An investigation of very young children’s perceptions of a natural disaster, a tornado, used a stratified random sample of 40 children, aged 4-5 years, from a population of 108 in ten classes. The study also investigated a research protocol for ascertaining prior knowledge through children’s responses: physical representation, drawing responses, and retelling of personal stories through dictating captions for drawings. Two data sets were taken soon after the tornado. The children physically represented what happens in a tornado and how one takes shelter. Drawings increased in complexity by the second data set. Children’s stories included personal experiences: houses lost or damaged, being scared, friends missing, and wanting a significant other. Researchers can use a variety of methods to investigate very young children’s prior knowledge. An implication is that disaster education has a role in early social studies education promoting meaningful understanding by children of dangers posed, protecting oneself, and coping with the aftermath. Such a role is increasingly important as recent major U.S. disasters have impacted large numbers of citizens including our very young students. Further research especially with very young children in the area of disaster and hazards education is warranted in the field of social studies education.

**Keywords**: social studies education, natural disasters, hazards education, very young children, data collection methods, prior knowledge

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Social Studies Beginnings: Investigating Very Young Children’s Prior Knowledge of a Disaster

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Very young children entering kindergarten bring with them prior knowledge affecting their subsequent classroom learning and social interactions. Because the kindergarten experience can lay foundations for much of social studies education, it should be considered a vital beginning element in the social studies curriculum (Brophy & Alleman, 2006). The perceptions of very young children, and the concepts they build from those perceptions, should be investigated and used to inform social studies teachers and curriculum developers.

Constructivism, as defined by cognitive and socio-cultural constructivist theorists, focuses on the learner’s ability to mentally construct meaning of his or her own environment and to create personal knowledge (Blaik-Hourani, 2011; Gray, 1997; Green & Gredler, 2002). Cognitive and social constructivist theories offer a conceptual framework for research design. Constructivist theory implies that students must take an active role in creating their own understanding as a way to learn (Gray). Social constructivists describe students’ knowledge acquisition as based on how they construct knowledge from their social surroundings. Children’s interactions with the world around them and their prior experiences in knowing help students process how they create knowledge for themselves (Jaramillo, 1996).
There is much to be learned by young students about hazards precipitating disasters, especially as the U.S.A. experiences a continued increase in disaster losses (Mitchell, 2009). Mitchell’s study of 10 southeastern states’ curricula indicates hazards are treated unevenly among states, geophysical events are overrepresented, and little integration exists between social studies and science. Although large disasters recently have been experienced in the U.S.A, such as 2012’s Hurricane Sandy, and the large southeastern tornado outbreak in April, 2010, the recommendations of the National Commission on Children and Disasters still must be fully implemented (Keegan, 2010). The Commission recommended the establishment of disaster preparedness at the school level including disaster response planning, training, exercises, and evaluation. Social studies education can provide children from pre-kindergarten through secondary schooling with the guidance, information, and opportunity for discussion and consideration of survival and recovery from a disaster (Kriewaldt, et al., 2003). There currently is a lack of information in the literature regarding very young students’ prior knowledge on which to begin appropriate and sufficient social studies education about natural disasters, the hazards they pose to people, and how to prepare for and survive them. In a comprehensive overview of the literature on children and disasters, Lori Peek (2008) indicates that researchers and practitioners should more carefully consider the experiences of the children themselves, yet few have examined those of very young children. The study we report here investigated very young children’s current understandings of a specific hazard, tornadoes, and the natural disaster they cause, in order to add descriptive information to the limited literature available. Our investigation of very young children’s perceptions of a tornado event used a stratified random sample of 40 children, aged 4-5 years, from a population of 108 in ten classes. The study also investigated a research protocol for ascertaining prior knowledge through children’s responses: physical representation, drawing responses, and retelling of personal stories through dictating captions for drawings.

Natural Disasters

Research on young children’s coping and understanding following disasters is virtually nonexistent. A few U.S. studies have been conducted, particularly after Hurricane Andrew (Vernberg, LaGreca, Silverman & Prinstein, 1996), but most did not involve very young children and focused on identifying indicators of post-traumatic stress disorder syndrome (PTSD). Studies also report coping responses seem likely to influence the process of adapting to highly traumatic events (Korol, 1990; Rachman, 1980; Terr, 1989). Coping typically is viewed as the product of the level of trauma suffered, personal and demographic characteristics, and situational characteristics such as access to supportive others (Compas & Epping, 1993). Major disasters are highly novel events influencing multiple aspects of children’s lives and producing continued long-term disruptions. In our investigation, we focused on children’s perceptions six weeks after a major disaster event, the April 27, 2010 Tuscaloosa, Alabama tornado, with a second data set collected at nine weeks. Children’s coping mechanisms and indicators of post-traumatic stress syndrome were not the focus of our study, but the literature was considered as we investigated children’s perceptions of a disaster and methods of ascertaining those perceptions in very young children.

Natural disasters are events with a relatively sudden and identifiable onset caused by external or environmental factors, and are associated with adverse effects on a group of
individuals (Rubonis & Bickman, 1991). These events primarily result from weather or geologic structures including, among others, tornadoes, hurricanes, landslides, and earthquakes (Compas & Epping, 1993). When identified as a disaster, natural events have human impacts associated with mortality and injury combined with impacts to the built and planted environment in which we live (Mitchell, 2009; Ocal, 2010). There are limitations to how humans prepare for a natural disaster. One kind of natural disaster, the tornado, often is associated with forewarning, allowing for some readiness. Tornadoes are uncertain in that they appear and disappear rapidly in a generally limited space and with varying severity (Edwards, 2012). Preparation involves finding a secure place in which to take shelter and getting into the sheltered area quickly upon notice by media and/or warning sirens of a tornado on the ground or the likelihood of one on the ground. Geographic limitations like a high water table may limit the opportunity to have an underground shelter in some regions, and all storm shelters require expense and pre-building before the event. Many individuals, therefore, do not have the security provided by a storm shelter and depend instead on sheltering in an inside room, closet, or bathtub. Conditions after a tornado may be chaotic. Streets will be debris covered and cell towers and power lines may be down, so the communication and transportation needed for search and recovery of people initially is limited. Recovery of the built environment takes years, adding to the severity of the disaster’s impact on people (Edwards, 2012; National Oceanic and Atmospheric Administration [NOAA], 2012).

Many of the aforementioned conditions were evident in Tuscaloosa, Alabama, which endured a wedge-shaped tornado stretching up to one and a half miles wide as it plowed a path over six miles long diagonally through the city and its suburbs, home to about 120,000 people on April 27, 2010. Some of these conditions have improved with extensive debris removal, and the beginnings of reconstruction, but the long-term effects continue. Accordingly, we explore the perceptions of very young children who experienced this event in order to describe their perceptions of this natural disaster. We further consider if they were able to represent it physically, by drawing, and orally through retelling of their personal experiences.

**Disaster Education**

Disaster education has an important place in the social studies curriculum. The focus of such education often is on preparedness for a disaster. Geography education frequently is tasked with education about disasters and related hazards because of its ability to consider the geology of a region and meteorological events associated with the place in which people live (Broehn, 1996), but is not necessarily the only home for such content within social studies. Preschool and kindergarten curriculum has been identified as an appropriate beginning point for hazards and disaster education in the United Nations World Disaster Reduction Campaign and during the 2000-2010 International Decade for Natural Disaster Reduction (Izadkhah & Hosseini, 2005). The National Commission on Children and Disasters (Keegan, 2010) produced recommendations for preparedness, but the U.S.A. has no national standards for disaster education and has acted upon the recommendations in a very limited manner. Very young children typically are open to learning, so disaster and hazards education can provide them with at least a basic knowledge of disaster preparation aiming at mitigation of damage (Izadkhah & Hosseini, 2005). Given that Tuscaloosa, Alabama is considered a “hot spot” for tornadoes in the U.S.A. (NOAA, 2012), we considered it important to investigate how the recent large tornado impacted young children to ascertain their perceptions and prior knowledge.
The central role of preparedness for disaster events in hazards education has been explored by a very limited set of studies. In Turkey, Ocal (2010) noted the nation is in one of the world’s most significant active seismic regions in the world. The Turkish elementary education curriculum underwent major revision with hazards education identified as the responsibility of the social studies program, which addressed it in grades four through seven. Ocal documented the implementation of the curriculum finding students became knowledgeable about preparedness for disasters and actions to be taken during the disaster event. In another investigation, Ronan and Johnston (2001) found children aged 7-13 who had experienced disaster and hazards education, communicated what they were learning to their family members, who then increased hazard adjustments in the home. In disaster and hazards education, teachers need to walk a fine line incorporating information about disasters into their lessons while helping students cope with media images of destroyed communities, raw emotions, and graphic wounds (Fuhrmann et al., 2008; Whitehead, 1996).

Scant research has occurred with very young children aged six and under. The lack of research partly is due to the method used to ascertain children’s perceptions of a natural disaster event. Because very young children, aged six and under, have levels of cognitive development that present some limitations on their abilities to cope with a disaster event and also to respond to the questionnaires and checklists used by most researchers, they are underrepresented in the research. Most often, parent report questionnaires are used (Sullivan, Lonigan et al., 1991; McFarlane, 1988; Saylor & Conway, 1991; Vernberg, LaGreca, Silverman, & Prinstein, 1996), sometimes in conjunction with teacher report questionnaires. Younger children occasionally have given self-reports using a questionnaire that is read to them, but they have not been successfully used with kindergarteners. So, there is a need to capture very young children’s perceptions and descriptions of how they interpret a disaster event.

Of the studies involving elementary school children, few reported using interviews with children. One study by Okhee Lee (1999) used open-ended interviews with fourth and fifth graders in south Florida to ascertain their knowledge of Hurricane Andrew, their world views, especially the causality of the hurricane, and their sources of information in social and cultural contexts. Lee’s study found significant differences as well as similarities in children’s knowledge, world views, and information sources by ethnicity, socioeconomic status, and gender with implications for scientific literacy for all students including socially and culturally diverse students. The methods used in Lee’s study, however, appear to have limited potential for research with very young children below the fourth grade. Researchers note younger children were unable to answer surveys or give usable responses to interview questions aimed at a range of ages culminating with adolescents (Ronan, Johnston, Daly & Fairley, 2001). So, there is little description of very young children’s perceptions of a disaster they have experienced and minimal information regarding appropriate methods of ascertaining those perceptions, in order to build the appropriate social studies curricula addressing disaster awareness and preparedness identified by investigators such as Furhmann, et al. (2008), Mitchell (2009), and Ocal (2010).

**Research Questions**

The research questions we investigated were (1) What perceptions of a tornado are held by very young children who have experienced a tornado disaster? (2) What perceptions of responding to a tornado are described by these very young children? and (3) How efficacious are
three methods of obtaining very young children’s perceptions of a tornado they experienced? Our study investigated the knowledge a sample of very young children would bring into kindergarten about three months after the Tuscaloosa 2010 tornado using two probes: What happens in a tornado? and, What do you do in a tornado? The study also investigated the capabilities of three methods of assessment of children’s responses to the questions: physically representing responses, drawing responses, and dictating a caption for the drawing by orally engaging them in retelling the story in the drawing.

Method

We began with the problem of very young children who had experienced massive tornadic destruction in our community soon entering a summer pre-kindergarten program. The research literature gave us little information on what perceptions these students would bring into the classroom, how to investigate those perceptions, nor how to structure disaster and hazards education as part of the social studies curriculum. Students’ perceptions and means of investigating them are beginning points for disaster and hazards education. Many, though not all, very young children have developed initial skills in scribbling/drawing to represent their environment and ideas and often physically act out events. Additionally, some have experience in describing events by telling stories. As the literature indicated questionnaires, reading questions to children, and obtaining teacher and parent feedback were highly limited as means of accessing very young children’s perceptions, we used physical representation, drawing, and oral retelling as our means of data collection. Two simple probes were used for physical representation, “show me what happens in a tornado” and “show me what you do in a tornado”. These probes were altered slightly as children drew responses and as they told the story in their drawing. Because of the potentially large amount of data, we randomly sampled four children from each class and trained each data collector in data recording and provided a protocol to follow, implementing Krippendorf’s (2004) suggestion.

We examined a sample of 40 children, 20 boys and 20 girls, aged 4.11-5.3 years, from a student population of 108. The children were in ten classes from five schools, including two schools with massive tornado damage to the school and its surrounding neighborhoods. Among the sample, 18 children, almost half of the sample, lived in neighborhoods devastated by the tornado, while 12 lived in neighborhoods on the periphery of the storm, and 10 were from neighborhoods with no physical impact. All of the children saw and heard the tornado and all saw damage done by the tornado. The children were in a voluntary six week, half day pre-kindergarten summer program beginning in the second week of June. A kindergarten teacher who would be their teacher when the school year started in August taught these children. They had been identified during the spring kindergarten registration and evaluation as potentially in need of additional preparation for the school year’s full-day kindergarten program. The curriculum ranged from learning classroom routines such as raising a hand to speak in a discussion and washing hands before a snack, to using learning centers to explore ideas in social studies, science, mathematics, and literacy.

The data were collected by undergraduate senior-level early childhood-elementary education majors in their summer clinical placement of 60 classroom hours. These teacher candidates had extensive prior experience in clinical placements in kindergarten through sixth grade classrooms. Two data sets were collected for each child, one in the first week of
placement, which was six weeks after the tornado, and another three weeks later, nine weeks after the event. Each child was assessed separately in a private space. First, the child was asked to “show me what happens in a tornado”, with a request to act out the response. The demonstration was documented with video. The children’s demonstrations in response to the prompt differed slightly in length, ranging from 45 seconds to 1 minute, 28 seconds, with an average of 1 minute 3 seconds. Next, the child was asked to “show me what you do in a tornado”, and this demonstration also was digitally videoed. The children’s demonstration to this second prompt ranged from 50 seconds to 2 minutes, 5 seconds in length, with an average of 1 minute, 39 seconds. Following the child’s physical demonstration was a request to draw what happens in a tornado, and then to tell a story about the drawing, which was written on the drawing as a caption. Finally, the child was asked to draw “what you do in a tornado” and then to tell a story describing that drawing and constructing the caption. This process was repeated three weeks later, collecting the second data set.

Using the videos, drawings, and captions, the two data sets were organized for each child and analyzed via content analysis (Rose, 2001). Neuendorf (2002) describes content analysis as a method utilized with data that are mainly text, images, and/or expressions written to be read and having value-laden meaning. Data generally are read for purposes of analysis from visual and written responses within contextual situations such as those found in the study’s videos, drawings, and dictated stories of experiences (captions) (Krippendorf, 2004). Content analysis explores data in order to understand “what they mean to people, what they enable or prevent, and what the information conveyed by them does” (Krippendorf, p. xviii).

We developed categories to identify the types of representations constructed in the photos, drawings, and captions (Krippendorf, 2004; Lutz & Collins, 1983; Neuendorf, 2002). First, each data sample was reviewed independently by two coders with a coding instruction to identify one to three key elements in the videos and drawings and words in the captions (Neuendorf, 2002). These key elements and words were listed and the videos, drawings, and captions associated with them also were listed. Second, the coders met to share and discuss the key element and word identifications derived from the captions and the accompanying photo list. This process allowed us to reduce our data to manageable representations and present preliminary findings (Krippendorf). Third, further discussion allowed us to reduce the key element and word identifications to agreed upon categories. Fourth, the codes were used by two coders who achieved 81% agreement. Frequencies are identified for each final coding category (Krippendorf, 2004).

Results

The results are presented in four parts: (1) descriptions of how the children physically represented their responses to the two prompts used in our study, (2) descriptions of how the children drew their responses to the two prompts, (3) the children’s oral descriptive stories of their drawings, which were written down as captions, and (4) the data obtained via the three different collection methods used.

Physically Representing Responses

The children all were able to physically represent what happens in a tornado in both data sets, although with a range of demonstrations. The children were shy in the first data set and all were prompted with a second request to “show me, or act out, what happens in a tornado.”
When responding, most frequently, children \((n = 34)\) spun around with 27 making screaming, whooshing, or growling noises while doing so and eight making no sound. So, over half incorporated noise as part of a physical representation. All but one child used gross motor skills in their representation. Children held their arms out straight from their shoulders while spinning. Of the remaining 6 children, who did not spin, 5 made circles with their arms straight out at their sides while also making whooshing or screaming sounds, while one child stood and only rotated one upright finger around and around while also making a growling sound. Gross motor skills plus oral language via the noises made, were utilized in most of the physical representations.

In the second data set, the children did not have to be prompted a second time to respond to the interviewer’s requests. They appeared to be more comfortable with the demonstration, drawing, and oral storytelling description skills utilized. Some stability was returning to the region with the beginnings of debris removal, healing of wounds, and closing of shelters as people found other housing. Fewer children \((n = 29)\) spun in the second data set, but those not spinning made rotating motions with their arms \((n = 11)\). Of the 40 children, all but five in the second data set made sounds—screaming, whooshing, or growling—an increase from the 27 making such noises in the first data set. In both data sets the physical representation was a concrete way through which the children depicted their experiences.

When asked to physically demonstrate what a person does in a tornado, in the first data set the children demonstrated movement toward a location, taking one to three steps, then demonstrated getting into that location. Most frequently \((n = 16)\), children mimed getting into a bathtub and pulling a cover over themselves which could be an item such as a blanket, seat cushion, or towel. Twelve mimed opening a door and walking through the doorway. Seven ran to a wall and crouched down. Five children mimed climbing down stairs, which they later described as moving toward an underground shelter. The position of the child in the area in the shelter included sitting with arms out and rounded as if wrapped around a parent, sibling, or significant other \((n = 13)\), sitting with hands at their sides or in their laps while screaming \((n = 12)\), laying down with arms wrapped around oneself \((n = 8)\), and crouching while scrunching up their faces pretending they were crying \((n = 7)\). In the second data set, the children again all demonstrated movement toward a location, where they showed taking cover. They mimed getting into the location keeping the same representations as in the first data set. Their stances, however, were calmer with just four demonstrating crying and five screaming. Their position most often was sitting on the floor cross-legged \((n = 28)\) with only three demonstrating crouching, and with fewer \((n = 8)\) showing arms wrapped around someone else.

Given their demonstrations in response to both questions, the children appeared to have used their physical abilities to represent what they saw and heard. The emotional physical descriptions lessened with time. There were few differences between the three subgroups of children: those who directly experienced the tornado, those on the periphery, and those experiencing no direct physical impact.

**Drawing Responses**

The children next drew their responses to the two prompts. Because of their youth, many lacked the fine motor skills needed to draw with well controlled movements. Still, in the first data set depicting what happens in a tornado, 24 drawings showed rotation, movement, and structures broken into pieces or with jagged edges rather than straight lines. The remaining 16 drawings were scribbles or very simple forms with 13 showing up and down or horizontal lines,
which were later described by the children as a drawing of a tornado. An example of a simple drawing is shown in Figure 1. The child clearly indicates the tornado by strong horizontal lines covering the page. A large drawing of himself occupies center space in the tornado while a drawing of himself just before the tornado is placed outside of it on the side. In Figure 2, a child has drawn the tornado with smaller horizontal lines in the center. On the right side of the tornado is a drawing of her dog with lines leading upward showing the dog being sucked upwards into a piece of the tornado. This drawing is accompanied by the caption, "My dog got dead in the tornado." The pictorial representations were dependent upon development, yet even those children using simple lines or scribbles were able to convey their perceptions.

Figure 1: Simple drawing indicating “I am in the tornado”.
In the second data set depicting what happens in a tornado, 25 drawings showed swirling, curving, or zigzag lines surrounding or approaching houses. An example is found in Figure 3. A child has drawn herself in the middle with her house on her left and the tornado approaching on her right. The other 15 drawings showed objects (later described as bricks, roofing shingles, household items, fallen trees, or other debris) lying on the ground or leaning at an angle. So, over time the children were more sophisticated in their depictions given the further development of their fine motor skills perhaps through their experiences in the school program. More detail and complexity were present overall in the second data set’s drawings. Talk also had occurred over the weeks at home and at school. In their travel around town, the children had viewed the wide destruction. Hence, they had an increased depth of physical and social experiences with which to create second data set depictions with greater detail and complexity.
Figure 3: *Complex drawing indicating the child, a house, and the approaching tornado.*
Figure 4. A drawing illustrating taking shelter in a closet from a tornado.
In response to the second prompt, children drew “what you do in a tornado”. The drawings in the first data set showed elements indicating final positions when taking shelter. The final positions were very similar to those demonstrated when physically representing what you do in a tornado. The children did not show the process of getting into a shelter, probably because such sequential drawing is not a skill they have developed. In the drawings, 15 showed a person inside a rectangular object later described as a closet (see Figure 4) or a bathtub (see Figure 5), 10 showed two entwined figures or figures next to each other, 8 showed a person against a line or box (later described as a wall or hallway), 4 showed a zigzag which was later described as stair steps with a person nearby, and 3 showed a horizontal person lying flat. Among the human figures, a range of complexity was found with some simple stick figures, some as round heads only, and some as elaborated stick figures with several details. Figure 4 illustrates a drawing of a house with the child inside and is described in the caption as “I stay safe in my closet.” Of the
40 drawings, 23 showed a round, open mouth or had dots, circles, or lines projecting out of the mouth (see Figure 5), which were later described by the children as screams or crying. Seven of the children depicted themselves as smiling and two of these children also drew a sun and a rainbow in the sky which they later described as happiness because they were “saved” as they were not in the tornado’s path.

In the second data set for the prompt, “what do you do in a tornado”, elements again were found to be similar to those in the physical representation with; however, only the final stage of taking cover. Children’s stances were mostly the same but less screaming and crying were found, with only six depicting open mouths and lines or dots coming out of them. Because the second data set occurred nine weeks after the tornado, and three weeks after the first data set, the calmer depictions could be expected as coping strategies may be asserting themselves as described by Compas and Epping (1993). In this set, five children continued to depict themselves smiling as they had done in the first data set.

Drawings in both data sets were not difficult to interpret as the tornado was prominent in all of them although there was a range of drawing abilities among the children. In the second data set, more detail was present in the drawings providing more information about their perceptions of the tornado event. Children’s drawings also were calmer with less use of circles or other elements identified by the children as screaming and fewer depictions of children holding on to an adult. Few differences were found among the three subgroups of children.

**Developing Captions for the Drawings**

Lastly, the children described their drawings in response to the prompt “show me what happens in a tornado.” As a child talked, the response was written out as a caption for the drawing by the interviewer. Of the children, 33 in the first data set appeared to be unfamiliar with telling a story or describing what was in a drawing, which was not unexpected among such young children. The children were then prompted to “tell me what is in the picture”. The children created descriptions about houses lost and severely damaged \((n = 31)\), being scared \((n = 27)\), friends missing \((n = 13)\), lesser damage to structures such as Grandma’s gate falling apart \((n = 12)\), and wanting a significant other who was not present during the tornado but was identified as a mother or grandmother \((n = 11)\) (see Table 1). Examples of some of these captions are, “The tree fell on a power line and there was no electricity, and it was dark”, “Stuff flies everywhere and you find it everywhere”, “You got to be careful of debris because he can cut you”, “The house goes away and I go somewhere else”, “People get hurt and yell for help”, and “I was outside, and the lights went out, and I ran in”. Ten children elaborated their stories further creating more extensive captions. Twenty children also described after effects of the tornado focusing on wounds received and on coughing and sore throats. The tornado threw a lot of particulate matter including fiberglass and asbestos into the air, which resulted in sore throats and coughing throughout the county. Many of the children \((n = 14)\) referred to the tornado as “he” with the rest mostly saying “the tornado”. Such personification should be addressed by social studies educators in a disaster and hazards education program to help children perceive the tornado as a natural event. The drawings of seven children, all from school regions not directly in the tornado’s path, depicted a smiling person and as one child described “everything is OK, so I’m smiling.”
Table 1
Themes in the Descriptions (Captions) Within Both Data Sets

<table>
<thead>
<tr>
<th>Theme *</th>
<th>Data Set 1</th>
<th>Data Set 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>What happens in a tornado?</td>
<td>What happens in a tornado?</td>
</tr>
<tr>
<td>Houses lost/damaged</td>
<td>$n = 31$</td>
<td>$n = 25$</td>
</tr>
<tr>
<td>Being scared</td>
<td>$n = 27$</td>
<td>$n = 22$</td>
</tr>
<tr>
<td>Wound received, coughing</td>
<td>$n = 20$</td>
<td>$n = 21$</td>
</tr>
<tr>
<td>Friends missing</td>
<td>$n = 13$</td>
<td>$n = 11$</td>
</tr>
<tr>
<td>• Out of hospital</td>
<td></td>
<td>$n = 7$</td>
</tr>
<tr>
<td>• Have died</td>
<td></td>
<td>$n = 2$</td>
</tr>
<tr>
<td>• Relocated</td>
<td></td>
<td>$n = 2$</td>
</tr>
<tr>
<td>Lesser structural damage</td>
<td>$n = 12$</td>
<td>$n = 10$</td>
</tr>
<tr>
<td>Wanting a significant other</td>
<td>$n = 11$</td>
<td>$n = 6$</td>
</tr>
<tr>
<td></td>
<td>What I do in a tornado?</td>
<td>What I do in a tornado?</td>
</tr>
<tr>
<td>Taking shelter</td>
<td>$n = 40$</td>
<td>$n = 40$</td>
</tr>
<tr>
<td>Cry and be scared</td>
<td>$n = 38$</td>
<td>$n = 38$</td>
</tr>
<tr>
<td>Worry about other family members</td>
<td>$n = 23$</td>
<td>$n = 19$</td>
</tr>
<tr>
<td>Don’t know when I and go outside</td>
<td>$n = 0$</td>
<td>$n = 16$</td>
</tr>
<tr>
<td>What I saw &amp; heard when I came out</td>
<td>$n = 0$</td>
<td>$n = 16$</td>
</tr>
</tbody>
</table>

* Children often discussed several themes so the number of responses associated with all of the themes add to more than the “n” of 40 children.

In the second data set, the children continued to discuss the same themes with the same frequency, with the exception of friends missing. Now, their friends were identified as recovering from injury but out of a hospital ($n = 7$), having died ($n = 2$), or having relocated to another area and living with relatives ($n = 2$). Students were calmer and quieter in speech when describing their drawings. Examples of some of their descriptions are, “The tornado spins around the city”, “I’m sad”, “It blows a house away”, “It was flying in the sky and it came down”, “Lots of trees come down on roofs and break houses”, “We got a new car because the tornado blew our car into the basement”, “We’re living with my aunt cause we don’t have a house”, “It killed some dogs and people”, and “A tornado turns in circles”. Elaborations of descriptions continued to include comments on after-effects including wounds and coughing. In the second data set, all of the children referred to the tornado as an “it” or as “the tornado” with none calling it a “he”. The five children whose drawings again depicted a smiling person all indicated they were not in the tornado’s pathway and were glad not to have been hurt.

In response to “show me what you do in a tornado”, all of the children described taking shelter from the storm, 38 said they were scared and cried, and 23 said they worried about other family members, with numerous and extensive details provided. Examples of elements of their responses included “I hide in a closet”, “you go in the hallway and sit with your family close together”, “I only stand in my storm shelter”, “you squat down and try to get small and close your eyes”, “we hide and close our eyes, and see a rainbow after the storm”, and “you duck so the dirt doesn’t come down from the sky into your eyes”. Twelve of the children did not, at first,
respond to the prompt, so were asked to “talk to me about what you showed in your drawing of what you do in a tornado”. In the second data set, the children gave similar responses but all provided more elaboration. It appeared that the children took additional time to articulate their perceptions and had been using oral language to process their experiences with the tornado. All of the children quickly responded to the initial prompt, with 35 giving descriptions that went beyond the drawing. The children described the process of taking shelter, their emotions while sheltering (e.g. scared, sad, worried), when it was decided that they should leave the place in which they were sheltering, and what they saw and heard upon emerging from the shelter (e.g., fallen trees, very little of the house still standing, no damage at all, a dark and cloudy sky, an injured neighbor, glass and wood imbedded into walls, and piles of debris).

The importance of talk with very young children was evident in the two data sets as children dictated stories for their drawings. Retelling a story about the event, such as the experience of sheltering, was important for these young children. The children provided descriptive statements that also identified consequences of the tornado. Discussion points became evident, for example, the frequent initial personification of the tornado as “he” or the expressed concern for a missing friend. Disaster and hazards education in the social studies curriculum could have an open ended approach that allows teachers to pursue such openings for discussion and encourages the retelling of personal stories that support processing of an event.

Data Collection Methods with Very Young Children

The children all responded quickly when prompted to physically represent what happens in a tornado and what you do in a tornado. Their responses were highly descriptive as in the instance of one girl with long straight hair who spun so that her hair flew out horizontally while she also lifted her arms straight out horizontally. The least active response was one from a child who stood still and silent, holding out an arm horizontally, while she held one finger straight up and rotated it. Many children elaborated their stance with sounds such as continuous screaming or growling. In physically representing a response to the second prompt, all of the children quickly mimed getting to a place of shelter and taking a position in that shelter.

Drawing a response appeared to be more difficult for the children than was physically representing it. By the time the second data set was collected, the children had had daily opportunities to draw freely and in response to topics and activities underway in their classrooms. The second data set contained more detailed and elaborated drawings. The themes of the drawings, and the elements found within them, closely matched those found in the physical representations including swirls, mouths opened in cries, dots representing screams coming out of a mouth, and sitting while sheltering. The drawings, in contrast to the physical representations, showed details of what happens in a tornado that could not be physically represented by an individual such as bricks flying through the air and trees laying on houses. The drawings in response to the prompt asking “what you do in a tornado” more closely matched what children had physically represented but were embellished with small details such as supplies such as a flashlight in a closet shelter. Children, however, drew only the final form of sheltering not the process of getting to and into a shelter, which is difficult to draw but was clearly depicted in the physical representations.

Describing what was in a drawing was a new experience for many of the children, as 27 required additional prompting in the collection of the first data set beyond the original prompt, such as “start here (in the upper left corner) and tell me what you drew here”, and “tell me a
story about your drawing and who is in it”. In the collection of the second data set, however, 14 children immediately began telling the story of their drawing with explanation of all the details it held. Twelve of the children went beyond the details describing additional elements, which they had not drawn nor physically represented. This was considered evidence that these children were retelling “their stories” using multiple modes.

**Discussion and Conclusions**

The physical demonstrations, drawings, and verbal descriptions/captions used in our study elicited different aspects of these very young children’s perceptions and thinking about their experiences. Each method advantaged different abilities. Some children had poorly developed fine motor control and so did not draw well, but were able to make stick figures or scribbles (Brittain, 1979) that represented a tornado’s movement and damage with swirling or jagged lines. Some were able to give complex verbal descriptions. Most had the least difficulty with physically representing a response to a question. The initial slowness of response when asked to physically represent a response in the first data set likely was a result of shyness as these children previously had not been in a classroom setting. The hesitant response might also have indicated a lack of prior social experiences in which adults interacted around an activity with the child (Black & Logan, 1995). With very young children then, these data suggest researchers should consider using multiple methods of investigating prior knowledge.

All of the children had prior knowledge they brought with them to the classroom about what a tornado does and what they do in a tornado. Among the sample, 18 children, almost half of the sample, lived in neighborhoods devastated by the tornado, while 12 lived in neighborhoods on the periphery of the storm, and 10 were from neighborhoods with no physical impact. All, however, heard the tornado sirens before the tornado hit and saw a darkening sky, even if their location did not suffer damage. Each also knew someone who had been impacted by the tornado as approximately 15,000 people lived in the area with severe destruction, resulting in a loss of about 5,800 of the city’s structures. Because the tornado’s path crossed the entire city from southwest to northeast, it is almost impossible to travel within the city without crossing a part of the path. Hence, all of the children had some experience with the tornado, and all have seen, and continue to see, evidence of its impact. The children used their prior knowledge to (1) concretely draw what they saw and heard, (2) describe their feelings, and (3) describe their actions immediately before the impact of the tornado and afterward. The only noticeable difference between the three subgroups of children was that some of those who were from neighborhoods with no impact drew themselves as smiling and described themselves as happy that they had not been directly impacted by the tornado. Those in the subgroup from neighborhoods on the periphery of the storm demonstrated prior knowledge that was in most respects similar to the prior knowledge of those who experienced the tornado’s direct impact.

The children were aware of immediate effects of a tornado’s action including falling dirt and glass, and resulting impacts such as damage to structures and wounds among people. They accurately divided immediate from resulting impacts. One child, for example, drew and described immediate actions, “He breaks things. This is a table and the tornado is breaking the table. Its’ going to hit it, see? It’s going right to it. That is at my house.” Another child noted a resulting impact saying, “It broke our house. We had to leave. We live somewhere else now.” Their descriptions indicated they recognized there now was instability in their lives or in the
lives of others who no longer had a home, and/or had lost a family member, friend, relative, or pet. Conversely, some of the children whose home was not in the path of the tornado described themselves as safe and relieved. The children demonstrated a complex set of understandings based on their experiences. One interesting finding was the personification of the tornado as “he” by several children in the first data set while in the second data set all but one (see Figure 5) used “it” or “the tornado”.

Such waning of personification may be related to children’s acceptance of the tornado as a natural event during a period of time when some stability began to return to the community.

In their representations of what you do in a tornado, these children clearly demonstrated how one takes shelter and the emotional upset caused by the threat. Their ability to communicate how one takes shelter indicates that hazards education curricula can teach even very young children strategies for sheltering and responding to a disaster. These children’s ability to communicate their emotions and to further communicate a lessening of fearful reactions by the time the second data set was collected indicates that hazards education might additionally have success in helping children cope following a disaster. Thus, the study suggests researchers and educators should consider the role of hazards education both before and after a disaster.

**Implications for Early Childhood Social Studies**

How children perceive and understand the social aspects of a weather disaster and the hazards such events present, and how best to protect oneself in such an event, are relevant components of social studies education (Furmann, 2008; Pang, Madueno, Atlas, Stratton, Oiler, & Page, 2008). Our study focused on children after the tornado, not on how they were prepared prior to it. Since they were just about to enter kindergarten, the study is relevant to disaster and hazards education at an early age. The social studies curriculum can address behaviors necessary to survival of a disaster with very young children, practice those behaviors, inform family members of the need to discuss such behaviors with children, and identify beforehand what strategies will be followed at home if the event occurs. Research has found that some families exhibit few useful coping behaviors after a disaster due to several reasons (Sullivan, Saylor, & Foster, 1991). Among these reasons is a lack of a disaster plan that identifies strategies for sheltering, for whom to contact, and for contacting first responders, insurance companies, and significant community resources. Hazards education was found by Ocal (2010) to engage families in developing plans as students talked with family members about what they were learning. There is a need to develop hazards education curricula that are engaging and meaningful to young children, and which aim at mitigating the effects of a disaster.

The role of social studies education following a disaster, the California wildfires, has been discussed by Pang et al. (2008) who noted that schools found children apprehensive. Teachers engaged primary grades children in writing and class discussions while guiding them away from over-dramatization of events because such communication might increase student anxiety. In the California instance, many children had not directly experienced the wildfires but had watched them on television repeatedly. The California children were not able to understand the complexities of regional wildfires. With our very young children, all experienced the
tornado directly or indirectly to a greater or lesser extent, which may have resulted in their active participation in physically representing the event. Over-dramatization did not occur perhaps because of the concrete experience of each child of a phenomenon that could be seen and heard with a specific location and size while the California wildfires were regional, multiple, and occurred over days. Changes in children’s physical, oral, and drawn descriptions indicated a less fearful and calmer approach in the second data set. With very young children, then, multiple opportunities using different forms of representation accompanied by individual discussion may be of value after an event. The work of Pang et al. suggests researchers might investigate involving very young children in discussions about possible regional natural disasters and also after an experienced disaster. While very young children may not be able to write about their perceptions as did the somewhat older children in Pang et al.’s study, our research indicates they might be able to draw their perceptions and discuss those drawings. Retellings of a disaster as they describe drawings of it would encourage communication that engages children’s own prior knowledge while employing oral language skills.

Disaster and hazards education, as part of social studies education for very young children should address disaster possibilities that could be predicted from regional weather patterns and geography. Mitchell’s (2009) study indicates that, while states may include disaster preparedness in the curriculum, it may not address hazards likely to be found in the region. Inclusion of the most likely hazards in curriculum for very young children, then, is the starting point suggested by our study. Very young children can understand what happens and how to take shelter in a tornado. Such understanding, then, may be possible for severe straight-line windstorms, hurricanes, flooding, and similar natural disasters. The focus of the curriculum would aim at developing some understanding of what occurs in the event and how to best protect oneself with mitigation of negative physical and emotional effects as a goal.

Studies in the USA and elsewhere by Ronan and Johnson (2001), Izadkhah and Hosseini (2005), and Ocal (2010), as well as others, have found older children in upper grades and beyond can benefit from disaster and hazards education and communicate what they have learned to their families, who then adopt clearer and more extensive preparations for a disaster. Our study indicates similar findings might occur with very young children. Curriculum efforts should focus on mitigating disasters through preparation of our children starting in kindergarten. Very young children must be helped to be safe and to establish a sense of security. This study’s findings indicate social studies education can engage even very young children in describing their prior knowledge through each of the three methods studied: physical representation, drawing, and retelling a personal story through describing a caption for a drawing. Description of prior knowledge provides a foundation for developing skills and concepts that help children build upon existing knowledge, restructure misconceptions, and extend knowledge and skills to more complex understandings and abilities.

Our study is hypothesis generating. We investigated children to identify their prior knowledge just at entrance to kindergarten and with no previous schooling. The understandings identified among the children in the study indicate they had sufficient skills to understand a complex disaster. Further research should investigate the effects of extended opportunities for very young children to act out, draw, and discuss disasters and protecting oneself in a disaster. Researchers also should investigate the representations made by children in the region who did not experience the event but may have seen media representations to discover how prior
knowledge is affected by the media. Another investigation would examine what prior knowledge children in a different region of the nation construct. Additionally, researchers should investigate the knowledge of students following a disaster for which some have had hazards education in the early childhood social studies curriculum prior to the event and some have not had such education.

As growing concentrations of people live in hazard prone areas, social studies education needs to address potential natural disasters and their effects. Social studies education also needs to involve children in preparing for possible local disasters and help them cope afterwards with the effects. This study indicates investigating perceptions of very young children through a variety of methods is possible, enabling us to recognize the prior knowledge they are bringing into the classroom, so that we might find ways to assist them in making sense of their own or others’ experiences with a natural disaster.

References


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