EMPOWERING CHILD PROTECTION ON DISASTER RISKS OF LANDSLIDE THROUGH INTERACTIVE LANDSLIDE SIMULATION MICRO-WORLD

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EMPOWERING CHILD PROTECTION ON DISASTER RISKS OF LANDSLIDE THROUGH INTERACTIVE LANDSLIDE SIMULATION MICRO-WORLD

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ABSTRACT

Over the past decades, catastrophic and disastrous effects of landslide have caused extensive damage to life and property worldwide. The study was conducted to enhance the knowledge of participants from Lininding Elementary School and Sultan Palao Ali Memorial Elementary School who are most prone to disaster risks of landslide through an Interactive Landslide Simulation Micro-world (ILSM). An adopted questionnaire developed by Ratiani, et al. (2012) was used to determine participants' knowledge on landslide preparation. The study employed one-group pretest-posttest research design and an evaluation was conducted to assess the level of preparedness among Schools' Disaster Risk Reduction and Management (SDRRM) in terms of dissemination, implementation and resource utilization and operation. Results showed that most of the respondents were *somewhat prepared* in dissemination, *unprepared* in implementation, and *very unprepared* in resource utilization and operation. This can be attributed to the fact there is less attention or priority given to SDRRM and limited budget from MOOE. Moreover, results demonstrate that respondents got poor to satisfactory performance in their pretest scores then increased in their posttest scores. This shows *clear improvement* of their performance before and after exposing them to ILSM. Also, results revealed a *significant difference* between the performance of participants before and after exposing them to ILSM ($t=-17.13$, $df=54$, $p<0.01$). This indicates a highly significant improvement of participants' performances relative to their pretest and posttest scores. Hence, it is urged to employ such developed ILSM in discussing topics pertaining landslide to prepare the school-community better in case this catastrophe arises.

Keywords: landslide preparation, interactive simulation micro-world, disaster risk, Lanao del Norte Division

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IV. Introduction of the Research

Over the past decades, catastrophic and disastrous effects of landslide have caused extensive damage to life and property worldwide. Landslide is soil, rocks and vegetal debris that are transported suddenly or slowly down a slope because the soil is not sufficiently stable. According to David Petley (2012), Philippines ranks third in terms of casualties and cases among 41 countries identified as key spots for non-earthquake related landslides. He identified mountain chains along the western edge of the Philippine Sea plate as among the global hotspots for landslides noting loss of 4,583 lives in 226 non-seismic landslides between 2004 and 2010.

The frequency of this natural disaster and the scale of human and material loss associated with it have significantly increased. Such phenomenon have become more aggravate due to increase population density, environmental degradation and climate change. Hence, it is essential to ensure an effective Disaster Risk Reduction and Management Program (DRRM) for the survivability of people in case of occurrence of a disastrous event. For it to be effective, it needs not only a sound scientific and technical basis but also a strong focus on people who are actually exposed to such risks.

An integral part of DRRM program is related to the development, evaluation and improvement of risk communication, which helps in transferring risk related knowledge such as warnings, causes-effect relationship, and appropriate measures before, during and after its occurrence in a manner easily understandable to the local community. Unfortunately, according to Charturvedi & Dutt (2017) recent surveys in developing countries (like Philippines) show only mediocre knowledge and awareness about causes and consequences of landslide disasters among general public.

The development of DRR skills among children and adults is one of the most urgent challenges among communities. Since, children are most vulnerable to this kind of disaster situations due to inaccessibility of appropriate information, lack of knowledge and skills that would enable them to protect themselves and make accurate decision when the situation arises. Prevention starts from the dissemination of information. Achieving increased awareness facilitates the first step made towards positive action. Taking into account that schools play vital role in the formation of values, school administrators can make significant contribution in establishing prevention culture. It can provide direct impact among its school stakeholders such as learners, teachers, parents and even community as a whole. The best way to protect children and prevent posed disaster risk into landslide prone areas is through dissemination of knowledge and obtainment of skills necessary for personal and collective safety.

According to Foss and Eikaas (2006), decision-making tasks micro-world have spread across discipline and different levels of education. Furthermore, such creation have long been used in study of decision making behavior to provide decision makers with practice and training in organizational system's control (Sterman 2011). As the school's DRRM Coordinator and Science teacher, the researcher desired to conduct this study which will utilize an Interactive Landslide Simulation Micro-world (ILMS), a computer-based decision making task, where a decision maker's goal is to choose the best option to survive in a landslide situation.

Also, this study will examine the disaster awareness and preparedness among school stakeholders and community. Furthermore, it will explore ways on how to reduce vulnerability to landslide as well as improve the DRRM among schools.

V. Literature Review

Landslides cause massive damages to life and property worldwide (Chaturvedi and Dutt, 2015; Margottini et al., 2013). Landslide is soil, rocks and vegetal debris that are transported suddenly or slowly down a slope because the soil is not sufficiently stable. It could be accompanied by a loud noise and the amount of soil sliding down during a landslide may reach tens and thousands of cubic meters; in some cases, even more than it. Landslide may damage and destroy residential houses, industrial buildings, roads, main pipelines, power transmission lines and cause the injury and death of people. It may happen when there is a lot of rain, or during earthquakes or volcanic eruption. The risk is greater when people build their homes in the wrong place, or cut down trees and thus nothing left bind the soil when it rains heavily.

Knowledge about causes-and-consequences of landslides and awareness about landslide disaster mitigation are likely to help people take good mitigation actions that prevent landslides from occurring (Becker et al., 2013; Osuret et al., 2016; Webb and Ronan, 2014). According to Charturvedi & Dutt (2017) recent surveys in developing countries (like Philippines) show only mediocre knowledge and awareness about causes and consequences of landslide disasters among general public.

To educate people about cause-and-effect relationships concerning landslides, effective landslide risk communication systems (RCSs) are needed (Glade et al., 2005). To be effective, these RCSs should possess five main components (Rogers and Tsirkunov, 2013): monitoring; analyzing; risk communication; warning dissemination; and capacity building (Dai et al., 2002; Montrasio et al., 2011).

Disaster risk reduction has gained a lot of attention and momentum in the Philippines for the past several years. Numerous projects and activities have been undertaken by various groups and organization. However, the follow through that is needed so that gains are sustainable or scaled up have been challenging. Threat remains to confront stakeholders in adopting good practices and learnings from past experiences.

Vulnerability and people's risk to disasters are still on rise. At the heart of disaster risk reduction is addressing the underlying causes of people's vulnerabilities- social, economic, physical and environmental. More efforts are needed in identifying hazard-prone areas and factors which contribute to people's exposure to disasters, incorporating risk analysis in developing plans, building people's capacities towards sustainable livelihood options, to name a few (NDRRMP, 2011).

Philippines ranks third in terms of casualties and cases among 41 countries as key spots for non-earthquake related landslides. Study showed that identified mountain chains along the western edge of the Philippine Sea plate as among the global hotspots for landslides noting loss of 4,583 lives in 226 non-seismic landslides between 2004 and 2010. In terms of casualties, the Philippines trails behind China with 6,860 deaths and Haiti with 4,475. It is believed that landslides are a global hazard requiring a major change in perception and policy. Nevertheless, there are things that can be done to manage and mitigate landslide risks such as controlling land use, proactive forest management and guiding development away from vulnerable areas (Petley, 2012).

According to Mendoza & Horondo (n.a.), the International Federation of Red Cross and Red Crescent Societies pointed out that disaster preparedness should aim to

develop activities that are useful in addressing everyday threats that communities face. It also emphasized that there is a need for training of stakeholders and the population at risk. Furthermore, the institution emphasized that early warning systems should be included in the disaster preparedness strategy and suggested to familiarize with the local people engaged in disaster preparedness, then design ways to support them.

With the existing gap on disaster risk communication and early warning system among local communities, it is imperative to seek for better and effective means of strengthening and improving the Disaster Risk Reduction and Management programs. This study is anchored on R.A. 10121, s. 2010 entitled Philippine Disaster Risk Reduction and Management Act of 2010 covering four thematic areas, namely (1) Disaster Prevention and Mitigation, (2) Disaster Preparedness, (3) Disaster Response and (4) Disaster Recovery and Rehabilitation.

This act is useful to this study for it will provide legal basis for crafting and implementing policies, plans and intervention programs in dealing with disasters. Through this, there will be a safer, adaptive and disaster resilient Filipino communities towards sustainable development.

Also, the study is in lined with DepEd Order No. 55, s. 2007 entitled “Prioritizing the Mainstreaming of Disaster Risk Reduction Management in the School System and Implementation of Programs and project”. Such D.O is of importance to this research due to the fact that it fortify the need of building disaster resilient school and communities seeing it as not just another school program but a top priority.

Lastly, the study will make use of Experiential Learning which focuses on learners reflecting on their experience of doing something, so as to gain conceptual insight as well as practical expertise. Kolb's experiential learning model suggests four stages in this process: active experimentation; concrete experience; reflective observation; and abstract conceptualization. It is also known as learning by doing referring to a theory of education wherein learning should be relevant and practical, not just passive and theoretical. This research sought to prove that by providing Interactive Learning Simulation Micro-world accompanied by Interactive teaching methods, learners can effectively absorbed the ideas and thus enhance their knowledge and decision-making on appropriate measures upon occurrence of landslide.

According to Foss and Eikaas (2006), decision-making tasks micro-world have spread across discipline and different levels of education. Furthermore, such creation have long been used in study of decision making behavior to provide decision makers with practice and training in organizational system's control (Sterman 2011). Interactive simulation tools provide a way of evaluating how experiential feedback influences people's decisions (Chaturvedi et al., 2017).

Interactive Landslide Simulation Micro-world (ILSM) is a computer-simulation tool where a decision maker's goal is to choose the best option to survive in a landslide situation considering the influence of both human factors and physical factors on landslide dynamics. As cited by, Chaturdevi, et. al. (2015), both Knutti (2005) and Wagner (2007) agreed that there is a need to develop simulation models that are able to integrate human factors in landslide risks mitigation in addition to physical factors.

They believed that such is effective in improving people's understanding on the problem.

Moreover, according to Baumeister et al., (2007) and Finucane et. al., (2000) emotional response to stimuli is seen to influence risk perception and decision making. The so-called "affect heuristic" can be derived from ILSM which allows learners to make decisions and solve problems quickly and efficiently, in which current emotion of fear, pleasure and surprise influences decisions. One's orientation of feelings either negative or positive can be an effective tool for risk communication when unexpected situations arise.

At one hand, Interactive teaching method as part of the ILMS involved enhanced pedagogies such as mini-lectures, discussion, excursion, brainstorming, presentation, case study, role, Socratic Method and learning by doing. *Mini-lectures* is defined as a brief lecture aimed to provide certain information to the audience. A *discussion method* is one of the interactive methods used to review different approaches, ideas, and problems within the group.

Adding to these, an *excursion* is a group visit to an institution or organization in order to learn about its function. Brainstorming is a creative group-work method with a goal to create and review the maximum number of ideas for solving concrete problems. A *presentatio*n is a means to convey theoretical or practical material in front of the group. *Case study method* is used to gain additional information and knowledge based on specific examples. *Role play* is another group work formats where learner stage a real situation, act-out certain roles and thus receive theoretical knowledge and practical experience. *Socratic Methods* is where teachers ask only the problem question, not

informative ones. Lastly, *learning by doing* where learners receive not just information but the exact instructions necessary for the experiment or simulation. (Ratiani et. al., 2011)

Certainly, prevention starts from the dissemination of information. Achieving increased awareness facilitates the first step made towards positive action. Taking into account that schools play an important role in the formation of values, schools can make significant contribution in establishing culture of prevention among the communities.

VI. Research Questions

The study aims to assess the effect of Interactive Landslide Simulation Micro-world (ILSM) towards participants on disaster risks posed by landslide occurrence. Specifically, this study sought to answer the following:

1. What is the level of Disaster Preparedness among School Disaster Risk Reduction and Management (SDRRM) in Lininding Elementary School and Sultan Palao Ali Memorial Elementary School, as to:
    1.1. Dissemination
    1.2. Implementation
    1.3. Resource utilization and operation?
2. What is the performance of participants before and after exposing to Interactive Landslide Simulation Micro-world (ILSM)?

3. Is there significant difference of the performance of participants before and after exposing them to Interactive Landslide Simulation Micro-world (ILSM)?

VII. Scope and Limitation

This study determined the effect of Interactive Landslide Simulation Micro-world (ILSM) aided by interactive teaching method in enhancing the knowledge and awareness of participants on disaster risks posed by landslide in Tagoloan District. Two (2) schools in Tagoloan District were included on this study consisting of 55 participants overall. Such schools were studied due to its geographical attribution causing schools to be more prone to landslide.

VIII. Research Methodology

A mixed research method was employed in this study using both qualitative and quantitative technique of collecting data through an adopted SDRRM Evaluation Form (SEF) by Jurilla (2016) which was slightly modified to fit the necessary information needed for this study. There was also a conduct of pretest-posttest assessment from the participants.

a. Sampling

This study was conducted on two (2) schools under Tagoloan District considered prone to landslide through purposive sampling such as Lininding Elementary School (LES) and Sultan Palao Ali Memorial School (SPAMES). Furthermore, it included not

only the teachers and school administrators, but also representatives coming from learners, barangay officials and parents.

Table 1

Distribution of Participants

School	No. of Participants
Lininding Elementary School	25
Sultan Palao Ali Memorial School	30
Total Number of Participants	**55**

Data Collection

Prior to the actual the conduct of the study, the researcher sent a letters requesting permission from the school principals involved. Such letter stated among others that the data obtained will be used for research purposes only and will be treated with outmost confidentiality. Upon approval, the researcher called the attention of participants for orientation and dissemination of consent. In gathering relevant data, the research made use of triangulation methods involving survey questionnaire, observation, interview, focus group discussion (FGD) and participatory assessment tool.

Furthermore, there was a conduct of pretest and posttest assessment using a developed Interactive Landslide Simulation Micro-world (ILSM) to assess the performance of participants in terms of their knowledge and understanding on disaster risks posed by landslide as well as appropriate decision-making when it occurs. The researcher then proceeded to the analysis of data gathered.

IX. Discussion of Results and Recommendation

This chapter presents, analyzes, and interprets the data gathered from the participants. The analysis also finds support from the literature reviewed. It is divided into three related parts. The first part tackles on the level of Disaster Preparedness among School Disaster Risk Reduction and Management (SDRRM) in Lininding Elementary School and Sultan Palao Ali Memorial Elementary School, as to Dissemination, Implementation, and Resource utilization and operation. The second part highlights the performance of participants before and after exposing to Interactive Landslide Simulation Micro-world (ILSM). The third part reveals the significant difference of the performance of participants before and after exposing them to Interactive Landslide Simulation Micro-world (ILSM).

Table 2 presents the level of disaster prepared of School Disaster Risk Reduction and Management. It reveals that both schools are somewhat prepared in terms of dissemination, and very unprepared in terms of resource utilization and operation. While, the SDRRM of Lininding Elementary School is somewhat prepared in terms of implementation, Sultan Palao Ali Memorial Elementary School is unprepared in terms of implementation. Generally, results show that schools are somewhat prepared in terms of dissemination, unprepared in terms of implementation and very unprepared in terms of resource utilization and operation.

Part I

Level of Disaster Preparedness on School Disaster Risk Reduction and Management

Table 2. *Summary Table on the Level of Disaster Preparedness of SDRRM*

Disaster Preparedness *on SDRRM*									
School	**Dissemination**			**Implementation**			**Resource Utilization and Operation**		
	$\bar{x}$	***sd***	***Qualitative Description***	$\bar{x}$	***sd***	***Qualitative Description***	$\bar{x}$	***sd***	***Qualitative Description***
Lininding ES	3.00	1.15	*Somewhat Prepared*	2.62	1.12	*Somewhat Prepared*	1.70	0.82	*Very Unprepared*
Sultan Palao Ali MES	2.90	0.88	*Somewhat Prepared*	2.53	0.78	*Unprepared*	1.80	0.63	*Very Unprepared*
Overall	**2.95**	**1.01**	**Somewhat Prepared**	**2.58**	**0.95**	**Unprepared**	**1.75**	**0.73**	**Very Unprepared**

Despite, the existing bills such as R.A. 10121, s. 2010 entitled Philippine Disaster Risk Reduction and Management Act of 2010 and DepEd Order No. 55, s. 2007 entitled “Prioritizing the Mainstreaming of Disaster Risk Reduction Management in the School System and Implementation of Programs and project”, needs of SDRRM are less likely to be prioritized in building disaster resilient school and communities seeing it as just another school program.

This can be attributed to lack of funds to purchase necessary emergency equipment for school including sufficient first aid kits, splints, oxygen, stretchers, communication system and mobilization. In addition, interviews and surveys conducted

reveal that there is low commitment and participation among different agencies like barangay officials, policemen and other volunteer groups. Furthermore, Local Disaster Risk Reduction and Management (LDRRM) are not very much functional or responsive and less likely show interest in involving or coordinating during school programs. Teachers were also not trained to respond during disaster thus making them rely on what they know and could be less of assistance when a circumstance arises. Despite having series of Division trainings on teachers and learners on how to respond during disaster, not all are accommodated.

Part II

Performance of Participants Before and After Exposure to Interactive Landslide Simulation Micro-World

Table 3. Respondents' Pretest and Posttest Scores

Scores	Performance Category	Pretest		Posttest	
		f	*%*	*f*	*%*
0-19	Poor	25	*45.5*	0	*0.0*
20-25	Fair	22	*40.0*	6	*10.9*
26-30	Satisfactory	8	*14.5*	13	*23.6*
31-35	Very Satisfactory	0	*0.0*	24	*43.7*
36-40	Excellent	0	*0.0*	12	*21.8*
	Total	**55**	*100.0*	**55**	*100.0*

Table 3 presents the distribution of respondents in terms of their pretest and posttest scores. It reveals that most of the respondents *(45.5%)* have poor performance in their pre-test; while, most of them *(43.7%)* have very satisfactory performance in their post-test scores and some respondents *(21.8%)* even got excellent performance in it.

This further validated the study of Charturvedi & Dutt (2017) where developing countries (like Philippines) show only mediocre knowledge and awareness about causes and consequences of landslide disasters among general public.

Result shows that the respondents can be classified within poor to satisfactory performance in terms of their pretest scores which relatively increased in their posttest scores having performance from satisfactory to excellent. This indicates a clear improvement of the respondent's performance before and after exposing to Interactive Landslide Simulation Micro-world (ILSM).

Part III

Significant Difference of the Performance of Participants Before and After Exposure to Interactive Landslide Simulation Micro-World

Table 4. Significant Differences on the Posttest Scores of the Respondents

Groups	Pretest		Posttest		Paired Mean Difference ± SE	t-value (df)	p-value
	Mean	*SD*	*Mean*	*SD*			
One Group	19.33	5.73	31.69	4.57	-12.36±0.722	-17.1324	<.001

*Note: 2-Analysis is based on Paired T-test SD-standard deviation ***-very highly significant at 0.05 level*

Table 4 presents the differences on the posttest scores of the respondents. Result portrays that there is a highly significant difference in the pre-test scores and posttest scores of the respondents since the p-value of <.001 does not exceed at the 0.05 level of significance. Hence, this indicates that there is significant difference in their pretest and posttest performance participants before and after exposing them to

Interactive Landslide Simulation Micro-world (ILSM). Furthermore, it can be noted that such adapted module is an effective enhancing participants' knowledge on landslide.

As cited by, Chaturdevi, et. al. (2015), both Knutti (2005) and Wagner (2007) agreed that there is a need to develop simulation models that are able to integrate human factors in landslide risks mitigation in addition to physical factors. They believed that such is effective in improving people's understanding on the problem.

Moreover, according to Baumeister et al., (2007) and Finucane et. al., (2000) emotional response to stimuli is seen to influence risk perception and decision making. The so-called "affect heuristic" can be derived from ILSM which allows learners to make decisions and solve problems quickly and efficiently, in which current emotion of fear, pleasure and surprise influences decisions. One's orientation of feelings either negative or positive can be an effective tool for risk communication when unexpected situations arise.

With the results shown, researcher highly recommend to fortify Disaster Risk Reduction and Management among school through prioritizing, crafting and implementing policies, plans and intervention programs in dealing with disasters efficiently and effectively. Through this, there will be a safer, adaptive and disaster resilient Filipino communities towards sustainable development. Having knowledge about causes-and-consequences of landslides and awareness about landslide disaster mitigation are likely to help people take good mitigation actions that prevent landslides from occurring (Becker et al., 2013; Osuret et al., 2016; Webb and Ronan, 2014).

Also, researcher highly recommends the emphasis a need for training of stakeholders and the population at risk. This includes creation of early warning systems

in the disaster preparedness strategy where local people in school-community can be familiarize with the disaster preparedness, then design ways to support them. Disaster preparedness should aim to develop activities that are useful in addressing everyday threats that communities face.

To educate people about cause-and-effect relationships concerning landslides, effective landslide risk communication systems (RCSs) are needed (Glade et al., 2005). To be effective, these RCSs should possess five main components (Rogers and Tsirkunov, 2013): monitoring; analyzing; risk communication; warning dissemination; and capacity building (Dai et al., 2002; Montrasio et al., 2011).

Certainly, prevention starts from the dissemination of information. Achieving increased awareness facilitates the first step made towards positive action. Taking into account that schools play an important role in the formation of values, schools can make significant contribution in establishing culture of prevention among the communities.

X. Dissemination and Advocacy Plans

Addressing the issues of vulnerability of school children against the catastrophic damages cost by landslide is not a one-man job. It should involve extensive coordination between the school stakeholder and community as a whole. As the prime agent of change, the researcher desires to propose a conduct of In-Service training participated by school principals, teachers, parents and Local Government Unit with the aim of promulgating the importance of enhancing disaster awareness and preparedness among the youth.

Furthermore, the orientation of general public and distribution of Preparedness Landslide flyers shall be administered. With this, the result of the study will be put to use as the community gained not only theoretical knowledge but practical experience on what to do before, during and after landslide occurrence as well as how to prevent it.

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