

Effectiveness of Educational Tools for Hurricane Resilience in Homes

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Abstract:

In the disaster mitigation community, one of the most important tasks is that of information transfer prior to, and following natural disasters. The goal of this research project was to assess the effectiveness of various forms of educational media/tools regarding home resilience practices during hurricanes for their attractiveness and educational value to home owners. Three types of educational media were developed –pulp board coasters, tri-fold pamphlets, and a web hosted video. The contents of these media were developed based on data from federal agencies, as well as scholarly articles and technical reports to form an inclusive body of information. Several focus groups of homeowners and potential homeowners were held to evaluate participant’s preference of these three media tools with regards to their usefulness for making homes safer during natural disasters, specifically during wind and wind-driven rain events (e.g., hurricanes).

Findings- Analysis of the focus groups indicate that media use (based on disaster prevention home resilience practices) is highly dependent on the target audience or the stakeholder group (e.g., consumers look for different information content as compared to the builders). While all three media were indicated by the participants to have merit, the pamphlet was preferred aesthetically and was most likely to be used. In addition, the study found that the usefulness of the tools depends on the ease of understanding and implementation of the best practices and ease of access to the tools (targeted location for each media).

Research limitations/implications- The findings of the study have implications for the entire disaster educational community. Although the findings are mostly qualitative and the small sample used in the focus groups limits the generalize ability to the entire population of the U.S., nevertheless, future educational information and tools used should: follow easy to understand language, be illustrated with examples and pictures, and be placed at convenient locations for homeowners.

Originality/value- By understanding how to better reach homeowners with information on home resilience, information can be more effectively disseminated to the public which allows for efficient use of tools as well as funds.

1. Introduction

Hurricane events are some of the most unpredictable occurrences along the eastern and gulf seaboard of the United States. These events combine high wind with blown rain, and flooding from storm surge and flash floods. They can also produce catastrophic damage including loss of property and more importantly, human life. As the world's oceans, especially the Atlantic, slowly rise in temperature due to global climate change, it is probable that the frequency of hurricane events will increase as well as their intensity.

In the past 15 years, there were 246 cyclone events in the North Atlantic (National Weather Service, 2010) (Figure 1). Of these events, 29 were tropical depressions, 102 were tropical storms, and 115 were hurricanes.

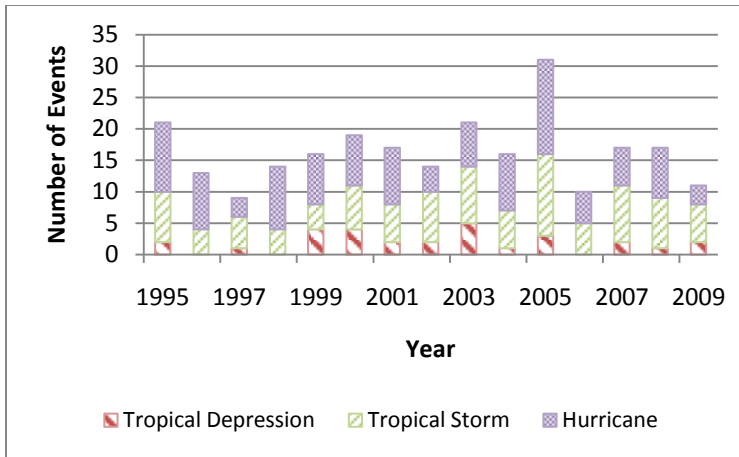


Figure 1: Atlantic hurricane activity 1995-2009 by year (Adapted from: National Weather Service, 2010)

In the years from 2005 to 2009, there were a total of 2170 deaths from Atlantic hurricanes (considering events only costing over \$1 Billion in damages) (National Climate Data Center 2010) (Figure 2). This number dwarfs those of previous seasons. In fact, that number is almost five times that of the deaths from Atlantic hurricane events (costing over \$1 billion in damages) between 1995 and 2004 (National Climate Data Center 2010). In addition to the incredible death toll, there was also a staggering economic loss between 2005 and 2009 accounting for a total loss of \$403.2 billion (Figure 3). This period included hurricanes such as Hurricane Ike in 2008 (\$27 billion) and Hurricane Katrina in 2005 (\$133.8 billion) (National Climate Data Center 2010).

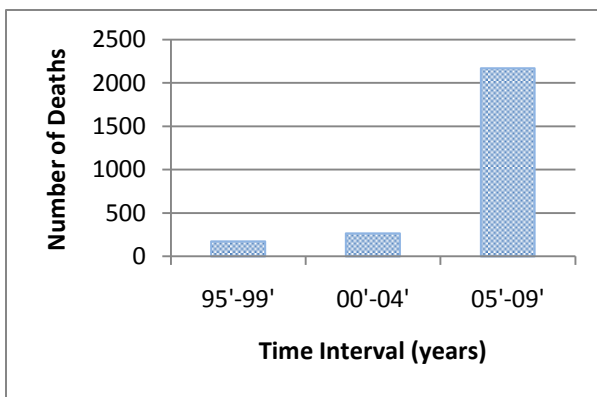


Figure 2: Deaths from Atlantic hurricane activity by five year interval (Adapted from: National Weather Service, 2010)

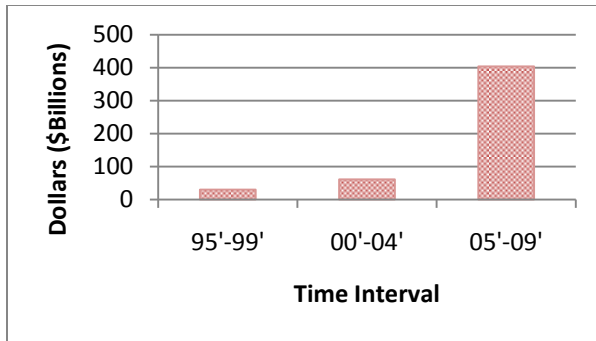


Figure 3: Monetary losses from Atlantic hurricane activity by five year interval (Adapted from: National Weather Service, 2010)

It is imperative to find ways to reduce losses during and following hurricanes. In order to do this, it is important to examine the tools that may better prepare home owners for hurricane events. A survey of over 350 key stakeholders¹ of natural disaster events in the Southeast U.S. conducted in 2008 showed that 91% of the respondents indicated a need for better education especially for the homeowners, with respect to the natural disaster resilience of homes (Tilotta, 2010). This is especially important not only because of similar findings highlighted in other studies (Hauser, Elmes, and Swartz, 2006) but also because of the lack of reinforcement techniques applied to their homes by the homeowners during natural disasters (The National Hurricane Survival Initiative, 2010, Mendez, 2009). Tilotta (2010) also found that respondents in their study generally felt that best practices for reinforcing roof and wall systems during wind events such as hurricanes are the weakest area in terms of information availability.

The purpose of this study was to examine the educational media tools that will better reach homeowners with information on making homes safer during natural disasters such as hurricanes. As a first step, informational content and methods of delivery were reviewed from various government agencies and nonprofit organizations that disseminate this information. It was found that most of the disaster related information is available in the form of technical bulletins, pamphlets, guide documents and technical reports (available both online and as hard copies) from these representative sources. A review of the available information indicated several recurring issues. First, information on reinforcement practices for homes to homeowners or potential homeowners was found to be highly technical and written above the average American's reading level. In addition the information presented

¹ Key stakeholders included general homeowners, builders, architects, engineers, government officials, extension agents, manufacturers, and other housing-related professionals.

is very general and vague lacking any detail on “how to apply the practices” (few step by step instructions for a general consumer). These generalizations fail to capture why the selected subject was important to a specific person or group. Generalizations about subjects such as “hurricane resilience”, “disaster mitigation”, and other buzz words that are prolific in the disaster management and preparedness community hinder understanding of the information being communicated (Goodman M. B., 2006). By removing this type of language and replacing it with plain language, it is hypothesized that marked improvement in the likelihood of use of different media as well as usability of such media measured by information retention will be observed.

2. Objectives

The goal of this study was to better understand how currently available information on best construction practices for natural disaster events (e.g., wind and wind driven rain) could be conveyed to homeowners more effectively.

The specific objectives of this study were:

1. To develop different educational media tools and their content to make homes safe during the natural disaster events;
2. To evaluate each of the above tools for their utility and effectiveness to consumers (current and future homeowners) and qualitatively discuss the factors that will improve the use of these tools.

3. Materials and Methods

As a means of delivering information about home resilience during natural disasters, three model educational media tools were developed including a traditional tri-fold pamphlet, a pulp board coaster, and a web-based video. The content of the media focused on best practice methods to reinforce a wood-framed wall and roof system during a wind or wind-driven rain event such as a

hurricane. Specifically, the three media types were developed to include information gathered from FEMA documents and guides, and documents from the National Association of Home Builders Research Center (NAHB RC).

The information in each of the media types was presented in an easy to understand language coupled with diagrams to aid in the understanding of difficult technical language and concepts. Depending on the nature of the media, differing amounts of information was presented; for example, the coaster contained only trivia questions about reinforcing homes because of the lack of space whereas the pamphlet contained detailed information on home reinforcement with illustrations and pictures. Specifically, the pamphlet was designed as a tri-fold color document containing text and pictures of roofs and walls suffering damages during hurricanes and specific techniques to reinforce these elements for improved resilience. If interactive materials are developed that grab the user's attention, challenge or entertain them, and finally educate them, the likelihood to use the materials improves, this is true regardless of informational content (Luma 2006, Lang 1994). In order to address this idea, the coaster was designed to challenge the user with questions and also to allow them access to further educational materials by including a web address to a site. The video was developed using humor to entertain the users while simultaneously educating them about roof and wall reinforcement techniques.

3.1. Data Collection

In order to evaluate the three developed media types for their utility, an expedient and efficient data collection method was needed that would allow for interaction and collaboration of ideas from the end user. In order to accomplish this objective, focus groups were utilized. Focus groups are a form of qualitative research based on interaction between group members aimed at promoting self-disclosure among participants (Rennekamp, 2006). The purpose of conducting a focus group is to listen and gather information. It is a way to better understand how people feel or think about an issue, product or service. In short, focus groups are a widely accepted method for obtaining consumer perceptions and attitudes, by stimulating new ideas and creative concepts, as well as for identifying problems and solutions for products or services (Rennekamp, 2006, Krueger, 2009).

Five focus groups were held with a total of 43 participants at the following locations:

1. Raleigh, NC – Three focus groups of 32 participants (6, 13 and 13 participants, respectively)

2. Biloxi, MS – Two focus groups of 12 participants (7 and 5, respectively).

The five focus groups were conducted between December 2009 and April 2010. No catastrophic natural disasters took place between those months in the U.S. (to introduce any bias in the results of the study). Each of the focus groups consisted of general consumers of various demographic characteristics and experience of natural disasters. The focus groups at Biloxi, MS were held specifically to capture inputs from hurricane survivors (e.g., Katrina). The focus groups in Raleigh included randomly selected consumers (of all demographics) recruited by a focus group recruiting firm. The focus groups in Biloxi involved random consumers participating at the Gulfport Resilient Home Building Show and Conference (March 2010).

Each of the focus groups were conducted for approximately one hour. In addition to gathering background information from participants, questions about the three media types, their usefulness and attractiveness were discussed and evaluated. In addition to qualitative discussions, focus group participants completed paper-based questions about media attractiveness and likelihood to use the media.

Since focus groups tend to be small in number and exploratory in nature, the responses from the participants are summarized and analyzed qualitatively as indicated by Krueger (2009). All frequent and repeated responses were recorded and categorized. The quantitative data collected from the survey questions were analyzed using Microsoft excel and Statistical Package for the Social Sciences (SPSS) statistical software. As the focus groups involved a small number of respondents, statistical analysis for differences among demographics were performed utilizing Mann-Whitney non-parametric tests of differences at 95% and 90% confidence level.

4. Results and Discussion

4.1. Demography

A profile of the sample respondents from the focus groups are presented in Figures 4, and 5. The ages of participants were evenly distributed 18 and 65 years of age (Figure 4). Of the respondent sample, 63% were male, and 37% were female. Overall 83.7% owned their home, while 16.3% rented (considered to be potential homeowners).

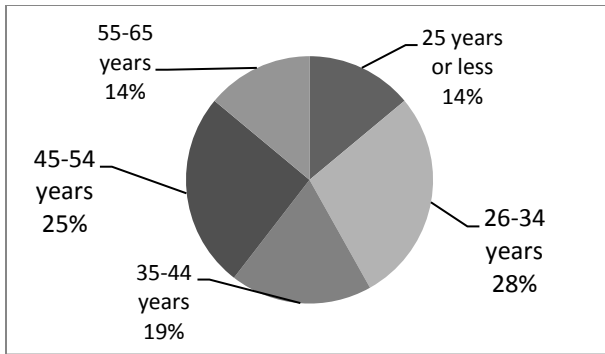


Figure 4: Focus group participant age

With respect to education (Figure 5) it should be noted that when comparing the focus group participant education to U.S. demography, some discrepancies were found. For example, according to the U.S. Census Bureau (2000), in 2000 80.4% of Americans indicated that they were high school graduates compared to 98% of focus group participants in the current study, and 24.4% reported having completed a Bachelor’s degree or higher in the U.S. compared to 63% in this study. Thus, the results of this study are applicable to a higher educated group of consumers if compared nationally.

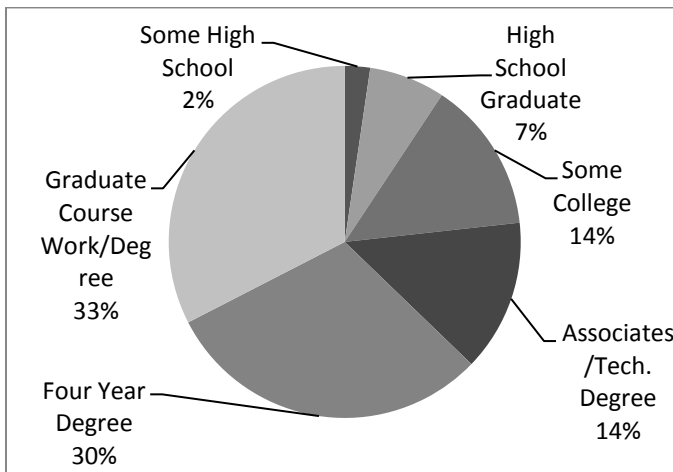


Figure 5: Focus group participant education level

When asked about prior disaster experience, 40% of participants indicated having been directly affected by a natural disaster in the past.

4.2. Media evaluation

To compare the value of the three media types, participants were shown them and asked to evaluate their usefulness, attractiveness, and the factors leading to the likelihood that the participants would use their information in the future. Average likelihood to use was evaluated using a five point likert scale question (where one was “not at all likely” and five was “very likely” to use the media) for each of the media types. Results of the analysis shows that participants reported the pamphlet to have the highest mean likelihood to use rating ($\mu=3.9$) followed by the video ($\mu=3.31$) and then the coaster ($\mu=2.26$) (Table 1). A statistical analysis of the differences in the mean ratings at 95% confidence ($\alpha=.05$), shows that respondents were more likely to utilize the pamphlet to gain information with respect to improving the performance of their homes with respect to hurricane events compared to the video or the coaster (Significance, $p=0.003$, 0.000 respectively for the video and the coaster). The participants also indicated that the video was more likely to be used for information about home resilience as compared to the coaster (Significance, $p=0.000$) (Table 1).

Average Likelihood of Use			
Media Type	Mean Likelihood of Use*	Std. Dev.	Significance (p value)**
Pamphlet (P)	3.90	0.850	P>V (0.003); P>C (0.000)
Video (V)	3.31	0.994	V>C (0.000)
Coaster (C)	2.26	1.148	
*On a 5 point scale (1=not at all likely to use, 5=very likely to use)			
**Significance at 95% confidence using t-test			

Table 1: Participant likelihood to use media

The media type attractiveness and appearance was evaluated by asking participants, regardless of the information presented, to rank order the three media in terms of their attractiveness (where three was most attractive and one the least attractive.) Results indicate a mean ranking of 2.40 for the pamphlet, 2.10 to the video, and 1.68 to the coaster (Table 2). As shown in Table 2, the coaster was ranked significantly lower than the pamphlet in terms of its attractiveness (Significance, $p=0.000$) and the video was ranked as more attractive compared to the coaster (Significance, $p=0.024$) at 95% confidence level. The participants of the focus group also indicated the pamphlet to be slightly more attractive than the video (Significance, $p = 0.084$) at 90% confidence level.

Average Media Attractiveness			
Media Type	Mean Attractiveness*	Std. Dev.	Significance (p value)**

Pamphlet (P)	2.40	0.735	P>C (0.000)
Video (V)	2.10	0.841	V>C (0.024)
Coaster (C)	1.68	0.789	
*Ranked from most to least (3=most, 2=moderate, 1=least)			
**Significance at 95% confidence using t-test			

Table 2: Average media attractiveness

Analysis of the demographic differences on the attractiveness and likelihood of using the media types showed the following results:

- Males were significantly more likely to use the coaster (Significance, $p=.003$, at 95% confidence);
- Homeowners were significantly more likely to use the pamphlet than the renters (Significance, $p=.039$, at 95% confidence);
- No significant difference was found on the likelihood of using any of the media types among participants belonging to different income groups, age categories, education categories and natural disaster experience (at 95% or 90% confidence);
- No significant difference in media attractiveness were found among participants with previous natural disaster experiences, home ownership status, gender categories, age groups, various education levels, or income levels (95% confidence.)

4.3. Qualitative results:

4.3.1. Overall

Analysis of the qualitative information from focus groups is valuable due to the rich discussion among participants which many other methods of data collection are unable to accomplish (Krueger, 2009). The opportunity to hear what the intended end user thinks is extremely valuable in understanding what the consumer needs and is also an ideal way to evaluate ways to improve a product (Krueger, 2009). The following section presents a qualitative summary of the most frequent responses for the participants overall (regardless of the media) and for the various media types.

Based on the recurring comments and discussions among the focus group participants, the attractiveness and corresponding likelihood of using a particular media could be grouped into the following regardless of the media type:

- Language and Appearance: Participants emphasized the use of bold colors and simple text (no technical language) and explanations coupled with the use of illustrations and pictures that

could clearly demonstrate to the consumers about “how to reinforce” a particular element (roof or wall) of a house in wind or wind driven rain events such as hurricane;

- Integration and Consistency: Instead of using only one medium at a time, all three media should be used together for conveying the same message and consistent information;
- Targeted Information: Almost all respondents agreed that similar media and educational tools could be utilized for all stakeholders but the look and the content should be based on the targeted audience. For example, a pamphlet for a homeowner should consist of checklists or description of best practices that an average homeowner will be able to accomplish (regardless of competency). A similar pamphlet for a builder or a contractor could highlight the technical details that a homeowner may not be able to accomplish or understand;
- Access: The specific location and access to the media tools is perhaps one of the most important strategies for improving their usage likelihood according to the participants. This is in agreement with a previous study that showed that if product placement is effective and convenient, then the intended end user is much more likely to benefit from the information which is disseminated (Holbrook and Hirschman, 1982). The locations for the media should be at or in association with a credible organization/agency and may include government or non-government organization frequently accessed by the target group (for whom the information is developed). Participants also emphasized that each of the media should include information of a contact (preferably local) or a credible website where the consumers may be able to get further information.

4.3.2. Pamphlet

The pamphlet was the best liked tool to present disaster information according to the participants because of the available space for including adequate information at one place. In addition to bolder text and color for presentation, the participants indicate the following strategies for use in pamphlets:

- Aggregation of Information: One of the key features of the pamphlet is that it can be made larger to accommodate more information. Not only can reinforcement best practices and solutions for the homeowners be included, but also pictures and illustrations of step by step methodology which highlight the key problems that the elements of a home (e.g., wall, roof, floor, foundation and openings – windows, doors and garages) may be subjected to during

natural disasters. The pamphlet was also more likely to be stored for easy reference just before a hurricane event.

- **Localized:** Participants emphasized that a pamphlet needs to have enough background information on the effects of natural disaster events for their particular location (county or state) to be most effective. It should use easy to use language and terminology that consumer at that location may be able to understand.
- **Strategic Access:** The participants indicated that the best strategic locations for a pamphlet will probably be at a home improvement store, especially just before a hurricane season or storm event. This will allow the interested consumers to be able to buy the tools and equipment required for reinforcements at the store. Other possible locations suggested by the participants for the pamphlet include the local county tax offices and town halls, utilities office, and through builders and remodelers. One of the distribution methods suggested at every focus group was for the local government offices to mail the pamphlet to the homeowners (preferably before the hurricane season).

4.3.3. Video

- **Short and Focused:** With respect to the video, the consensus was that the videos should be condensed into small fragments focusing on only one aspect of a home during disasters in order to hold the end users attention. A demonstration of application of the best practices to make the home safer through the use of easily available products and easily doable processes (from a homeowner's perspective) would be effective in videos.
- **Strategic Access:** While the video was entertaining, participants felt it would only be as credible as the location at which it was hosted. A video hosted on social media sites such as YouTube were not as credible as those hosted by governmental agencies for disaster resilience information. Thus, best locations were discussed to be easily available links under "disaster management" or similar information subject areas within county websites, as well as state and federal online portals.

4.3.4. Coaster

- **Condensed information:** The coaster as a media type met with mixed reviews from the respondents, however, the versatility of the media and its nature made it attractive. When

asked, most participants indicated looking at coasters, and if available, taking coasters home from bars and eateries.

- **Interactive and challenging:** If the coasters were interactive and challenged the user with questions (as developed for this study with multiple choice answer type question on one side and explanation of answer on the other side) it would be a viable method to aid in the consumer learning process with respect to natural disasters. The coaster (and in this study the video as well) is an active learning method which is correlated to information retention more than a passive learning method (such as a pamphlet or book) provided all other variables remain the same (Haidet et al. 2004).
- **Dissemination:** Beverage coasters are limited by the amount of information they can present at one time. This nullifies the possibility of allowing all needed information from being conveyed. The participants indicated that coasters could be used only to catch the homeowner's attention and pique their interest enough through challenging questions or trivia to drive them to seek out more information. As a result, important sites (web addresses) or contacts should be provided on the coaster for follow up by the consumers. The appropriate place of placement and distribution suggested by homeowners are at restaurants and local eateries.

5. Conclusions

According to these focus group discussions, all three media types have merit; however the pamphlet was found to be a more attractive media tool when compared to the video and the coaster used in this study for disseminating information about natural disasters to the general consumers. The key findings indicate that clear and understandable language with pictures and illustrations, consistency of information presented, a credible source for distribution, and ease of availability and accessibility of each of the tested media should improve the consumer likelihood to use the media.

All of the media types studied could be used together as an integrated marketing and promotion strategy to provide consistent and helpful information to intended homeowners. The content and location of the media should be based on its intended use and audience. For example, a pamphlet could be located in a home improvement store for the homeowner to pick whereas a local builder may be able to pick it up at the same place or at the county offices or building code offices.

6. Limitations and Future Work

In performing this research, there were some inherent limitations. Because of the exploratory nature of the study, the difficulty involved in conducting focus groups, and cost considerations, focus groups including consumers from only two states were included in this study. However, as stated previously, focus groups are one of the most effective methods for gleaning more information on a complex topic (such as natural disasters) through in-depth discussions (Krueger 2009). The results presented are also representative of a more educated group of participants. For confirmation of findings, a full scale survey including representatives from various regions of the U.S. and demographics must be included.

7. Acknowledgements

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