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Evaluating and promoting disaster awareness among children: The disaster awareness game

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ABSTRACT

Children account for the greatest proportion of casualties from hazard impacts, especially in developing countries where they comprise the largest percentage of total population. This disproportionate vulnerability of children has recently been the focus of various United Nations initiatives for disaster risk reduction and is increasingly being the focus of local and national measures to reduce the impacts of hazards. The overarching focus of these children-specific measures has been the promotion of disaster education to enhance the level of awareness among school-age children. However, this new trust toward the disaster awareness among children presents a new challenge for disaster planners, especially as this relates to the development of appropriate tools and techniques for the enhancement of the disaster knowledge base of children. Specifically, disaster management planners are challenged in ensuring not only that the information provided is appropriate to the information-assimilation capacity of children but also that the appropriate tools and techniques are developed to ensure effective conveyance of information through a medium that is neither stoic nor boring. The disaster awareness game presented in this article was designed with these challenges in mind and is intended to evaluate and promote disaster awareness in children. Preliminary results suggest that the tool is effective in meeting this objective.

Key words: disaster risk reduction, disaster education, hazard vulnerability, disaster educational game technique, disaster risk education, children

INTRODUCTION

Overview of hazard impact on children

The comparative vulnerability of children to the impact of hazards and disasters is being increasingly documented to determine the interventions for reducing their exposure to these events. This is especially true in developing societies where scarcity of resources undermines the capacity to develop and implement effective measures for the promotion of awareness among children.[1] The specific vulnerability of children has been highlighted by many recent catastrophic events.[2] For instance, the 2004 Indian Ocean Tsunami, in which children younger than 15 years, along with women, accounted for most of the fatalities. Likewise, the October 2005 earthquake in Pakistan killed more than 16,000 children when their school house collapsed.[3] Events like these underscore the need for due consideration and promotion of measures that will allow children to protect themselves from the impacts of hazards. Other examples of children-specific vulnerability are exemplified by the 2006 mudslides on Leyte Island in the Philippines that caused more than 200 deaths among school children; the March 2005 earthquake in Western Iran that destroyed 130 schools and directly affected 36,000 children; and the 2002 earthquake in the Mose region in Italy where 26 children were killed after the local school was destroyed.[4] Between 1991 and 2000, the lives of an estimated 77 million children were affected by natural and technological disasters.[5] Fatalities among children could have been significantly higher if the "near misses" of catastrophic events are considered. For instance, there are several instances

in which school buildings have been destroyed by hazard impacts during out-of-school periods.

In developing societies, where the largest proportion of the population falls within the youngest age cohort, the potential impact of catastrophes is significantly multiplied. These impacts extend far beyond the immediate because the death of each child represents the loss of 40-70 years of productivity and contributions to social development in societies which can least accommodate these losses.[6] These experiences reinforce the argument that if disaster management initiatives are to be effective in the reduction of social and economic loss, the promotion of awareness among children must be a critical component of such initiatives. Children represent the greatest human resource investment for the future and, as such, the protection of children from the impact of natural and human-induced catastrophes must include two distinct yet interrelated sets of priorities: (i) disaster risk education and (ii) school safety. These priorities are potential multipliers for overall disaster risk-reduction initiatives.[6] However, while gender issues in disasters have enjoyed a higher profile in recent years,[1,7-9] current research tends to assume children are passive victims with no role to play in communicating risks, participating in decision-making processes, or preventing disasters.[10-12]

Disaster awareness among children as a strategy for loss reduction

None of the more recent theoretical models[13] or guidelines for good communication practice[14] single out the unique needs and potential role of children[3] and youth[3] as resources or potential informants within risk communication systems. This is despite the fact that almost all models detail the heterogeneous nature of those at risk and the wide socioeconomic and cultural differences in the processing and filtering of risk information. Although within the literature some practitioners have discussed the merits of educating children about the risks of natural hazards so they are prepared for them, only a small minority have evaluated the benefits of this approach for the family and wider community.[13] The ability of children and youth to be proactive in reducing their own risks has been completely ignored outside the development field.[10] The vast majority of the literature on the role of children in disasters is devoted to the psychosocial impacts they endure,[15,16] and this has commonly focused on younger children, rather than older children and youths.[17] Recently, however, the continuous increase of hazard impact on youths and children has fostered repeated calls for the inclusion of children and their particular needs in the disaster management planning process. In addition, the role of disaster awareness through education and knowledge transfer in building more resilient societies and communities has been repeatedly highlighted.[25] This is particularly true as it relates to the preparedness, mitigation, emergency response, and recovery stages of the disaster management cycle.[18] In similar vein, the United Nations International Strategy for Disaster Reduction has consistently campaigned to make disaster awareness and risk reduction integral to school curricula in formal, informal, and nonformal education. The objective here is to promote disaster risk education in national school curricula in countries vulnerable to natural hazards.

It is believed that knowledge management and education can help hazard-prone communities to gain better understanding of ways to cope with risks and become more resilient. Therefore, disaster education is recognized as an essential element in sustainable development because it accelerates the progress of societies toward disaster resilience.[19] This view is reiterated in the Kobe Report 2005,[20] where it is noted that "education for creating a culture of disaster resilience is an interactive process of mutual learning among people and institutions. It encompasses far more than formal education at schools and universities, and affects all aspects of life through the concerted effort to overcome universal barriers of ignorance, apathy, disciplinary boundaries and lack of political will present in communities. Education also involves the enhancement and use of indigenous knowledge for protecting people, habitat, livelihoods, and cultural heritage from natural hazards." The report further postulates that history teaches that inadequate disaster reduction awareness and the corresponding lack of preparation repeatedly lead to preventable

loss of life and damage in all major natural disasters and that preparation through education is less costly than learning through tragedy.

According to the ISDR Report,[4] schools are the best venues for sowing collective values. Recently, there has been a renewal of focus, at both the national and global levels, on the importance of using public education as a key to disaster mitigation. The 1990s Decade for Natural Disaster Reduction emphasized the importance of governments "educating and training their citizens to increase awareness."[21(vii)] Likewise, it is widely recognized that an educated public is better able to prepare for and adapt and respond to hazards and that education for disaster reduction is complex yet essential to any properly implemented, centrally managed hazard strategy. The implementation of disaster loss reduction programs in schools is increasingly being recognized as one of the key elements in long-term disaster risk-reduction strategies. The rationale is that school children can play an important role in real-life future catastrophic events if disaster risk reduction is integrated into school curricula. The importance of disaster awareness in reducing fatalities among children was demonstrated during the Indian Ocean Tsunami, when many lives were saved because a child was able to recall the warning signs of a possible tsunami from her geography lesson in school. It is in this context that the promotion of disaster education among school children and the subsequent transfer of the knowledge gained to the communities from which these children come can be an effective way of building more disaster-resilient societies.

Wisner[6] echoes this view in his statement that "at all levels, pupils and students from primary schools to postgraduate level can actively study the safety of their own schools and work with teachers and community members to find ways to protect themselves. They can also spread the methods of participatory vulnerability and capacity assessment and hazard mapping to the broader communities surrounding schools and other institutions of education and research of which they are a part." Similar sentiments are expressed by the ISDR,[22] in the statement that "disaster loss-reduction education for children fosters awareness and better understanding about the immediate environment in which they and their families live and work. Since children are widely known to be influential and effective communicators, lessons learned at school will later be transmitted to the home."[19] The value added by current disaster education into the schools' curricula is that children who get disaster education will, once they become adults, have a greater understanding of disasters, of the effects of human actions and of the consequences of poor environmental management, as well as of the need to promote a new kind of development path that is in greater harmony with nature.[23] In other words, education for disaster reduction is an integral part of education for sustainable development as education, knowledge, and awareness are critical to building the capacity for hazard loss reduction.[6] This is especially the case in many developing countries because children form the bulk of the population and a high proportion of the death tolls in a disaster.[6] Excluding children from the disaster planning process threatens their safety when disaster strikes and ignores a valuable resource for risk communication, education, advocacy, and practical risk-reduction activities.[10]

Recently, there is an emerging paradigm in which children are not regarded merely as potential victims of hazards and disasters but more so as catalysts for loss reduction. This is because children represent the gateway to creating a culture of prevention in society. They can be taught the value of prevention and encouraged to play proactive roles in disaster reduction.[24] The idea of involving children and youths and encouraging their participation in risk-reduction measures is in line with international commitments toward children's rights and is also considered critical to the achievement of the Millennium Development Goals.[26] However, the new paradigm is not without its challenges, especially as these relate to the development of appropriate methodologies and techniques for providing children with information that will build their disaster awareness capacity. Although the relevance of disaster education among children to risk reduction cannot be overstated, the process of incorporating the relevant information into a school curriculum is fraught with challenges. Those that are most relevant to this article include the following:

1. Determination of existing levels of awareness prior to curriculum design as a means of establishing the level of intervention required;

2. Design and development of appropriate tools for evaluating existing levels of awareness as well as knowledge gained from interventions; and

3. Ensuring that the techniques employed for imparting disaster knowledge to children are sufficiently interesting and interactive to hold their attention.

These challenges are central to the design and development of the disaster awareness game (DAG) which is the focus of this article.

THE DAG

Objectives of the DAG

The DAG is a process that combines a number of tools and techniques designed to

1. measure levels of hazard and disaster awareness,

2. educate children as well as adults about hazards and disasters that are relevant to their environment,

3. encourage positive behavior at all stages of the disaster management cycle, and

4. dispel myths about hazards and disasters.

These tools include presentations on local hazards and the relevant disaster management context, a board game with related question cards, and a score sheet that is used to evaluate levels of awareness prior to and after exposure to the game. The board game also helps to inform players of the consequences of poor environmental behavior, especially as these relate to hazards.

Playing the DAG

The DAG includes a board game whereby players learn about various hazards to which their communities are vulnerable as well as strategies to mitigate impacts. When playing the game, each player rolls a dice and moves a corresponding number of playing spaces along the game board. On landing on one of the hazard playing spaces, the player is asked a corresponding question from one of the question cards. If the player correctly answers the question, he or she will be required to move the game piece one space forward. If the player incorrectly answers the question, he or she moves backward two playing spaces and loses his or her turn. Each player can only advance along the game board by correctly answering a question or landing on a playing space that suggests positive hazard mitigation measures. If players land on a hazard picture while moving backward, they will not be required to answer another hazard question.

The players will also move backward or forward or lose a turn if they land on any of the marked disaster scenario boxes on the board. In addition, several boxes contain instructions written directly on the board. Statements or scenarios that suggest that an action has positive environmental consequences will require the player to move forward. Landing on a box which suggests a negative environmental action would require the player to move backward. Winning the game can be achieved in one of two ways: (1) The first player who reaches the finish box is the winner. If the number on the dice is higher than the number of spaces between the player's position and the finish line, the player must advance to the final space and then move his or her game piece back as many spaces as are left over from the number on the dice. (2) The person with the most correct responses at the end of a given timeframe can also be declared the winner.

From the players' perspective, the objective of playing the game is to pit his or her knowledge of hazards and disasters against that of opponents while at the same time enjoying the competition.

Design consideration of DAG for school children

The DAG consists three tiers, basic, intermediate, and advanced, and is adaptable to any level of

educational attainment or age group. The layout of the board game is identical for all levels, but the level of difficulty and challenge posed by questions contained on the game card varies in accordance with the level at which the game is being played. Currently, the DAG is in an electronic format that allows its users to adapt and format the game for different levels by adjusting the level of challenge of the questions, the types of hazards, and related questions to reflect local vernacular and hazard experience or exposure. The flexibility of the game allows formatting by users to reflect specific areas of disaster management that decision makers seek to promote. The adaptation discussed in this article targeted grade 5 primary school students and was tested in two Caribbean countries, namely, St. Vincent and the Grenadines (SVG) and the Turks and Caicos Islands (TCI). To date, the DAG is available in English, with translation into Japanese currently underway.

A number of key elements were considered in designing the DAG adaptation for grade 5 primary school children. First was the need to ensure simplicity in all aspects of the game. In that regard, the DAG question cards utilized a multiple-choice format with response options limited to three. Other considerations included a minimum age that was deemed appropriate for playing the game. Consultations with educational practitioners indicated that an appropriate minimum age would be nine years because at this age, the comprehension level of normal school children is sufficiently developed for them to understand key issues related to hazards and disasters and the effective management of these processes. The difficulty of the questions posed was also informed by the comprehension level of children at that age. Once developed, the questions were submitted for review to a panel of disaster managers and educators. This process allowed determination of the appropriateness of questions and feedback from the panel informed the redesign of relevant questions. The questions utilized in the game focused on the four key components of the disaster management cycle, namely, preparedness, mitigation, response, and recovery. Basic facts about hazards and disasters and explanations for the correctness of response were placed on the game cards.

Validation of the DAG: Comparative assessment of grade 5 students in two Caribbean countries

Validation is a critical component in the development of any evaluation tool. With regard to the DAG, the validation process was intended to identify and eliminate any glitch in the process. One school was selected for evaluation in each of the countries where the game was tested. The Marriaqua Government School and the Ona Glinton Primary School were selected for SVG and TCI, respectively. A total of forty-two students were evaluated in SVG, whereas thirty-three students were evaluated in TCI.

Validation methodology

The validation methodology was undertaken in four stages:

1. *Pretest stage*: This stage is intended to evaluate the existing level of disaster awareness among the target population using a questionnaire survey.

2. *DAG exposure 1*: This represents the second stage of the pretest through exposure of the target population to the DAG.

3. *Provision of disaster information*: In this stage participants are provided with disaster management information on hazards that are pertinent to their environment.

4. *Posttest stage*: This stage was intended to evaluate the impact of the game and disaster information on the level of awareness among participants.

Pretest stage. Testing of the DAG was carried out at a two-day workshop in each of the targeted countries. The objective of each workshop was not only to evaluate the existing levels of disaster awareness within the context of the DAG but also to enhance awareness. Participating grade 5 students in SVG ranged in age from 9 to 12 years, with the mean age being 10.9 years. In TCI, ages also ranged from 9 to 12 years, with the mean age being 10.2. There was a significant difference

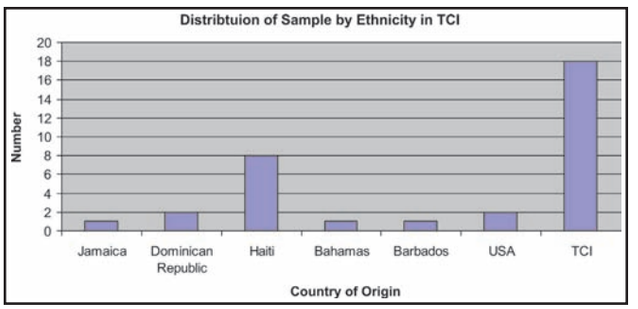

Figure 1. Distribution of sample by ethnicity in TCI. School populations are often a good representation of the community or country in which they exist. In that regard, the mixed nationality indicated in Figure 1 for the TCI is a true microcosm of the country as a whole. Ascertaining the level of diversity that exists in a population is important in tailoring risk information to vulnerable populations.

between the two samples with regard to ethnicity. The grade 5 students evaluated in SVG were homogenous in their ethnicity, with all of them originating from SVG, while the ethnicity of the TCI students varied (Figure 1). The ethnicity of the target population is relevant to the evaluation process because ethnic background is a major consideration in assessing perceptions, attitudes, and behavior in relation to hazards or disasters. In spite of the ethnic homogeneity of the SVG sample, the diversity of locations from which students originated resulted in a variety of hazard experiences, thus making the evaluation process as interesting as that of TCI where hazard experiences were largely related to countries of origin.

Questionnaire design

The questionnaire used as an evaluation tool for the DAG workshop consisted of 74 items or questions that are relevant to components such as hazard awareness, vulnerability perception, hazard management measures, and so on. The components ensured comprehensive coverage of the relevant areas of disaster management and the organization of data in a format that aided comparative analysis of children's responses. The questionnaire incorporated both factual and opinion or attitude questions. Factual questions quantified facts about hazards while opinion or attitude questions provided a basis for the interpretation of specific behaviors. Both open-ended and closed-ended questions were used. Closed-ended questions were appropriate where the researcher was aware of the potential range of responses to a specific question. For example students were asked:

Do you know what you should do to recover from the damage caused by a Hurricane?

☐ *Yes, very well* ☐ *Yes, a little* ☐ *No, not at all*

Open-ended questions were used where uncertainty existed about potential responses, or where the opinions of respondents were required to assess a phenomenon. An example of this is as follows:

What are some measures that people can take to recover following the impact of a hurricane?

a. _____

b. _____

c. _____

There was a bias toward the use of closed-ended questions because this facilitated the precoding of responses, thereby accelerating the data collection process by minimizing the amount of writing during the course of administering the questionnaire. The questionnaire was arranged to accommodate a maximum number of questions per page. Check boxes were used to allow speedy recording of responses and computer data entry. The questionnaires design, therefore, allowed the assessment of children's level of awareness, risk perceptions, factual knowledge, and physical preparedness for hazards to which their communities are vulnerable. For instance, questions addressed to students in SVG were related to hurricanes, volcanoes, landslides, mudslides, and floods whereas those for TCI students were confined to hurricanes and floods. The questionnaire also allowed the assessment of children's prior exposure to specific hazards and disaster education programs designed to increase awareness as well as knowledge and preparedness that were provided by local disaster management officials, media, and school teachers.

DAG exposure 1. At this stage of the validation process, students were exposed to the rules of the game and allowed to play in groups of four (Plate 1).

Plate 1. Playing of DAG in the TCI & SVG. Students in both the TCI & SVG were divided into groups of four to play the DAG. Students were provided with accompanying score sheets to record their responses to hazard related questions. Since the DAG was tested in both the TCI and SVG the pictures included are of both countries.

A scorecard was kept to record the correctness of responses but more importantly as a database for determining levels of awareness at this stage. The scores of students were analyzed at the end of this stage.

Provision of disaster information. Exposure to the DAG was followed by the provision of relevant hazard or disaster information in the form of simple lectures, videos, and interactive discussions with participants.

Posttest stage. The posttest stage consisted of a second exposure to the DAG and evaluation of student's performance in light of their previous exposure and the provision of hazard and disaster information.

RESULTS AND DISCUSSION

Pretest analysis

The pretest analysis is discussed in terms of children's natural hazard awareness, their risk perceptions, and their household level of preparedness.

Children's hazard awareness. Level of hazard awareness among children is influenced by the extent of their hazard and disaster education as well as their level of exposure especially within the context of their household. During the pretest exercise, the level of awareness among children was assessed by asking participants to identify hazards that have or are likely to impact their communities. Table 1 summarizes the results of this exercise.

In all cases, children in SVG demonstrated a higher level of pretest awareness of hazards that are likely to impact their communities than those in TCI for hazards that are common to both environments. The zero score for children in the TCI in relation to landslides or debris flows and volcanic eruption could be anticipated since these hazards are not a part of the hazard profile of the TCI. The generally higher level of awareness in SVG is likely related to the frequency of occurrence of these hazards and better media coverage when compared with the TCI. The exception is drought, because rainfall levels are extremely low in the TCI; yet, children demonstrated a low level of awareness of the potential impacts of meteorological and physiological drought. The likely explanation is that in spite of low rainfall levels in the TCI, the domestic water supply is fairly reliable owing to the extensive use of rain water harvesting as well as desalinization of sea water. Unlike SVG, where drought is most noticeable in terms of its impact on agriculture which is the main livelihood activity, agriculture as a form of livelihood in the TCI is almost nonexistent.

Table 1. Children's perceptions of likely hazard impacts on their communities (pretest results)

Hazard	TCI (%)	SVG (%)
Hurricane	72.7	100
Flood	42.4	93.9
Tropical storm	33.3	78.8
Windstorm	18.2	54.5
Earthquake	15.2	81.8
Drought	9.1	45.5
Wildfire	6.1	12.1
Tsunami	3.0	33.3
Landslide/debris flow	0	93.9
Volcanic eruption	0	97.0

The importance of hazard education in promoting levels of awareness and by extension, risk reduction, is underscored. The level of hazard education among sampled children was assessed in terms of exposure and access to disaster information related to two hazards (Floods and Hurricanes) that are common to the profile of both TCI and SVG. Figure 2 summarizes the results of this pretest exercise. For both groups of students, the pretest survey revealed that TV programs were their primary source of flood and hurricane hazard information. These programs are for the most part seasonal and are broadcasted during the Atlantic Hurricane Season when impacts from hurricanes and related flooding are most likely. Schools also feature significantly in the disaster education of children. However, it is interesting to note that in SVG,

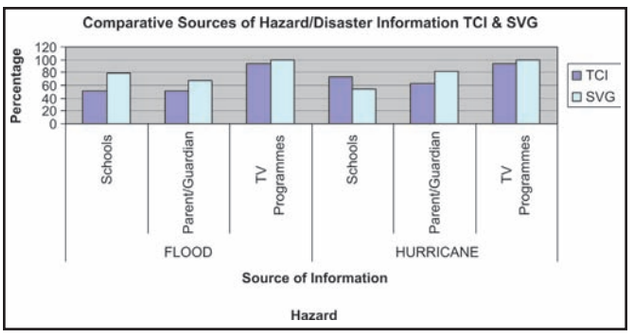

Figure 2. Comparative sources of hazards or disaster information—TCI and SVG (Sources of information are not mutually exclusive). It depicts the sources of hazard information that are utilized by children to access hazard-related information in their respective country. The figure also illustrates among each groups of student which medium of communication is the most important. This information is important in the field of risk communication.

schools are the least important source of Hurricane hazard-related information. This is probably because the media and parents provide significant information to children, thus reducing the emphasis of disaster information in schools. It is noteworthy that the programs that provide hazard and disaster information to children are not always intentionally educational but take the form of popular Hollywood productions such as, "The Day After Tomorrow," "Volcano," and "The Perfect Storm," that have been formatted for television.

Although the level of hazard education among the sample might seem relatively high, the extent and comprehensiveness of this education needs to be the focus of further research. Indications are that misconceptions about hazards and disasters, especially within the home environment, are still rife. Because of this, the role of schools in providing appropriate and factual information for disaster loss reduction cannot be overstated. The pretest exercise suggests that caution should be exercised in the interpretation of results from tools designed to evaluate levels of disaster awareness and education among children. For instance, results from the administration of the pretest questionnaire survey suggest a high level of awareness among the sample. However, the results of the DAG score sheet, a practical demonstration of levels of awareness, were contrary to those of the questionnaire survey. This discrepancy is likely the result of the tendency of children to perceive positive responses to questions as desirable. The practical nature of the DAG does not allow nonfactual responses, so the real level of awareness among children is better evaluated.

Children's exposure to and experiences with hazards are major influences on their disaster education and level of awareness. Given the age cohort of the sample, exposure to hazards is a function of how recently these events have occurred in their environment. It is for this reason that grade 5 students in the TCI had a higher (72.7%) level of exposure to hurricanes than those in SVG (57.6%). This level of exposure is a reflection of recent (since 2004) hurricane events such as Hurricanes Ivan, Francis, and Charlie, which have impacted the TCI. On the other hand, children in SVG have had minimal exposure to hurricanes in recent times. Moreover, the recent hurricane experiences were mainly coastal and would not have significantly impacted the Marriaqua Valley, where the school from which the children were sampled is located. With regard to flooding, the exposure of children in SVG was higher (57.6%) than those in TCI (39.4%), reflecting the greater frequency of flooding in SVG as well as the location of the Ona Glinton Primary School from which the TCI sample was drawn. Had the sample been drawn from a primary school on the island of Providenciales in the TCI, the level of exposure would likely be higher owing to recent flood events on that island. This suggests that a more comprehensive comparison of levels of awareness, education, and exposure among Caribbean countries would require more comprehensive and representative samplings.

Children's risk perceptions

The risk perception of the sample was assessed in terms of perceived vulnerability of their country, community, and homes. Questions such as, *"If flooding took place in your community, do you think your house might be damaged? (☐Yes, likely ☐Yes, a chance ☐No, unlikely ☐No, not at all)"* were asked to measure risk perception. It is recognized that this assessment of risk perception is somewhat simplistic but given the

Table 2. Pretest risk perception among sampled children

Sample source	Flood			Hurricane		
	Perceived vulnerability of country	Perceived vulnerability of community	Perceived vulnerability of home	Perceived vulnerability of country	Perceived vulnerability of community	Perceived vulnerability of home
TCI (%)	75.8	56.3	43.8	87.9	81.8	63.6
SVG (%)	90.9	81.3	68.8	87.9	93.9	78.6

Table 3. Pretest summary of household preparedness among sampled children

Sample source	Flood			Hurricane		
	Understand what to do to prepare	Understand what to do to evacuate safely	Understand what to do to recover from the damage	Understand what to do to prepare	Understand what to do to evacuate safely	Understand what to do to recover from the damage
TCI (%)	87.9	69.7	66.7	81.8	87.9	66.7
SVG (%)	93.9	75.8	69.7	93.9	75.8	69.7

age and level of education of the sample a more complex approach to the assessment was deemed inappropriate. The assessment is confined to hazards that are common to both TCI and SVG to allow comparison. Table 2 summarizes the risk perceptions of the sample. The higher risk perception of children in SVG, when compared with the TCI, is consistent with higher exposure and real vulnerability. Not only is SVG vulnerable to a wider range of hazards but frequencies of occurrence are also higher then in the TCI. The lowest perceived vulnerability among children in the TCI is in relation to the effect of flooding on their homes. This perception is consistent with reality because the sandy soils and gently undulating topography of much of the TCI is not conducive to flooding except in areas adjacent to salt ponds as well as low lying areas from which drainage is impeded.

Although a hurricane of category 3 and above has not been experienced in the TCI in the last 45 years, students identified hurricane as a greater source of threat than flooding even though small scale flooding occurs annually throughout the TCI. The higher threat level for hurricanes reflects experiences with the outer bands of hurricanes that pass to the north and south of the TCI. Although these bands are far removed from the eye of the hurricane, they have caused wind damage and localized flooding. A major natural hazard has not affected the TCI for more than half a century, and although the TCI periodically experiences flooding because of heavy rainfall, or high tide, this flooding has not severely affected social or economic life, and it is seen merely as an inconvenience or a reason for a holiday. Here again, caution must be exercised in the interpretation of questionnaire results for reasons indicated earlier. More extensive use of reliability check questions can eliminate such shortcomings in the data.

Children's level of preparedness

Assessment of children's level of disaster preparedness is in essence an evaluation of existing levels of preparedness in the household from which they originate. Information on this was ascertained by asking students questions such as, "What are some measures that people can take to prepare for an approaching hurricane?"

The pretest assessment of children's preparedness, therefore, focused on their knowledge of the measures that are required to ensure their safety and minimize impact during an event. Table 3 summarizes household preparedness among sampled children.

The pretest results indicate relatively high levels of preparedness among children in both TCI and SVG. If these results are reliable, it would be extremely difficult to explain the continued high levels of impacts from hurricanes and floods. In that regard, the assessment tools should have been more exploratory in identifying the specifics of their preparedness. For instance, when a child responded that he or she is aware of the measures required to reduce the impacts of floods and hurricanes on his or her own household, the specifics of this knowledge requires investigation.

The challenge is in devising means of garnering such information without frustrating the responses of young children. It is noteworthy that while most of the children stated that they know how to prepare for floods and hurricanes less than 75% of them have ever participated in emergency drills at home, at school, or in their community. While most of the samples were aware of what the contents of an emergency bag should be, none of the households from which they came had such a bag. When probed, the vast majority were unaware of simple preparedness measures such as cutting down overhanging limbs from trees, removing fruits like coconuts that could become missiles during storms, or elevating furniture and unplugging electrical items before a flood. This fact points to the need for the formal introduction of disaster education into school curricula, as students' disaster knowledge would be increased and this, in turn, would have a trickle-down effect on the wider society. This points to the need for comprehensive assessment of the preparedness measures to which children are exposed and which can be used to inform interventions for the promotion of disaster education in schools.

POSTTEST ANALYSIS

The posttest assessment of the DAG is intended to measure the effectiveness of this technique in enhancing the disaster awareness knowledge base of targeted students. The pretest process was followed by a posttest exercise in which students were again subjected to an identical questionnaire survey, playing of the board game and evaluation of score sheets. Changes in levels of awareness were assessed using the same criteria as those of the pretest and are discussed in the ensuing sections.

Children's risk perception

A notable increase in risk perception was observed for both the TCI and SVG sample students for both floods (Figure 3) and hurricanes (Figure 4). In the case of flooding, the risk awareness of the TCI sample increased by an average of 20 percent, while that of the SVG sample increased by approximately 10 percent. The smaller increase in risk awareness for the SVG sample is a reflection of higher levels of existing flood awareness in the pretest evaluation. This level of awareness is a function of greater exposure to flood events when compared with the TCI sample. The analysis of posttest data for the TCI indicates that the most significant increase in flood risk awareness related to the vulnerability of communities reflecting lower levels of exposure to and experience with flooding in the communities from which the students originated. In the case of SVG, the most significant increase related to the perceived vulnerability of homes because, although students have a high level of exposure to flooding, the site-specific location of their homes makes direct impact from flooding unlikely except in extreme high magnitude events.

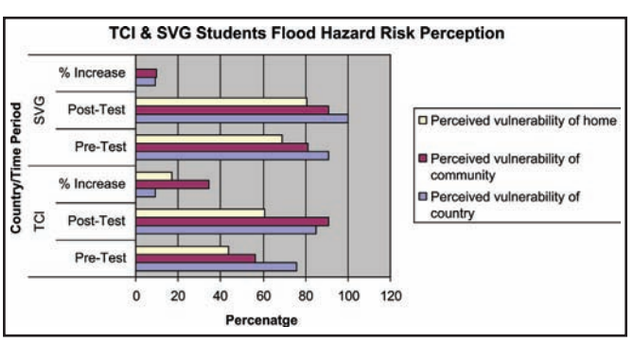

Figure 3. TCI and SVG flood hazard risk perception. Risk perception is a very important issue in the disaster management paradigm. This is because it can influence how residents will respond in an emergency situation. Additionally, it is also believed that children's risk perception is influenced by that of their parents or other adults in the home. It depicts children's risk perception in TCI and SVG before and after the provision of formal disaster education during the disaster awareness workshop. For both groups of children, a notable increase was measured in their level of risk perception with regard to their home, community, and country.

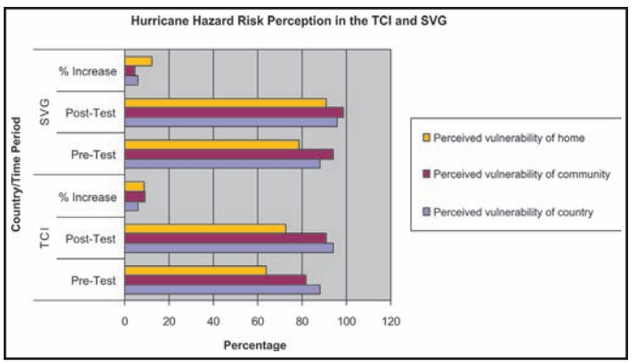

Figure 4. TCI and SVG hurricane hazard risk perception. As is the case in Figure 3, the same holds true for Figure 4. However, children in both the TCI and SVG had a higher risk perception for hurricane than for flood hazards. Perhaps this has to do with the fact that generally hurricane hazards are feared more and receive more media attention than flooding in the Caribbean. Students' risk perception of hurricanes was also measured both before and after exposure to the DAG and to the provision of disaster education in the form of lectures, viewing of hazard related videos, etc. The results of the workshop revealed that students' risk perception for hurricane increased for all areas measured.

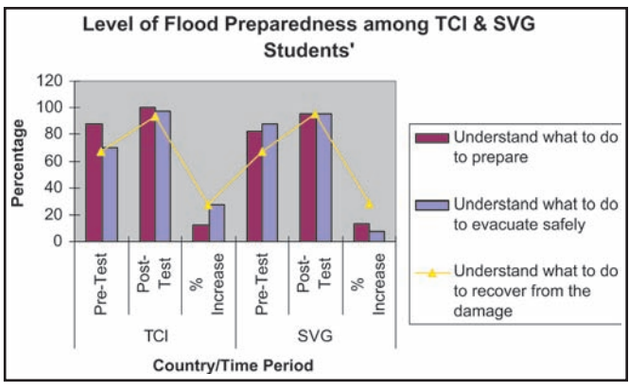

Figure 5. TCI and SVG flood hazard preparedness. This figure depicts children's perception of their level of preparedness to respond to a flood hazard. While the results for the level of preparedness before the workshop was high, if this information was taken as is, then it would lead one to assume that the students and the household from which they originated are adequately prepared to respond effectively to a flood hazard. However, further probing of students during interactive discussion and during the playing of the DAG revealed that students lack basic knowledge of this hazard and how to effectively prepare for one. This information was important as it allowed the workshop coordinators to better tailor the lectures that were provided to students. Consequently, posttesting of students through playing the DAG and completing a questionnaire survey indicated an increase in level of preparedness.

In the case of hurricanes, the increase in risk perceptions following exposure to the DAG was generally lower than for flooding. In the case of TCI, hurricane risk perception increased by approximately 7.8 percent while for SVG, the increase was 7.6 percent. The main explanation is that existing levels of hurricane awareness before exposure to the DAG was significantly high for both samples. The similarity of the increase for TCI and SVG reflects universality in the character and dissemination process of hurricane information throughout the Caribbean and especially within the context of the Caribbean Disaster Emergency Response Agency participating states to which the TCI and SVG belong. Information on hurricanes is the most developed and most accessible of all the hazards that affect the Caribbean region. In that regard, students in both the TCI and SVG would be exposed to similar hurricane-related information.

Children's knowledge of hazard preparedness

As is the case of risk awareness, there was a significant increase in children's knowledge of preparedness measures in relations to floods (Figure 5) and hurricanes (Figure 6) for both samples. In the case of flooding, knowledge of preparedness measures among students in the TCI increased by an average of approximately 22 percent while in SVG the increase was nearly 17 percent. In relation to hurricanes, preparedness knowledge increased by 16 percent and 15 percent for TCI and SVG, respectively. Explanations for the difference in increase between the two locations are similar to those for risk awareness. The increase in preparedness knowledge was manifested in the children's ability to list items that should be included in an emergency evacuation kit as well as how these can be used during an emergency. In addition, children demonstrated a better understanding of hazards and their impacts and a more comprehensive knowledge of steps that can be taken to mitigate the effects of hazards, after exposure to the DAG.

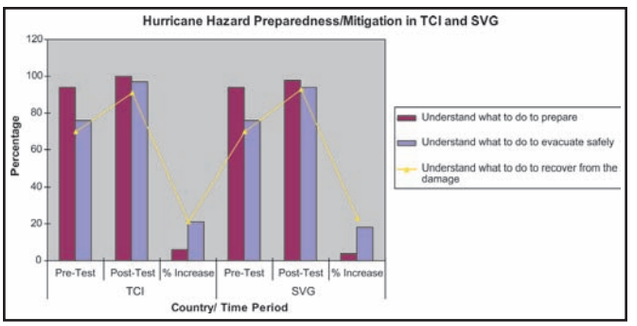

Figure 6. TCI and SVG hurricane hazard preparedness. This figure depicts the level of preparedness for children in TCI and SVG for both before and after exposure to the disaster awareness game (DAG) workshop. Pretesting of students before the commencement of the DAG workshop indicated that children's perception of their level of preparedness for a hurricane hazard was significantly high. Subsequently, children were exposed to the DAG board game which consists of hazard-related questions and disaster scenarios to which they were required to provide a response for and to record their responses on a score sheet which was provided. Examination of the score sheets indicated that there was a disparity between the answers provided by students on the pretest questionnaire survey and on the DAG score sheet. The DAG score sheet revealed a lower level of hazard awareness preparedness measures than originally stated by students in both countries. Exposure to disaster information followed by a second exposure to the DAG board game revealed an increase in student's knowledge of mitigation measures that can be employed against a hurricane hazard.

Exposure to the DAG also assisted students in identifying ways in which they can assist their parents with disaster preparedness activities. Most were able to compile checklists to remind their parents of preparations required to mitigate the impact of specific emergencies. Evacuation knowledge also increased with exposure to the DAG, although more so for the TCI than SVG. This is primarily because of a higher incidence of pretest evacuation knowledge among students in SVG. Most of the students in the Marriaqua Valley, where the sample school is situated, would have had repeated exposure to evacuation exercises during a flood and hurricane. The paucity of hurricane experience in the TCI would have hindered the development of this knowledge in children. It is for similar reasons that recovery knowledge was higher for students in TCI.

CONCLUSIONS

The importance of children's knowledge in overall disaster risk reduction and by extension the sustainability of development is increasingly being documented. However, the promotion of hazard and disaster awareness among young children is challenged by the need to design disaster educational tools that are not only sufficiently simple but also interesting enough to be readily and easily embraced by children. The need to promote disaster awareness among young children in the Caribbean cannot be overstated. However, there is a paucity of programs and tools for the education of children in relation to disasters. The DAG is designed to address this gap in the disaster management initiatives in the Caribbean as well as in other relevant regions.

Preliminary testing of the DAG among grade 5 students in the TCI and SVG suggest that the tool is effective in not only evaluating existing levels of awareness but more importantly in enhancing the knowledge base of children so as to allow them to protect themselves, their families and communities from the impact of hazards that are a part of the profile of their environment. Evidently, there are gaps in the design component of the DAG especially as these relate to the comprehensiveness of pretest evaluations. Further revision of the DAG will therefore be undertaken but the relevance of this technique in addressing one of the main gaps in the disaster management initiatives of the Caribbean region-disaster education in schools, is important.

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