Student Expressions of Geospatial Inquiry:

The E-Communicative Art of Research Storytelling in the Classroom

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Abstract

Technology increases student critical thinking and engagement through active and participatory learning. Digital storytelling, conveyed or showcased via e-communications, offers exciting possibilities for student engagement in scholarship via technology. Digital media afford the platform and technologies for communicating stories that describe research, utilize critical thinking and analyses, and relay information. Communications take place by showcasing on the internet, social media, as videos and other electronic transmission. These forms of communicating research may be particularly attractive to groups underrepresented in STEM. The purpose of the project is to increase student interest and efficacy of Geographic Information Systems (GIS) as STEM research method within the Geog 4110-5110: GIS for Non Majors course. This course attracts multidisciplinary students from research areas across all colleges. The project is thus approached from the perspective of communication across the curriculum. Qualitative and quantitative methods will be used to assess digital storytelling/e-communications for deeper learning of content and enhancement of technological competencies as well as for increased interest in GIS and STEM research. Pre-post storytelling student Likert-scale surveys and course grades will provide data for quantitative assessment via T-tests. Thematic analyses of focus group responses and of comparative examination of story map content will be made with reference to student self-identified racial/ethnic group. Project results will be disseminated to promote digital storytelling as culturally responsive pedagogy effective in GIS course mastery and for increasing multicultural interest in geospatial STEM research.

Budget Request for SOTL Grant
Year ____2018-2019____

Joint Proposal? _____ Yes __X__ No

Title of Project   Student Expressions of Geospatial Inquiry: The E-Communicative Art of Research Storytelling in the Classroom

Duration of Project   January 2018 – June 2019

Primary Investigator(s)   Laurie Garo, PhD

Email Address(es)   lagaro@uncc.edu

UNC Charlotte SOTL Grants Previously Received (please names of project, PIs, and dates)   Delmelle, E., Tang, W., & **Garo, L. (2011).** *Improving Geographic Knowledge Discovery and Spatial Reasoning with Mobile and Web-based Geographical Information Systems*

Allocate operating budget to Department of   Geography & Earth Sciences

		Year One
Account #	**Award**	**January to June**
Faculty Stipend	Transferred directly from Academic Affairs to Grantee on May 15	$0
911250	Graduate Student Salaries	$3375
911300	Special Pay (Faculty on UNCC payroll other than Grantee)	
915000	Student Temporary Wages	
915900	Non-student Temporary Wages	
920000	Honorarium (Individual(s) not with UNCC)	
921150	Participant Stipends	$750
925000	Travel - Domestic	

Account #	Award	
926000	Travel - Foreign	
928000	Communication and/or Printing	
930000	Supplies	
942000	Computing Equipment	$100
944000	Educational Equipment	
951000	Other Current Services	
	GRAND TOTAL	**$4225**

		Year Two
Account #	**Award**	**July to June**
Faculty Stipend	Transferred directly from Academic Affairs to Grantee on May 15	$0
911250	Graduate Student Salaries	$6750
911300	Special Pay (Faculty on UNCC payroll other than Grantee)	
915000	Student Temporary Wages	$3000
915900	Non-student Temporary Wages	
920000	Honorarium (Individual(s) not with UNCC)	
921150	Participant Stipends	$1500
925000	Travel - Domestic	$1500
926000	Travel - Foreign	$2000
928000	Communication and/or Printing	
930000	Supplies	
942000	Computing Equipment	$100
944000	Educational Equipment	
951000	Other Current Services	
	GRAND TOTAL	$14850 + $4225 = $19075

Attachments:

1. Attach/provide a narrative that explains how the funds requested will be used.
2. Has funding for the project been requested from other sources? ___ Yes ___X_ No. If yes, list sources.

Budget Narrative

January to June, 2018

Faculty Stipend: As a 12 month faculty, I do not get summer stipends. I will instead request travel funds for dissemination of the project and its results.

Graduate Student Salaries: One masters student in Geography at 15 hrs/wk x 15 wks x $15/hr = $3375. Graduate assistant will assist with developing the interview instrument, creating the online form for recording student responses, conducting pre-project focus groups with students who have taken the course prior to the implementation of the e-communications component, transcribing and compiling data and carrying out thematic analysis. Note: the GA will be mentored in this process.

Participant Stipends: $25 Target gift cards for each of 30 participants in the pre-project focus groups (25 x 30 = $750).

Computing Equipment: $100 for a digital recorder for use in recording focus group responses.

July 2018 to June 2019

Graduate Student Salaries: One master's student in Geography at 15 hrs/wk x 15 wks x $15/hr = $3375 x 2 = $6750 for fall 2018 and spring 2019 semesters. Graduate student will serve as the TA for the course in the fall, carry out participant observations of all e-communications components, prepare ethnographic account of observations, conduct post-course focus groups of students who took part in the e-communications version of the course, transcribe and compile data for thematic analysis.

Student temporary wages: Summer graduate assistant (at 20 hrs/week x 10 weeks x 15/hr = $3000). GA will assist with revisions to focus group assessment instrument as needed according to results of spring, 2018 focus groups, conduct summer interviews to obtain data on cultural importance of storytelling through focus groups with various groups underrepresented in STEM, transcribe and compile results, and carry out thematic analyses.

Participant Stipends: $25 Target gift cards for each of 30 summer and 30 fall focus groups (25 x 60 = $1500).

Travel – Domestic: $1500 to cover expenses for dissemination of project results at the American Education Research Association (AERA) annual meeting in April, 2019. Expenses include conference registration, airfare and ground transportation, hotel and per diem.

Travel – International: $2000 to cover expenses for dissemination of project concept and focus group analyses/results at the International Conference on Urban Education (ICUE) in November, 2018 (held in Nassau, The Bahamas). Expenses include conference registration, airfare and ground transportation, hotel and per diem. *Note: Travel is in lieu of faculty stipend.*

Computing Equipment: $100 for microphone and headphones for voice recording as part of e-communications.

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October 17, 2017

SOTL Grants Committee
Center for Teaching and Learning
ctl@uncc.edu

Dear Committee Members:

On behalf of Dean Nancy Gutierrez in the College of Liberal Arts & Sciences, I am writing this letter in support of the SOTL proposal submitted by Dr. Laurie Garo from the Department of Geography & Earth Sciences which is entitled, "Student Expressions of Geospatial Inquiry: The E-Communicative Art of Research Storytelling in the Classroom."   This project is focused on incorporating technology-enhanced, integrated communication methods in the cross-listed courses GEOG 4110 and GEOG 5110, entitled GIS for Non Majors. The proposal represents one of the priority research areas of focus for the 2017-2018 SoTL grant competition.
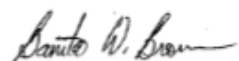
Dr. Garo plans to study if student interest and engagement in geographic information system (GIS) increases through e-communications storytelling. It is proposed that students will improve in their understanding of GIS concepts and techniques by combining GIS research with digital story mapping. A variety of multimedia software and application tools are available for students to create their story maps in written, oral, pictorial, or other visual communication forms. This opportunity for creative expression of GIS research between students from a variety of disciplines across campus sheds a unique twist to the concept of communication across the curriculum. Students may then disseminate their stories through web pages, YouTube, and various social media platforms. An appropriate evaluation and dissemination plans have been described.

I fully support this proposal. It closely aligns with the university's strong focus on student success, retention, and persistence in STEM as well as critical thinking and communication. The narratives and story maps that students create through the various multimedia and transmedia presentations may also be useful materials for the college. We are continuously looking for interesting ways to

inform prospective or newly admitted students about the unique educational opportunities available in CLAS.

Sincerely,

Banita W. Brown
Associate Dean for Academic and Student Success
College of Liberal Arts and Sciences
Associate Professor of Chemistry

Project Narrative

Project Aims

The purpose of the project is to increase student interest and efficacy of Geographic Information Systems (GIS) as research method within the Geog 4110-5110: GIS for Non Majors course, particularly for groups typically underrepresented in STEM. The project is approached from the perspective of communication across the curriculum by incorporating a modification of e-portfolios into a multimodal communications format that incorporates various technology-enhanced, integrated communication methods among students from majors within every college at UNC-Charlotte. Students will make use of multimedia software for written, oral, graphic, sound and other artistic communication. These will be introduced within several of the lab exercises wherein students will analyze and display their maps as digital stories. The course culminates with final projects carried out on topics within individual student disciplines. Each student will prepare a final project digital story map encompassing multimodal communications. The story map tells the story about the project much as does a research report, however, by embellishing the writing with oral, visual, and other artistic elements. Employing the e-portfolio concept will enable external showcasing of student projects via public access sites such as UNC-Charlotte web pages, YouTube uploads and other social media platforms. Thus the term e-communications refers to electronic showcasing of digital story maps produced via multimedia and incorporating various means of communication.

Qualitative and quantitative methods will be used to assess digital storytelling/e-communications for deeper learning of content and enhancement of technological competencies. Likert-scale surveys, course grades, visual comparisons and focus groups will provide data for assessment. The inclusion of e-communications will afford students the opportunity to tell intellectual stories about their research projects within respective disciplines. The e-stories have

potential to indicate content and skills mastery as well as ability to use GIS for data exploration, analyses, reporting results, and reflection. Likewise, e-communications storytelling enables infusion of various culturally artistic elements such as music (rhythms, beats, harmonies, etc.), lyrical or poetic expression, photos and other art forms. Storytelling, itself, has potential to invoke a sense of subject authority and increase confidence in conveying knowledge to others. As such, cultures that employ storytelling to transmit knowledge from generation to generation may be attracted to this form of research dissemination. Through focus group feedback, the project will also be assessed for the impact of digital storytelling on heightening interest in STEM via GIS among underrepresented cultural groups.

Project Goals, Objectives and Assessment Measures

There are two project goals as listed below, each with related objectives and assessment methods:

Goal 1. Improve mastery of GIS content and techniques through adaptation of the Learning e-portfolios concept by combining GIS research with story mapping via multimedia.

- Objective A: Gauge efficacy in mastery of course material through quantitative evaluation and comparison of course assessments of pre-e- communications and e-communications students.

- Objective B: Assess student perceived effectiveness of e-communications for understanding GIS through digital research storytelling, as measured by quantitative analysis of student Likert scale surveys.

- Objective C**:** Gauge ease and efficacy of multimodal e-communications as method for digital research storytelling through qualitative assessment of focus group responses from e-communications students.

Goal 2. Examine the extent to which e-communications storytelling enables cultures that utilize oral history and storytelling the opportunity to express academically through culturally meaningful e-communication, and thereby fostering increased interest in STEM.

- Objective A: Compare and contrast ways that differing "cultures" express academically/ intellectually via e-communications (digital storytelling) through comparative thematic analyses of the artistic and expressive elements within stories, and through thematic analysis of focus group responses.

- Objective B: Gauge potential increased interest in STEM through thematic analysis of responses from focus groups with pre-e-communications and e-communications students.

The research questions for the project are thus:

1. Is there noticeable improvement in mastery of GIS content through the introduction of e-communications storytelling?

   Hypothesis for Question 1: Performance on selected GIS lab exercises and exams [content mastery] will be higher for the e-communications group as compared with the pre-e-communications group.

2. To what extent what does digital research storytelling foster understanding of GIS concepts and techniques?

   Hypothesis for Question 2: Digital research storytelling improves student ability to understand GIS concepts and techniques as compared with the pre-e-communications group.

3. How effective is digital research storytelling at increasing student interest efficacy in GIS?

4. In what ways does cultural expression through digital research storytelling differ by race/ethnicity?

5. What evidence, if any, indicates that cultural expression opportunities within research storytelling via e-communications increases interest in STEM among underrepresented groups?

Project Rationale

<u>Problem to be addressed</u>

There are several areas of investigation this project aims to address. First is whether e-communications will serve as an effective pedagogical strategy for improving student GIS interest and content learning across the curriculum, that is, among students from numerous disciplines across all colleges within the university. Second is the study of potential for enhancement in oral, written, and artistic communication competencies as a result of e-communications storytelling. Thirdly, the project aims to examine the possibility to increase diverse cultural representation in STEM from among currently underrepresented groups such as African American, Hispanic/Latino, and Native American students, through the use of technology-based e-communications. Finally is the study of whether student self-confidence in STEM research with GIS is enhanced through the digital storytelling and showcasing aspect of e-communications technology.

<u>Relationship to the mission, objectives and priorities of GEES, CLAS and UNC-Charlotte</u>

Geographic Information Science is a concentration within the bachelors, masters and PhD degrees in Geography, popular because of the multifaceted applications and numerous associated job opportunities. GIS is the integration of hardware, relevant software and spatial data for the collection, management, analysis and display of all forms of geographically referenced information (ESRI, 2014). Through GIS, data can be compared, analyzed and visualized in ways

the help answer questions, solve problems, model social and environmental behavior, and discover spatial patterns and relationships. GIS has application within any field that comprises spatial data, that is, with concern for location.

The mission and objective of the GIS faculty within GEES is to increase student interest, engagement and performance outcomes among GIS students within the department. This includes all majors for whom GIS is included within core course content. Additionally, given the breadth of topics for which GIS may be applied, the department wishes to expose other majors across the curriculum to GIS as a research and data analysis and mapping method. An important mission of UNC-Charlotte is equity and inclusion among all groups within every aspect of this institution of higher learning. Increasing cultural diversity in STEM is therefore among the academic priorities of the college and university as a whole. Technology is integral to GIS, and the spatial dimension lends well to applications that span the social and environmental sciences, engineering and the arts. GIS thus serves as an ideal STEM subject and a bridge across disciplines within CLAS and across other colleges. Additionally, given that the products of spatial analysis are both visual and virtual, GIS is ideally suited to digital storytelling, also known as story mapping.

Prior work

I have used story mapping as a means of engaging students in critical thinking, data analysis and communication of research results within my Cartographic Design course. Students investigate an issue with GIS, and then place data, maps, charts, and relevant images into movie maker or power point, add music and captions, and create a "movie" saved and shared in mp4 format. Based upon my observations, most students put exceptional effort into creating their movies, afford time and care into critical analysis, and take great pride in their work, especially

for presenting to others. I am interested in content analysis and focus group discussions with my former and current (e-communications) students as to the impact of multimedia communications on their interest and effort as well as the extent to which they believe their learning was improved.

I have also incorporated movie and music making within my summer scholars high school, and middle school outreach workshops on environmental applications of GIS. Where students begin to tire from the rigors of scientific investigation, their interest is rejuvenated with the opportunity to incorporate music and art into the e-technology presentation of their projects. The majority of these students have been African American or Hispanic/Latino. They have particularly enjoyed the inclusion of visual arts and rhythm into the story, leading me to investigate the cultural appeal of digital storytelling.

<u>Impact on undergraduate and graduate teaching and learning</u>

Technology increases student critical thinking and engagement through active and participatory learning (Hill & Solent, 1999; Tiba, Condy, Chigona, & Tunjera, 2015). Multimodal forms of technological pedagogy address the various 21st century skills that are necessary for the types of work our students will encounter upon graduation (Norander, 2017). Story mapping/storytelling via multimedia offers alternative means of oral, written and graphic communication wherein electronic, or e-technology provides the communication platform. Geog4110-5110 is offered every fall semester and typical enrollments of 20-24 students. The course has thus far attracted students from sociology, anthropology, psychology, biology, engineering, criminal justice, public administration, environmental studies, history, meteorology, public health, social work, public policy, and education. Undergraduate and graduate students across many majors within all colleges will thus have opportunity to participate and benefit from this e-communication strategy, and to further develop these 21st century technological

competencies. The course will help prepare them for technology and communications they are likely to encounter within a multitude of career paths while concurrently enhancing their knowledge and skill with GIS as a multidisciplinary research method.

Literature Review

Digital storytelling, conveyed or showcased via e-communications, offers exciting possibilities for student engagement in scholarship (Tiba, et.al, 2015). Digital media afford the platform and technologies for communicating stories that describe research, utilize critical thinking and analyses, and relay information (Barber, 2016). Communications take place by showcasing on the internet, social media, as videos and other electronic transmission (Ramasubramanian, 2016). Historically, storytelling has involved people sharing information about the human and physical environment, passing down information orally. It was storytellers who preserved and shared information across generations. Over time, stories became encoded in written form, often re-enacted as drama that included narrative, music, art and other cultural elements (Barber, 2016). Digital storytelling enables the listeners of stories to themselves become storytellers. As such, it empowers and gives "…voice to individuals and groups traditionally silenced, marginalized, or ignored by mainstream culture…[whereby] people create powerful personal stories using digital tools like computers, cameras, audio recorders, and digital media software" (Barber, 2016, p. 3). The method enables creation of narratives that are emotionally compelling, and engaging through formats that include documentaries, eye witness accounts, memoirs, essays, podcasts, community asset maps, and other multimedia (multiple forms of media combined to tell a story) and transmedia (multiple storyline components told on separate technology platforms, with overarching connecting thread) presentations of research findings (Barber, 2016; Pstross, Talmage & Knopf, 2014; Ramasubramanian, 2016).

Multiple forms of media offer the ability to bring maps to life. A single map can only represent a portion of reality. This limits the maps' ability to convey information about the landscape. Uses of film/video, and other forms of multimedia, enable authentication of map symbols and make geographic concepts real (Dando & Chadwick, 2014). Maps as stories facilitate personalized conveyance of emotions about an area depict cultural aspects not well represented by symbols on paper. Likewise, the user may experience the operation and physical layout of the city landscape (Cartwright, 2009). Reenacting the landscape and its peoples provides enhanced understanding for the audience, and makes the process of mapping so much more engaging for the creator as compared with traditional map-making (Cartwright, 2009). Student creation via multimedia technology has been demonstrated to enhance geographic understanding and improve critical reflection and digital media literacy (Dando & Chadwick, 2014).

Storytelling provides meaning making for many racial/ethnic groups that have traditionally passed down cultural history via storytellers (Banks-Wallace, 2002; Carter-Black, 2007). Racial/ethnic identity may be reflected within the media for digital storytelling whereby minority groups are "actively adapting, resisting, and challenging the practices of mainstream media…through collaborative, community-based transmedia storytelling …critical media literacies and active, digital scholarship" (Ramasubramanian, 2016, p. 333). Digital storytelling offers effective means of cultural expression through creative and artistic narrative development. It was used, for example, in health promotion among vulnerable female populations in Puerto Rico (Gubrium, Fiddian-Green, Lowe, DiFulvio & Del Toro-Mejias, 2016). Termed "intentional storytelling", this digital means of research reporting is utilized to transfer knowledge and wisdom among civil engineers in South Africa (Marsh, 2012). South African pre-service teachers

found digital storytelling to be beneficial in motivating students to learn, promoting collaborations among students, offering self-expression, and for learning multiple technological skills (Tiba, et.al, 2015).

Evidence of cultural underrepresentation in STEM at institutions of higher education is well documented. Underrepresented groups documented in the literature include Black, Latina/o, Native American, and Southeast Asian American (Cambodian, Hmong, Lao, and Vietnamese) students (Museus & Liverman, 2010), also, Alaska Natives, Native Hawaiians and other Pacific Islanders (Jackson, Starobin, & Laanan, 2013). Factors affecting STEM performance among these groups include feelings of isolation and invisibility at predominantly White institutions, unsupportive and unwelcoming atmosphere within STEM classrooms, faculty and peer preconceived stereotypes of lesser qualification and ability, inconsistencies in program alignment between universities and community colleges (Jackson, Starobin, & Laanan, 2013), absence of minority representation among faculty, and lack of mentoring by faculty, staff and peers (Wilson, Holmes, deGravelles, Sylvain, Batiste, Johnson, McGuire, Pang & Warner, 2012). Retention in STEM is improved through early exposure to relevant subject matter, in-and after school programs, and research opportunities, mentoring processes that begin in elementary or middle school and continue into all levels of higher education (Wilson, et.al, 2012), diffusion of negative perceptions and creation of welcoming environments and better program alignment between high schools, community colleges and universities, creation of a campus culture that openly values and supports diversity (cultural centers, mentoring programs and other academic support, counseling and advising), utilize active and collaborative learning pedagogies with culturally responsive content (Jackson, Starobin & Laanan, 2013; Museus & Liverman, 2010).

As a final note, there is recent explosion of digital storytelling, or story mapping among GIS students and practitioners, evidenced by the proliferation of story maps on the website for the Environmental Systems Research Institute (ESRI), founder of the ArcGIS software (ESRI, 2017). Story maps range from basic tour maps and historical accounts, to in-depth research and analyses and representing a wide range of socio-cultural and environmental topics covering national and international issues. Each incorporates multimodal forms of communication including writing, narration /video, maps, graphs/charts, photographs and other imagery, and elements of animation. Figure 1, entitled *Hurricane Irma Photo Story Map*, represents an example of a type of tour map whereby the user clicks on a mapped location and is shown a photo or photos with caption descriptions. In Figure 2 are illustrations reporting on a detailed social justice study entitled *The Genesis of Exodus, Violence, Poverty, and Social Disintegration: The root causes of Central American Migration*, with selection in English or Spanish. Five pages from the story map are shown (Figure 2a-e) to demonstrate the types of multimodal communications possible through digital research storytelling, and the potential to increase interest in GIS and other STEM research.
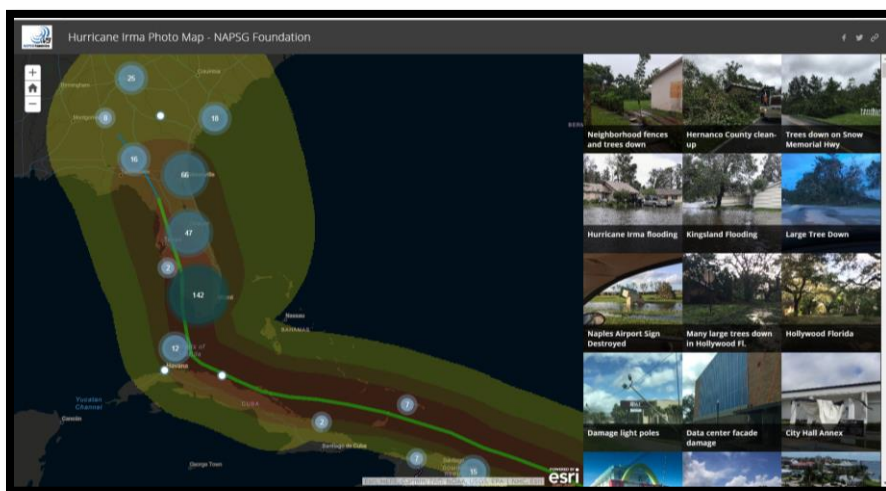

Figure 1: *Hurricane Irma Photo Story Map*. The story map was "crowdsourced", that is, people from all relevant locations posted photos of the damages wrought by Irma. These were compiled

onto the story map such that the user clicks on a location along the hurricane path and a photo and description appear.

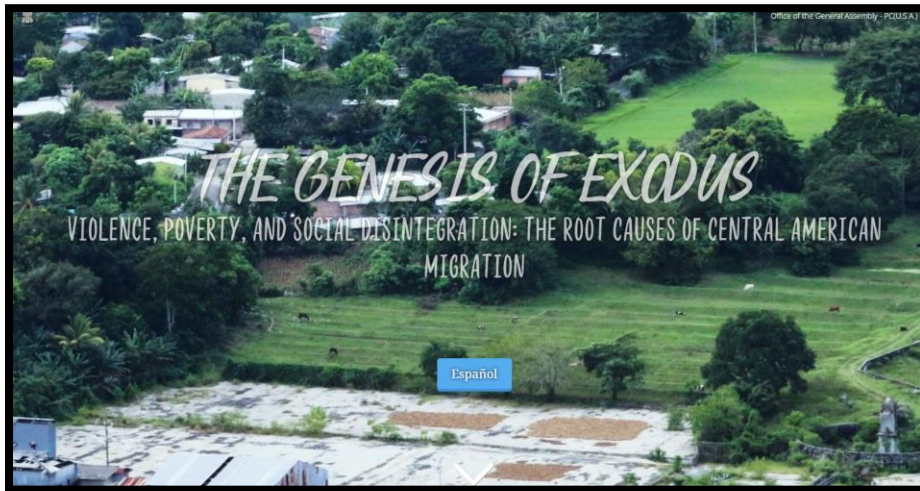(Source:https://napsg.maps.arcgis.com/apps/StoryMapCrowdsource/index.html?appid=65f0dde429504c3cb07f0cae0f2c4be6)

Figure 2a: Title slide with tab for Spanish text.
(Source: http://storymap.genesisofexodusfilm.com/index.html)
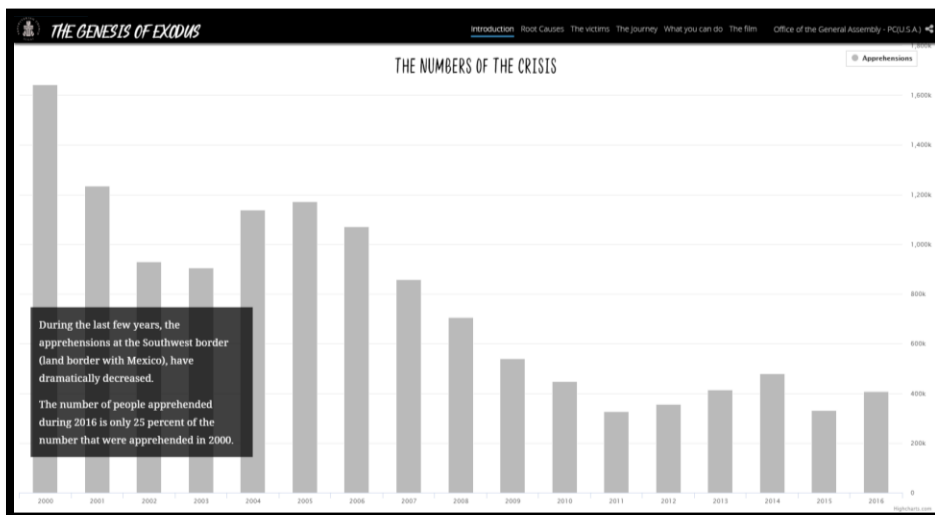

Figure 2b: Example of chart illustrating quantitative information with text explanation.
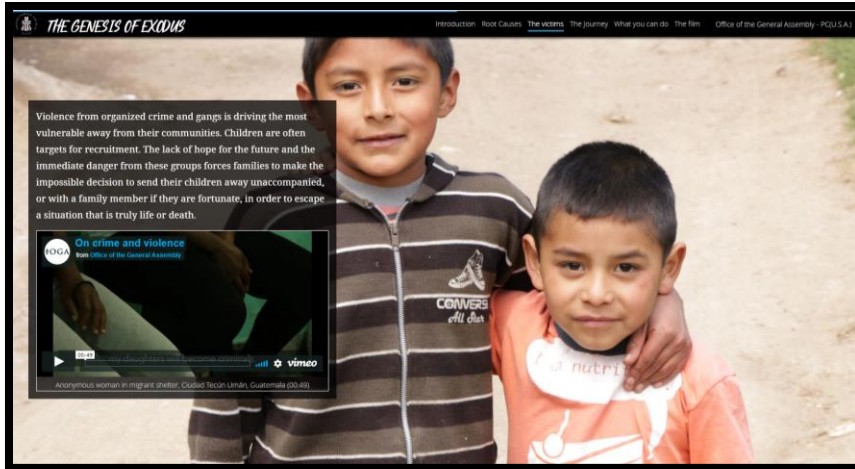
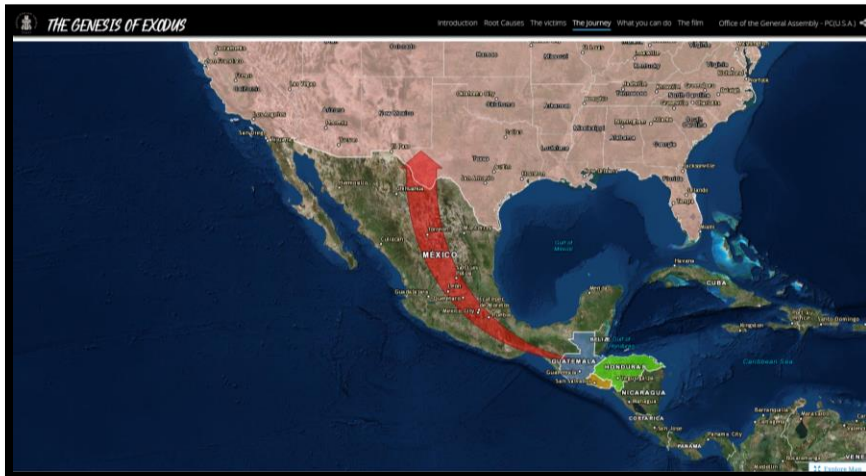Figure 2c: Inserting Video and Photographs to help demonstrate purpose and/or indicate information and findings.

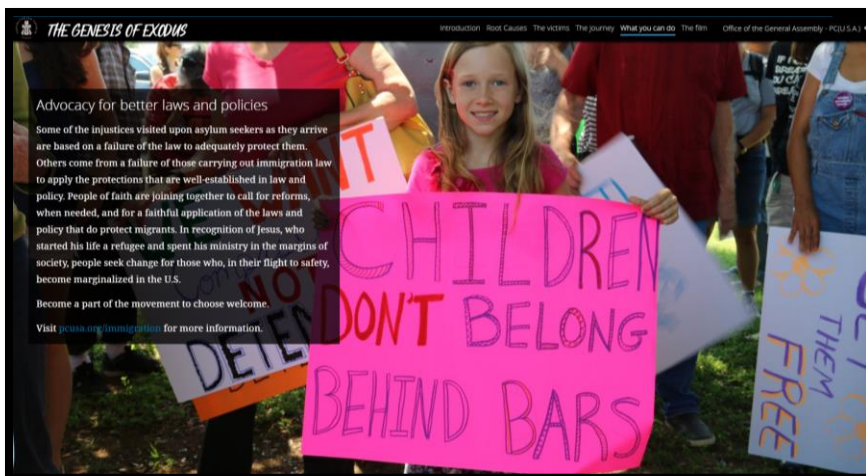Figure 2d: Maps illustrate spatial dimensions of the study

Figure 2e: Presentation of study findings and recommendations.

Methods

The digital storytelling via multimedia e-communications methods invokes several modes of integrated or multi-modal communication. There is written expression as captions within the movie slides or frames. Verbal and cultural (poetry, rap, song) forms of oral expression are added to the story via e-recording. Graphic expression is added through creation of maps, illustrations, charts and other graphics representative of the topic of exploration or inquiry. Photographs and music create emotion and develop impact. Digital media literacy will incorporate several technologies including movie maker/i-movie, "garageband" or other music making/recording software, power point, products from GIS and Excel, e-portfolios, and online graphics. These digital media methods will be integrated into lab exercises and final projects such that students become proficient not only with GIS, but also with creative e-communication of research through digital storytelling.

Data Collection

Data on student mastery of GIS content through multimedia e-communication techniques will be collected from grading rubrics as saved on Canvas for selected lab exercises and exams from Fall 2016 and Fall 2017 (pre-digital storytelling students), and Fall 2018 (digital storytelling students). Data on potential increased content mastery and interest in GIS resulting from digital storytelling will be collected via Likert-scale surveys of former and current students in the GIS for Non-majors course. These will be augmented by focus group discussions and responses. Likert-scale responses will be quantified as 5 = strongly agree through 1 = strongly disagree. Cultural expression via digital research storytelling will be obtained by comparison of cultural art forms and other expressions within projects, grouped by the self-identified race/ethnicity of each student and through anecdotal stories by students during focus group

sessions. Further, case study observations of students compiling research stories during class sessions will be recorded for assessing interest and efficacy in GIS by racial/ethnic group identity through the multimodal e-communications processes.

<u>Evaluation</u>

Data collected from rubrics and exams will be compared for pre and post groups using descriptive statistics and t-tests to measure mastery of GIS content. Likewise, Likert-scale survey results will be evaluated via descriptive statistics and t-tests to measure student perceived mastery of GIS content, and digital storytelling impact on interest in GIS. Focus group responses and supplemented by anecdotal narratives will be evaluated using thematic analysis and diagramming, with direct quotes included within the assessment report and dissemination documents and presentations. Digital stories, and individual narratives will be compared between racial/ethnic groups through tabulations of various types of content and thematic diagramming of the comparisons. Case study observations will be analyzed thematically making use of cloud diagrams and frequency graphs to compare cultural expression and STEM interest between groups. The entire research method is diagrammed in Figure 3 indicating data collection and evaluation by research question.
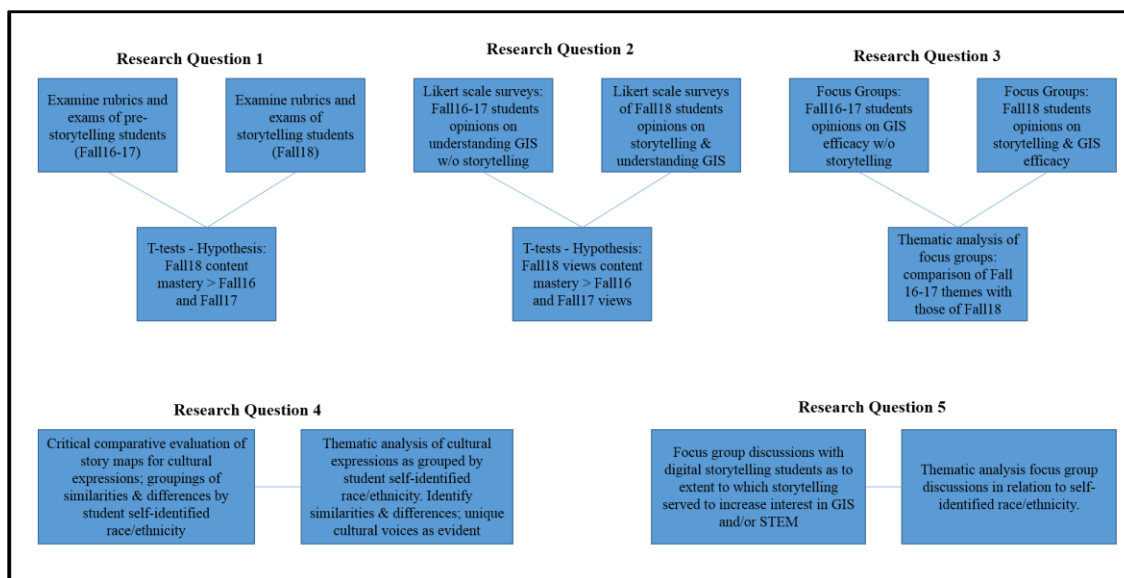
Figure 3: Diagram of the research method process by research question.

Knowledge Dissemination

Knowledge gained from the project will be disseminated in several ways. Students will have the opportunity to showcase their work to multiple audiences via e-portfolio or other public access website. The project and results will be shared with other UNC-Charlotte faculty during SOTL research sharing opportunities offered through the Faculty Center for Teaching and e-Learning. Education-oriented papers will be prepared and presented at two education conferences. The American Education Research Association (AERA) provides a forum for sharing research and practice that influence education policy. The AERA presentation will focus on the research aspect of the digital storytelling project with recommendations for increasing access to higher education student groups underrepresented in STEM. Effectiveness of digital storytelling as multicultural pedagogy will be presented at the International Conference on Urban Education (ICUE) as a way to disseminate the effectiveness of this method to an international as well as national audience of P-12 urban school educators. Finally, an article will be submitted to a professional geography journal e.g., Journal of Geography, to present the findings in relation to improvements in GIS content mastery for use as pedagogy in higher education GIS programs.

Human Subjects

IRB approval will be sought and obtained for the focus groups portion of the project. Dr. Garo will prepare and submit IRB documents during the early part of spring semester, 2018 such that focus groups can begin by mid-semester, and continue through summer and fall.

Extramural Funding

There is no extramural funding for this project. Apart from the purchase of a digital recorder, microphone and headphones, all necessary hardware and software are already available through UNC-Charlotte.

Timeline

The project timeline is diagrammed in figure 4 below, with line by line description beneath the diagram.

January – February 2018: IRB materials preparation and approvals.

February-March 2018: Survey instrument design for quantitative surveys and qualitative focus group sessions

April-May 2018: Initial surveys/focus groups with former GIS for non-majors and Cartographic Design students; compilation of data for analysis

June-August 2018: Data analysis from spring semester surveys and focus groups; initial write

up of results; modifications to survey instruments as needed; further surveys and focus group

sessions with data analysis and write-up.

September – December 2018: GIS for non-majors course with introduction of digital

storytelling and e-communications; case study observations and write-up; surveys of current

students.

January-March 2019: Focus group sessions with digital storytelling GIS for non-majors

students

April-May 2019: Quantitative and qualitative data analysis and write-up

June 2019: Finalize report and prepare presentations and other dissemination materials

References

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pedagogy. *Cogent Arts & Humanities*, 3, 1-14.

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traditions. Journal of Social Work Education 43(1), 31-50.

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