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RESEARCH ARTICLE

Towards Developing Science of Survival (SOS) Pamphlets *for Typhoon, Flashflood, Storm Surge and Tsunami* and *for Earthquakes and Their Aftermath:* A Pilot Study

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Abstract
The catastrophic devastation from recent natural calamities in the Philippines such as Typhoon Yolanda and Central Visayas earthquake in 2013 had made disaster preparedness a primary concern in the country. Prompted by the critical need to use science to save lives, this study developed Science of Survival (SOS)

pamphlets titled *When the Wind Rages and Water Rises: A Science of Survival Pamphlet for Typhoon, Flashflood, Storm Surge and Tsunami* and *When the Earth Moves: A Science of Survival Pamphlet for Earthquakes and Their Aftermath (Liquefaction, Fire, Landslide and Tsunami).* The study used the` developmental research design consisting of three phases: needs and context analysis phase, design, development and formative evaluation phase, and semi-summative evaluation phase. By carefully documenting the iterative process of analysis, design, evaluation and revision, insights were sought with regard to the development of pamphlets that provide useful and scientifically accurate information about surviving natural calamities such as typhoons and earthquakes. Experts from government agencies involved in disaster risk reduction and management, science experts in the university, and students who were victims of major disasters reviewed and evaluated the pamphlets. The results of the semi-summative quantitative evaluation showed that both pamphlets are highly acceptable as supplementary resource materials on disaster response and management.

Keywords: *disaster response, earthquake, flashflood, natural calamity, pamphlets, science of survival, storm surge, typhoon*

Introduction

The United Nations report (2015) on the role of science and technology in disaster reduction claimed that coping with hazards - whether natural or attributable to human activity - is one of the greatest challenges of the applications of science and technology in the 21st Century. While the occurrence of earthquakes or typhoons cannot be prevented, the report argues that we can apply the scientific knowledge and technical know-how that we already have to reduce human suffering and damage to natural and built environments. Disaster reduction is both possible and feasible if the sciences and technologies related to natural hazards are properly applied. This study represents one such effort to use scientific knowledge to help save lives in times of natural disaster. It aims to develop science of survival pamphlets that provide useful and accurate information about surviving typhoons and earthquakes through an iterative process of analysis, design, evaluation and revision.

The Philippines' location on the Ring of Fire and close to the equator provides it with abundant natural resources and some of the world's greatest biodiversity. However, it also makes the country prone to recurring hazards such as typhoons, storm surges, earthquakes, volcanic eruptions, floods, and landslides. More than 20 typhoons hit the country every year, which makes the coastline of its 7000 islands vulnerable to storm surges. With the recurrence of large-scale disasters in recent years like Typhoon Ondoy in 2009 (> 400 deaths) , Typhoon Sendong in 2011 (> 1300 deaths), and Typhoon Yolanda in 2013 (> 6200 deaths), the "unprecendented" is becoming the new "normal" in the Philippines (Montejo, 2015).

Since the 1600s, the Philippines has endured 106 earthquakes with a magnitude of more than 6.0. One of the most devastating earthquakes in recent times hit the Northern part of Luzon on July 16, 1990. The 7.8 magnitude earthquake left 2 412 people dead and around $369.6 million worth of damages to property. On October 15, 2013, Central Visayas was rocked by a 7.2 magnitude earthquake, leaving 28 people dead and damaging buildings and historical sites across the region, particularly in Bohol and Cebu (Rappler, 2015).

In comparison with other countries, the Philippines' vulnerability to natural disasters is unusually high. Verisk-Maplecroft conducted an analysis of the combined risk posed by storms, floods, tsunamis, earthquakes, fires, volcanoes and landslides in more than 1,300 cities. The results showed that of the 10 world cities most exposed to natural hazards,

eight are in the Philippines (Business Mirror, 2015). In fact, the Philippines is ranked as the third most disaster-prone country in the world out of 173 countries, after Vanuatu and the Republic of Palau, (United Nations Philippines, 2015).

The Philippines also has the unfortunate honor of topping the ranking of countries suffering from extreme weather, according to a new report published by the German think tank Germanwatch (Bloomberg, 2014). The report classifies countries into two categories: countries high in the rankings because they are regularly hit by extreme events, and countries hit by "exceptional catastrophes" that cause their ranking to soar. The Philippines has the distinction of fitting in both categories, since it not only gets lots of bad storms, it also suffers from unusually fierce weather events that may become more common with global climate change (Bloomberg, 2014).

According to the World Bank (2015) report on the Philippines, this inherently high disaster risk is aggravated by the effects of unplanned urbanization, environmental degradation, and global climate change. To make matters worse, the country also has poor institutional and societal capacity to manage, respond and recover from natural hazard events.

The country's level of preparedness for catastrophic events was put to a severe test recently when the most powerful and destructive typhoon in recent memory, Typhoon Yolanda (International name: *Haiyan*), struck the country on November 8, 2013. The typhoon left 6,300 dead, 1,061 missing, 28,689 injured and more than one million houses totally or partially damaged (NDRRMC, 2014). Further, the NDRRMC report estimated the total damage from the typhoon to be close to 90 billion pesos. The devastating 4 to 5-meter Yolanda storm surges, one of the biggest storm surge events in several decades, caused much of the damage and fatalities.

In the wake of Typhoon Yolanda's catastrophic destruction, the weaknesses and significant gaps in the country's disaster response and management system were exposed once more. At present, there are heightened efforts to improve risk reduction strategies in the country. With climate change and the risk of disasters becoming seemingly unavoidable and on the rise, the various agencies and institutions, NGOs, and the private sector in the Philippines need to work together to increase the country's disaster preparedness and resiliency.

At the forefront of the Philippine government's efforts in disaster risk reduction and management are the National Disaster Risk Reduction and Management Council (NDRRMC), Department of Science and Technology Philippine Atmospheric, Geophysical and Astronomical Agency (DOST-PAGASA), Philippine Red Cross (PRC), Department of Health (DOH), Department of Social Welfare and Development (DSWD), and the local government units (LGUs), among others. The private sector, some non-government organizations (NGOs), and institutions of higher learning in the country are also contributing significantly to these efforts. The NDRRMC is the body empowered to perform policy-making, coordination, integration and supervisory functions, as well as monitor the preparation, implementation and evaluation of the National DRRM Plan to ensure the protection and welfare of the people in times of disaster (NDRRMC, 2015).

Agencies such as DOH, Red Cross, and PAGASA produce information materials, usually leaflets, on specific topics for distribution in schools and communities. These leaflets are highly readable, brief, concise and are good for quick access. However, due to their

conciseness, they seldom include the scientific explanations for the phenomena and precautionary measures during a disaster.

The SOS pamphlets aim to fill that gap by providing more comprehensive information about disasters including the scientific explanation to the do's and don't's before, during and after a disaster. The information provided in the pamphlets are meant to supplement any other information or advise given by government agencies involved in disaster risk reduction and management such as NDRRMC, DOST-PAGASA, DOH and the Philippine Red Cross.

This project aims to answer this question: How should Science of Survival pamphlets be designed to be informative, accurate, relevant, and useful in disseminating information about disaster risk reduction and management among schools and communities?

Conceptual Framework

After the catastrophic devastation caused by Typhoon Yolanda, disaster risk-reduction and management became a most pressing concern for the government and the private sector. Various agencies, institutions and companies extended their assistance in promoting disaster awareness and preparedness in the country. Information materials for disaster risk-reduction, response and mitigation such as leaflets, flyers or brochures were distributed in schools and communities. These types of materials offer small amounts of information on a specific topic and are cheaper ways of getting the information out to a larger number of people. In its desire to go beyond the do's and don't's, the present study chose to develop pamphlets instead.

A pamphlet is described as a booklet consisting of a few pages that are folded in half and saddle stapled at the crease to make a simple book. In order to count as a pamphlet, UNESCO requires a publication (other than a periodical) to have at least 5 but not more than 48 pages exclusive of the cover pages (AArtDesign, 2013). Beyond 48 pages, it already counts as a book. A pamphlet's aim is to educate, inform, persuade, or entertain the intended audience. It may also be used to mobilize people to support one's cause (AArt Design, 2013).

Pamphlets are more likely to be effective when: (1) the aim is to improve knowledge; (2) the aim is to change people's attitudes, (3) they are used in conjunction with other interventions; or (4) they are aimed at specific high risk groups (Newell, 1996). Further, the following need to be maximized: (1) receipt and readership of pamphlets; (2) comprehensibility; (3) readability; and (4) emphasis on the main message. To ensure comprehensibility, the use of short words and sentences, the active voice, the positive voice, and a low reading level are required. To ensure readability of the pamphlets, spelling, grammar and readability estimate must be checked.

Newell (1996) identified seven techniques for emphasizing the main message in written materials, namely: (1) having a title which explains the materials; (2) putting the key point first in the materials; (3) repeating the key points within the materials; (4) using question-based paragraph headings; (5) visually emphasizing the key points- i.e. bolding, underlining, using color, etc.; (6) avoiding the use of symbols; and (7) using illustrations that are appropriate to the target group and topic. In this study, efforts were made to increase comprehensibility, readability, and emphasis on the main message.

To ensure that the contents of the pamphlets are sufficient, accurate, responsive to the needs of the target audience, and appropriate for their intended purpose, the development process began with needs and context analysis. This required reviewing the news reports, articles, documentaries and reports from the media, related books, journals and information materials, and websites of NDRMMC, Philippine Red Cross, PAGASA, DOH, and other sources. The review of the literature and the researchers' expertise in the different branches of science became the basis for the contents of the preliminary drafts of the pamphlets.

At the forefront of the government's disaster management efforts are NDRRMC, DOST-PAGASA and DOH in collaboration with a non-government organization like the Philippine Red Cross. The National Disaster Risk Reduction and Management Council (NDRRMC) is tasked to prepare for, and respond to, natural calamities, like typhoons and earthquakes. The NDRRMC uses strategies to mitigate the impact of disasters and increase the resiliency of both the national government and local government units in the face of disasters (NDRRMC, 2015).

The Philippine Atmospheric, Geophysical and Astronomical Agency (PAGASA), one of the attached agencies of the Department of Science and Technology (DOST) under its Scientific and Technical Services Institutes, is mandated to "provide protection against natural calamities and utilize scientific knowledge as an effective instrument to insure the safety, well being and economic security of all the people, and for the promotion of national progress" (PAGASA, 2015). On the other hand, the Department of Health (DOH) is the agency tasked to guarantee equitable, sustainable and quality health for all Filipinos, especially the poor, and to lead the quest for excellence in health. Public health centers and government hospitals play significant roles in planning and preparing for, and responding to, various emergencies, including environmental emergencies, foodborne and sanitation issues, and water supply safety, especially in times of disaster (Department of Health, 2015).

Lastly, the Philippine Red Cross is the premier humanitarian organization in the country, committed to provide quality life-saving services that protect the life and dignity especially of indigent Filipinos in vulnerable situations (Philippine Red Cross, 2015). Aside from disaster management services, the Philippine Red Cross provides five other major services: blood services, safety services, health services, social services, and Red Cross youth and volunteer services.

In view of the significant roles and experiences of these agencies in disaster response and management, they are in the best position to evaluate the SOS pamphlets. Thus, after a series of review and revision by the science experts in the university, the SOS pamphlets were submitted to experts in NDRRMC, DOH, DOST-PAGASA and Philippine Red Cross and to students who have survived major disasters for evaluation. Their comments and suggestions, both oral and written, guided the revision of the pamphlets. The revised versions of the SOS pamphlets were returned to these three groups of experts for further review and evaluation. Additional comments and suggestions from the experts were considered in producing the final version of the SOS pamphlets. Figure 1 shows the framework of the study.

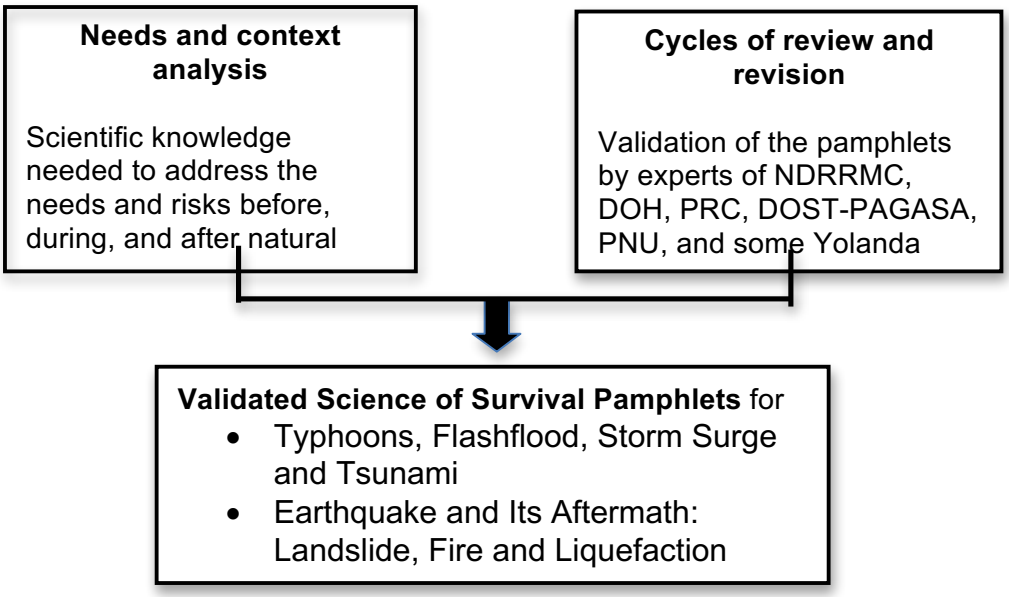


Figure 1. Framework of the Study

Methodology

Study Design

This study falls under developmental research, which is defined as "the systematic study of designing, developing and evaluating instructional programs, processes and products that must meet the criteria of internal consistency and effectiveness" (Seels & Richey, 1994, p. 127, in Richey & Klein, 2005). Based on the two categories of developmental research of Richey, Klein and Nelson (2004), this study is developmental research Type 1 because it aims to design, develop and evaluate an instructional product, specifically, the Science of Survival pamphlets.

Procedure

The study consisted of three phases: needs and context analysis phase, design, development and formative evaluation phase, and finally, semi-summative evaluation phase (see Figure 2) following the process of a developmental research. The goal of the *needs and context analysis phase* was to survey the literature on disaster response, risk reduction and management and to identify the needs and risks during disasters and how science can help before, during and after disasters to improve the victims' chances of survival. The goal of the *design, development and formative evaluation phase* was to design the pamphlets and improve it through a series of evaluations by various experts along with corresponding revisions. The goal of the *semi-summative evaluation phase* was to determine the pamphlets' readiness for field testing in schools and communities based on the expert evaluation of government agencies involved in disaster risk reduction and management, science experts in the university, and students who are survivors of major disasters.

Figure 2 provides of visual representation of the iterative process adopted in this study. The height of each cycle indicates the number of people involved in each step in the process.

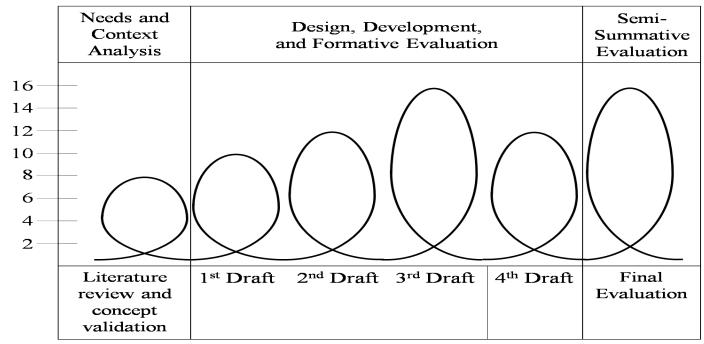


Figure 2. Iterative process of the study

a. Needs and context analysis phase

Nine PNU lecturers, all experts from various fields, namely, biology (2), chemistry (3), physics (2), and mathematics (2) composed the team of researchers in this study. During this phase, the team identified, selected, analyzed and summarized the scientific literature on what to do before, during and after natural disasters such as typhoons, tsunamis, storm surges, flash floods, earthquakes and their aftermath. More importantly, the scientific bases for the phenomenon and the do's and don't's were identified. The researchers also reviewed the websites and information materials of government and non-government agencies involved in disaster preparation and management. The rules for writing documents for the general public and methods to assess readability and comprehension were also reviewed. At the end of this phase, the team identified the scope, sequence and content of each pamphlet.

b. Design, development and formative evaluation phase

This phase progressed in four cycles. In each cycle, drafts of the pamphlets were formatively evaluated, with each set of feedback influencing the next draft. In the first cycle, the team drafted the preliminary draft of the pamphlets based on the literature review and their own expertise in the sciences. Discussions centered on the features and lay-out of each pamphlet. Each pamphlet was presented to the research team for peer review and critiquing in terms of scope, sequence, accuracy of content, relevance and lay-out. In the second cycle of this phase, the enhanced drafts of the pamphlets were subjected to further peer review, critiquing and language editing. In the third cycle, the drafts in quality prints were submitted for evaluation by experts in government agencies involved in disaster risk reduction management, namely, NDRRMC, DOH, DOST-PAGASA, and PRC. The experts evaluated the pamphlets in terms of relevance and accuracy of content, format and language used. In addition, two medical doctors in PNU, two science specialists (one in physics and the other in chemistry), and three students who are survivors of major disasters likewise evaluated the pamphlets. Evaluative feedback in this cycle was gathered through a product evaluation questionnaire, interviews, and in some cases, group discussions with experts in government agencies. All inputs, suggestions and

comments of the experts were considered in preparing the fourth draft of the pamphlets, which were again critically reviewed by the team and subjected to language editing.

c. Semi-summative phase

In this phase, the expert evaluators evaluated the pamphlets for a second time to help ensure that all their suggestions, comments and inputs were incorporated in the revised versions and to determine if the pamphlets were ready for use as instructional materials in schools and communities. Additional comments or suggestions were considered. The outcome of this phase was the final version of the pamphlet, which is ready for try-out in schools and communities. The try-out in schools and communities will constitute another study.

Data Analysis

The product evaluation instrument was crafted based on Newell's (1996) description of effective pamphlets and the purposes for which these pamphlets were being developed. The draft of the instruments was reviewed by experts in the university and were tried out in the first cycle of the pamphlets' evaluation by the internal and external experts and the students.

Data obtained from the product evaluation instrument were statistically treated using the arithmetic mean. The weighted mean was used to get the general feedback of the pool of experts and students who evaluated the pamphlets and these were interpreted using the following scale:

Range of Means	*Interpretation*
3.51 – 4.00	Highly Acceptable
2.51 – 3.50	Acceptable
1.00 – 2.50	Needs Improvement

To evaluate how readable the pamphlets are, Word's Flesch Reading ease score and Flesch-Kincaid score were obtained. According to Stockmeyer (2009), the Flesch Reading Ease score is computed using the average number of syllables per words and words per sentence. Syllables-per-word is a measure of word difficulty while words-per-sentence is an indicator of syntactic complexity. The Flesch Reading Ease scale ranges from 0 to 100 and has the following interpretations (Stockmeyer, 2009):

0 - 40 difficult to very difficult reading
41 - 79 moderately difficult reading
80 - 100 easy to very easy reading

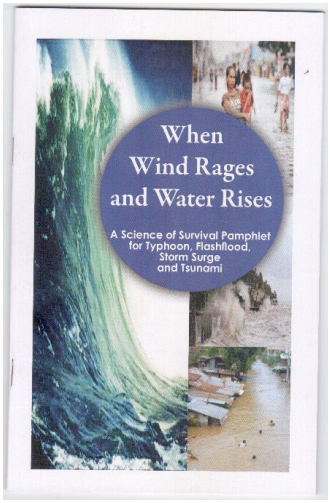
The aim for standard documents is to be in the moderately difficult range.

The Flesch-Kincaid score has the advantage of measuring the readability of a document based on the minimum education level required for a reader to understand it. Microsoft recommends aiming for a Flesch-Kincaid score of 7.0 to 8.0 for most documents (Stockmeyer, 2009).

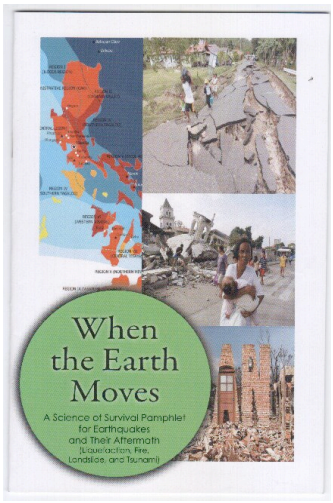
The handwritten and oral recommendations given for the improvement of the pamphlets were summarized and considered in the revision of each pamphlet.

Results and Discussion

This research project developed two Science of Survival pamphlets, titled, *When Wind Rages and Water Rises* and *When the Earth Moves.* Figure 2 shows the cover photos of the two Pamphlets.



Pamphlet 2



Pamphlet 1

Figure 3. Front covers of SOS pamphlets 1 and 2

When Wind Rages and Water Rises is a 23-page pamphlet for typhoon, flashflood, storm surge and tsunami. *When the Earth Moves*, on the other hand, is a 21-page pamphlet for earthquakes and their aftermath (liquefaction, fire, landslide, and tsunami). Both pamphlets aim to increase awareness on the dangers posed by the different natural calamities and to provide tips and suggestions on what to do before, during and after any of these natural calamities. Experts from PAGASA provided several pages of detailed and very helpful comments, corrections, and suggestions for the improvement of the content, lay-out, and overall presentation of the pamphlet *When Wind Rages and Water Rises* as this is their area of expertise.

Prior to the semi-summative evaluation of the pamphlets, many of the comments and suggestions of the external evaluators focused on accuracy of content and illustrations. For instance, the agencies suggested the adoption of PHILVOCS' definition for "earthquake", the enhanced earthquake hazard map, and its classification of the magnitudes of earthquakes. PAGASA emphasized the accurate use of terms, phrases, and data on major water-related calamities in the Philippines, including the basis for classifying weather disturbances. On the other hand, the comments of the internal evaluators of the university and the students centered on the need to increase font size, improve grammar and lay-out, and enhance the clarity of figures, illustrations and graphs. They also cited some inaccuracies in dates and data. All the comments and suggestions were taken into consideration in the revision of the pamphlets during the formative phase.

The revised pamphlets were again evaluated by the experts in the semi-summative phase and the feedback this time was overwhelmingly positive. In its endorsement of the SOS pamphlets, NDRRMC suggested the translation of the pamphlets to Filipino for mass

production and distribution in the country. The Philippine Red Cross proposed a partnership between the university and their agency in the conduct of training on disaster management using the pamphlets in the different parts of the country. Both PAGASA and DOH certified that the contents of the pamphlets had been checked by their experts and they supported the pamphlets' use as supplementary resource materials on disaster management. Likewise, the university's internal evaluators and students highlighted the huge improvement of the final version of the pamphlets compared to the earlier versions. They were proud to have been part of the development of such a relevant and timely information material for disaster management for use in schools and communities.

At this point, the quantitative results using the product evaluation instrument will be presented starting with the ratings given by the internal evaluators, followed by the students and external evaluators.

The internal evaluators consisted of university experts who were not involved in the writing of the pamphlets. They included two medical doctors, a chemistry professor, and a physics professor. Table 1 shows the ratings given by the internal evaluators for the two pamphlets.

Table 1. Internal Evaluators' Ratings of the SOS Pamphlets

Criteria	Weighted Mean	
	Pamphlet 1	Pamphlet 2
Relevance of Content		
1. The content of the pamphlet is timely and relevant.	4.0	4.0
2. The content of the pamphlet presents solutions to the problems encountered during typhoons, tsunamis, storm surges and floods./The contents of the pamphlet address problems or situations encountered before, during, and after an earthquake.	4.0	4.0
3. The pamphlet is significant and useful.	4.0	3.7
AWM	**4.0**	**3.9**
Accuracy of Content		
1. The scientific concepts presented in the pamphlets are accurate.	3.7	3.3
2. The illustrations and graphs are accurate.	3.7	3.3
3. The situations presented are realistic.	3.7	3.7
4. The tips and suggestions presented are based on accurate scientific knowledge.	3.7	3.3
5. The tips and suggestions given are practical and doable.	3.7	3.7
AWM	**3.7**	**3.5**
Lay-out of the Pamphlet		
1. The cover of the pamphlet captures the essence of its content.	4.0	4.0
2. The cover of the pamphlet attracts people to read it.	3.7	4.0
3. The lay-out of the pamphlet is easy to follow and is reader-friendly.	3.7	3.3
4. The font size used is appropriate.	3.7	3.3
5. The lay-out draws the reader's attention to what is important.	3.7	3.3
AWM	**3.8**	**3.6**
Language		
1. The language used is simple and easy to understand.	4.0	3.7
2. The language used is appropriate for teachers, trainers and community leaders.	4.0	4.0
3. The pamphlet is free of grammatical errors.	3.7	3.3
4. The discussions and explanations in the pamphlet are clear and easy to follow.	4.0	4.0
AWM	**3.9**	**3.8**

Legend:
Pamphlet 1 - *When Wind Rages and Water Rises*
Pamphlet 2 – *When the Earth Moves*

On a scale of 1 to 4, both pamphlets were rated as highly acceptable in all categories namely, relevance and accuracy of content, lay-out and language used, with SOS Pamphlet 1 getting a slightly higher average weighted mean (3.9) than SOS Pamphlet 2 (3.8).

Table 2 shows the ratings given by the external evaluators of both SOS Pamphlets, namely experts from NDRRMC, Philippine Red Cross, PAGASA and DOH. The experts from DOH provided comments and suggestions on the content but declined to evaluate the pamphlets using the rubric, claiming that many of the areas discussed in both pamphlets were not within their line of expertise.

Table 3. External Evaluators' Rating of the SOS Pamphlets

Criteria	Weighted Mean	
	Pamphlet 1	Pamphlet 2
Relevance of Content		
1. The content of the pamphlet is timely and relevant.	3.7	4.0
2. The content of the pamphlet presents solutions to the problems encountered during typhoons, tsunamis, storm surges and floods. /The contents of the pamphlet address problems or situations encountered before, during, and after an earthquake.	3.3	4.0
3. The pamphlet is significant and useful.	3.7	4.0
AWM	**3.6**	**4.0**
Accuracy of Content		
1. The scientific concepts presented in the pamphlets are accurate.	4.0	4.0
2. The illustrations and graphs are accurate.	3.3	3.5
3. The situations presented are realistic.	3.7	3.5
4. The tips and suggestions presented are based on accurate scientific knowledge.	4.0	3.5
5. The tips and suggestions given are practical and doable.	3.7	3.5
AWM	**3.7**	**3.6**
Lay-out of the Pamphlet		
1. The cover of the pamphlet captures the essence of its content.	3.3	3.5
2. The cover of the pamphlet attracts people to read it.	3.3	3.5
1. The lay-out of the pamphlet is easy to follow and is reader-friendly.	3.3	3.0
4. The font size used is appropriate.	3.3	3.0
5. The lay-out draws the reader's attention to what is important.	3.3	3.0
AWM	**3.3**	**3.2**
Language		
1. The language used is simple and easy to understand.	3.3	3.0
2. The language used is appropriate for teachers, trainers and community leaders.	3.0	3.0
3. The pamphlet is free of grammatical errors.	3.3	3.0
2. The discussions and explanations in the pamphlet are clear and easy to follow.	3.3	3.0
AWM	**3.2**	**3.0**

Legend:
Pamphlet 1 - *When Wind Rages and Water Rises*
Pamphlet 2 – *When the Earth Moves*

The external raters found the contents of both pamphlets very relevant and accurate, as the means were all above 3.5. The iterative cycles of review and revision clearly improved the accuracy of the contents. All comments, suggestions and corrections made by the

experts in the earlier version of the pamphlets were considered carefully resulting in much improved pamphlets in terms of content.

In terms of lay-out and language, the experts from the different agencies rated the pamphlets as “acceptable” only. The lowest marks obtained by both pamphlets were on the appropriateness of the language used for teachers, trainers, and community leaders. Admittedly, some terms and phrases were technical and not commonly used in everyday language. This suggests the need to further simplify the language used. One way to do that is by presenting the contents in the local language of the teachers, trainers and community leaders and that will constitute another study.

The reviewers also noted the low readability of some figures and graphs. As these figures and graphs were culled from the internet and websites of agencies, the team had difficulty enhancing them to increase readability. Further enhancement of the lay-out and language used will be prioritized in the translation of the pamphlets to different local languages, before the try out in schools and communities, which could be the next phases of this study.

Finally, four students who are survivors of major disasters were asked to evaluate the pamphlets. Both pamphlets received perfect marks in terms of relevance and accuracy of content and the language used. Both the language and layout were likewise rated very highly by the students. The students did not seem to be bothered by the technical terms and phrases used to describe phenomena in the pamphlets. Table 3 shows the summary of the results.

Table 3. Students' Ratings of the SOS Pamphlets

Criteria	Weighted Mean	
	Pamphlet 1	Pamphlet 2
Relevance of Content		
1. The content of the pamphlet is timely and relevant.	4.0	4.0
2. The content of the pamphlet presents solutions to the problems encountered during typhoons, tsunamis, storm surges and floods. /The contents of the pamphlet address problems or situations encountered before, during, and after an earthquake.	4.0	4.0
3. The pamphlet is significant and useful.	4.0	4.0
AWM	**4.0**	**4.0**
Accuracy of Content		
1. The scientific concepts presented in the pamphlets are accurate.	3.3	4.0
2. The illustrations and graphs are accurate.	4.0	4.0
3. The situations presented are realistic.	4.0	4.0
4. The tips and suggestions presented are based on accurate scientific knowledge.	4.0	4.0
5. The tips and suggestions given are practical and doable.	3.3	3.7
AWM	**3.7**	**3.9**
Lay-out of the Pamphlet		
1. The cover of the pamphlet captures the essence of its content.	4.0	3.7
2. The cover of the pamphlet attracts people to read it.	4.0	4.0
3. The lay-out of the pamphlet is easy to follow and is reader-friendly.	4.0	4.0
4. The font size used is appropriate.	3.7	3.7
5. The lay-out draws the reader's attention to what is important.	4.0	4.0
AWM	**3.9**	**3.9**
Language		
1. The language used is simple and easy to understand.	4.0	4.0
2. The language used is appropriate for teachers, trainers and community leaders.	4.0	4.0
3. The pamphlet is free of grammatical errors.	4.0	4.0
4. The discussions and explanations in the pamphlet are clear and easy to follow.	4.0	4.0
AWM	**4.0**	**4.0**

Legend:
Pamphlet 1 - *When Wind Rages and Water Rises*
Pamphlet 2 – *When the Earth Moves*

The average summative ratings from the three groups of evaluators namely, internal experts in the university, external experts from agencies, and students who are survivors

of major calamities, showed that the different components of both pamphlets were all highly acceptable (see Table 4).

Table 4. Average of Evaluators' Ratings of the SOS Pamphlets

Criteria	Weighted Mean	
	Pamphlet 1	Pamphlet 2
Relevance of Content		
1. The content of the pamphlet is timely and relevant.	3.9	4.0
2. The content of the pamphlet presents solutions to the problems encountered during typhoons, tsunamis, storm surges and floods. /The contents of the pamphlet address problems or situations encountered before, during, and after an earthquake.	3.8	4.0
3. The pamphlet is significant and useful.	3.9	3.9
AWM	**3.9**	**4.0**
Accuracy of Content		
1. The scientific concepts presented in the pamphlets are accurate.	3.7	3.8
2. The illustrations and graphs are accurate.	3.7	3.6
3. The situations presented are realistic.	3.8	3.7
4. The tips and suggestions presented are based on accurate scientific knowledge.	3.9	3.6
5. The tips and suggestions given are practical and doable.	3.6	3.6
AWM	**3.7**	**3.7**
Lay-out of the Pamphlet		
1. The cover of the pamphlet captures the essence of its content.	3.8	3.7
2. The cover of the pamphlet attracts people to read it.	3.7	3.8
3. The lay-out of the pamphlet is easy to follow and is reader-friendly.	3.7	3.4
4. The font size used is appropriate.	3.6	3.3
5. The lay-out draws the reader's attention to what is important.	3.7	3.4
AWM	**3.7**	**3.5**
Language		
1. The language used is simple and easy to understand.	3.8	3.6
2. The language used is appropriate for teachers, trainers and community leaders.	3.7	3.7
3. The pamphlet is free of grammatical errors.	3.7	3.4
4. The discussions and explanations in the pamphlet are clear and easy to follow.	3.8	3.7
AWM	**3.8**	**3.6**

Legend:
Pamphlet 1 - *When Wind Rages and Water Rises*
Pamphlet 2 – *When the Earth Moves*

The highest ratings were given to relevance of content, followed by accuracy of content and language. The lay-out of the pamphlets obtained lower scores, but still within the highly acceptable range.

In the Flesch Reading Ease readability test, Pamphlets 1 and 2 scored 58.4 and 64.4, respectively, which means that both require moderately difficult reading. In the Flesch-Kincaid Grade Level scoring, Pamphlets 1 and 2 obtained 8.4 and 7.6 levels, respectively. Since the Microsoft recommends aiming for a Flesch-Kincaid score of 7.0 to 8.0 (Stockmeyer, 2009), both pamphlets are in the acceptable range. The results suggest that Pamphlet 1 is more difficult to read than Pamphlet 2. Efforts should be made to increase its readability index in future revisions. The results of the readability tests support the relatively lower ratings given by the evaluators to the language component as compared to relevance and accuracy of content.

Conclusions

Based on the quantitative and qualitative evaluation by experts from PAGASA, DOH, NDRRMC, Philippine Red Cross, the University and students who are survivors of major disasters, this study concludes that:

1. The Science of Survival Pamphlets, namely, *When Wind Rages and Water Rises* and *When the Earth Moves,* contain relevant and accurate scientific information about natural disasters and useful and doable tips and suggestions to increases one's chances of survival during disasters.
2. The developmental research design which consisted of three phases: needs and context analysis phase, design, development and formative evaluation phase, and finally, semi-summative evaluation phase, were found to be appropriate and helpful in developing relevant, informative, and quality Science of Survival pamphlets.
3. The series of formative evaluation by experts from different sectors, and the corresponding cycles of revisions, greatly enhanced the accuracy and relevance of the content and the over-all lay-out, readability and appearance of the pamphlets.
4. The semi-summative quantitative evaluation by experts showed that both pamphlets are highly acceptable as supplementary resource materials on disaster response and management. This finding is reinforced by the certification of the four agencies, namely, NDRRMC, DOH, PAGASA, and Philippine Red Cross, that the pamphlets had been reviewed by their respective agencies and that they support its use as supplementary materials on disaster response and management.

Recommendations

Based on the conclusions drawn, the study recommends the following:

1. Both SOS pamphlets may be promoted and used as supplementary resource materials on disaster response and management trainings/seminars in schools and communities.
2. To further enhance the readability and usability of the pamphlets, these should be translated to the local language of the community using fewer technical jargon and simpler words, if possible.
3. For greater impact, the pamphlets need to be mass-produced and used in actual disaster management trainings in calamity-prone schools and communities, in cooperation with agencies like NDRRMC and Philippine Red Cross.

4. The pamphlets need to be regularly updated to maintain and even further enhance the relevance and accuracy of the information contained.

References

AArtDesign (2013). Difference and specification between flyers, brochures, leaflets, pamphlets & newsletters. Retreived May 31, 2014 from http://www.aart.us.com/marketing-materials.html.

Bloomberg (December 2014). New storm threatens the Philippines, the world's most disaster-prone country in the world. Retrieved January 12, 2014 from http://www.bloomberg.com/bw/articles/2014-12-03/another-typhoon-for-typhoon-weary-philippines.

Business Mirror (March 15, 2015). Eight Philippine cities most disaster-prone. Retrieved June 3, 2015 from http://www.bworldonline.com/content.php?section=Nation&title=eight-philippine-cities-most-disaster-prone&id=103880.

Montejo, M. (2015). *Environment, disaster preparedness, climate change and energy.* A paper presented at the APEC 2015 High Level Policy Dialogue on Science and Technology in Higher Education held at PICC, Manila on August 13-14, 2015.

National Disaster Risk Reduction and Management Council (2014). *Update on effects of Typhoon Haiyan.* Retrieved on June 5, 2015 from http://www.ndrrmc.gov.ph/attachments/article/1329/Update_on_Effects_Typhoon_YOLANDA_(Haiyan)_17APR2014.pdf.

National Disaster Risk Reduction and Management Council (2015). *National Disaster Risk Reduction and Management Plan (NDRRMP) 2011-2028.* Retrieved August 21, 2015 from http://www.ndrrmc.gov.ph/attachments/article/41/NDRRM_Plan_2011-2028.pdf.

Newell, S. (1996). Writing effective pamphlets: A basic guide. Southern Cross University ePublications @SCU School of Education. Retrieved May 31, 2014 from http://epubs.scu.edu.au/cgi/viewcontent.cgi?article=1143&context=educ_pubs.

PAGASA. Retrieved August 21, 2015 from http://www.pagasa.dost.gov.ph/index.php/transparency/about-pagasa

Philippine Red Cross. Retrieved August 21, 2015 from http://www.redcross.org.ph/about-the-philippine-red-cross.

Rappler (March 15, 2015). Map: Strongest earthquakes in the Philippines. Retrieved on August 5, 2015 from http://www.rappler.com/science-nature/33807-map-strongest-earthquakes-in-ph.

Republic of the Philippines Department of Health. Retrieved on July 15, 2015 from http://www.doh.gov.ph/about-us.

Richey, R. & Klein, J. (Spring 2005). Developmental research methods: Creating knowledge from instructional design and development practice. *Journal of Computing in Higher Education*, Vol. 16 (2), 23 – 38.

Richey, R.C., Klein, J. & Nelson W. (2004). Developmental research: Studies of instructional design and development. In D. Jonassen (Ed.) *Handbook of Research for Educational Communications and Technology (2ND ed) (pp. 1099 – 1130).* Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Stockmeyer, N. (January 2009). Using Microsoft Word's readability program. *Michigan Bar Journal, Vol. 88, p. 46.*

The World Bank (2015). Disaster risk management East Asia & the Pacific: Philippines. Retrieved August 21, 2015 from http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/EXTEAPREGTOPRISKMGMT/0,,contentMDK:22240932~pagePK:34004173~piPK:34003707~theSitePK:4077908,00.html

United Nations Philippines (2015). Country profile. Retrieved July 12, 2015 from http://www.un.org.ph/country-profile.

United Nations International Strategy on Risk reduction (2015). The role of Science and Technology in Disaster Reduction. Retrieved on October 12, 2015 from http://www.unisdr.org/2001/campaign/pdf/Kit_2_The_Role_of_Science_and_Technology_in_Disaster_Reduction.pdfn.