kit and PowerPoint teaching slide.

MATERIALS AND METHODS

This is a pre-post intervention study. By using the same learning module, the purpose of this study is to evaluate the effectiveness of disaster learning's knowledge transfer methods among school children by using two different learning tools (17). The learning module is an own developed module and has already undergone content validity to evaluate how essential a content item is in the learning module. The content validity was performed by 8 subject matter experts from the related- field of members of Disaster Response Team, Rescue Team of Fire and Rescue Department, Emergency Practitioner, and Disaster Management. The result shown positive value (0.143) at once concluded that the items in the learning module are essential.

The respondents were randomly recruited among 337 elementary school children whose schools located at one of the flood-prone areas or ever experience flood among schools located at Klang Valley in Malaysia. School children ages between 9 to 10 years old are recruited to support the theory of Erik Erikson (1963) who suggested that children between the ages of 5 and 12 years are at their best capabilities to receive information through cognitive skills (see, listen, feel, touch) (7).

This intervention program is designed to recruit two groups of school children, one for the experimental group (N=188) and the other for the control group (N=149). Both groups underwent the same one-month knowledge transfer intervention program and utilized the same learning modules, except the experimental group was introduced to a customized flood learning educational kit while the control group was received traditional classroom-based learning via PowerPoint teaching slide (as shown in Fig. 1)

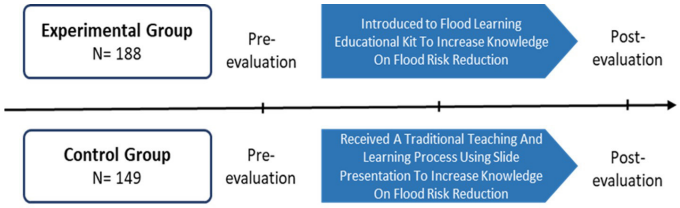

Fig. 1: The Pre-Post Quasi-Experimental Study Design

Questionnaire

The questionnaire was designed based on the literature review from Emily et al (2018) (2). This questionnaire consists of four sections, Section 1 (General knowledge of flood), Section 2 (Flood warning and hazard), Section 3 (Assembling flood emergency kit), and Section 4 (Readiness for flood response).

The questionnaire underwent reliability and validity test to ensure that the question items were measured according to the study objectives. The content validity was performed by letting experts of the recognized subject matters evaluate whether the test items assess defined the content of the study. The subject matters are made of eight experienced disaster respondents and professions such as members of Disaster Response Team, Rescue Team of Fire and Rescue Department, Emergency Practitioner, and Disaster Management. To further quantify the content validity, the content validity ratio (CVR) developed by Lawshe (1975) was used to evaluate the agreement among subject matters (11). In this context, the CVR value of +0.143 was achieved which shows that the questionnaire is valid to measure the knowledge of the content domain that was designed to measure knowledge. Next, the test-retest reliability was also conducted to examine the degree to which the results are consistent over time. To measure the test-retest reliability, the same test was given to the same test respondents after the one-month interval. The scores are then correlated by using Cohen's Kappa Coefficient test. Overall, four sections of the questionnaire show a good (0.762) to excellent (0.845) Cohen's Kappa Coefficient score.

Learning Method

Two types of learning methods were prepared in this study, one with a miniature learning kit and another with a PowerPoint teaching slide. Both learning methods adapted the same learning module and contents that were designed based on the literature review from Emily et al (2018) (2). Table I summarizes the learning module and the content covered in both methods.

Table I: Learning module and Content for both Learning Methods.

Learning module	Learning content
Part 1: General flood knowledge	▪ Definition of flood. ▪ Illustration conditions that reflect flood situation. ▪ Flood hazards and warning.
Part 2: Flood warning and hazard	▪ Clean water and food sources during flood. ▪ Hygiene and sanitation practice. ▪ Identify the health symptoms as a result of diseases happen because of floods.
Part 3: Assembling flood emergency kit	▪ The purpose of emergency kit. ▪ The items need to be in the emergency kit.
Part 4: Readiness of response to flood	▪ Recap of previous learning module to make sure all the information given throughout the activity well received at once nurture readiness towards flood disaster.

A total of 188 school children from the experimental group were guided to learn with the miniature learning kit that has been customized based on the learning module; while 149 school children from the control group were guided to learn flood risk education with PowerPoint slides. Researchers enable interactive engagement pedagogy for both groups of school children where they focus on two-way interaction student-centered learning rather than a one-way flow of information. School children from the experimental group, however, embrace miniature learning kit that enhances the visual presentation of the flood hazards and hands-on practice with the learning tools throughout the learning process. This has made the learning less of a chore when compared to the control group who experienced classroom-based learning via PowerPoint Slide.

By using learning Kit

The learning kit is a hands-on teaching material that has included a realistic miniature world, printed pictures, cue cards, and user manuals as a guidance note. Flood scenario made up by using slime. Concerning past study (7), this kit covers interactive problem-based learning design with the customized "miniature" flood case simulation to promote effective active learning among the school children. This kit is divided into four main sections which covered the learning module and learning content respectively.

- Part 1 (General knowledge of flood) - Printed picture and cue card of past flood scenario in Malaysia and neighboring country were showed,
- Part 2 (Flood warning) – blue and brown mud slime use to flood the school and housing environment in the miniature design and student were guided to identify

flood hazards and identify safe evacuation zone

- Part 3 (Assembling flood emergency kit) – student was guided on the 'Do' and 'Don't' to assemble inside flood emergency kit, next, the student was given different cue cards. They need to figure out which items to be included in the embedded emergency bag.
- Part 4 (Readiness for flood response) – A checklist of school, house, and individual flood preparedness were to prepare by students in the group (based on the miniature design) and the readiness of response to the flood was cross-checked.

By using PowerPoint slide

The teaching slide was developed in a PowerPoint form with a topic of flood risk reduction, and the learning purpose is to support the traditional learning method by using a lecture-based teaching process. All topic contents were the same as the contents in the flood learning educational kit. The presentation has 20 slides that cover four main topics and divided into four parts; Part 1: General knowledge of flood; Part 2: Flood warning; Part 3: Assembling flood emergency kit; Part 4: readiness for flood response (7). The teaching and learning process was done by way of the researcher teaching in front of the classroom or hall with the help of the presentation slides.

RESULTS

Socio-demographic

Based on the school criteria, a total of 337 school children whose schools in government-based schools around Klang Valley area were recruited in this study. They were randomly assigned into two different groups; with 188 school children into the experimental group and 149 school children into the control group. 71.8% of school children are 10 years old and 28.2% of them are 9 years old. Gender-based are equally distributed with 55.8% are girls and 44.2% are boys. Most of the school children are Malays (97.3%), followed by Indian (1.5%), and other races (1.2%).

Before Knowledge-Transfer Intervention (Baseline Knowledge)

The flood risk related knowledge among school children was assessed by using a questionnaire. The level of knowledge for both groups, i.e. experimental and control group were compared using an independent t-test. As shown in Table II, there is no significant difference was shown for both groups in their baseline knowledge, except for Section 1 (Table II).

After Knowledge-Transfer Intervention (Changes of Knowledge) consists of two parts,

i) Experimental Group uses Customized Flood Learning Kit

Table II: The baseline knowledge level on flood risk reduction between Experimental group and Control group (N= 337)

Section	Mean (SD)[a]		Mean difference (95% CI)	*p*- value
	Intervention (n= 188)	Control (n= 149)		
Section 1: General flood knowledge (Total marks=10 marks)	8.74 (1.39)	8.04 (1.76)	0.699 (0.360, -1.038)	≤**0.001****
Section 2: Flood warning and hazard (Total marks=54 marks)	47.47 (4.97)	47.01 (5.84)	0.467 (-0.693,-1.626)	0.429
Section 3: Assembling flood emergency kit (Total marks=32 marks)	25.06 (4.74)	25.21 (4.76)	-0.156 (-1.180, 0.868)	0.764
Section 4: Readiness and responses to flood (Total marks=18 marks)	16.98 (2.09)	16.68 (2.82)	0.294 (-0.232, 0.820)	0.272
Total scores (total marks= 114 marks)	98.25 (9.61)	96.95 (11.56)	1.304 (-0.965, 3.572)	0.259

[a] Independent t-test
** p-value is significant at 0.001

Table III compares the mean scores of flood risk reduction knowledge level at baseline (before knowledge) and after one month of the introduction to flood learning kit as a learning medium for the experimental group by using paired sample t-test. The results shows there was significant different (p≤0.001) for all sections in the question items including the total scores, with the mean difference in Section 1 -0.543 (95% CI -0.748, -0.337), Section 2 -1.691 (95% CI -2.484, -0.899), Section 3 -3.457 (95% CI -4.267, -2.648), Section 4 -0.356 (95% CI -0.668, -0.045) and Total Scores -6.048 (95% CI -7.532, -4564).

Table III: The comparison of the flood risk reduction knowledge level before and after 1 month interval of the intervention activities among respondents in the intervention group (N= 188)

Section	Mean (SD)[a]		Mean difference (95% CI)	*p*- value
	Before	After		
Section 1: General flood knowledge (Total marks=10 marks)	8.74 (1.39)	9.28 (1.15)	-0.543 (-0.748, -0.337)	≤**0.001****
Section 2: Flood warning and hazard (Total marks=54 marks)	47.47 (4.97)	49.16 (4.69)	-1.691 (-2.484, -0.899)	≤**0.001****
Section 3: Assembling flood emergency kit (Total marks=32 marks)	25.06 (4.74)	28.52 (4.32)	-3.457 (-4.267, -2.648)	≤**0.001****
Section 4: Readiness and responses to flood (Total marks=18 marks)	16.98 (2.09)	17.34 (1.58)	-0.356 (-0.668, -0.045)	≤**0.001****
Total scores (total marks= 114 marks)	98.25 (9.61)	104.30 (8.78)	-6.048 (-7.532, -4.564)	≤**0.001****

[a] Independent t-test
** p-value is significant at 0.001

ii) Control Group uses Classroom-based PowerPoint Slide Note

Table IV compares the mean scores of flood risk reduction knowledge level at baseline and after a month of the introduction to teaching slide presentation as a learning medium for the control group by using paired sample t-test. The result shows all parts including Total Scores show a significant difference (p≤0.001) except for Section 4 (p=0.317). The mean differences scored for Section 1 -1.034 (95% CI -1.324, -0.744), Section 2 -1.832 (95% CI –2.861, -0.804), Section 3 -3.154 (95% CI -4.217, -2.091) and Total Scores -6.188 (95% CI -0.778, 0.443). No significant difference between before and after knowledge changes in Section 4, with mean difference -0.168 (95% CI -8.248, -4.127).

Table IV: The comparison of the flood risk reduction knowledge level before and after 1 month interval of the intervention activities among respondents in the Control group (N= 149)

Section	Mean (SD)[a]		Mean difference (95% CI)	*p*- value
	Before	After		
Section 1: General flood knowledge (Total marks=10 marks)	8.04 (1.76)	9.07 (1.26)	-0.543 (-0.748, -0.337)	≤**0.001****
Section 2: Flood warning and hazard (Total marks=54 marks)	47.01 (5.84)	48.84 (4.65)	-1.691 (-2.484, -0.899)	≤**0.001****
Section 3: Assembling flood emergency kit (Total marks=32 marks)	25.21 (4.76)	28.37 (4.79)	-3.457 (-4.267, -2.648)	≤**0.001****
Section 4: Readiness and responses to flood (Total marks=18 marks)	16.68 (2.82)	16.85 (2.84)	-0.356 (-0.668, -0.045)	≤**0.001****
Total scores (total marks= 114 marks)	96.95 (11.56)	103.13 (9.94)	-6.048 (-7.532, -4.564)	≤**0.001****

[a] Independent t-test
** p-value is significant at 0.001

iii) The Effect of Flood Learning Kit on Knowledge Transfer Intervention

Next, the level of knowledge on flood risk reduction among the school children was compared by using the independent sample t-test. After being treated with different learning materials during the intervention program (Table V), both groups have shown that there are no significant changes in knowledge, except for Section 4. The mean differences scored in the Section 1 -0.208 (95% CI -0.467, 0.051), Section 2 -0.326 (95% CI -11.33, 0.681), Section 3 -0.147 (95% CI -1.125, 0.831) and Total Scores -1.164 (95% CI -3.172, 0.844). Section 4 has shown a significant difference with mean difference -0.483 (95% CI -0.963, -0.002).

Table V: The comparison of knowledge on flood risk reduction after 1 month interval of the knowledge transfer intervention between Intervention group and Control group (N= 337)

Section	Mean (SD)[a]		Mean difference (95% CI)	*p*- value
	Experiment Group	Control Group		
Section 1: General flood knowledge (Total marks=10 marks)	9.28 (1.15)	9.07 (1.26)	-0.208 (-0.467, 0.051)	0.116
Section 2: Flood warning and hazard (Total marks=54 marks)	49.16 (4.69)	48.84 (4.65)	-0.326 (-1.333, 0.681)	0.525
Section 3: Assembling flood emergency kit (Total marks=32 marks)	28.52 (4.32)	28.37 (4.79)	-0.147 (-1.125, 0.831)	0.768
Section 4: Readiness and responses to flood (Total marks=18 marks)	17.34 (1.58)	16.85 (2.84)	-0.483 (-0.963, -0.002)	**0.049****
Total scores (total marks= 114 marks)	104.30 (8.78)	103.13 (9.94)	-1.164 (-3.172, 0.844)	0.255

[a] Independent t-test
** p-value is significant at 0.001

The covariance analysis (ANCOVA) was used to determine the efficacy of the two learning methods (Flood Learning Kit and the teaching slide presentation) in transferring the flood risk reduction related knowledge among school children. The test was done after statistically control the effects of the pre-test that was considered as the covariate. Table VI shows that there is no significant effect of different learning methods on

Table VI: The effect of flood learning kit on the effectiveness of knowledge transfer among Intervention group and Control group with pre-evaluation as co-variate (N= 337)

Sections	Adjusted mean (95% CI)[a]	*F*- statistics	*p*-value	R^2 value
Section 1: General Flood knowledge Total marks=10 marks)				
Treatment	9.197 (9.034, 9.360)	0.017	0.896	0.129
Control	9.181 (8.997, 9.364)			
Section 2: Flood warning and hazard (Total marks=54 marks)				
Treatment	49.108 (48.472, 49.745)	0.165	0.685	0.096
Control	48.911 (48.196, 49.626)			
Section 3: Assembling flood emergency kit (Total marks=32 marks)				
Treatment	28.526 (27.881, 29.170)	0.118	0.732	0.016
Control	28.357 (27.633, 29.081)			
Section 4: Readiness and responses to flood (Total marks=18 marks)				
Treatment	17. 313 (16.998, 17.628)	3.232	0.073	0.039
Control	16.880 (16.526, 17.234)			
Total Scores (Total marks=114 Marks)				
Treatment	104.125 (102.866, 105.385)	0.643	0.423	0.113
Control	103.352 (101.937, 104.767)			

[a] One-way ANCOVA
** p-value is significant at 0.05

enhancing flood risk reduction knowledge level to both the intervention and control group.

DISCUSSION

Disaster education has been mainstreamed by countries that integrating it into their formal education syllabus, mainly into science, geography, and literature (8). Malaysian, on the contrary, was reported to have relatively low readiness and preparedness in cases of disaster (25). Therefore, this study shows that both groups of students had a similar background of flood preparedness knowledge. Instead of implementing a sustainable flood education learning platform, most of community disaster program in Malaysia conducted a one-off and ad- hoc program after each flood disaster occurred (26, 14). This way, children as the vulnerable group will not be able to know the right ways to respond before, during, and after a disaster.

This research underlines the importance of disaster knowledge in reducing vulnerability to disaster risks and in improving disaster preparedness among school children. This study shows that children from elementary school mostly revealed the fundamental and essential knowledge about flood risk. This could due to the general education received through the educational program; formal or non-formal and may through various media used for giving information as part of disaster management programs. However, Malaysia, need to improve and sustain a suitable medium to transfer disaster knowledge to every level of the community for positive and promising results of the resilience community.

After Knowledge-Transfer Intervention (Changes of Knowledge)

i) Experimental Group uses Customized Flood Learning Kit

The flood risk reduction knowledge level was shown to be significantly increased for every section of the evaluation after introducing the customized flood learning kit as the learning tools to the intervention group. This interactive flood learning kit was designed to complement existing disaster learning education. With the aid of the flood learning kit and its strategized approach, students are keen to be engaged throughout the learning process. The design of this hybrid interactive learning environment is based on the constructivist concept of conforming to the micro- world, supported with games elements and simulations to enable active learning among children (7). With the application of interactive learning using the flood learning kit, disaster-related education will be more effective as the content of learning easily to be absorbed and accepted by the children.

An individual will show interest in the things they experience or related to their life or future. Students feel more motivated to involve themselves to learn things they are interested not just gaining knowledge but also about the situation (23). Moreover, this kit allows learners to participate in the learning process with the aids of engaging in teaching materials. For instance, a mobile teaching facility was designed to teach earthquake disaster education among elementary schools in Iran is one of the examples of interactive learning since it promotes the active participation of the learners in the activities (8). It is important to take into account the learning content. Being in group work to share and discuss disaster knowledge will perfectly make the learners achieve learning objectives. Also, Indonesia and Philippine had worked together to produce Disaster Preparedness Guides which was designed for people with disabilities. The guides containing well- designed pamphlet for a different type of disability including audio stories for a person with visual limitation (32).

ii) Control Group uses Classroom-based PowerPoint Slide Note

The idea of using teaching slide presentation as a learning medium is to portray the traditional ways of teaching which practicing the passive involvement of the learner during the learning process. The learner passively receiving information as the educator teaches, and the learner merely watches and listens. The passive involvement of the learner leads them to not critically thinking with poor solving skills as no teamwork and discussion occurred. Traditional education emphasizes teacher-directed learning and used non- interactive teaching modes such as lecture and textbook reading (4). Some believed that this method is increasingly less relevant in this era due to its passive interaction between the educator and the learner. This is because many educators believe that, the students need more than knowledge transfer and not simply receiving information with less understanding (15).

Nevertheless, the flood risk reduction knowledge level was shown to be significantly increased in every section, except for Section 4 of the evaluation, after the intervention activities using teaching slides as the learning method to the control group. Due to the broad list of teaching materials and teaching styles, it is difficult to quantify the disadvantages of the effectiveness of this method. Having good topic/ subject knowledge, have a clear objective and good questioning skills and emphasizing instruction are some of the criteria listed as effective teaching require in primary schools (10). Despite the traditional method emphasize the one- way learning/ teacher-directed learning, however, the use of some pictures and colors act as the visual aids in the teaching slides has made it attractive to catch the attention of the audience which then, assist this method to become a bit more effective to be used as a medium to transfer flood risk reduction knowledge among the respondents in control group. Those factors were overemphasized better than the actual concept of 'teacher-directed

learning and passive involvement of the learner that was should be accentuated. Moreover, factors like learners' motivation and the relationship between the educator and learner are potentially influencing the effectiveness (6). The students were becoming more enthusiastic and excitedly expecting new 'teachers' to conduct the teaching session and they were paid more attention and focus to hear the 'lecture'. Thus, it has caused the teaching method to seem effective and resulting in an improvement in knowledge level.

iii) The Effect of Flood Learning Kit on Knowledge Transfer Intervention

Both learning methods (flood learning kit and teaching slide presentation) shown the positive outcomes to enhancing the disaster (flood) risk reduction knowledge level after the intervention activities, however, the finding shows there is no significant difference to the effectiveness between both methods. Both methods nearly have the same effectiveness to transfer the disaster (flood) risk reduction to the primary school children at Klang Valley, Malaysia.

The effectiveness of preparedness is essential to minimize the devastation caused by a disaster, saving lives, reduce injuries, and limit the property damages and losses. Given this, empowering community disaster preparedness could be achieved by integrating disaster risk reduction into the educational system (25). But, considering the efforts and the expenses allocated on disaster education in Malaysia, the level of preparedness remains low although claiming to be knowledgeable in disaster preparedness aspect (20, 5). The gap of disaster risk reduction in the educational approach still exists and should be overcome as the efficacy of disaster risk reduction education in this country was somehow doubtable.

The awareness program is part of a traditional way of response via information delivery of disaster risk management often being held in certain locations claimed as a disaster-prone area with frequent experience of a disaster event. It was not seen as a necessity to create awareness programs in places that are not disaster-prone which in the end will develop ignorance in the community living in that area as they do not receive such information to understand the possibility and the chances towards the imminent of disaster hazards. The prior misconception and judgment should be improved to ensure an effective and protective public response and action (41).

Disaster preparedness aims to develop a resilient community by integrating disaster risk reduction knowledge, attitude, and practices into the community at all levels. Therefore, a sustainable education in disaster risk reduction should be in place to maintain the continuity and to sustain the community resiliency (1) by utilizing school children as a suitable medium for knowledge transfer to reach a larger community. With this in view, school is a perfect place to initiate the disaster learning platform among students and teachers as well as within the local community (19). Children spend most of their time at school, which is where the foundation of education begins. School, at the same time, provides an education system equipped with structured learning modules, adequate time to learn, and sufficient facility and resources to support learning (28). Therefore, by integrating disaster risk reduction education in the school educational system either curricular or co-curricular activities, it may foster a sustained disaster preparedness in every student as they received full- time education with clear objectives in suitable time throughout their lifetime of learning.

CONCLUSION

In conclusion, by utilizing both methods of flood learning kit and the teaching slide presentation in disaster (flood) risk reduction education is seen as an effective effort. In other words, the learning materials showed little influence while implementing an effective knowledge transfer, instead, the patterns of conduct, and the efficiency of acquisition of knowledge that encourages interest in learning among learners play an important role in marking sustainable learning at an early age. Through this, further planning in policy improvement, and framework development should be done through developing collaboration and partnership between government agencies and NGOs such as Ministry of education and National Disaster Management Agency (NADMA), to succeed the disaster education at an early age that could be starting from school through curricular and co-curricular activities.

Education can have the catalytic effect to strengthen community and act synergistically with the others disaster risk reduction management done to mitigate the disaster impacts in the country and help to become thoughtful and be prepared, as well as strengthen the community to become resilient to threats and impacts of disaster occurrences in the future. Moreover, by utilizing children as the suitable medium to transfer the information and idea related to disaster education are important that will help the far-reaching impact of raising the awareness, and expand it into the larger community as the educated children share the knowledge gained with the parents and family at home and also to the next generation of their children when they become parents.

Hence, this study implies that the effort to mainstream and utilize interactive and various methods of disaster education at an early age would contribute an invaluable contribution to children, regardless of the learning material used. This could be achieved by creating opportunities for them to obtain prominent roles in disaster risk reduction learning and build disaster-related knowledge in their learning routine. This

initiative serves to strengthen the children's capability and adaptation in handling emergencies and mitigate the impact resiliently.

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