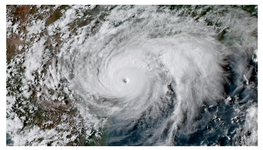
21

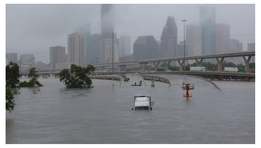
Online Local Natural Hazards Education for Young Adults: Assessing Program Efficacy and Changes in Risk Perception

Presenter: Dr. Courtney Thompson

T3: TEXAS A&M TRIADS FOR TRANSFORMATION
A President's Excellence Fund Initiative

Introduction





Img 1 (left): Hurricane Harvey courtesy NOAA (NESDIS). Img 2 (right) Flooding in Houston, TX by Richard Carson.

Natural hazards education has been found to reduce disaster impacts at individual and community levels. During disasters, people choose to act depending on how they perceive a hazard or risk. However, studies often omit the severity to which children and young adults experience disasters, including changes in risk perception. In addition, curriculum in most secondary schools does not cover local natural hazards or their impacts in sufficient depth.

This study aimed to develop a formal child-centric natural hazard and disaster educational program while investigating how the program influences risk perceptions of local natural hazards. Local college students were the preliminary subjects to ensure the program's quality and efficacy.

Methodology

The study area was College Station, TX. Two introductory Geography courses were selected at Texas A&M University for testing; one that briefly covers natural hazards and disasters (GEOG 305: Geography of Texas), and one that does not (GEOG 201: Introduction to Human Geography).

Development

The program was deployed on two online platforms (eCampus and KidGab) and consisted of:

- Pre/Post risk perception survey administered at the beginning and end of the program
  - Consists of Likert scale (3-5 point), demographic, and Yes/No questions
- 5 lesson modules on natural hazards, disasters, and Hurricane Harvey
  - 1-2 applied activities per module
- Pre and post-tests to assess the efficacy of each module and subject matter proficiency
  - Consists of Likert scale (3-5 point) and scored (based on correctness) questions

Analysis

Paired-sample t-tests, Welch's t-tests, and regression models were conducted to compare changes in risk perception and subject matter proficiency using:

- Overall pre/post risk perception responses
- Total score of individual and all modules
- Class (GEOG 201 vs. GEOG 305)
- Course Platform (eCampus vs. KidGab)

Implementation & Results

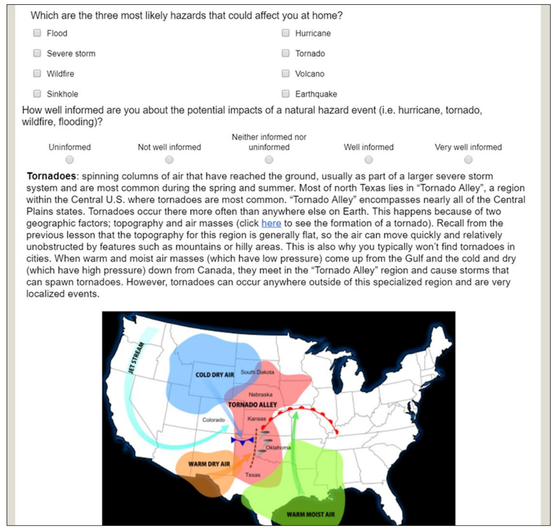


Fig 1 (left): Reading and questions for module 2 Natural Hazards of Texas on Qualtrics.

KidGab utilizes interactive images (right) on an outside site that link to the content and surveys hosted on Qualtrics (left).

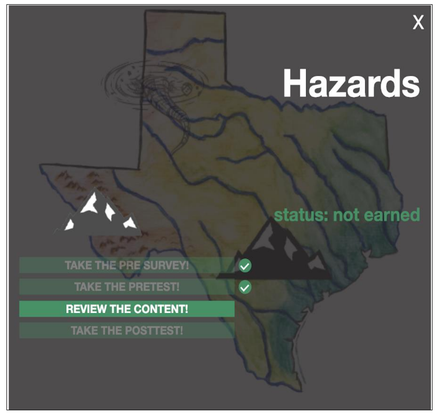


Fig 2 (right): KidGab module content and badge completion status.

PAIRED AND WELCH'S T-TESTS

Results show statistically significant changes in subject matter proficiency and risk perception of Hurricane Harvey and hurricanes. However, students in GEOG 305 had consistently higher total scores than those in GEOG 201.

Table 1: Paired t-test results for total and individual module scores

Module		All Students			Course: GEOG 201			Course: GEOG 305		
		pre	post	p-value	pre	post	p-value	pre	post	p-value
Module 1	mean	7.182	7.831	**<.0001**	6.565	7.739	**0.0001**	7.444	7.870	**0.012**
Module 2	mean	6.753	6.753	0.500	6.478	5.957	**0.035**	6.870	7.093	0.067
Module 3	mean	4.571	5.623	**<.0001**	4.261	5.391	**0.002**	4.704	5.722	**<.0001**
Module 4	mean	8.325	8.909	**0.001**	7.957	8.652	**0.029**	8.481	9.019	**0.006**
Module 5	mean	5.701	6.870	**<.0001**	5.000	6.348	**0.0005**	6.000	7.093	**<.0001**
Total Modules Score	mean	32.532	35.987	**<.0001**	30.261	34.087	**0.0002**	33.500	36.796	**<.0001**

Bold indicates α < 0.05

Table 2: Paired t-test by a question in the overall risk perception survey, comparing the pre and post answers.

Question	Pre mean	Post mean	p-value
Vulnerability and Knowledge			
How vulnerable do you feel in terms of hurricane impacts directly affecting the accessibility of your home or possible isolation from damage/debris?	3.065	3.532	**0.001**
How vulnerable do you feel in terms of hurricane impacts directly affecting you?	3.221	3.649	**0.002**
How vulnerable do you feel in terms of hurricane impacts directly affecting your family?	3.273	3.636	**0.006**
How vulnerable do you feel in terms of hurricane impacts directly affecting your property and/or possessions?	3.169	3.662	**0.001**
How well informed are you about the potential impacts of a natural hazard event (e.g., hurricane, tornado, wildfire, flooding)?	3.688	4.247	**<.0001**
Coping Capacity			
How capable do you feel of recovering from damage or loss to material belongings (i.e. home and personal belongings) from a hurricane and its associated hazards (flood and wind damage?	3.584	4.13	**<.0001**
How capable do you feel of recovering from injury or loss of life to you or your family from a hurricane and its associated hazards (flood and wind damage)?	3.377	3.792	**0.002**
How capable do you feel of recovering psychologically (i.e. stress and hardship) from a hurricane and its associated hazards (flood and wind damage)?	4.195	4.429	**0.007**
Planning			
Do you or those you live with have a plan of your house showing exits and where to turn off water, electricity, and gas?	1.727	2.104	**0.002**
Have you ever practiced what to do in the event of a natural hazard or disaster (at home, school, or elsewhere)?	2.416	2.61	**0.011**
How motivated are you to learn more about different planning and mitigation practices (e.g., adding storm shutters to your home) that can help you reduce impacts from hazards and disasters?	3.545	3.844	**0.009**
In an emergency, do you know where you would meet your family (or those you live with/are close to)?	2.13	2.364	**0.018**
Do you or those you live with have an emergency plan that tells you what to do to be ready for a natural hazard or disaster?	0.325	0.584	**0.0001**

Bold indicates α < 0.05

REGRESSION MODELS

Results show improvement in **POST-CURRICULUM SCORES**, further indicating the program's efficacy and the impact of risk perception on the overall pre-test.

Table 3: Regression model results of total module scores using demographic, risk perception score, and experience variables

Variables	Entire Curriculum (pre): Hurricane (pre) Coefficient	p-value	Flood (pre) Coefficient	p-value	Entire Curriculum (post): Hurricane (post) Coefficient	p-value	Flood (post) Coefficient	p-value
Module Score	32.272	**<.0001**	32.758	**<.0001**	37.704	**<.0001**	38.685	**<.0001**
Race (1=Minority/Hispanic, 0=White or did not answer)	-2.026	**0.041**	-2.309	**0.024**	-2.406	**0.044**	-2.555	**0.034**
Age (18-20=1)(21-24=2)(25-40=3)	1.215	0.162	0.996	0.264	0.626	0.548	0.313	0.767
Gender (1=Female, 0= Male)	-0.792	0.389	-0.799	0.399	0.481	0.664	0.527	0.638
Coastal hometown location (1=Coastal, 0 = Noncoastal)	-1.768	**0.081**	-1.333	0.193	-0.528	0.662	-0.265	0.826
Risk Perception Score	-0.011	0.876	0.014	0.862	-0.094	0.277	-0.101	0.285
Previous Hazard Experience	1.896	**0.049**	0.149	0.884	1.848	0.110	1.107	0.362
Model RSq	**0.163**		**0.116**		**0.123**		**0.101**	

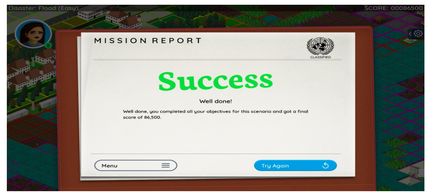
Most **RISK PERCEPTION** regression models showed **gender** trending towards female with positive coefficients.

Table 4: Regression model results of risk perception score using demographic, experience, and module score variables

Variables	Risk Perception Score (pre): Demographics ONLY Coefficient	p-value	Demographics & Previous Experience (Hurricane) Coefficient	p-value	Risk Perception Score (post): Demographics ONLY Coefficient	p-value	Demographics & Previous Experience (Hurricane) Coefficient	p-value	Demographics & Previous Experience (Hurricane), & Total Module Score (post) Coefficient	p-value
Risk Perception Score	23.130	**<.0001**	21.537	**<.0001**	27.939	**<.0001**	25.659	**<.0001**	17.673	**0.002**
Race (1=Minority/Hispanic, 0=White or did not answer)	1.200	0.461	1.590	0.327	0.788	0.579	1.307	0.351	1.917	0.185
Age (18-20=1)(21-24=2)(25-40=3)	0.933	0.519	1.189	0.407	0.883	0.485	0.886	0.471	0.806	0.507
Gender (1=Female, 0=Male)	4.347	**0.004**	4.181	**0.005**	2.850	**0.028**	2.674	**0.034**	2.632	**0.035**
Coastal hometown location (1=Coastal, 0=Noncoastal)	4.313	**0.007**	3.455	**0.035**	2.837	**0.041**	1.905	0.174	1.973	0.155
Previous Hazard Experience	-	-	2.765	0.078	-	-	3.563	**0.025**	0.218	0.119
Total Module Score (post)	-	-	-	-	-	-	-	-	3.600	**0.022**
Model R2	0.23		0.26		0.147		0.21		0.23	
Model p-value	**0.001**		**0.001**		**0.021**		**0.005**		**0.004**	

Bold indicates α < 0.05

Discussion



Img 3: One of the three participants who successfully completed the Stop Disasters Game by the UNDRR. This module activity was to complete the Flood challenge on Easy.

"The amount of damage that Harvey did cause, I knew it was a huge issue but I truly didn't grasp the severity." – participant comment

The results of the t-tests and contingency tables indicate:

- Modules had increased subject matter proficiency
- Curriculum influenced on risk perception (either increased or decreased overall in the post-test)
- Students in course that briefly addresses hazards have slightly higher means scores and risk perception than those that do not, indicating having supplemental information from the course helps improve scores
- Gender is an influencing factor in pre- and post-program scores. Males and females both experienced significant changes, mostly increases, in total and individual module scores, however, males tended to score higher overall than females in the pre-tests. Furthermore, females were found to come into the program feeling less confident in their knowledge about hazards compared to how the males reported higher levels of feeling knowledgeable.

Conclusions

T-test and regression model results indicate the program influenced risk perception and subject matter proficiency. Results suggest that the curriculum content improved overall subject matter proficiency in participants ($p<0.01$) and that participants with higher post-program scores demonstrated higher risk perception and hazard awareness. These findings demonstrate how exposure to natural hazards educational programs can increase hazard awareness and coping capacity in young adults and adolescents.

The module of Hurricane Harvey and questions related to hurricane hazards such as flooding and storms showed statistically significant changes, indicating the participants had improved their subject matter proficiency, thus also obtaining enough information to influence their risk perception (see participant comments below):

"Learning about hurricane [Harvey] because [I] am not from here so it's crazy to see the numbers and actual photos from it."

"I did not realize how much damage was done to all of Houston not just south Houston. (in terms of Harvey)"