The Effects of Geographic Affiliation on Students' Perceptions, Awareness, and Responses to the 2010 *Deepwater Horizon* Oil Spill

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ABSTRACT

The 2010 *Deepwater Horizon* oil spill greatly affected the Gulf Coast, and the news media reported information to wide audiences. Students enrolled in an online Environmental Geoscience course in fall 2010 voluntarily participated in a Gulf oil spill survey. More than 92% of the students ($N = 77$; 83 total enrollment), who were primarily in-service teachers, participated. The 24-question survey probed students' demographics, current geographic locations, affinity with the Gulf, oil spill knowledge, and emotions resulting from the incident. We sought to determine whether students with Gulf Coast geographic affinity (one aspect of Gulf sense of place) would have stronger reactions, have greater knowledge, and exhibit more behavioral changes than their noncoast peers. Multivariate analysis of variance revealed students with a geographic association with the Gulf Coast had stronger interest and emotional responses than did noncoast students. However, students with a Gulf affiliation did not score statistically higher on their knowledge of the spill, exhibit significantly different behavioral changes, or have stronger plans to incorporate the spill within their K–12 classrooms. Student age had no significant effect on any category. We concluded that current events that tap into students' affiliations and senses of place may offer affective portals through which instruction can be optimized, but more research is needed to elucidate media effects and competing variables. © *2013 National Association of Geoscience Teachers*. [DOI: 10.5408/12-357]

Key words: Gulf oil spill, online education, distance learning, *Deepwater Horizon*, sense of place

INTRODUCTION

On 20 April 2010, the *Deepwater Horizon* drilling rig exploded in the Gulf of Mexico. Eleven workers lost their lives, and 17 additional workers were injured in what became the world's largest accidental oil spill. As crude continued to flow unabated into the Gulf, the public was riveted to the news media for updates on how much oil was spilled and when—if ever—the flow would be stopped. In addition to the loss of life, attention was focused on the spill's long-term effects on the Gulf's ecosystems and the impact on seafood and tourism industries of Gulf Coast states.

Students in our online classrooms posted information and sought to discuss the unfolding tragedy in the Gulf as it occurred. Were our online students' reactions typical of the general population, or were interests and responses influenced by their geographic locations, their ages, and whether they had a connection to the Gulf? If students' geographic affiliations included the Gulf Coast, were they more aware of the oil spill and more emotionally involved? We developed a voluntary 24-question survey in an online Environmental Geoscience course to research potential correlations between geographic affiliations (e.g., place attachment) and students' knowledge, perceptions, and responses to the Gulf spill. This investigation primarily involved geographic attachment, one component of a student's sense of place; place meaning (place identity and dependence) can also influence a person's relationship and perception of a location (Jorgensen and Stedman, 2001; Kudryavtsev et al., 2012).

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DEEPWATER HORIZON OIL SPILL

British Petroleum (BP) had a majority interest in the Macondo Prospect, located in Mississippi Canyon Block 252 in the deep waters off Louisiana's coastline. Using the *Deepwater Horizon* drilling platform leased from Transocean, BP drilled an exploratory well in the area. The well successfully located petroleum-bearing strata. However, while Halliburton was in the process of cementing the well, the regular procedures went horribly wrong. The final cement job did not hold, and escaping methane ignited and exploded (Fig. 1). The blowout prevention device did not engage, and despite precautionary procedures, the rig sank 2 d later. A containment dome over the spewing wellhead later failed to stymie the crude flow, as did an attempt to pump drilling fluids into the blowout preventer. Oil continued to gush from the broken wellhead, and it was not until the well was capped on 15 July 2010 that the flow was controlled. When a relief well intercepted the Macondo well and was cemented on 12 September 2010, the well was declared effectively dead (Kerr, 2010).

However, in the 3 mo before it was capped, the broken wellhead leaked crude oil into the Gulf of Mexico (Fig. 2). BP made a controversial decision to diffuse the crude with large volumes of a commercial dispersant, Corexit, applied in subsea injections. Booms were emplaced along coastlines, some oil was skimmed from the surface, and some controlled burns were implemented. The early estimates of oil flow per day (as low as 1,000 barrels/d) were edited and expanded to a rate of 35,000–60,000 barrels/d. Crone and Tolstoy (2010) analyzed data using optical plume velocimetry to conclude that $4.4 \times 10^6 \pm 20\%$ barrels were released during the total spill event. The interdisciplinary scientific

FIGURE 1: The U.S. Coast Guard responded to the fire on the *Deepwater Horizon* drilling rig. Despite firefighting efforts, the rig sank 2 d after the initial explosion. (Photograph courtesy of the U.S. Coast Guard.)

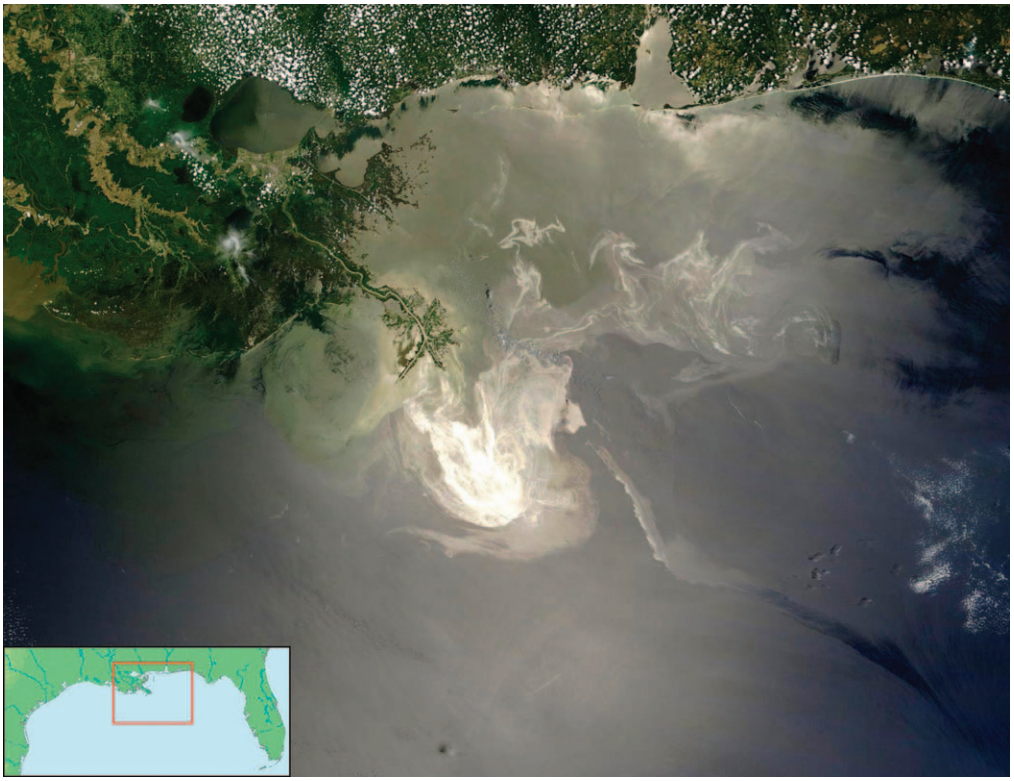

FIGURE 2: The oil slick produced by the *Deepwater Horizon* incident is seen here on 24 May 2010. (Image courtesy of Michon Scott, National Aeronautics and Space Administration's Earth Observatory.)

Flow Rate Technical Group estimated 4.9×10^6 barrels were released over the 3 mo (RestoreTheGulf.gov, 2011).

Early reports predicted that the spill would evolve into a catastrophic event (Kerr et al., 2010), and several news magazines featured stories about the spill (Thomas and Stone, 2010). Some articles attempted to educate the public as to why deepwater petroleum reserves existed in the Gulf of Mexico and how salt tectonics are strongly intertwined with them (Voosen, 2010). The media reports did not decrease with the capping and death of the well. The effects of the spill continue to be researched, with some scientists (Bjorndal et al., 2011) calling for improved assessment tools and data sharing to effectively ascertain the full impact. Patches of oil on the seafloor, probably resulting from dispersant–petroleum mixtures settling from the surface, extended 40 mi (64.4 km) from the wellhead (Raloff, 2011). The long-term health effects from the oil spill on cleanup workers are being probed (Reardon, 2011), and research into natural petroleum seeps seeks to compare these natural emissions with the *Deepwater Horizon* catastrophe (Fischman, 2012).

EFFECT OF MEDIA ON VIEWERS' PERCEPTIONS

The *Deepwater Horizon* spill was one of the premier news stories from 20 April 2010 until the capping of the well on 15 July 2010. The public received news reports through television, radio, and electronic media updates. However, news reports often tend toward sensationalism and can socially amplify a disaster, resulting in distorted perceptions (Kasperson et al., 1988). Errors and inconsistencies also lead to conflicting reports, and viewers do not typically receive consistent, accurate information following a disaster (Scanlon, 1978). When the public receives most of its information concerning a disaster or risk through the media—as opposed to scientific reports—the inconsistencies can result in great confusion (Matricardi et al., 2000). Even when a scientific concept is not sensationalized, Tang (2013) found that out-of-school representations of science and technology can present contrasting views that pose challenges for beginning students of engineering.

SENSE OF PLACE

In human geography, sense-of-place research has been conducted since the 1970s. Sense of place, in its most basic definition, is an individual's personal attachment to a geographic location (Buttimer, 1976; Tuan, 1976). A multivariate concept, sense of place is primarily composed of place attachment and place meaning, with meaning influenced by place identity and place dependence (Jorgensen and Stedman, 2001; Kudryavtsev et al., 2012). Since the 1990s, a general sense-of-place concept has been familiar in geography and environmental education studies (Matthews, 1992; Nabhan and Trimble, 1994; Spirn, 1998; Schneider, 2000). Semken (2005) and Semken and Brandt (2010) extended sense of place into the geological landscape and correlated geological interpretations with cultural identifications and sustainability.

Sense of place can be used to determine awareness and environmental interest in a specific location (Farnum et al., 2005). Although different senses of place can be established and can vary throughout a person's lifetime (Hay, 1998), the primary sense of place is referred to as the idiotopy (Pascual-de-Sans, 2004). According to Stedman (2002), a person must interact within a place to assimilate it. However, indirect educational experiences, or instructional approaches, can also influence a person's place meaning (Kudryavtsev et al., 2012). Geographic affiliation influences one aspect of sense of place, while indirect instruction provides additional impact. Our earlier sense-of-place research resulted in the development of writing templates that probed students' memories and recorded students' interactions with the geology and biology of their childhoods (Clary and Wandersee, 2006; Wandersee et al., 2006). We defined geological sense of place (GSP) as the affective and intellectual state that can be retrieved through students' memories of particular places and Earth events that made an impression during childhood (Clary and Wandersee, 2006). In our analysis of GSP in college classrooms, we learned that for most college students, the local landscape had the greatest effects on their emotional responses and content knowledge of geology themes and issues. These place attachments can affect environmental awareness and behavioral changes (Stedman, 2002; Smaldone, 2002).

RESEARCH POPULATION

Our research population included students enrolled in an online master's degree program that is conducted entirely online, with the exception of a culminating capstone field course. The program is administered by a research university in the southern U.S. Most students enrolled in the program are in-service teachers who seek to expand their geosciences content knowledge. This research study focused on the Environmental Geoscience course, offered as a second-year, fall semester course within the program. Therefore, students enrolled in this course have a year of experience within online classes and are familiar with the course structure and platform system.

METHODS

Because of students' comments and electronic communication during the height of the *Deepwater Horizon* spill in summer 2010, we developed a survey to gauge whether students' current geographic locations and sense of place influenced their level of knowledge, concern for the spill, and behavioral responses after the oil spill. Two instructors—a geography professor with a geospatial research interest and a geology professor with an interest in geoscience education—constructed the resultant 24-question survey (see Supplemental Materials at http://dx.doi.org/10.5408/12-357s1). To ensure effective instrument design, three categories were identified for the goals and objectives of the survey: student background, oil spill content knowledge, and subsequent classroom incorporation of the oil spill. Questions were designed to (1) query one concept per question, (2) clearly specify the query's intent, (3) allow all possible responses of an item, and (4) maximize efficiency of item choices to avoid clutter. The survey development process involved four iterations, elimination of confusing or redundant questions, and organization of questions into categories for better flow of the instrument. The survey was further validated through pilot testing by online instructors

familiar with online program's course structure and student population.

Students in four sections of Environmental Geoscience ($n = 29, 19, 7, 28$) were offered the opportunity to access the survey to offer their feedback. No rewards or incentives were offered, and students had to access an electronic informed consent form and agree to its terms before the Gulf Oil Spill Survey was available to them.

Survey responses, logged according to students' zip codes, were assigned random numbers to protect students' identities. Analysis of survey data proceeded via a mixed methodology approach (Creswell, 1994; Tashakkori and Teddlie, 1998). A statistical multivariate analysis of variance (MANOVA) was chosen to compare students' sense of place (geographic location and affiliation) with other variables to account for possible patterns of covariations among participants and to limit error potential. Content analysis for open-ended responses proceeded according to Neuendorf's (2002) guidelines.

The Gulf Oil Spill Survey

Several questions probed students' background (sense of place) and included geographic location and general demographics. Students reported their current zip codes and whether they had ever lived in the Gulf Coast region. Students also chose the geographic region they considered "home."

Questions regarding the *Deepwater Horizon* spill probed students' environmental interest in the spill, the (disaster) level at which they personally classified the incident, and their content knowledge of the spill (geographic location and magnitude of accidental petroleum release). Additional questions probed students' emotional responses to the spill, the impact of the spill within their lives, and the potential impact on their future interactions with the Gulf Coast. Finally, students' opinions were sought as to whether the oil spill would affect their fossil fuel use and whether their perceptions of alternative energy sources had changed. Students also predicted the length of time that would be needed for the Gulf Coast's recovery from the spill's impact.

Because practicing teachers constitute most of the student population in the online master's program, the last group of survey questions probed the *Deepwater Horizon* incident's current and future impact in the classroom. Students reported the grade levels and subjects they teach and whether they planned to incorporate the oil spill into their classrooms. Questions probed the amount of time that could be allocated to the oil spill issue and whether in-class or homework assignments would be used. Finally, students were asked to respond to the statement "K–12 teachers should be morally obligated to teach about the oil spill."

A final survey question offered students the opportunity to provide more in-depth information on any question or make additional comments.

RESULTS

Although no incentives were offered to students for participation in the Gulf Oil Spill Survey, 92.8% of students ($N = 77$) from all sections of Environmental Geoscience ($N = 83$ total enrollment) accessed and responded to the survey. Geographic locations of the students were plotted via zip codes and indicated a rather dispersed online student

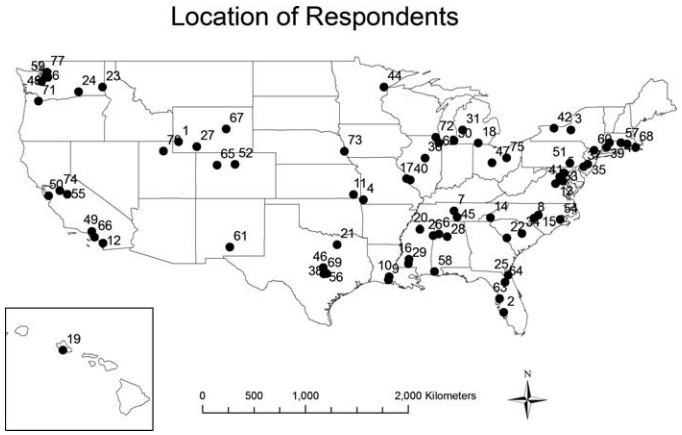

FIGURE 3: Geographic locations of student responders ($N = 77$) to the Gulf Oil Spill Survey are plotted for anonymous student numbers by postal zip codes.

population (Fig. 3). Only 18.2% students ($n = 14$) considered the southern U.S. region their "home." Seven students reported the Gulf Coast as their primary residence, while two students noted that the Gulf Coast was their childhood area. Nine students lived on the Gulf Coast because of employment after college, and three students reported the Gulf Coast as a sporadic residence only. Our students' Gulf Coast state associations included Texas ($n = 7$), Louisiana ($n = 7$), Mississippi ($n = 3$), Alabama ($n = 2$), and Florida ($n = 8$). Most students (72.7%, $n = 56$) stated they had no association with the Gulf Coast.

Gulf Oil Spill Survey Responses

Student Interest

Most students stated that they were "very interested" in the Gulf oil spill and environmental issues (66.2%, $n = 51$). All but two students expressed some level of concern, including seven students who were "extremely interested" and 17 students who were "somewhat interested." A diagram of students' level of concern according to geographic location revealed no obvious pattern, however (Fig. 4).

Similar results were noted for the categorization of the *Deepwater Horizon* spill as a catastrophic event, with most students agreeing ($n = 41$, 53.2%) or strongly agreeing ($n = 19$, 24.7%) that this incident was the "worst U.S. environmental disaster within the last 50 years."

Gulf Oil Spill Student Content Knowledge

When students were asked to estimate the amount of oil that was released from June through August 2010, most students could not accurately do so. It is estimated that approximately 4.9 million barrels, or 210 million gallons, were accidentally released during the duration of the *Deepwater Horizon* incident (United States Coast Guard, 2011). In our analysis, we opted to consider responses within 20% of the official estimates as correct responses (provided the students also supplied the correct unit). Twenty-five students (32.5%) were accurate in their estimates.

Students' content knowledge of the location of the *Deepwater Horizon* rig fared better. In the survey, 49 students

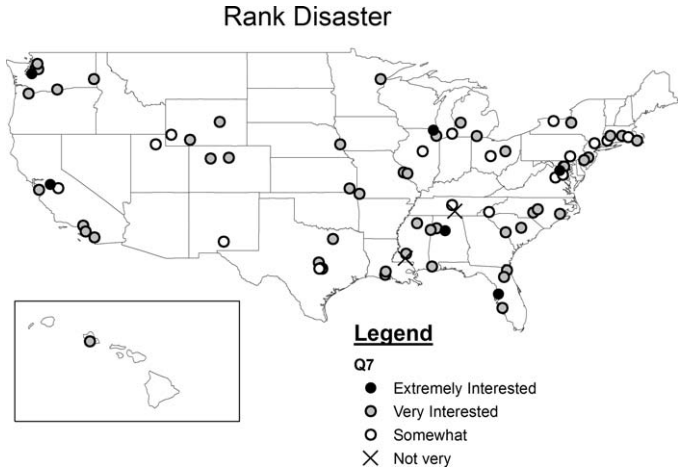

FIGURE 4: Students' level of concern for the *Deepwater Horizon* oil spill and other environmental issues is plotted against geographic location. Upon initial perusal, there appeared to be no correlation between geographic location and level of interest.

(63.6%) picked the correct location on the provided map (Supplemental Materials, Question 10).

Gulf Oil Spill Emotional Response

Students acknowledged being "extremely upset" (n = 7), "upset" (n = 33), or "somewhat upset" (n = 24) by the Gulf oil spill. Only three students stated that they were unaffected emotionally. However, the responses varied on the effects of the oil spill on students' personal lives. Twenty-four students (31.6%) stated they had no direct effects, while 26 students (34.2%) were "upset about the marsh ecosystem." Although some students vowed to change their consumption of seafood because of the spill, the majority (n = 43, 55.8%) noted that the spill had no impact on their decision to consume Gulf Coast seafood.

Our students were divided on whether the oil spill influenced conservation of fossil fuels (27 students in disagreement versus 20 students in agreement), with most students (n = 30) having no opinion. Alternative energy sources were more positively received, with 49 students either strongly favoring or favoring alternative sources, compared with 15 students who disagreed or strongly disagreed with being more inclined toward energy sources other than fossil fuels. Students predicted that the Gulf Coast would take several years (n = 19), decades (n = 52), or even centuries (n = 13) to recover.

Inclusion of the Gulf Oil Spill in the Classroom

Of the survey respondents, we were surprised to learn that 15 students (19.5%) were not teaching. However, most of those students who were teaching planned to include the Gulf oil spill in their classrooms, with 35 students (45.5%) planning to use in-class assignments on the *Deepwater Horizon* incident and 26 students (33.8%) planning to incorporate homework assignments involving the spill. When students responded with an estimation of the amount of time they would spend on the oil spill in their classrooms, the range varied from 0.5 to 8 class periods. Most teachers (n = 25) predicted they would include the Gulf oil spill in one or two class periods.

Correlation Between Sense of Place and Student Responses

We subjected survey data to statistical analysis. A two-way MANOVA determined the effect of the students' association (sense of place) with the Gulf Coast, their home region, and their age group on their interest in the *Deepwater Horizon* oil spill, knowledge of the oil spill, emotional connection to the spill, and behavior change related to the oil spill. Although the distribution of interest based on current location did not show a distinct pattern (Fig. 4), when we investigated the students' true "home" or geographic affiliation with the Gulf Coast, statistically significant relationships emerged.

The initial analysis investigated students' specific regions, with each region coded using a separate value. However, multiple regions only included one or two individuals, so the analysis was discarded because of lack of diverse regional data. We returned to Question 3 and coded students as either (1) associated with the Gulf Coast or (2) not associated with the Gulf Coast. The analysis was rerun, and all other variables in the survey questions were compared with the individual's association or nonassociation with the Gulf Coast region, as well as with the individual's age category. (Because Box M indicated significance in homogeneity between groups, Pillai's trace values are reported.) Age groups were given in year-born ranges: before 1945 (n = 0), 1945–1955 (n = 6), 1956–1965 (n = 16), 1966–1975 (n = 27), or after 1976 (n = 28). The results indicate that students' association with the Gulf Coast played a significant role in their *Deepwater Horizon* oil spill interest level [Pillai's trace = 0.157, $F(5, 65) = 2.419$, p = 0.045, $\eta^2 = 0.157$]. Age categories of participants did not show overall significance in the MANOVA test [Pillai's trace = 0.243, $F(15, 201) = 1.139$, $p = 0.324$, $\eta^2 = 0.078$]. Table I includes data results for the multivariate test.

We conducted univariate ANOVA and Bonferroni post hoc tests as follow-up tests. ANOVA results confirmed the significance between those associated with the Gulf Coast and interest level in the oil spill [$F(1, 1.862) = 3.897$, p = 0.05, $\eta^2 = 0.144$]. A post hoc test did not unearth unexpected results among the age groups. Based on the average Gulf of Mexico oil spill interest level mean score for those associated with the Gulf Coast compared with those not associated

TABLE I: Two-way MANOVA revealed that students' association with the Gulf Coast as a "home" region was significant in the students' interest level to the *Deepwater Horizon* oil spill. Student age categories, however, were not significantly linked to interest level.

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Association with the Gulf Coast	Pillai's trace	0.157	2.419	5	65	0.045	0.157
Age	Pillai's trace	0.235	1.139	15	201	0.324	0.078

with the Gulf Coast, those associated with the Gulf Coast show a significantly higher interest in the *Deepwater Horizon* oil spill in the Gulf of Mexico.

Despite increased interest in the spill from those students with a Gulf Coast association, there was no parallel increase in content knowledge about the spill (e.g., Questions 9 and 10). When we examined students' association with the Gulf Coast and their knowledge of the location and magnitude of the *Deepwater Horizon* oil spill, we found no significance. Students who were associated with the Gulf Coast exhibited knowledge levels similar to those of students who had no Gulf Coast association ($p = 0.05$). Likewise, there was no relationship among Gulf Coast association, age, and the subjects that our students, as in-service teachers, taught. Most of our students ($n = 27$) taught Earth Science. There were also chemistry teachers ($n = 10$), biology teachers ($n = 13$), mathematics teachers ($n = 2$), or other disciplines ($n = 10$), including nontraditional classroom settings or middle-school physical science. (In the initial analysis that investigated subjects taught against other variables, we eliminated those students who were not actively teaching.)

Content Analysis of Open-Ended Responses

The Gulf Oil Spill Survey free responses were analyzed using Neuendorf's (2002) guidelines for content analysis. Two researchers independently read through responses to identify the variables contained in students' responses. Next, variables were used to define concepts and identify categories whose parameters contained the variables. (Categories included ecology, interrelated science, environmental concerns, energy resources such as fossil fuels and alternatives, and classroom implementation—advantages and constraints). Analysis of categories led to the recognition of patterns and themes. Three stable themes emerged: (1) the *Deepwater Horizon* incident served as an important portal to expose K–12 students to environmental perspectives and to direct students' concern toward the marsh ecosystem; (2) environmental concern should facilitate a re-examination of global oil dependence, conservation of natural resources, and investigation of alternative sources; and (3) environmental concern and sense of place do not translate to increased classroom time for the *Deepwater Horizon* spill, because states' scope and sequence charts, pacing guides, and standardized tests dictated most content in science classrooms.

Our students emphasized that the public "should be more educated on all of the effects that a major accident like the Gulf oil spill has on the environment," and environmental perspectives should promote "decreasing the carbon footprint for future generations." One teacher stated that classroom discussion revealed "a spray of feelings from everyone" and that multiple perspectives had to be included, with the teacher responding to "different points of view that were going around including: Oil is bad and we should be off of it, oil is fine—oh well, the environment is ruined forever, the environment is fine, who cares about the environment."

Several comments noted that the *Deepwater Horizon* incident should "emphasize the very great need to move to an alternate fuel source." Its inclusion in K–12 classrooms would promote "stewardship in regards to our planet and all of the environment and inhabitants."

Despite the timeliness of the Gulf oil spill, the common theme that ran through comments of classroom incorporation was that teachers' state policies dictated what had to be taught in the classroom. One student noted, "We don't have much time to allot in the curriculum," while another student stated, "Competencies required by the state department need to be taught first."

Two minor themes also emerged in our content analysis: some students voiced concern over "moral obligations" to teach any topic, while other students reported frustration with media reports, which they felt did not effectively capture the depth and breadth of the incident. Some students strongly objected to the suggestion that they were "morally obligated" to teach a topic, with one student noting, "Public school educators need to refrain from subjecting students to their own personal morals." Another student reflected that the Gulf oil spill should be taught to their students "not on moral grounds but because something [is] scientifically happening in the world around them." Still another student reflected, "It is a good idea and timely—yes but morally right, not my call."

Several students expressed frustration with what they perceived to be media bias in the reporting of the *Deepwater Horizon* oil spill. A student in the military reflected that his or her personal interaction with the area provided "a better idea of the scope of the damage that could not be contained in a 30 second news bit."

After the original content analysis, we returned to the survey data and sought to determine whether there was correlation between the emerging themes and our students' connection to the Gulf Coast. We found no correlations. Although students with Gulf Coast associations expressed greater interest levels than their noncoast peers for the *Deepwater Horizon* spill, this interest did not translate into greater concern for incorporation of environmental issues in the classroom or increased awareness of energy sources and sustainability.

DISCUSSION AND IMPLICATIONS

Shortly after the *Deepwater Horizon* oil spill in the Gulf of Mexico, most students in the online Environmental Geoscience course voluntarily responded to our survey request, expressed interest in the spill, and reflected upon the spill's impacts on the environment and in their personal lives. Those students with personal affiliations to the Gulf Coast—that is, those students who included the Gulf in their place attachment—exhibited greater interest and concern over the Gulf oil spill. This positive relationship between students' Gulf Coast association and their interest in the *Deepwater Horizon* oil spill was not surprising. Previous research linked environmental concern with an individual's sense of place (Kaltenborn and Williams, 2002), and we hypothesized that students with a personal Gulf Coast association would express greater interest in an environmental disaster that occurred in a region that was incorporated within their sense of place. (However, we only attempted to correlate geographic affiliations, not place meaning.)

Somewhat unexpectedly, students associated with the Gulf Coast showed no increase in cognitive insight when queried about facts related to the oil spill. Some previous research investigations indicated a sense-of-place attachment or a significant interest in a geographic region may

correlate with more knowledge about a region (Stedman, 2002; Farnum et al., 2005; Smaldone, 2005). We could not statistically verify that in our investigation. One factor that may have affected content knowledge was the intensive media coverage of the Gulf spill, which often included conflicting reports. Media reports may have had a stronger influence on students' knowledge and misconceptions about the *Deepwater Horizon* spill, and future research should examine whether media sources and/or discrepancies affected knowledge and influenced behavioral changes related to the spill.

Even though students associated with the Gulf Coast expressed more interest in the spill, they did not exhibit more behavioral changes than their noncoast peers. Nor did emerging themes from the content analysis of open-ended responses reveal greater concern or behavioral impact from students with a stronger tie to the Gulf Coast. Several other variables possibly influenced those students regarding the Gulf oil spill. Many Gulf Coast residents have family members employed in the petroleum industry. Therefore, Gulf Coast students may have been concerned over unemployment as a result of the petroleum industry's postspill image, in addition to being concerned over the spill's effects on seafood and tourism industries. More research is needed to determine whether these variables were part of students' considerations in their responses to the Gulf oil spill disaster.

We also observed that interest in the Gulf oil spill diminished over the subsequent year. Following our research investigation with the Gulf Oil Spill Survey in the Environmental Gesocience course (fall 2010), we introduced the *Deepwater Horizon* oil spill as one of four required discussion topics in the spring 2011 semester's Geology II, Earth, Time, and Life course. The Geology II course is also part of the online master's program but was offered as a first-year, second-semester course within the program. Therefore, the student populations of the two courses did not overlap.

Prior to the spring 2011 semester, our mandatory discussions within the Geology II course focused entirely on climate change. (See Clary and Wandersee, 2012a, for a thorough discussion of mandatory discussions and methodology.) We were able to directly relate the spill to the location of fossil fuel resources to the Gulf of Mexico's formation and salt tectonics, two topics discussed within the course. Because the discussion was implemented less than a year after the *Deepwater Horizon* incident, we suspected students would respond favorably to the topic. Although our previous research with mandatory online discussion boards indicated that semesterlong discussions resulted in improved content knowledge and student understanding of the nature of science (Clary and Wandersee, 2012a), we did not observe similar results with the 3-week mandatory discussion units. The analysis of the open-ended response questions revealed that the *Deepwater Horizon* discussion unit was not effective at increasing students' content knowledge about the spill, increasing their general scientific literacy, or overcoming their scientific misconceptions (Clary and Wandersee, 2012b). Despite the recent nature of the Gulf spill event, students chose "biodiversity" and "climate change" as their most interesting and favored discussion topics. The *Deepwater Horizon* oil spill garnered few student votes. However, these results are in accordance with risk perception research (Kasperson et al., 1988), because the sensationalism of the media's coverage of the Gulf oil spill greatly diminished following the final interception and "killing" of the well in September 2010, although scientific research and reports continued.

Although our research only revealed a correlation between level of concern for the oil spill and student geographic affiliation with the Gulf Coast, we propose that these results have implications for geoscience education. Our results showed a significant increase in concern levels for those students who had an association to the Gulf Coast. This may indicate an opportunity for educators to tap into the affective domain of their students and leverage students' affiliations and senses of place with important scientific constructs and environmental issues. Understanding students' senses of place may also help instructors develop appropriate discussion forum questions and assignments. This may further encourage knowledge acquisition based on the students' specific interest areas. However, the role and potential influences of the popular media and other competing variables should be investigated to optimize scaffolding geoscience content knowledge through students' geographic affiliations and senses of place.

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