

Effects of decontextualized tsunami disaster education: A case study of schools in Acapulco, Mexico

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ABSTRACT

Disaster risk reduction education is provided through external support at schools. Most educational programs evaluate the level of knowledge transfer. However, the particular context of school is not considered, even though it prescribes the understanding of students. In this study, tsunami education was provided by a non-Mexican NGO at two schools in Acapulco, Mexico, and questionnaire surveys were conducted. The surveys identified that students were more interested in obtaining knowledge than learning action for their self-protection. This tendency in motivation was generated by the school context: the school teaches decontextualized knowledge despite the need to contextualize disaster education in daily life. This disparity caused a gap in the communication between the NGO members and the students. Therefore, it is important that disaster education programs remove students from the school context and place them in the context of daily life. More localized content could help remove students from the context of school. This study argues that the effectiveness of disaster education is influenced by the context in which students learn, and the findings suggest that educational practices should be designed on the basis of the context of the learners.

Key words: disaster risk reduction education, tsunami, context of school, Mexico

1. INTRODUCTION

An increasing number of studies on disaster risk reduction education (DRR education) and related project reports have been published since 2008 (Johnson et al., 2014), detailing how researchers, NGOs, and international aid organizations are implementing DRR education. There is also a trend for these DRR educational activities to be implemented at schools because they are considered the center of local communities, and the transferred knowledge and skills are expected to spread from students to parents and community members (see, for example, Shaw, 2011; Shiwaku, 2016).

The literature illustrates that many DRR education programs are delivered to school students by external supporters (non-teachers). Johnson et al. (2014) and Chijiwa (2017) have

conducted a methodological review of DRR education research, noting that the majority evaluated the degree of knowledge transfer from external supporters (non-teachers) to school students, asking whether the knowledge of hazards, risks, and protective action taken during disasters had been accurately learned. In other words, there is a trend in DRR education evaluation to analyze the level of text, with the external supporter evaluating what is explicitly written or expressed by students in questionnaire surveys and interviews. However, when DRR education is evaluated in this manner, an important level of evaluation is overlooked: context. The school has a unique and particular context different from that of daily life and so the level of context also needs to be considered when evaluating DRR education at a school.

This paper analyzes tsunami education programs provided by a non-Mexican NGO (external supporter) to school students of Pie de la Cuesta in Acapulco, Mexico, while taking into consideration the level of context, specifically that of the school. The Pacific Coast of Mexico is a tsunami prone area, having experienced 70 tsunamis between 1732 and 2011. Tsunami disaster education is thus necessary, and Mexican governmental research institutions have developed various educational materials (e.g., CENAPRED, 2005; CICESE, 2014) and websites (e.g., CICESE, 2013; CENAPRED, 2016). However, the distribution of these materials as well as community-based educational practices for tsunami response remains limited in Mexico. Disaster education research in Mexico is also limited—a subject that this study seeks to address. In doing so, discussion regarding the uniqueness of the school context is reviewed, before explaining the study location and its tsunami history. This paper then provides a detailed explanation of the DRR education given by the NGO and introduces the questionnaire survey results. Finally, these results are analyzed on the basis of the school context, findings distinct from those produced through an analysis at the level of text.

2. Particular context of the school

Context is an important component of communication as it provides implicit situational information that defines the meaning of what is explicitly expressed. Research on recognition psychology claimed that context was static and constituted within individuals. Thus, for example, in the context of a conversation, which “self” is speaking is understood through the independent context of the self, while which “other” listens is similarly understood through the independent context of the other. As such, the context between the self and the other was considered detached. The idea of static context was replaced by the concept of dynamic context in the 1970s. According to Kawadoko (2007), the concept of dynamic context claims that context is constituted through the mutual acting of the self and other reflexively. In other words, the context of which self speaks and which other listens is reflexively constituted, thereby enabling the self and the other to identify the meaning of a conversation. Kawadoko (2007) emphasizes that context is situation-dependent. Hence, the meaning of a conversation also varies depending on the situation even if the self and other utilize the same text. For example, imagining a boy teases a girl in a classroom saying “I hate you”. The meaning of the text “I hate you” clearly denotes a feeling of dislike; however, it can also be understood as a feeling of like depending on the context.

Context prescribes the meaning of communication. Various studies have pointed out the particular context observed in formal school education (see, for example, Kawadoko, 2007; Murayama, 1995; Fujie, 2012). Formal school education is produced by an institutionalized educational system and implemented through a chronological curriculum; knowledge is provided in an organized and structural way, and learning is intentional from the learners’ point of view

(Coombs and Ahmed, 1984; Dib, 1988). School education tries to ensure the transfer of interrelated systematic knowledge and skills based on the developmental stages of the child. Kawadoko (2007) notes that the knowledge and skills provided in school education is decontextualized, thus enabling its application to another context. Take the following question from Kawadoko (2007), for example: “There are three oranges in a box. There are four boxes of oranges. How many oranges are there in total?” The way to solve the question is “three oranges times four boxes equals 12 oranges.” When this knowledge and calculation skill is learned by students, they can also answer questions like: “There are eight elementary school students and each student weighs six kilograms. What is the weight of all the students in total?” Students thus answer “48 kilograms” even though it is an unrealistic figure (Kawadoko, 2007). This is the effect of the type of knowledge and skills provided at schools, which are characteristically decontextualized, abstracted and symbolized. Murayama (1995) has also raised the issue of the discontinuity between the knowledge learned at schools and that learned in daily life. Murayama’s (1995) study pointed out that school education—especially mathematics and science education—asks students to find the answer using processes not used in everyday life, so that students memorize the solution without linking the scientific knowledge to their daily lives.

Similarly, Vygotsky (2005) has explained the differences between the personal concepts children develop in everyday life and in those they develop through school education. In fact, the flow of concept development works in the opposite direction. In the case of the development of personal concepts, a child finds a sunflower or a violet on the street and learns those names separately. At this moment, however, the child does not relate the sunflower and/or the violet with the concept “flower”; thus, the knowledge is not conceptually structured. However, in the case of the development of concepts in school education, “flower” is taught first, and “sunflower” and “violet” are taught afterwards as they fall under the categorization of “flower.” As such, the concept becomes structured and organized.

The explanations discussed above do not appear to show the context of school, but the characteristics of school education. The following example, however, clarifies that answering a question like that regarding the oranges in the box posed by Kawadoko (2007) is already strongly influenced by the particular context of the school. Kawadoko (2007) uses Depman’s (1987) study to illustrate that the particular school context is not necessarily implemented in a school. Depman provided an example of a mathematics class given in North East Siberia, in which a teacher asked the students: “A hunter named A killed five seals on the first day. On another day, the same hunter killed 6 seals. How many seals did the hunter kill in total?” The students proceeded to ask: “Who is hunter A? Is it hunter B (mentioning the name of a real person in the community)? Because hunter A is not capable of killing many seals. How can we solve this false question?” While the intention of the teacher was to infer the capability of the calculation ($5 + 6 = 11$), the students tried to answer the question by relating it to their reality and judged it to be a false situation. What this case seeks to show is the failure of the teacher and students to share a common context. While the teacher asked the question from the particular context of the school (testing whether students were capable of calculation), the students—who tried to identify the hunter, etc.—were in the context of daily life. Similar experimental results are presented by Cole (1989).

In short, the particular school context has characteristics that make the knowledge it transfers conceptually structured, as well as decontextualized and abstracted at the same time. As such, the knowledge is disconnected from everyday life. This must be taken into account when evaluating DRR education in this study area: Pie de la Cuesta, Acapulco, Mexico. Moreover,

questions asked in the classroom already share the context of testing. Thus, students know that they are being asked the questions by teachers for the purposes of testing. It can be assumed that the particular context of the school is also strong in the study area as the school enrollment rate for pre-, primary, and junior high school is 97% in Guerrero state, in which the study area is located (SEP, 2017). Furthermore, the Secretary of Public Education is now in the process of introducing a “New Educational Model” (*Nuevo Modelo Educativo*) in order to modify the educational method in Mexican schools from knowledge-centered education—which produces a strong school context—to active learning. As noted, most DRR education is provided by external supporters at schools. As long as students receive DRR education in school, the particular school context should also be taken into consideration when analyzing DRR education.

3. TSUNAMI HISTORY AND RISK AT LOS MOGOTES AND PIE DE LA CUESTA, ACAPULCO

Schools implementing the tsunami education program are located at Los Mogotes and Pie de la Cuesta, on the west side of Acapulco Bay in the state of Guerrero, Mexico (Fig. 1). Inhabitants simply call this area “La Barra” (“The Bar”), as it is a large sandbar having a length of 16 km and a maximum width of 650 m, forming a smooth rugged plain 7 m above sea level. The narrowest stretch of the bar is located on the east, close to the marginal urban area of Acapulco. The sandbar terminates at Coyuca Lagoon in the north and at the Pacific Ocean in the south. It is thus extremely difficult to evacuate residents to higher ground quickly and smoothly if a tsunami occurs. There are approximately 6,650 inhabitants across the four settlements on this sandbar: Los Mogotes, Pie de la Cuesta, Colonia Luces del Mar, and San Nicolás de las Playas.

Guerrero has experienced numerous large earthquakes, notably the M_s 7.8 quake in 1911. Several events around M_s 6 in scale have occurred since 1911—particularly along the edges of the Guerrero gap, where the Acapulco region is located (Kostoglodov and Ponce, 1994; Lowry et al., 2001; Larson et al., 2004). There is a high probability of a major inter-plate earthquake with an estimated M_w of 8.1–8.4 along this coast (Suárez et al., 1990). Thus, there is also a high probability of a tsunami occurring.

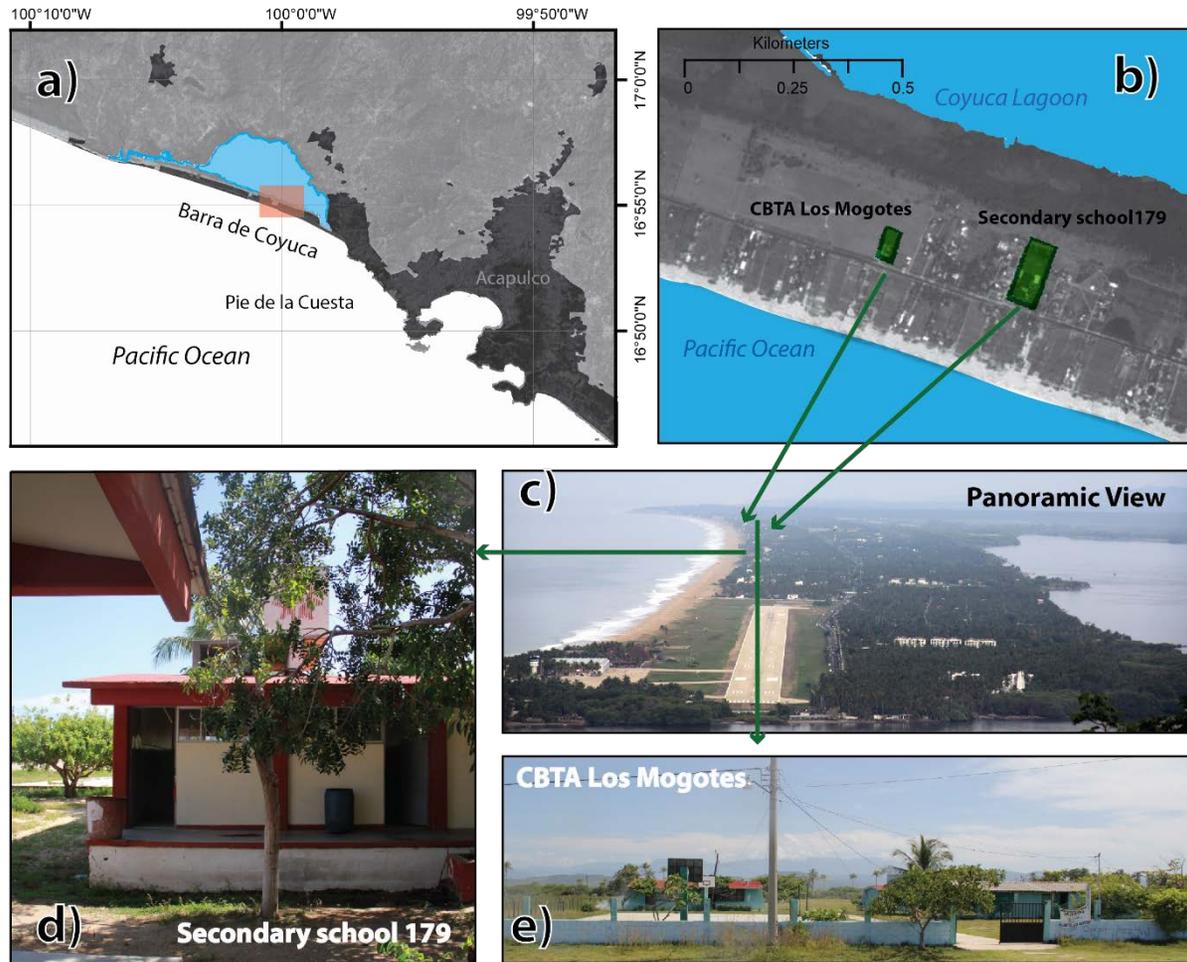


Fig. 1. Study area and school locations: a) regional context; b) close-up view of sites where schools are located; c) panoramic view of the sandbar, with schools highlighted; d) image of the secondary school; and e) CBTA Los Mogotes.
Source: Made by author

While four large earthquakes of M_w 7 or greater occurred along the Guerrero coast in the early twentieth century—on January 14, 1900, January 20, 1900, April 15, 1907, and December 16, 1911 (Fig. 2)—a tsunami was associated with only the first of these (Milne, 1911; Soloviev and Go, 1975; Sanchez and Farreras, 1993; Garcia- Acosta and Suárez, 1996). Approximately 31 tsunamis have occurred along the Guerrero coast between 1537 and 2012 (Ramírez-Herrera et al., 2015). In the majority of cases, information is sparse because of the historically low population density along Mexico’s Pacific Coast. With the exception of the events in 1925 and September 19 and 21, 1985—which affected Zihuatanejo at different maximum water depths than in Acapulco—tsunami effects have only been reported for the city of Acapulco, the oldest and most populated locality on the Guerrero coastline (Ramírez-Herrera et al., 2015).

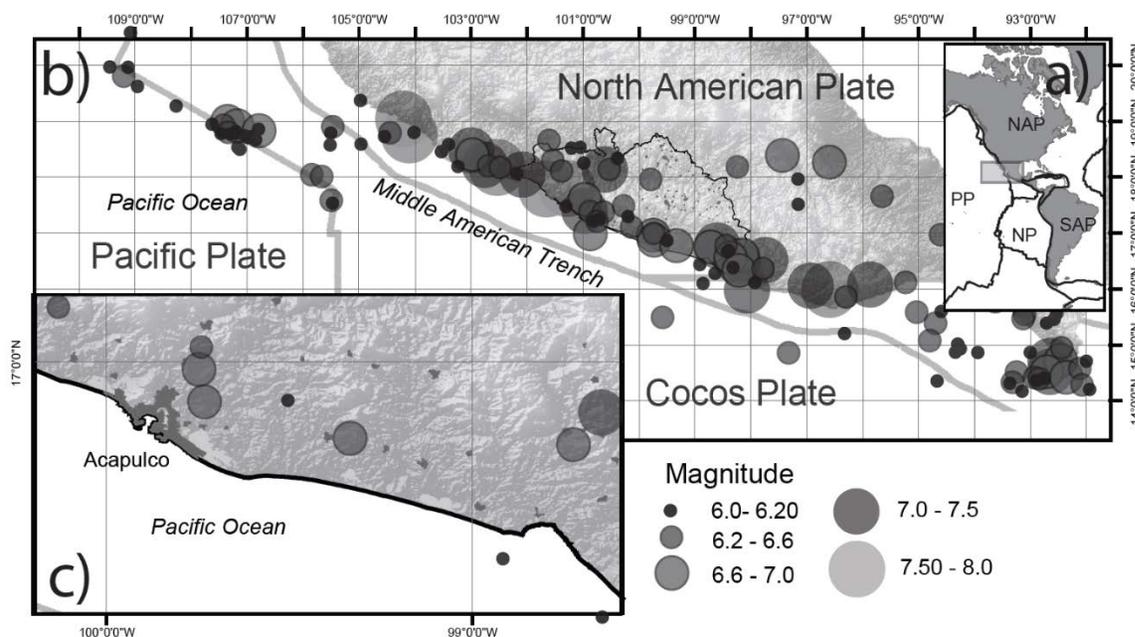


Fig. 2. Seismic activity along Guerrero coast
Source: NGDC/WDS (2017)

Evidence of three earthquakes and their probable resulting tsunamis have been identified at Laguna Mitla, near Pie de la Cuesta, using the geological record of different sites in the Guerrero area (Ramírez-Herrera et al., 2007, 2009, 2012). Furthermore, additional paleo-tsunamis (Ramírez-Herrera et al., 2005) have been tentatively proposed based on geological evidence found elsewhere on the Guerrero coastline. A significant event occurred in the late Holocene (c 3400 BP) near Laguna Mitla—an environmental shift and relative rise in sea level indicating a tectonic collapse preceded by marine flooding approximately 5 km inland. The 1979 earthquake and the 1985 earthquake and tsunami have also left an imprint in the geological record (Ramírez-Herrera et al., 2012).

While some studies have lacked an understanding of the seismotectonic context and history of earthquakes and tsunamis in the area (e.g. Bianchete et al., 2016), and some reviews have been incomplete and skewed (Chagué-Goff et al., 2017), several researchers have provided convincing geological, historical, and archeological evidence of past earthquakes and tsunamis on the Guerrero coast (González-Quintero, 1980; Kennett et al., 2004; Ramírez-Herrera et al., 2005, 2007, 2009, 2015; Suárez and Albin, 2009). As such, tsunami hazard assessments based entirely on instrumental and historical data may underestimate the tsunami hazard in this area, which is now highly populated and has attained considerable affluence through tourism. It is important to integrate instrumental, historical, and prehistorical tsunami records based on geological evidence of tsunami deposits. Moreover, geological evidence clearly indicates the importance of assuming that larger tsunamis than those that have occurred in the twentieth century are possible, highlighting the importance of educating the population about tsunami hazards to reduce loss of life and economic damage.

4. METHODOLOGY

In this study, tsunami education was conducted at Barra de Coyuca by two non-Mexican members of a non-governmental organization (NGO) based in the United States, from August 18 to August 24, 2014. Instruction was provided in Spanish by a fluent Spanish speaker. The class was presented in a classroom during school hours as part of the extra-curricular education. The second and third authors of this article observed the tsunami education with no direct participation. The DRR education program was provided at two schools. One was Guerrero State High School, Los Mogotes (hereinafter, “the high school”), comprising 113 students aged 15–18 years old. The high school provides general education as well as occupational training. The other was Technical Secondary School 10079 (hereafter, “the technical school”), comprising 165 students aged 12–15 years. Although the school is referred to as “technical,” its course curriculum is basically that of an ordinary junior high school. Figure 1 shows the locations of these schools. These two schools were selected because they are located in areas that have a very high risk of being affected by a tsunami: sandwiched between the Pacific Ocean and Coyuca Lagoon, quick evacuation is the only countermeasure in the case of a tsunami. As such, the needs of DRR education are prioritized.

Students responded to questionnaires before and after an informative talk about earthquakes and tsunamis. Both the pre- and post-education surveys were paper-based questionnaires consisting of two types of questions: multiple-choice questions scored in a 1–5 range and descriptive free responses. The survey questionnaire conducted before the program examined students’ motivation regarding the education program, as well as their risk perception of earthquakes and tsunamis. The survey questionnaire conducted after the program asked about their learning through the program and their impressions of it, as well as the action they should take to prepare for earthquakes and tsunamis. In total, 113 students from the high school and 164 from the technical school responded to the survey, and the results were analyzed with a specific focus on the descriptive responses in order to understand risk perceptions and the effect of the educational program.

5. TSUNAMI EDUCATIONAL PRACTICES AT SCHOOLS IN PIE DE LA CUESTA, ACAPULCO

The disaster education programs took 30 minutes each. The class content can be divided into nine parts: 1) introduction, 2) earthquakes in Mexico, 3) the tectonic plate model and inter-plate earthquake generation, 4) the effects of earthquakes, 5) security measures in the case of an earthquake, 6) tsunami generation mechanisms, 7) tsunami damage, 8) tsunami-related knowledge as the primary safety countermeasure, and 9) the most appropriate response to a tsunami. A summary of the class content is provided in Table 1. The presentation was supplemented by multimedia material (Power Point slides). All images and videos showed general mechanisms and features, which did not necessarily focus on the situation of Acapulco or Pie de la Cuesta.

Table 1. Overview of the DRR class content

Topic	Content (<i>multimedia resource</i>)
1) Introduction	NGO members briefly introduced themselves. Speakers asked students whether they knew about any local hazards. <i><u>Pictures of the NGO in fieldwork and other workshops.</u></i>
2) Earthquakes in Mexico	The presenter explained that many earthquakes (tremors) with $M_s > 6.5$ have occurred since 1900. They then asked students: “Do you know why earthquakes occur?” Students responded in their own words. <i><u>Image of earthquake epicenter distribution along the Mexican Pacific coast.</u></i>
3) Tectonic plate model and inter-plate earthquake generation	Students were provided an explanation of how earthquakes occur. This included a brief overview of the tectonic plate model and the continuous movement of plates throughout the world, noting that subduction zones produce the largest earthquakes. When oceanic and continental plates collide, one sinks beneath the other in ongoing slow motion. The truncation of this movement accumulates energy, and when these enormous slabs of rock can no longer resist the strain, they break and release energy, producing an earthquake. Having explained this process, a map of the Middle-American Trench was used to show that the Acapulco is on a subduction zone. It was then explained that while nobody knows <i>when</i> an earthquake might occur, scientists can say <i>where</i> they might occur by using geological and historical data. <i><u>Global plate tectonic image. Image of the Middle-American Trench. Image of historical epicenter data the Acapulco region, 1900–2010. Seismic rupture areas map.</u></i>
4) Effects of earthquakes	A 53-second video of the 1995 Kobe Earthquake was presented: showing the catastrophic effects of the earthquake and chaos of the event, such as buildings crumbling and objects falling to the floor. After the video, the speaker asked students to identify the mistakes made by the people in the video. <i><u>YouTube video of the 1995 Kobe Earthquake.</u></i>
5) Security measures in the case of an earthquake	Students were provided an explanation of appropriate responses in different situations during an earthquake. This included a description of what to do if you are inside a building during an earthquake: crouch, cover, and hold on, then proceed to a safe area when conditions permit. The students participated in a roleplay of an earthquake occurring. <i><u>Pictures of the three actions to take during an earthquake.</u></i>
6) Tsunami generation mechanisms	A brief overview of tsunami generation was provided, and the speaker explained how subduction-related earthquakes are the main source of tsunamis. This was followed by showing how Acapulco is located in a tsunami zone. <i><u>Video of tsunami generation in an animated model</u></i>
7) Tsunami damage	Students watched a 2.6-minute video about tsunami effects, mainly showing what happens when a tsunami strikes a coast, and how their destructive power and velocity sweep away everything in their path. Special mention was made of evacuation measures. <i><u>An NGO-edited video of the effects of a tsunami.</u></i>
8) Tsunami-related knowledge as the main safety measure	Students were shown that the most effective way of facing a tsunami is through knowledge, particularly knowing what happens after an earthquake when living near the coast. The Tilly Smith case and Laut Moken tribes were used as examples. <i><u>A collage of images showing a Tilly Smith newspaper article, Moken tribes, and sea retreat.</u></i>

9) The most appropriate response to a tsunami	Learners were told that: “If you feel an earthquake so intense that you can barely remain standing, run to high land as soon as you are able.”
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6. RESULTS OF THE QUESTIONNAIRE SURVEY

Students at the high school showed a strong interest in the tsunami education program before it was held: of the 113 students, 96 (85%) answered “interested,” 16 (14%) answered “neutral,” none answered “not interested,” and one student did not answer this question. To increase our understanding of their motivation, the survey asked students to explain their answers. The nature of the answers could be categorized as: “to know what to do,” “to learn something,” “to learn the risks,” “for mutual help,” “for precaution,” “for awareness,” or “no answer.” After tallying the answers, 38 were categorized as “to know what to do,” and 64 as “to learn something” and “to learn the risks” (see Table 2). While the majority of students were interested in the education program, these answers show that they had two main motivations: the “to know what to do” group (34%) considered the program an opportunity to learn action, while the other group (57%) considered the program an opportunity to gain knowledge. A similar tendency was observed in the questionnaire conducted at the technical school: of 164 students, 119 (73%) answered “interested,” 42 (26%) answered “neutral,” while one student stated that they were “not interested” in the education program. In the descriptive answers, using the same categorizations noted above: 57 students (35%) considered the program an opportunity to learn action, while 80 (49%) considered it an opportunity to deepen their knowledge.

Table 2. Results of motivation categorization

Category	Number of students in high school	Number of students in technical school
To know what to do	38	57
To learn something	28	48
To learn the risks	36	32
For mutual help	3	2
For precaution	2	0
For awareness	1	16
No answer	5	10
Total	113	164

The surveyed schools are located in a critically high-risk area for earthquakes and tsunamis (Fig. 1). However, the results of the tsunami education program surveys show that half the students at both schools were interested in knowledge rather than action, despite their inherent interest in action due to their living in such a high-risk area.

The post-program questionnaire was answered by 113 students at the high school and 164 at the technical school. The first part of the survey questioned the students’ risk perception of

earthquakes and tsunamis, and to what extent they had obtained knowledge. Students responded to each question on a numerical scale from one (do not at all agree) to five (strongly agree). The objective of the program was considered to have been achieved if students answered agree (numerical scale of four) or strongly agree (numerical scale of five); the number of students who answered in this range was converted to a percentage. The questions and results are provided in Table 3.

Table 3. Risk perception and knowledge (students answering agree or strongly agree)

Questions/School	High school (N=113)	Technical school (N=164)
I am at risk of earthquakes	84%	66%
I am at risk of tsunamis	78%	65%
I know what to do in the case of an earthquake	79%	61%
I know what to do in the case of a tsunami	67%	62%

Approximately 84% of students at the high school and 66% at the technical school perceived the risk of an earthquake, while 78% of students at the high school and 65% at the technical school perceived the risk of a tsunami. As such, a larger number of high school students recognized risk than did technical school students. However, a certain percentage of students at both schools did not perceive the risk, even after the tsunami education. A similar tendency was observed in the question regarding their understanding about what to do in the case of an earthquake and tsunami; even though the education program explained what to do, as Table 3 shows, a certain percentage of students did not retain the knowledge.

In further exploring the descriptive answers categorized as “I know what to do in the case of an earthquake” provided by the high school students, we observed a tendency among 44 students to use the term “calm” (*calmar* in Spanish), even though this term was not emphasized in the program. In contrast, usage of this term was rarely observed in the descriptive answers of technical school students. One possible reason for this difference is varying exposure to information depending on age group. As noted, the high school students were around 15–18 years old, while those of the technical school were aged 12–15 years. In the event of an earthquake in Mexico, television broadcasters request that viewers remain calm; earthquake safety brochures similarly instruct readers to remain calm in such a scenario. The term “calm” is thus frequently used in connection with earthquake safety procedures, and it was assumed that older groups of students have been exposed to such information more often.

The education program taught the appropriate response to an earthquake in 11 potential situations, such as “if you are in your classroom,” “if you are in your house,” “if you are in the playground,” and “if you are in the library.” However, no students explained what to do in different situations in their open responses. The technical school showed a similar tendency in this respect. The education program also emphasized the importance of getting under a desk, using illustrations on a Power Point slide to do so. In the open responses to the questionnaire, however, only 36 (32%) of the 113 high school students and 81 (49%) of the 164 technical students mentioned getting under a desk in the event of an earthquake—a minority of students in

both cases. This suggests that a primary message of the education program was not well understood by the students.

These results may be because, while the tsunami education was presented using numerous figures, photos, and videos intended to promote the students' understanding, the formal educational curriculum rarely provides earthquake and tsunami instruction. According to Iwahori et al. (2017), there is a unit covering the history of the Earth in the 6th grade at elementary level, and this briefly introduces plate tectonics. Indeed, this is the only aspect of mandatory education regarding earthquakes at elementary and junior high school levels; while earthquakes are introduced in physics and environment classes in the junior high school curriculum, this class is optional. As such, even though many illustrative materials were utilized, students lacked the basic knowledge required to understand the lectures provided by NGO members. Furthermore, the illustrative materials detailed cases such as the 1995 Great Kobe earthquake in Japan and the 2004 Indian Ocean tsunami, in addition to location specific information—such as historical epicenter data of Acapulco. Consequently, transmission of the primary message was hampered. Thus, in the space of a 30-minute lecture, students were provided an abundance of information, from the mechanisms of earthquakes and tsunamis to the response procedures. Since students did not have basic scientific knowledge about earthquakes, the lecture may have been overly informative for students, making it difficult for them to follow its content. Moreover, that the degree of understanding was higher for high school students than it was for technical school students is possibly due to the level of school year. In addition, taking into consideration the particular school context, the motivation gap between students and NGO members may be another important factor.

7. GAPS IN MOTIVATION BETWEEN TEACHERS (NGO) AND STUDENTS

As observed by the pre-program survey, half the students in each school considered the program an opportunity for deepening their knowledge. This tendency can be understood in relation to the particular context of the school. As discussed earlier, the knowledge transferred through school is abstracted and symbolized, and thus decontextualized from the learners' daily environment. In other words, the school is a place for students to learn how to answer the given questions, obtain knowledge, and prepare for examinations in a testing context. They do not have to link school-obtained knowledge with their everyday life. As such, we consider that the students who were interested in knowledge were strongly influenced by this particular school context, and that their attitude was to learn decontextualized knowledge that is not necessarily linked with their daily life. This also supports the fact that some students did not perceive the risk of earthquakes or tsunamis, as the post-program survey showed (Table 3).

The fundamental and ultimate goal of DRR education is to protect lives and property by promoting everyday action before, during, and after a disaster. Knowledge transferred through disaster education should thus be contextualized according to the learners' circumstances. However, there is a gap between the desire of students for knowledge and that of education providers for action. This gap contributed to the interrupted communication between NGO members and students. Therefore, knowledge transfer will be improved if that gap is removed. As such, it is important that DRR education programs be contextualized to daily life, rather than to the particular context of school. For example, the educational materials used in the NGO tsunami education program addressed only two of nine topics (Table 1) that directly explained or referred to the Los Mogotes–Pie de la Cuesta region. More localized content could help students learn

outside of the school context. Examples might include listening to the experiences of local tsunami survivors, letting students plan evacuation routes to higher ground from their homes, or creating floorplans of students' homes with furniture placement in order to specify safe and dangerous places should an earthquake occur.

This study has implications for the methodology applied to the pre- and post-program surveys. Quantitative data obtained through the questionnaire showed that most students were motivated to learn before the education program, while the post-program survey showed that most students perceived the risk of earthquakes and tsunamis and learned what to do in disaster scenarios. When descriptive answers were analyzed and integrated into the analysis, however, we identified two categories of student motivation toward the program, and a motivation gap between students and the NGO emerged. There are many comparative studies of pre- and post-DRR education surveys, which tend to be statistically analyzed only to isolate post-program changes. This study highlights the importance of integrating qualitative analysis into the methodology of the comparative analysis of disaster education.

8. CONTEXTUALIZED DISASTER EDUCATION

This study analyzed changes in student motivation for learning by comparing pre- and post-program surveys in tsunami education conducted in the Los Mogotes–Pie de la Cuesta area of Acapulco, Mexico. The area has experienced several tsunamis, and we assumed that residents were aware of natural disaster risks. As questionnaire surveys clarified, however, students were more motivated to obtain knowledge than they were action from the DRR education program. Even after the program, some students did not perceive the risk of earthquakes and tsunamis. Students intending to obtain knowledge who did not perceive risk were strongly influenced by the particular context of school. This result suggests that DRR educational practices should be designed not only on the basis of risk and awareness levels in targeted areas but also on learner contexts. In other words, some students remained unaware of the risks because of incongruity between the intended NGO contexts and actual student contexts. To maximize the effectiveness of DRR education, such a misalignment should be mitigated through the introduction of localized DRR education content. Today, DRR education is used as an outreach activity by various organizations. Those who engage in such outreach activities should abandon their stereotypes regarding risk perception. For example, students in the Los Mogotes–Pie de la Cuesta area did not necessarily feel the tsunami risk expected by outsiders given their living in a high-risk area. Narrowing such context gaps is necessary for more effective implementation of DRR education.

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