Disaster Prevention and Management
Emerald Article: Effectiveness of educational tools for hurricane resilience in homes
Tyler Strayhorn, Sudipta Dasmohapatra, Dave Tilotta, Phil Mitchell

Article information:
Permanent link to this document: http://dx.doi.org/10.1108/09653561211256143
Downloaded on: 30-10-2012
References: This document contains references to 14 other documents
To copy this document: permissions@emeraldinsight.com

*Related content and download information correct at time of download.*
Effectiveness of educational tools for hurricane resilience in homes

Tyler Strayhorn, Sudipta Dasmohapatra, Dave Tilotta and Phil Mitchell

Department of Forest Biomaterials, North Carolina State University, Raleigh, North Carolina, USA

Abstract

Purpose – In the disaster mitigation community, one of the most important tasks is that of information transfer prior to, and following natural disasters. The purpose of this research project was to increase the understanding of key aspects (such as attractiveness and educational value) that influence the utility and effectiveness of educational media tools for home resilience during hurricanes.

Design/methodology/approach – A total of 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 by homeowners. 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 USA, 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 to access.

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.

Keywords Hurricanes, Natural disaster, Home resilience, Education, United States of America

Paper type Research paper

1. Introduction

Hurricane events are some of the most unpredictable occurrences along the eastern and gulf seaboards of the USA. 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.

In the years from 2005 to 2009, there were a total of 2,170 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 was 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 large scale death toll, there were also significant economic losses 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 1.
Atlantic hurricane activity 1995-2009 by year


Figure 2.
Deaths from Atlantic hurricane activity by five-year interval

It is imperative to find ways to reduce losses during and following hurricanes. In order to do so, it is important to examine the tools that may better prepare homeowners for hurricane events. A survey of over 350 key stakeholders[1] regarding natural disaster events in the southeast USA conducted in 2008 showed that 91 percent of the respondents indicated a need for better education especially for the homeowner, 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 et al., 2006) but also because of the lack of reinforcement techniques applied to their homes by the homeowners during natural disasters (Mendez, 2009). Tilotta (2010) also reported that respondents in their study generally felt that information on 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 increase an understanding of the key aspects (attractiveness and value) that influence the utility and effectiveness of educational media tools for community resilience. Educational media tools, in this study are defined as the communication medium such as television, radio, print material, web sites, etc. that may provide information about a subject area. As a first step, informational content and methods of delivery (communication medium) were reviewed from various government agencies and non-profit organizations that disseminate this information to the general public. It was found that most of the disaster-related information was 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 in concept. It is feasible to assume that these materials are difficult to understand and are written above the average American’s reading level. This assessment was based on National Assessment of Adult Literacy (NAAL) data which showed that only 13 percent of adult Americans read at a “proficient” level and 43 percent read at a “basic” or “below basic” level (US Department of Education, 2003). In addition the information presented was very general and vague; with a lack of 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,”

![Figure 3. Monetary losses from Atlantic hurricane activity by five-year interval](source: National Weather Service (2010))
“disaster mitigation,” and other buzz words that are prolific in the disaster management and preparedness community hinder understanding of the information being communicated (Goodman et al., 2006). By removing this type of language and replacing it with plain language, it was hypothesized that marked improvement in the likelihood of use of different media as well as usability of such media measured by information retention would be observed.

2. Objectives
The goal of this study was to understand how homeowners and renters in the southeast USA feel about the design and utility of different representative educational materials specifically created to convey information on natural disaster events (e.g. wind and wind-driven rain) to homeowners more effectively.

The specific objectives of this study were:

- to design and develop three different educational media tools (pamphlet, video, and a coaster) and their content to make homes safe during hurricanes; and
- to evaluate each of the above tools for their utility and effectiveness to consumers (current and future homeowners) at two locations (in Raleigh and Biloxi) and qualitatively discuss the factors that will improve the use of these tools for reinforcement of homes during hurricanes.

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 trifold pamphlet, a pulp board coaster, and a web-based video. The content of the media focussed 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 were 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 trifold 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 were to be developed that grab the user’s attention, challenge or entertain them, and finally educate them, the likelihood to use the materials improves; this is reported to be true regardless of informational content (Luma and Zeqiri, 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 and Nall, 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 people’s perceptions and attitudes, by stimulating new ideas and creative concepts, as well as for identifying problems and solutions for products or services (Rennekamp and Nall, 2006; Krueger, 2009).

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

- Raleigh, NC – three focus groups of 32 participants (6, 13, and 13 participants, respectively); and
- 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 USA (to introduce any bias in the results of the study). Each of the focus groups consisted of individuals of various demographic characteristics and experience regarding natural disasters. The focus groups in Biloxi, MS were held specifically to capture inputs from hurricane survivors (e.g. Katrina). The focus groups in Raleigh included randomly selected individuals (of all demographics) recruited by a focus group recruiting firm. The focus groups in Biloxi involved random individuals participating at the Gulfport Resilient Home Building Show and Conference (March 2010).

Each of the focus groups was 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 questionnaires 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 were 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 respondent groups within the sample were performed utilizing Mann-Whitney non-parametric tests of differences at 95 and 90 percent confidence level.

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

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

When asked about prior disaster experience, 40 percent 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 all three media 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 1 was “not at all likely” and 5 was “very likely” to use the media) for each of the media types. Results of the analysis showed 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 (μ = 2.26) (Table I). A statistical analysis of the differences in the sample mean ratings at 95 percent confidence (z = 0.05) showed 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 I).

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 3 was most attractive and 1 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 II). As shown in Table II, 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 percent 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 percent confidence level.

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 = 0.003, at 95 percent confidence);
- homeowners were significantly more likely to use the pamphlet than the renters (significance, p = 0.039, at 95 percent confidence);
- no significant differences were found on the likelihood of using any of the media types among participants belonging to different income groups, age categories,

<table>
<thead>
<tr>
<th>Media type</th>
<th>Average likelihood of use*</th>
<th>SD</th>
<th>Significance (p-value)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pamphlet (P)</td>
<td>3.90</td>
<td>0.850</td>
<td>P &gt; V (0.003); P &gt; C (0.000)</td>
</tr>
<tr>
<td>Video (V)</td>
<td>3.31</td>
<td>0.994</td>
<td>V &gt; C (0.000)</td>
</tr>
<tr>
<td>Coaster (C)</td>
<td>2.26</td>
<td>1.148</td>
<td></td>
</tr>
</tbody>
</table>

Notes: *On a five-point scale (1 = not at all likely to use, 5 = very likely to use); **significance at 95 percent confidence using t-test

<table>
<thead>
<tr>
<th>Media type</th>
<th>Average media attractiveness*</th>
<th>SD</th>
<th>Significance (p-value)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pamphlet (P)</td>
<td>2.40</td>
<td>0.735</td>
<td>P &gt; C (0.000)</td>
</tr>
<tr>
<td>Video (V)</td>
<td>2.10</td>
<td>0.841</td>
<td>V &gt; C (0.024)</td>
</tr>
<tr>
<td>Coaster (C)</td>
<td>1.68</td>
<td>0.789</td>
<td></td>
</tr>
</tbody>
</table>

Notes: *Ranked from most to least (3 = most, 2 = moderate, 1 = least); significance at 95 percent confidence using t-test

Effectiveness of educational tools
education categories, and natural disaster experience (at 95 or 90 percent confidence); and

- no significant differences 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 percent 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 important 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 people about “how to reinforce” a particular element (roof or wall) of a house in wind or wind-driven rain events such as hurricanes.

- 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 was effective and convenient, then the intended end user was much more likely to benefit from the information to be 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 was developed). Participants also emphasized that each of the media should include information of a contact (preferably local) or a credible web site where the consumers may be able to get further information on the subject.

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 was 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. Respondents indicated that they were more likely to use a pamphlet that they could store for easy reference just before a hurricane event, as compared to the video or any other educational material.

- **Localized**: participants emphasized that a pamphlet should have enough background information on the effects of natural disaster events for their particular location (county or state) to be most effective. It should utilize easy to use language and terminology that an individual at that location may be able to understand.

- **Strategic access**: The participants indicated that the best strategic locations for a pamphlet would 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 included the local county tax offices and town halls, utilities office, and through builders and contractors. 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 focussed**: With respect to the video, the consensus was that the videos should be condensed into small fragments focussing 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 or Facebook were considered 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 subject areas within county web sites, 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 to participants. 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. Generally, coasters are not thought of as an educational material, however, in this study it is used in an innovative way for interacting with consumers regarding home resilience. If the coaster or similar tools can be used to communicate or even direct interested individuals to think and search for information on important topics such as those discussed in this paper, then they may be a very effective tool. The coaster (and in this study the video as well) is considered 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 though challenging questions or trivia to drive them to seek out more information. As a result, important web addresses or contacts should be provided on the coaster for follow-up by individuals. The appropriate place of placement and distribution suggested by homeowners were 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. This point is of extreme importance due to the well-documented impact that location and access can have on ultimate knowledge dissemination. 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.

It is clear that the medium used to disseminate information of this nature were most useful if it provided the individual with a sense of the importance of the topic, allowed the homeowner to understand the basic concepts involved, and finally provided a method by which to move forward and act on it. Government and non-government organizations as well as researchers and local communities may use the findings to develop educational media and tools to communicate and deliver information related to natural disasters and home resilience practices to the general public.

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 USA and demographics must be included. Additionally, the focus group participants at Biloxi voluntarily attended the conference and may represent a group of very interested individuals on the topic of resilient building (which may differ from the general population). However, interested consumers may generally be the ones to take the lead in searching for materials and information and thus represent the target group that others may follow or mimic over time.

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

References


About the authors

Tyler Strayhorn is a Graduate Research Assistant in the Department of Forest Biomaterials at North Carolina State University in Raleigh, North Carolina. His current research focuses on disaster resilience, as well as renewable wood composite research and environmental assessment of these materials. He received his BS in Wood Products at North Carolina State University in 2009. Tyler Strayhorn is the corresponding author and can be contacted at: strayhorn@ncsu.edu

Sudipta Dasmohapatra is an Assistant Professor in Marketing in the Department of Forest Biomaterials at North Carolina State University in Raleigh, North Carolina. Her current research focuses on customer value, branding, environmental and local marketing strategies in the energy, housing, and forest industry. She received her PhD in Forest Products Marketing from The Pennsylvania State University in 2005 and her MS in Forest Management from the Indian Institute of Forest Management, India in 1998. Before joining North Carolina State, she worked as a Market Research Consultant for three years solving marketing and new product development problems for Fortune 500 companies in the US. She has been a member of the Resilient Home Program team since 2008.

Dave Tilotta is an Associate Professor and Extension Specialist in the Department of Forest Biomaterials at North Carolina State University (North Carolina State). He received his BS degree in Chemistry from the University of Iowa and his PhD from Kansas State University. His educational and research interests include analytical methods for the detection of chemicals in solids and liquids, the conversion of cellulosic biomass to fuel, resilient housing, and the contamination of homes as a result of flooding. He joined the faculty of North Carolina State in 2003 after spending 13 years in Grand Forks, North Dakota, as a Chemistry Professor at the University of North Dakota. He has published more than 50 papers, co-holds three patents, and received four awards for his research and teaching activities.

Phil Mitchell is an Associate Professor and Wood Products Extension Specialist at North Carolina State University. Prior to joining North Carolina State, he worked at Weyerhaeuser Company and at Mississippi State University. Educational programs developed by him include wood gluing, CNC introduction, and lean manufacturing implementation. His current research interests include wood recycling and local wood products marketing, and the performance of flooded wood materials.

To purchase reprints of this article please e-mail: reprints@emeraldinsight.com
Or visit our web site for further details: www.emeraldinsight.com/reprints