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Effects of an introductory geography course on student perceptions of geography at the University of Idaho

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This case study surveyed students in geography courses at the University of Idaho, investigating perceptions of geography's role in their daily lives, relevance to careers or academics, and parts of their geographic skill. Primarily, white, younger than 20, gender-balanced students in Introduction to Physical Geography and Human Geography courses comprised the study sample. A sample of 265 students formed the pre-course survey and 82 students formed the post-course survey. Pre-course, men held a more positive sense of geographic skill, while women viewed more positively geography's relevance to careers and academics. Post-course, women's agreement concerning geography's role significantly increased, outpacing men's agreement.

Keywords: geographic perception; gender; course impact; student views

Introduction

Geography coursework directly influences student perceptions of geography: the first geography course a student takes will influence their perception of geography for the rest of their academic career (Jones, 2006), while geography courses can help students connect with their campus and environment (Sommers, 1997). However, connecting with students and understanding instructional influences are challenging in large introductory courses (Brown, 1994). Knowing which students have greater understandings of geography is useful for refining geography education (Sinton, 2009). Geography educators benefit substantially from a more detailed understanding of students in geography courses and programs (Murphy, 2007). An understanding of how geography's inherently cross-disciplinary nature (Baerwald, 2010) and multifaceted standing influence geographic perception is an important aspect of geography education research. As academic geography has grown in size and diversity, however, it is unknown what perceptual differences exist across gender, age, and cultural lines (Hopwood, 2008). Understanding how these demographics perceive geography can guide and refine outreach efforts. This case study seeks to understand how students perceive geography in introductory geography courses at the University of Idaho (UI). We investigate whether perceptual differences of geography exist between demographic groups in this population, and how completion of a geography course alters student perceptions of geography as a discipline.

Background

Geography is a complex, multidisciplinary subject. Geography education is researched to understand the role and contributions of geography in education more broadly (Firth &

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Morgan, 2010) as well as its relationship to other disciplines (Lambert, 2010). These advances parallel a more complete and interdisciplinary view of geography as a subject of teaching and learning (Taylor, 2009). Students engaged in their introductory science course develop greater interest in the subject (Gasiewski, Eagan, Garcia, Hurtado, & Chang, 2012), yet balancing theory, practice, and effective teaching methods in geographic curriculum is difficult (Morgan & Firth, 2010), complicated by the lack of a measurable increase in geographic understanding, particularly in the USA (National Geographic Education Foundation & Roper Public Affairs, 2006). This difficulty persists despite evidence of progress in engaging K-12 students in geography and related concepts through extra-curricular activities (Thomas-Brown, 2011) and hands-on and engaged learning exercises (Farmer, Knapp, & Benton, 2007).

Method of instruction plays an important role in student attitude. Blended learning models increase critical thinking in students (Korkmaz & Karakuş, 2009), while active learning increases student engagement (Day, 2012). Extensive planning is necessary to maintain teaching quality in introductory high-enrollment courses (Brown, 1989). Reduced content and support found in large courses can become a problem for student learning (Jenkins & Smith, 1993), and instructors are often hesitant to begin implementation of different instructional styles (Scheyvens, Griffin, Jocoy, Liu, & Bradford, 2008). Combining these factors, student learning and understanding of subject relevance vary based on their perceptions of instruction (Smimou & Dahl, 2012). Research in mathematics has found that students who perceive math skills as useful have higher self-confidence and enjoyment of the subject (Ramos & Carvalho, 2011). Visual literacy influences science learning; for example, understanding a diagram varies based on student comprehension abilities and visual understanding (McTigue & Flowers, 2011). Geographic perception varies similarly. Students have not been able to consistently perceive the goals of their geographic curriculum (Bar-Gal & Sofer, 2010), and link geographic skill as primarily beneficial to studying history (Uto-Visi, 2001).

The complexity of some basic geographic tenets is a pedagogical challenge. To understand a basic spatial relationship, students need an understanding of mathematics, metaphor, and visual literacy to fully grasp the spatial concept (Johnson, Watson, Delahunty, McSwiggen, & Smith, 2011). Understanding maps requires textual and visual learning, and different combinations of text and visuals result in varied learning outcomes (Lloyd & Bunch, 2010). As students access geographic topics, their understanding becomes more comprehensive over time (Taylor, 2011), but the students' realization of geographic skills can develop suddenly rather than gradually (Ünlü, 2011). Despite a historically high number of students pursuing geography degrees, lack of coordination in geography education might result in a diminished or no longer cognitively separate and unique field (Castree et al., 2007).

Research across demographics in related science, technology, engineering and mathematics (STEM) fields has shown perceptual differences for gender, race, and age (sometimes leading to reduced representation in the workforce). Engineering students hold differing perceptions of their education by gender (Tully & Jacobs, 2010), while Miller, Blessing, and Schwartz (2006) found that women perceive scientific jobs as less interesting and more unattractive as a career. Primary schoolgirls report less enjoyment and more anxiety related to mathematics than boys (Frenzel, Pekrun, & Goetz, 2007), while women's perceptions of mathematics depend greatly on the type of interactions they receive (Stout, Dasgupta, Hunsinger, & McManus, 2011). Minority women (specifically Asian) remain significantly underrepresented in STEM careers (Wu & Jing, 2011), while minorities in science and health professions remain severely underrepresented (Winkleby,

Ned, Ahn, Koehler, & Kennedy, 2009). Nontraditional students succeed under altered pedagogy from traditional peers (Roberts, 2010), but relatively older students in the college classroom also require additional support structures to succeed (Schaefer, 2010). Student demography impacts learning experience generally (Pike & Killian, 2001) and influences geographic understanding. Ethnicity, combined with social, economic, gender, and age factors, impacts student performance in higher education, even when socioeconomic status improves (Stuart, Lido, & Morgan, 2011).

There remains a gap in understanding how postsecondary students (who voluntarily enroll in geography courses) perceive geography as a discipline and respond to geographic instruction across demographic groups, and there are few case studies that seek to address that gap. The present research was conducted to form a better understanding of how UI undergraduate students form and change perceptions of geography's role in their daily lives, its relevance to their future careers, and their own geographic skills. The primary objectives of this study were to (1) understand the initial perceptions of geography held by undergraduate students enrolled in two introductory geography courses at the UI, (2) quantify changes in perceptions of geography resulting from the completion of lecture-based introductory geography courses, and (3) determine whether differences in perception can be attributed to demographic differences across the population.

Methods

We developed and administered a survey to students in two introductory level courses at UI during the spring semester of 2011: Physical Geography and Human Geography. We selected these courses because they comprise primarily (i.e., 99%) students not majoring in geography and typically include a broad sample of the UI undergraduate populace; during any given semester, 3–4% of the university undergraduate population is enrolled in one of these two courses. The Physical Geography course focuses on fundamental earth systems processes in the atmosphere, lithosphere, and biosphere. The Human Geography course focuses on human interactions with the landscape. Professors not involved in the present study taught each course in a traditional lecture format, meeting three times a week in 50-minute blocks. Regular tests (multiple choice and written) assessed student learning. A lab component existed for Physical Geography, which focused on hands-on supplemental learning, and although co-registration in lecture and lab was not a requirement, approximately 90% of students were co-registered. An experienced instructor, without active research, taught the Physical Geography course, and a tenured full professor, actively researching in a human geography subfield, taught the Human Geography course. Both professors have previously taught these courses. Students from a single major are not dominant in these courses; instead, students who register for these courses choose to take geography as a component of their education, and this case study represents that choice.

We administered the survey in two parts. First, a pre-course survey was distributed and completed in-class during the first week of the semester to capture pre-course perceptions of geography unaffected by the course content. We administered the survey to students before introductory course content lectures the first week of classes. The pre-survey consisted of 35 Likert-scale questions on a five-point scale, where a response of "1" indicated strong disagreement with a given statement, a response of "5" indicated strong agreement, and a response of "3" provided a neutral "neither agree nor disagree" selection.

Survey questions informally fit into three content areas. Twelve questions (referred to as "Role" questions) pertained to student perceptions of geography's general role in their

daily lives and applicability to general topics. Another 12 questions (“Relevance” questions) addressed student perceptions of geography’s relevance to selected careers and academic fields. The remaining 11 questions (“Skill” questions) addressed student perceptions of basic components of their own simple geographic skills, in this case, focusing on ability to use geographic tools. These questions do not explicitly test student capabilities, but instead rely on self-expression of skills and abilities. In addition to the 35 questions (Table 1), we collected demographic information on student age, gender, ethnicity, and previous geography courses completed.

We repeated this survey during the last week of classes prior to final exams. Students at UI refer to this week colloquially as “dead week”, and an observed large drop in respondents reflects reduced attendance during this week of courses. We administered surveys in both courses after a review session of course content. We added four open-answer questions to the post-course survey to gather qualitative data, in addition to the repeated Likert-scale questions, to understand what portions of the course impacted student perception. These questions asked students what portions of the course resonated with them, and which geographic topics or ideas influenced their views the most. Student participation in all aspects of this study was nonmandatory, did not affect grades positively or negatively, and aside from reminders from the professors in class and through email, instructional components of the courses did not integrate this study.

To address the first objective, we used an exploratory data analysis and characterized the range of student perceptions of geography across the three topic areas for the 265 pre-survey respondents. To address the second objective, we conducted a comparative analysis to identify significant differences between pre- and post-survey ($n = 82$) perceptions, utilizing the qualitative responses to characterize and explain results. This comparative analysis occurred by full population and by demographic stratification.

We investigated differences in demographic groups with the null hypothesis of no significant difference. For individual questions, we compared gender (women vs. men), ethnicity (white vs. nonwhite), prior geographic experience in high school (HS) as defined by whether or not geography courses were taken (no courses vs. yes courses), and age (18–22 vs. older than 22). We tested for significant differences using the two-tailed t -test at the 95% confidence level ($p < 0.05$) (Student, 1908). The qualitative answers from the post-survey were coded in Atlas.ti and analyzed in conjunction with the pre-to-post change results to better understand what information, ideas, or examples from the geography courses were affecting student learning.

Students in the pre-survey (Figure 1) were primarily white (87%). Most had not taken a geography course in HS (54%), and were under the age of 20 (51%). More pre-survey respondents were male (52%) than female. Post-survey respondents showed some demographic shift (Figure 1). While students were still primarily white (79%), slightly more reported taking a geography course in HS (52%) and more were female (57%) than male. Education and business majors were the largest populations in the post-survey.

Limitations

As this is a case study, a number of limitations need mentioning. This sample represents students enrolled in introductory geography courses at UI in the spring semester of 2011 only, and is not meant to represent all college undergraduates, particularly since UI is disproportionately white compared to the general population. A large population drop exists between the pre- and post-course surveys. We could not mandate that students take the survey, and we captured a large end of semester drop in attendance. An alternate

Table 1. Quantitative question summaries.

Question	Role category	Question	Relevance category	Question	Interaction/skills category
1	Geographers know where places are	12/13	Geographic knowledge is useful to biology majors/careers	24	Geographic knowledge will be important to my future career
2	Geographers understand spatial relationships	14/15	Geographic knowledge is useful to mathematics majors/careers	25	I know how to use a compass
3	Geographers make maps	16/17	Geographic knowledge is useful to business majors/careers	26	I can use a road map to navigate an unfamiliar place
4	Geographers use geographic information systems software	18/19	Geographic knowledge is useful to education majors/careers	27	I can use the GPS device in my car, on my cell phone, etc.
5	Geographers understand regional connections	20/21	Geographic knowledge is useful to political science majors/careers	28	I am taking this course because I like science
6	Geographers understand human and social connections	22/23	Geographic knowledge is useful to environmental science majors/careers	29	I am taking this course because I enjoy geography
7	Geographers understand cultural connections			30	I am taking this course because I heard it was easy
8	Geographic factors influence political conflicts			31	I am taking this course to fulfill a University requirement
9	Geographic factors influence economics			32	Geographic knowledge helps me in my daily life
10	Geographers can give good directions			33	I use Google Maps, Mapquest, or a similar service to obtain directions to unfamiliar locations
11	Geographical knowledge contributes to world peace			35	Global climate change will affect my way of life in the next 50 years
34	Global climate change is an issue that can be investigated by geographers				

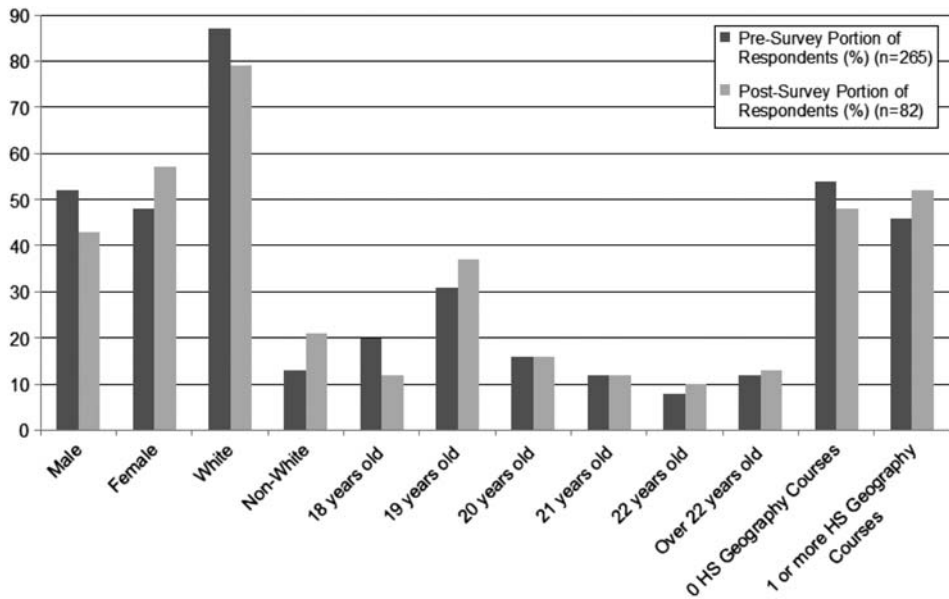


Figure 1. Pre- and post-survey demographics. The dark gray bar represents the pre-survey sample and the light gray bar represents the post-survey sample. Note the shift in gender from primarily male to primarily female, indicating a shift in course attendance from beginning to end of the semester.

survey format that mandated participation in some fashion, or captured student perception more regularly, would not be as vulnerable to these swings in population. Simple survey questions allowed only basic interpretations of change in the survey population. Limited access to the students precluded a more intensive research agenda. An expanded survey should quantify knowledge changes as well as perceptual changes. Despite these limitations, we feel this assessment provides an important window into the perceptions of a student population drawn from primarily rural western communities that are predominantly white and less exposed to global diversity of landscapes and politics compared to their more urban counterparts.

Results

Objective one

In the pre-survey, respondents generally agreed that geography played an important “Role”, that it was “Relevant”, and that they felt they had some geographic “Skill”. Respondents displayed the highest mean level of agreement with statements regarding the “Role” geography plays in their lives (Figure 2). The strongest mean agreement (4.4) was with the statement that geographers understand place (Q1), while the lowest mean level of agreement (2.9) was that geographic knowledge is a contributor to world peace (Q11). For “Role” questions, this singular statement produced a mean level of agreement less than 3.0 (neutral response).

Respondents displayed a slightly lower overall agreement that geography is “Relevant” to their studies and interests (Figure 3). The strongest mean agreement (4.5) was with the statement that geographic knowledge is useful in environmental science careers (Q23), while the lowest mean level of agreement (3.0) was with geographic knowledge being useful in mathematics careers (Q15). For the “Relevance” set of statements, no statement produced a mean level of agreement less than 3.0 (neutral response).

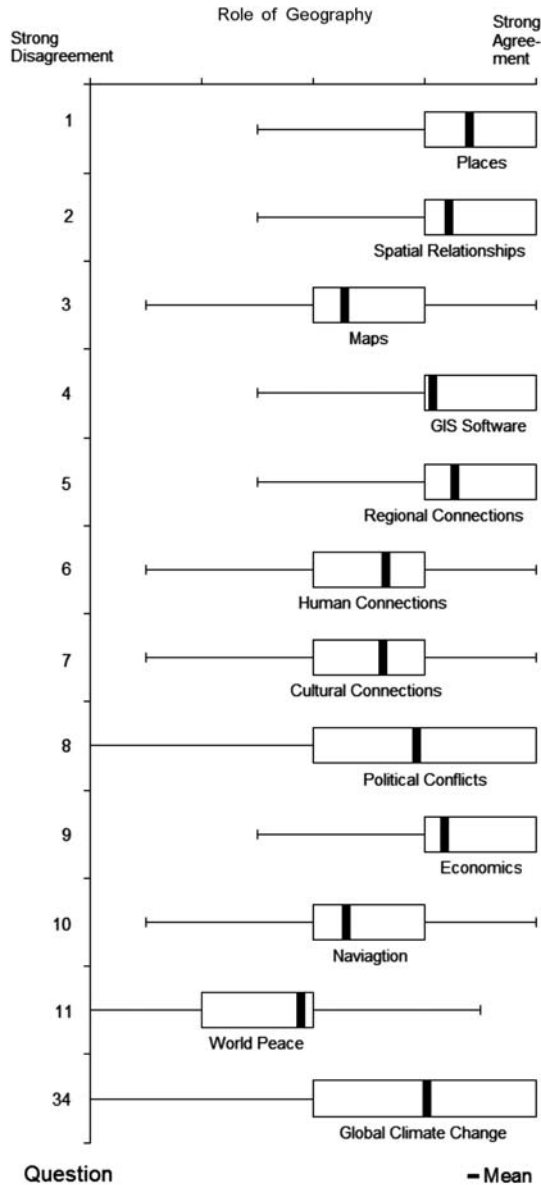


Figure 2. Box plots for pre-survey: Role questions. Box at Q1 and Q3. Whiskers at Inter-Quartile Range (IQR). Students agreed the strongest that geography has a role in understanding place while slightly disagreeing that geography has a role in fostering world peace.

Respondents were comparatively closer to neutral on statements concerning personal geographic “Skill” (Figure 4). The strongest mean agreement (4.4) from respondents was with their perceived ability to use an online mapping service to obtain directions (Q33), while the lowest mean level of agreement (2.5) was with their opinion of geography as an easy subject (Q30). For the “Skill” set of statements, only two statements produced a mean level of agreement less than 3.0 (neutral response).

Comparing the three sets of questions by group for the pre-course survey, respondents displayed nearly equal range and mean agreement with statements identifying the “Role”

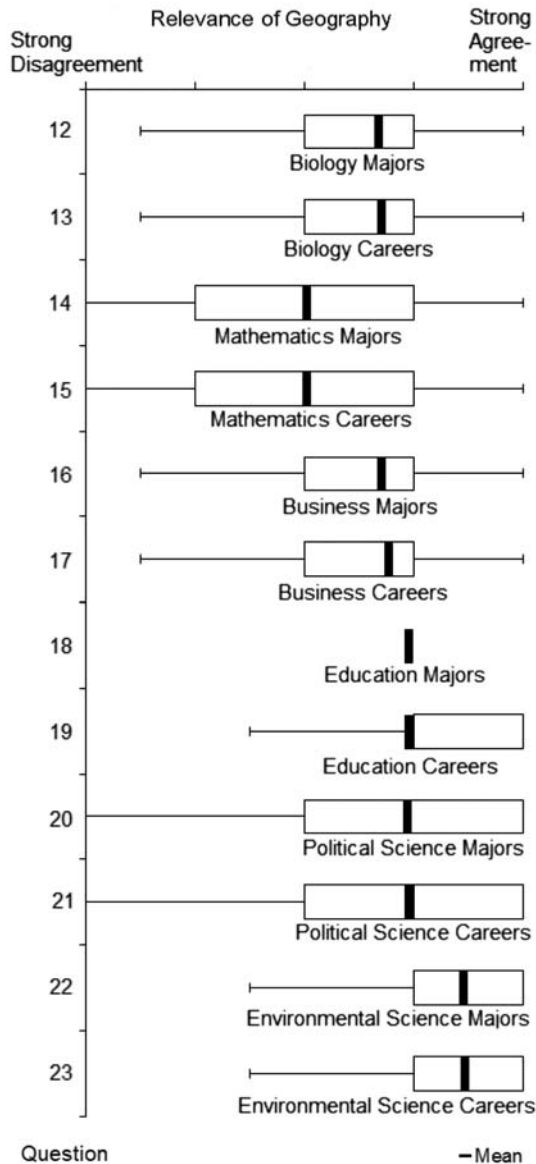


Figure 3. Box plots for pre-survey: Relevance questions. Box at Q1 and Q3. Whiskers at IQR. Students agreed the strongest that geography would be important to environmental science majors and careers, but were neutral about geography's importance in mathematics.

(mean = 3.82) and the "Relevance" (mean = 3.80) of geography. They agreed less with statements qualifying their own personal geography "Skill" (mean = 3.70).

Objective two

In the post-course survey, the greatest significant change was an increase in mean agreement (0.21) with statements about the "Role" of geography. The "Relevance" and "Skill" areas both showed an increase in mean agreement, with a mean difference (m.d.) of 0.12.

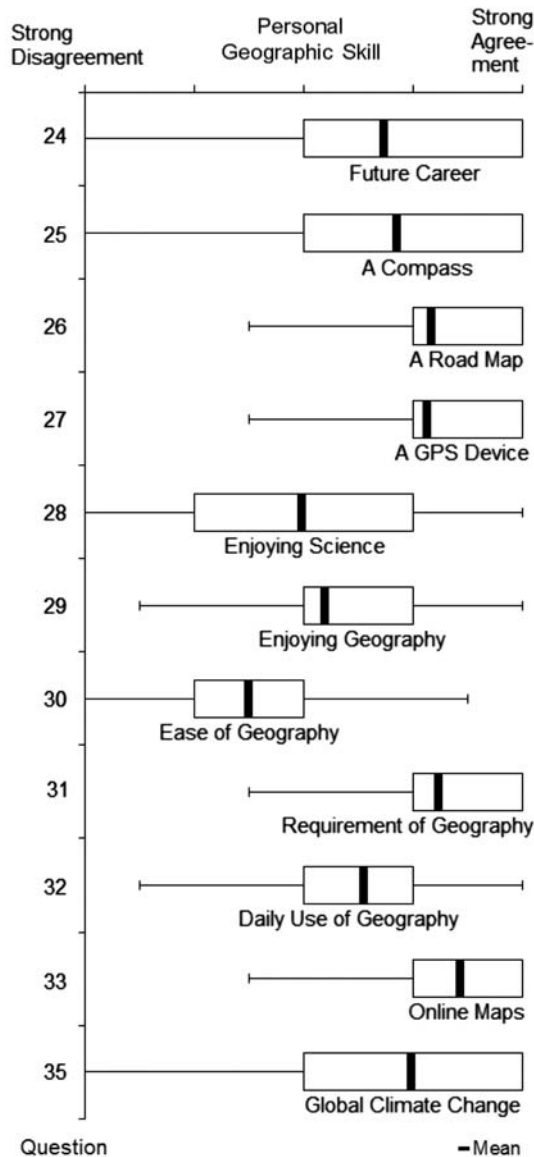


Figure 4. Box plots for pre-survey: Skill questions. Box at Q1 and Q3. Whiskers at IQR. Students agreed the strongest that they were capable of using an online mapping service, but disagreed that geography was an easy subject.

Significant changes in agreement exist for seven questions in the post-survey: six for “Role” questions, one “Relevance” question, and zero “Skill” questions. All changes were positive, indicating greater agreement with statements in the post-survey than in the pre-survey (Figure 5). Q11 (geographic knowledge’s contributions to world peace) had the greatest increase in mean agreement (m.d. = 0.46). The only “Relevance” question with a significant increase in mean agreement (m.d. = 0.27) concerned the relevance of geographic knowledge in mathematics careers (Q15). The changes for each of the three areas in aggregate were statistically significant.

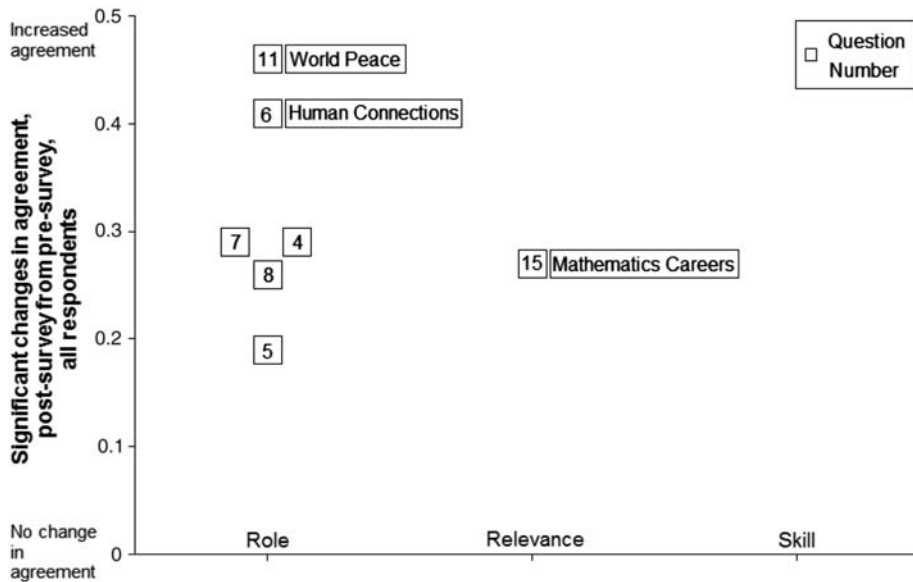


Figure 5. Significant changes in agreement in post-survey by question. All of these questions showed a significant increase in agreement across the survey population in the post-survey. Geography's relevance to world peace showed the strongest increase in agreement, while six of the increases pertained to geography's role in various subjects.

Objective three

For the "Role" of geography, only one pre-survey significant difference was found when stratified by demographics (Figure 6). Students with a HS geography course agreed significantly more (m.d. = 0.19) about the role geographers have in investigating climate change (Q34) than students without HS geography.

Four significant demographic differences were found in the pre-survey "Relevance" stratification (Figure 7): three for ethnicity and one for gender. Women agreed significantly more that geographic knowledge is useful to mathematics majors (Q14; m.d. = 0.23). White students agreed significantly more that geographic knowledge is useful to business majors (Q16; m.d. = 0.52) and business careers (Q17; m.d. = 0.49).

Demographic stratification resulted in 12 significant differences in perceptions of geographic "Skill" (Figure 8). Men reported significantly greater perception of geographic skill than women for seven questions, the greatest difference being their reported ability to use a compass (Q25; m.d. = 0.79). Students with a HS geography course also showed significantly stronger agreement with Q25 (m.d. = 0.33), while students older than 22 agreed significantly more than younger students that they are able to use a road map (Q26; m.d. = 0.36). Students aged 18–22 agreed significantly more that geography is easy (Q30; m.d. = 0.43) and that it is required for their academic studies (Q31; m.d. = 0.44).

Aggregating the questions to the three areas, four significant differences exist in demographic stratification. White students agreed significantly more than nonwhite students with both "Role" (m.d. = 0.13) and "Relevance" (m.d. = 0.23) questions. Students with a HS geography course agreed significantly more with "Skill" questions than students without a HS geography course (m.d. = 0.14), while men showed significantly greater agreement with statements of "Skill" than women (m.d. = 0.29).

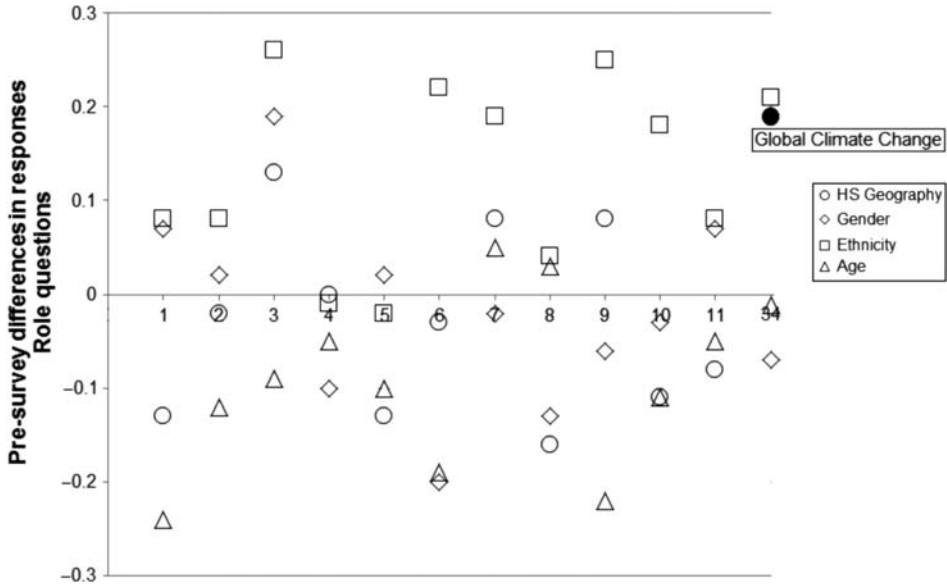


Figure 6. Pre-survey demographic differences: Role questions. Positive numbers indicate more agreement by students with a HS geography course (circles), women (diamonds), white students (squares), and students aged 18–22 (triangles). Negative numbers indicate more agreement by students without a HS geography course (circles), men (diamonds), nonwhite students (squares), and students over the age of 22 (triangles). Filled symbols indicate significant difference. Note that only students who had previously taken a HS geography course hold a significant difference in any area of the Role questions.

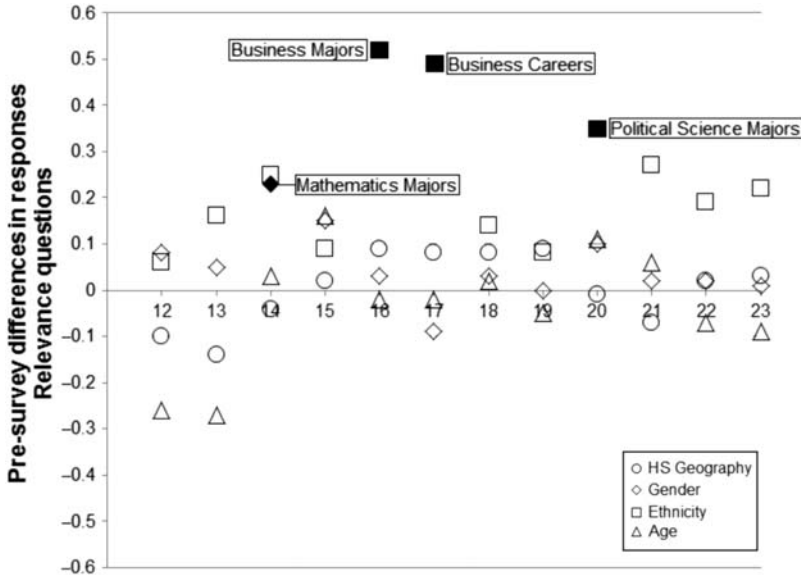


Figure 7. Pre-survey demographic differences: Relevance questions. Positive numbers indicate more agreement by students with a HS geography course (circles), women (diamonds), white students (squares), and students aged 18–22 (triangles). Negative numbers indicate more agreement by students without a HS geography course (circles), men (diamonds), nonwhite students (squares), and students over the age of 22 (triangles). Filled symbols indicate significant difference. White students hold a significantly higher agreement with geography’s relevance in both aspects of business, and for political science majors.

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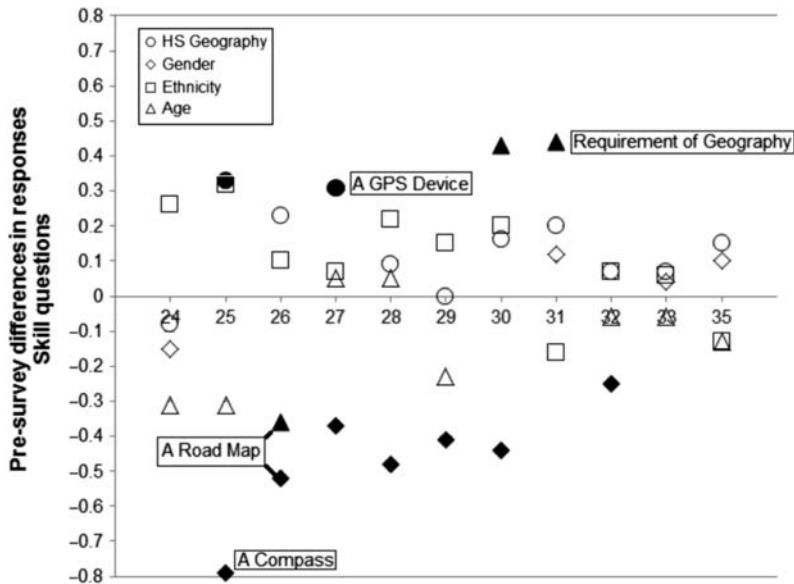


Figure 8. Pre-survey demographic differences: Skill questions. Positive numbers indicate more agreement by students with a HS geography course (circles), women (diamonds), white students (squares), and students aged 18–22 (triangles). Negative numbers indicate more agreement by students without a HS geography course (circles), men (diamonds), nonwhite students (squares), and students over the age of 22 (triangles). Filled symbols indicate significant difference. Note that men hold numerous significantly stronger agreements with these aspects of simple geographic skill.

In assessing changes in agreement from before to after course completion by demographic group, the greatest number of significant changes exists for gender, with 16 questions (Figure 9). All significant changes were positive for women, and the greatest increase in agreement was with geographers' understanding of human and social connections (Q6, *m.d.* = 0.71). Men significantly increased their agreement with two statements, but significantly decreased agreement that geography is useful to daily life (Q32; *m.d.* = -0.38). This was the only significant decrease in agreement from pre-to-post across all demographics.

Nine significant changes in agreement exist in individual questions by age delineation (Figure 10), six for the under-22 group and three for the over-22 group. The greatest change for the under-22 group was a significant increase in agreement that geographic knowledge contributes to world peace (Q11; *m.d.* = 0.47). The over-22 group saw the greatest increase in agreement for any demographic group in appraising the ease of geography (Q30; *m.d.* = 0.97).

Students with a HS geography course showed eight significant changes from pre-to-post; students without a prior geography course showed four (Figure 11). The former group most increased their agreement that geography is important to understanding political conflict (Q8; *m.d.* = 0.54). The latter group most increased their agreement that geographers make human/social and cultural connections (Q6 and Q7; *m.d.* = 0.45).

Quantitative response results

The greatest proportion of students reported that learning about the weather (42%) and climate (7%) was useful to their daily lives (Figure 12). Another 19% noted that basic

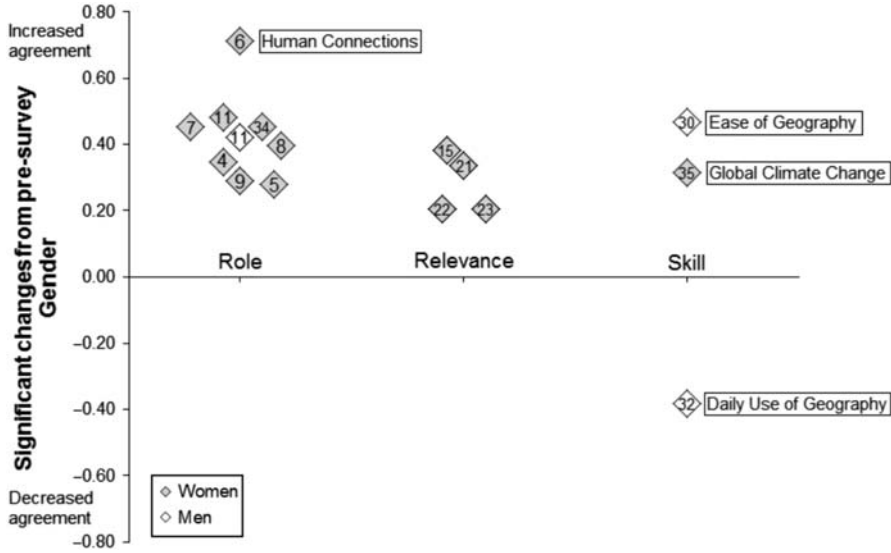


Figure 9. Significant changes in agreement from pre-survey: results by gender. Specific questions are highlighted. Women mostly hold these significant changes, while men hold the only significant decrease. The only shared increase comes concerning the topic of world peace.

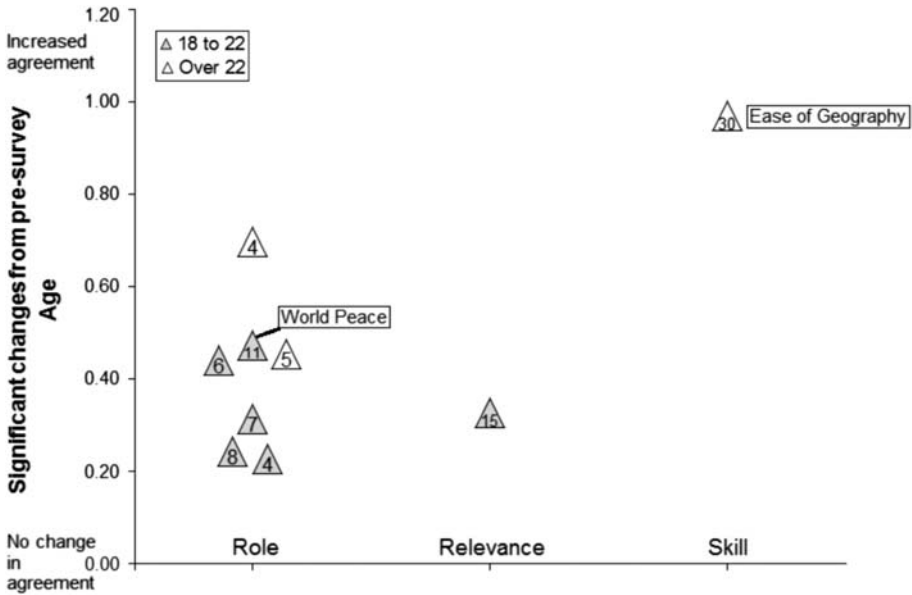


Figure 10. Significant changes in agreement from pre-survey: results by age. Specific questions are highlighted. Older students greatly increased their agreement with the question concerning the ease of geography.

general knowledge was useful to them. Other common answers to the open-ended questions included information on natural disasters (15%), natural resource (10%), and navigation skills (9%). Five percent of students reported nothing they learned was useful. Over three-quarters of respondents (77%) indicated that concepts or techniques learned in the course were relevant to their major. Of these respondents, general knowledge (34%),

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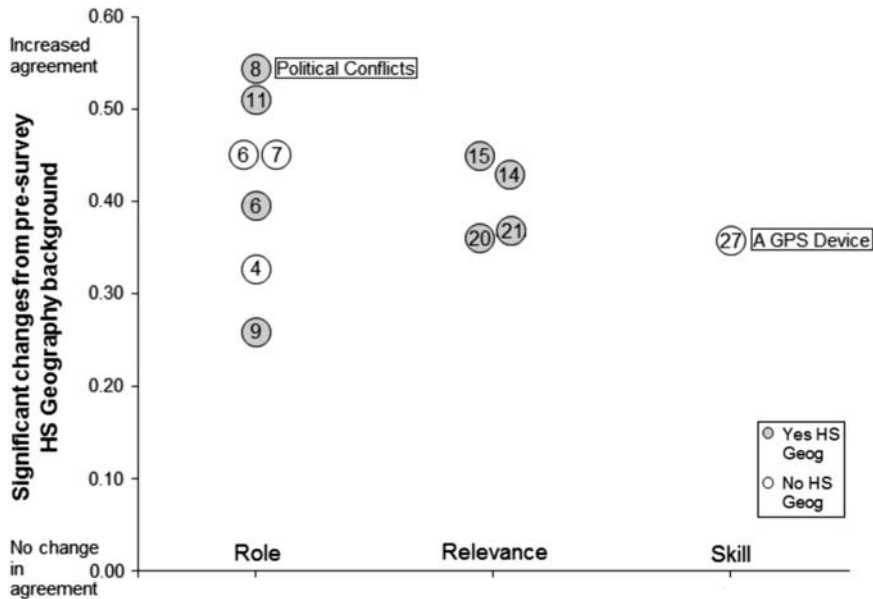


Figure 11. Significant changes in agreement from pre-survey: results by HS geography background. Specific questions are highlighted. Important to note here is that students who have previously taken geography and those who have not are both making increases in agreement with questions in this study.

location and topography (25%), weather and climate (19%), environment and natural resources (8%), and culture (6%) were the most relevant topics. Business students split on the relevance of the course to their major, while all geography, education, and broadcasting and journalism majors felt the information was relevant. Conversely, language majors (86%) and athletic training majors (100%) felt the topic was not relevant to them (Figure 13).

Most respondents (84%) felt that the information they learned would be relevant to their career. Of this group, 60% felt that the general knowledge would be useful, while the remaining (40%) felt a specific skill would be useful. Almost half of the respondents (46%) felt they realized something about geography in their course, while 14% reported that their view of geography was broadened by the course. Slightly more than the 8% of students who felt no impact to their view, and 4% of students felt a negative impact to their view of geography after course completion (Table 2).

Discussion

Students in our case study generally thought geography to play a bigger “Role” in their lives, be more “Relevant” to their academic and future careers, and perceived their own geographic “Skill” to be greater following completion of a geography course. Women and students with a prior course in geography show an emphasized trend of perception of “Role”, “Relevance”, and “Skill”. Students in this case study expanded on their views in written responses. These responses are insights into these students’ mindsets after exposure to new topics and ideas they might not have previously encountered.

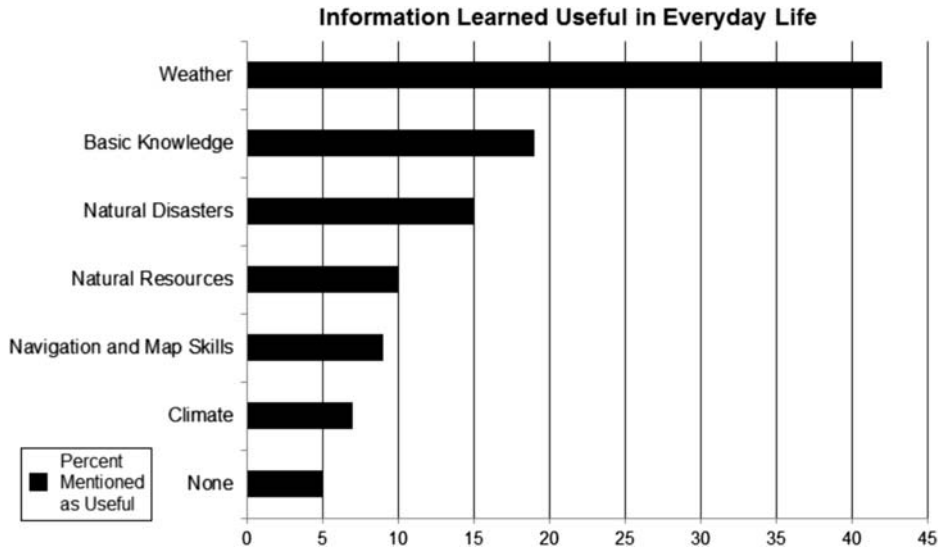


Figure 12. Information noted as useful in everyday life. Students' written responses were broken down into their basic topic. Note the student preoccupation with the weather, mentioned twice as much as any other singular topic.

Men initially perceived themselves as more geographically skilled than women. Previous neurological research has shown in some cases that males have a statistically significant visual-spatial ability over females (Keith, Reynolds, Patel, & Ridley, 2008; Reynolds, Keith, Ridley, & Patel, 2008), and gender differences have been shown in situations requiring strong spatial skills, such as recalling landmarks (Piccardi et al.,

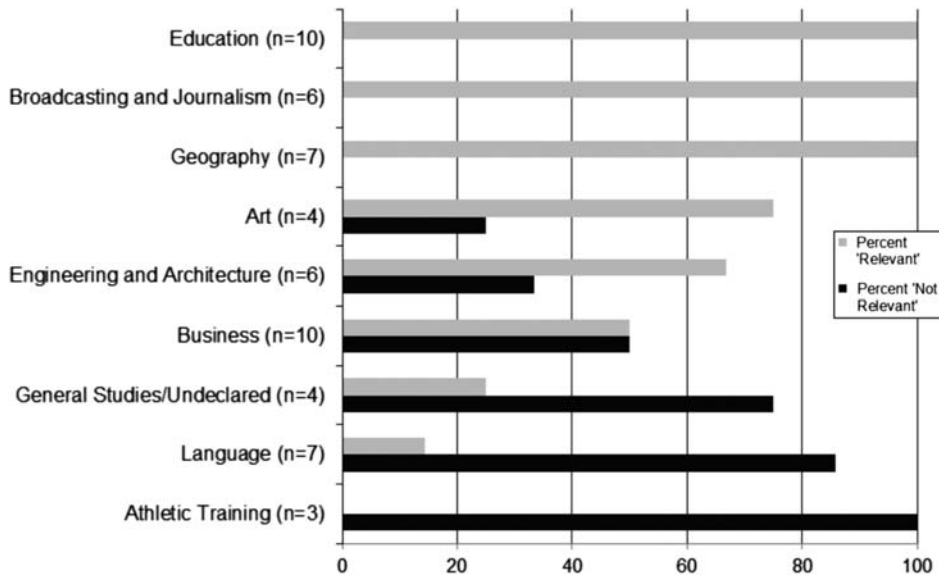


Figure 13. Responses of relevance by major. Majors with $n < 3$ are not represented. While no major in the post-survey held a clear majority, the unanimous agreement of relevance by education majors is worth emphasis.

Table 2. Qualitative question results: impact on view of geography.

Impact on view of geography	
Impact	Percentage
Realized	46
Broadened	14
Interested	14
Enjoyed	13
No impact	8
Negative impact	4

2011). In contrast, Gilmartin & Patton (1984) found no major spatial proficiency differences among college-aged students. We did not test skill in our assessment.

The disparity between men and women in the change analysis, where most significant increases in agreement were by women and men had the only significant decrease, potentially indicates that women gained confidence over the course of the semester in their own geographic capabilities and ability to address geographic content. Men generally did not, perhaps because they already perceived themselves as more skilled pre-course. Neurological research is not clear on whether gendered brains are different (Voyer, Voyer, & Bryden, 1995), and it is difficult to assess which gender is “better” at geography (Butt, Weeden, P., & Wood, 2004). Here, women perceived and identified better with geography than men after course completion and, of particular note, were the only demographic group to increase their agreement with geography’s role in addressing global climate change. Qualitative responses reflect this increase. A female nonscience major wrote:

The information . . . gave me more motivation to take more care and interest in living in a way that will not harm the world.

One female elementary education major wrote:

I want to better understand this information and be able to present it in a way that younger students will understand and enjoy.

While a female environmental science student wrote:

Knowledge about global warming inspired me . . . I will keep looking for more information about global warming throughout my daily life.

Men also responded positively to geographic learning:

My understanding of (Geography’s) importance and broad relevance to everyday life has been increased greatly. Geography plays a vital role in everyone’s life.

Students previously exposed to geography initially not only self-perceived greater geographic skill but also increased those skills through the course more than students without previous geography coursework. This repetition and reinforcement of concepts also applied to statements about geographic “Relevance”; students without a previous geography course showed some increased agreement, but not as great as those who were reinforcing previously learned information. This agrees with previous findings that realization of geography skills may happen rapidly and the repetition of a subject may instigate that realization (Ünlü, 2011). Regardless of background, most students reflected positively on geography’s usefulness. A female student without HS geography noted:

This Geography background helps me to understand, in part, what influenced people in the past to do what they do. Geography is a very useful science as it is a bit broader (than other sciences).

Another female student, an advertising major, made a key connection between her geographic skills and usefulness in her future career:

My major (advertising) is affected by geography because I will be eventually selling and promoting products to consumers and the environment could have an impact on that.

While younger students held a greater perception of their own geographic skill before the course and showed significant changes across more statements, older students perceived their skills to increase following the course and produced larger magnitude changes on average. Previous research has shown that forming a clear picture of the fundamental differences between the capabilities of “digital natives”, who have grown in their education parallel to advances in computer technology, and digital immigrants, who were born and developed largely before these advances, is too complex to always explain in clear terms (Salajan, Schönwetter, & Cleghorn, 2010). Although generation is a factor in digital attunement and access, regular use and learning with digital technologies might allow adults and those without regular technical access to become “digital natives” (Helsper & Eynon, 2010).

Some observations from the older students indicated their advances in geographic perception. A male student older than 22 wrote:

(Geography) is a lot (broader) than I thought it was and really opened my eyes to a possible career choice.

A white student older than 22 added:

(I) gained much more respect for the width of the subject, and ultimately its importance.

There are some interesting and important implications of our findings, particularly for geography education. First, high levels of agreement both before and after the course that geography is important for addressing global climate change reaffirm that these students see geography as important to addressing this potentially catastrophic global issue. This is particularly important in a state like Idaho, where a conservative political structure lags behind much of the country in addressing environmental and global climate concerns that are considered to be politically liberal. Second, the large, significant increases in self-perceptions of skill with GPS and compasses likely stem from an optional lab component of the Physical Geography course taken by approximately 80% of the students who took this survey. An additional hands-on laboratory might be generating this increase.

Third, the statement about the contributions of geographical knowledge to world peace (Q11) showed a significant increase in agreement for five of the eight demographics despite having one of the lowest levels of agreement in the pre-survey. This increase occurred despite neither course explicitly incorporating world peace as a curriculum topic. This change perhaps best illustrates the wide range and applicability of geographical knowledge; geographers are able to connect issues in novel and unique ways. Fourth, while the written responses generally showed an understanding of the multidiscipline nature of geography, only two mentioned the “spatial” core of geographic investigation. While perceptual change is evident in the students in this study, a single geography course has not completely given students a complete geographic education.

A few responses from this survey capture the necessity of geographic knowledge and the meaningful alterations to the lives of students in this study. One elementary education major’s view is as follows:

Learning about resources has opened my eyes to the thought of a world without some of them (like Helium, fuel or even fresh water). (This) class makes me think about making life changes.

A student who had never taken a geography course before wrote:

My understanding of the importance and broad relevance to everyday life has been increased greatly. Geography plays a vital role in everyone's life.

Finally, a 19-year-old female made a conclusion about geography's place in academics:

Geography is equally important to other fields.

The realizations made by women, in particular, are worth noting given the considerable efforts made to raise the number of women in STEM fields. If geography is a bridging science that connects the humanities to the hard sciences, it may also be a gateway for bringing women into the STEM fields. This is particularly true if women have hesitated to enter STEM fields based on self-perceptions of low skill and capacity, but find themselves capable and gain confidence through geography and other bridging sciences.

Conclusion

This case study serves as an insight into the view of a specific set of students. While geography instructors have a solid understanding of geography, the uninitiated student does not. Each student population will respond to geographic concepts and information differently, but as the complexity of global geopolitical and environmental challenges intensifies, geography's role as a multidisciplinary science gives geographers the opportunity to form cross-disciplinary bridges easier than other fields in understanding these problems and seeking solutions. Connections made by students at the UI indicate that these geography courses can increase student appreciation of the relevance of geography. Understanding how different types of students understand, perceive, and react to information improves instruction, and this type of case study improves our understanding by outlining student perceptions and that perceptual change.

In this research, women in particular showed the greatest changes in agreement. This included a significantly greater level of agreement that geography plays an important role in their lives, that it is relevant in academics and to potential careers, and that climate change as an issue will impact their lives in the future and is pertinent to geographers.

Our study, though limited, raises additional questions and opens new avenues for study. A longer term study could track student perceptions over the course of an academic year, tracking their worldview perceptions given the large amount of information they encounter in the college environment. A quantifiable method of tracking student's geographic skills, connected with the perceptual tracking, would allow researchers to obtain a more detailed view of student learning. More diverse and larger studies are necessary to determine whether the significant changes and improved perceptions of geographic role and relevance found here are valid in wider student populations. This is particularly true for respondents like those participating on our study: primarily humanities majors who took this course to fulfill a science requirement and will have few additional opportunities to be educated in basic science. Each case study that adds to the understanding of how students learn geography improves our abilities to understand student learning and to guide our instruction to the best possible learning outcomes. If students see geography as important to addressing global geopolitical and environmental issues, and significantly improves their own geographic knowledge, this connection supports other suggestions made that geographic knowledge, as a component of science more broadly, is critical to solving global crises and improving society.

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Note

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