Learning Outcomes Data for the Senate Committee on Instructional Program Priorities

Program: B. A., Geography, Physical Geography concentration (IMPORTANT NOTE: The Geography Department uses the same assessment for all four concentrations within the Geography B.A. degree.)

Department: Geography

Number of students enrolled in the program in Fall, 2011: There were 97 total Geography majors as of Fall 2011. Of those, 68 had indicated a concentration. 20 of those 68 had declared the Physical Geography concentration. (The representation of the other concentrations out of 68 was: Metropolitan Area Planning (MAP), 11; Human Geography, 5; Geographic Information Systems & Analysis (GISA), 8; our older Cartography, GIS, and Planning concentration (replaced by MAP & GISA), 24).

Faculty member completing template: Robin Datel, Chair (Date: January 2012)

Period of reference in the template: 2006-07 to present

1. Please describe your program’s learning-outcomes trajectory since 2006-07: Has there been a transformation of organizational culture regarding the establishment of learning outcomes and the capacity to assess progress toward their achievement? If so, during which academic year would you say the transformation became noticeable? What lies ahead; what is the next likely step in developing a learning-outcomes organizational culture within the program?

Geography’s transformation of organizational culture regarding student learning outcomes and assessment can be dated to 2006-2007. The department had been doing its own internal assessment of how well it was achieving its stated mission since 2000-2001. That process underwent continuous modification, most notably as part of the 2002-2003 university-wide assessment initiative and in response to recommendations from the department’s 2005 program review. Substantial change in the nature of our required senior seminar in Spring 2007, from a course on the history of geographic thought to one in which every student designed, carried out, and presented his or her own research project greatly enhanced our ability to assess our programmatic learning outcomes and thus can be considered the transformational event.

We have been using data from that course, as well as from other assessment instruments, to make (and then evaluate) annual curricular changes since 2007, and will continue to do so. Some specific program assessment tasks just ahead include tracking individual (rather than just cohort) performance via our baseline geography knowledge quiz (which we are planning to give on-line starting next academic year); and redesigning course assignments to give students maximum practice working with (geographic) data and utilizing scholarly literature. There are also some campus Baccalaureate Learning Goal subpoints that we do not currently assess at a program level (e.g., oral communication, teamwork) that we may wish to add. Also, we will discuss whether we want to specialize the assessment of our four concentrations; we already have suitable class projects that could be used: the GEOG 110 (Advanced GIS) course project for GISA, the GEOG 117 (Landforms) paper for Physical, the GEOG 143 [formerly GEOG 196D]
(Environmental Hazards and Society) group project for Human, and the GEOG 148 (Regional Planning) real-world planning project for Metropolitan Area Planning (MAP).

2. Please list in prioritized order (or indicate no prioritization regarding) up to four desired learning outcomes (“takeaways” concerning such elements of curriculum as perspectives, specific content knowledge, skill sets, confidence levels) for students completing the program. For each stated outcome, please provide the reason that it was designated as desired by the faculty associated with the program.

The following learning outcomes are not listed in any priority order; they constitute only half of the learning outcomes that are used in Geography’s regular assessment reports.

a) Identify and describe basic concepts and patterns in physical and human geography.

This learning outcome captures the desire of the geography faculty to have our students acquire both the discipline’s overarching spatial perspective and specific content knowledge. Geographers study a highly diverse array of earthly phenomena from a spatial point of view. Concepts such as location, scale, spatial distribution, spatial interaction, spatial behavior, diffusion, distance decay, boundary, place, and region permeate the discipline and provide common ground for those studying subjects as diverse as hail storms and urban crime. Faculty belief in the importance of these concepts was echoed in a 2008 article in Professional Geographer, “Skills in Professional Geography: An Assessment of Workforce Needs and Expectations,” in which “spatial thinking” was ranked by a nationwide sample (N = 280) of geography alumni as their most frequently used geographic skill area. Part of this learning outcome is to give our students the concepts needed to be good spatial thinkers.

Faculty are also committed to geography students acquiring some basic factual knowledge as a substrate for further analysis and understanding. Geography majors are expected to be familiar with basic terms relating to, and global distributions of: climates, landforms, and biomes on the physical side; and of the human population, economic activity, and major languages and religions on the human side. Other distributions could be chosen, but these have important interconnections with other patterns and are relevant to current environmental, political, and social problems.

Also at the heart of geography is the theme of human-environment interrelationships. How physical environments have molded peoples is among the oldest interests of geographers, dating back to Classical Greece. More modern is the now critical concern of how peoples have molded their environments. A host of environmental problems at all scales calls out for students who understand their complexities. Geography students are expected to be familiar with the key concepts and patterns of human impacts on plants and animals, soils, landforms, water, and air.
b) Demonstrate competency in geographic tools/techniques for data collection, display, and analysis.

This geography learning outcome reflects the faculty’s belief that students graduating from our program must acquire the means to create new geographical knowledge. Stresses on our natural and social systems are growing, and geographical approaches are central to addressing them.

Geography has developed or adapted a substantial spectrum of tools and techniques for data collection. At one end of the scale is collecting observations via local fieldwork; this includes using equipment such as GPS units, rangefinders, cameras, and other digital devices to measure, locate, and record information. At the other end of the scale is the use of imagery remotely sensed by a satellite hundreds of miles from Earth. In between is information from a growing array of media and sensors generating ever more numerous, large, and complex data sets (including scanned texts for research in historical and human geography) waiting to be mined and put to work. As for display and analysis, modern geographers use cartography (including animated and interactive maps), visualization, geographic information systems (GISs), and spatial statistics and modeling. The geography faculty expects a basic level of competency in using these tools and techniques of the discipline.

c) Show written competency in the description and analysis of geographic subject matter.

In the national geography alumni survey mentioned above, respondents ranked “writing skills” second only to “time management” when queried about what skills they “always or very often” needed to perform. A small telephone survey we conducted last summer of our own alumni and those who employ them similarly revealed the consistent workplace demand for good writing. Many geography alumni find employment in government agencies and NGOs where they are called upon to write reports that will be read by other technically trained people and also by members of the general public. It is important that they be able to communicate effectively with these audiences. A somewhat specialized type of writing that geography students are expected to acquire is translating information from a spatial format, such as a map, remotely sensed image, or graph, into a verbal one, in other words, being able to describe and interpret spatial patterns.

As part of learning to do original research, our students are expected to learn how to write a research paper and research poster. (Geography majors meet the Writing Intensive requirement with GEOG 190, our capstone senior research seminar.) We believe this is important in a knowledge-based economy. Furthermore, even if a geography graduate never undertakes another formal geography research project in his/her life, he or she will have enhanced general writing skills such as summarizing the work of others, describing data and procedures, and making a clear argument about what is significant in a set of results.
d) Synthesize geographic models, data, and methodologies in research design and execution.

Geography faculty judge that it is important for each of our students to integrate the various kinds of geographical learning they have experienced at Sacramento State by conducting a senior research project. The integrative nature of these projects and creative, the active learning involved provide a pedagogically desirable capstone to undergraduate geography training. All the senior projects are located in the greater Sacramento region, so they have the added benefit of linking students to people and organizations locally, just before they are graduating and looking for a job. The projects involve crafting a geographical research question and identifying an appropriate methodology, completing a literature review, gathering data, displaying and analyzing it, discussing results, and drawing conclusions. The project is presented in a research paper and on a research poster, the latter presented at a poster session held in the University Union at the end of each spring semester. The posters, in particular, have proven a very useful medium by which students can show their skills to potential employers. The faculty use the senior project and its various components as a major assessment tool.

3. **For undergraduate programs only**, in what ways are the set of desired learning outcomes described above aligned with the University’s Baccalaureate Learning Goals? Please be as specific as possible.

**Competence in the Disciplines.** The four learning outcomes above are critical for geography students to gain “competence in the discipline.” They aim at graduating students who can (1) understand and apply basic disciplinary concepts and “facts” (which in geography often take the form of spatial patterns); (2) select and use appropriately the techniques at the heart of “doing” geography; (3) write well about geographical subjects, and (4) create new geographical knowledge through research.

**Knowledge of Human Cultures and the Physical and Natural World.** Knowing geography’s basic concepts and being familiar with basic spatial distributions (learning outcome “a” above) most certainly expand students’ “knowledge of human cultures and the physical and natural world.” Geography as a discipline turns its spatial eye on diverse phenomena, from those studied in the sciences (such as weather, climate, landforms, and plants and animals) to those studied in the social sciences (such as cities, economies, populations, and governments) to those studied in the humanities (such as languages and religions). Geographers examine these topics from a perspective that emphasizes location, spatial distribution, movement, place, region, and human-environment relationships. Furthermore, geographers often examine the complex interrelationships among natural and human phenomena in their study of such topics as migration, food systems, global climate change, and hazards management.

**Intellectual and Practical Skills.** Geography learning outcomes “b” and “c” above are closely aligned with this Baccalaureate Learning Goal (BLG). Competency in data collection, display, and analysis in geography involves critical thinking about what kind of data is needed to answer...
a particular question or solve a particular problem. Our students learn methods of searching for existing spatial data sets, an example of developing information literacy, and assembling their own data sets, often a highly creative activity involving fieldwork. They increase their quantitative literacy by working with map scale, map projection, quantitative map symbols, Geographic Information Systems (GIS) and remote sensing analytical tools, and models and formulas used in physical and human geography courses. They develop their written communication skills by practicing a wide variety of types of writing.

**Personal and Social Responsibility.** Geography learning outcome “a” above is aligned with this BLG. Geography students acquire intercultural (local and global) knowledge in their human and regional geography courses. Outcome “d” above is also in alignment; students are expected to properly use research methods, which includes acting ethically as a scholar and practitioner while conducting their field studies in local communities and environments.

**Integrative Learning.** Geography learning outcome “d” above embodies integrative learning. All geography majors take the capstone senior research seminar in which they synthesize their previously acquired knowledge and skills by conceptualizing, executing, and presenting their own research project. This is an advanced accomplishment for undergraduate students.

4. For each desired outcome indicated in item 2 above, please:
a) Describe the method(s) by which its ongoing pursuit is monitored and measured.
b) Include a description of the sample of students (e.g., random sample of transfer students declaring the major; graduating seniors) from whom data were/will be collected and the frequency and schedule with which the data in question were/will be collected.
c) Describe and append a sample (or samples) of the “instrument” (e.g., survey or test), “artifact” (e.g., writing sample and evaluative protocol, performance review sheet), or other device used to assess the status of the learning outcomes desired by the program (SEE ATTACHMENTS 1 [baseline knowledge quiz], 2 [senior project rubric], and 3 [example of a Physical Geography concentration senior research project poster]).
d) Explain how the program faculty analyzed and evaluated (will analyze and evaluate) the data to reach conclusions about each desired student learning outcome.

a) **Identify and describe basic concepts and patterns in physical and human geography.**

Geography uses a “baseline knowledge quiz” (ATTACHMENT 1) to assess this outcome. All geography majors take the quiz in GEOG 102 (Ideas and Skills in Geography), a course that most majors take the fall semester of their junior year. At that point, many have had only the lower division courses in physical and human geography. All majors retake the quiz, usually three to five semesters later, in GEOG 190 (Senior Research Seminar in Geography), when they are close to graduating.
Initially we looked at the quiz scores year by year, then last year we tracked the same cohort. Now we have started having students put their names on the quizzes, so that in future we can measure the progress of individuals. We will also be able to see if students with different concentrations perform significantly differently on various quiz questions.

The most recent version of the baseline knowledge quiz is appended. Here are four years of summary results:

**QUIZ RESULTS for 2010-2011**

<table>
<thead>
<tr>
<th>Course</th>
<th>Physical Geog.</th>
<th>Human Geog</th>
<th>Mapping</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 102 Fall 09</td>
<td>54.6</td>
<td>50.4</td>
<td>44.5</td>
<td>49.8</td>
</tr>
<tr>
<td>GEOG 190 Spr 11</td>
<td>68.4</td>
<td>59.4</td>
<td>64.0</td>
<td>63.9</td>
</tr>
</tbody>
</table>

Numbers = overall percentage of questions answered correctly
n = 41 for 102 (F 2009); n = 25 for 190 (S 2011)

**QUIZ RESULTS for 2009-2010**

<table>
<thead>
<tr>
<th>Course</th>
<th>Physical Geog.</th>
<th>Human Geog</th>
<th>Mapping</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 102</td>
<td>54.6</td>
<td>50.4</td>
<td>44.5</td>
<td>49.8</td>
</tr>
<tr>
<td>GEOG 190</td>
<td>58.1</td>
<td>53.3</td>
<td>67.8</td>
<td>59.7</td>
</tr>
</tbody>
</table>

Numbers = overall percentage of questions answered correctly
n = 41 for 102 (F 2009); n = 29 for 190 (F2009 & S2010)

**QUIZ RESULTS for 2008-2009**

<table>
<thead>
<tr>
<th>Course</th>
<th>Physical Geog.</th>
<th>Human Geog</th>
<th>Mapping</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 102</td>
<td>55.6</td>
<td>52.3</td>
<td>47.6</td>
<td>51.8</td>
</tr>
<tr>
<td>GEOG 190</td>
<td>66.2</td>
<td>58.3</td>
<td>66.5</td>
<td>63.6</td>
</tr>
</tbody>
</table>

Numbers = overall percentage of questions answered correctly
n = 35 for 102 (F 2008); n = 19 for 190 (S 2009)

**QUIZ RESULTS for 2007-2008**

<table>
<thead>
<tr>
<th>Course</th>
<th>Physical Geog.</th>
<th>Human Geog</th>
<th>Mapping</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 102</td>
<td>64.0</td>
<td>54.2</td>
<td>37.6</td>
<td>53.1</td>
</tr>
<tr>
<td>GEOG 190</td>
<td>57.1</td>
<td>59.0</td>
<td>52.7</td>
<td>56.7</td>
</tr>
</tbody>
</table>

Numbers = overall percentage of questions answered correctly

Professor Tom Krabacher, who routinely teaches both GEOG 102 and one section of GEOG 190, grades the quizzes and reports the results to the department chair, who discusses them in the department’s annual assessment report, completed each June. At the department’s annual retreat in August, the whole faculty reviews all assessment results, including student performance on individual questions and the quiz as a whole, and decides on any necessary actions.

b) Demonstrate competency in geographic tools/techniques for data collection, display, and analysis.

In addition to the techniques questions (called “mapping” questions in the above tables) on the baseline quiz, the Geography Department uses the senior research project, which every geography major completes in his or her senior year, to assess this outcome. The rubric used to
evaluate the projects is attached (ATTACHMENTS 2 & 3). Elements titled Methodology Choice and Description, Presentation of Results (Data and Analysis), and Graphics are of relevance here. Each professor who teaches GEOG 190 grades the projects in his or her own section, reports (and reflects on) the results (by student and by rubric element) to the department chair, who uses the data to assess this and other learning outcomes in the annual assessment report, which is later discussed by the whole faculty. Here is the 2010-2011 discussion of student performance on the “Presentation of Results (Data and Analysis)” element as it relates to “Demonstrate competency in geographic tools/techniques for data collection, display, and analysis.”

In the three sections of GEOG 190 in Spring 2011 (n = 28), the average scores on this rubric item were 4.4, 3.7, and 3.4 (out of 5.0). These were the lowest or next to lowest averages among the seven rubric elements. In two of the three sections of GEOG 190, students’ answers to the reflective questionnaire on the senior project did not reveal that they would have liked more prior experience with gathering and presenting data, but 4 of 11 students in the third section did express that desire. We do not consider this year’s generally lower scores on this item to be a trend. Still, it doesn’t hurt to be reminded of the usefulness of class assignments throughout our curriculum that have students collecting, organizing, displaying, and analyzing data.

c) Show written competency in the description and analysis of geographic subject matter.

Geography uses the senior research projects to assess this outcome. The rubric element titled Overall Written Expression is of relevance here. Here is the comment on student performance on that element from the 2009-2010 report, as this learning outcome was not discussed in last year’s report (all eight geography student learning outcomes are not discussed each year):

The average student scores were 4.5, 4.5, and 4.8 [on a 3-point scale ranging from 3.0 to 5.0] in the three sections of GEOG 190, with only two students out of 35 receiving a score of 3. This suggests that students, in general, are performing satisfactorily in this area.

d) Synthesize geographic models, data, and methodologies in research design and execution.

Geography uses the senior research projects to assess this outcome. All rubric elements and the summary score are of relevance here. Here is part of the discussion of student performance on this learning outcome from the 2009-2010 report:

The elements and average scores earned on them by the three sections of GEOG 190 taught during 2009-2010, as well as the total number of students who received a low score (“3”) for each element, follow:

<table>
<thead>
<tr>
<th>Element</th>
<th>Class Score F2009</th>
<th>Class Score S2010 - 1</th>
<th>Class Score S2010 - 2</th>
<th># of Students (n = 35) earning a “3”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement of Research questions or Hypotheses</td>
<td>4.5</td>
<td>4.5</td>
<td>4.4</td>
<td>3</td>
</tr>
<tr>
<td>Literature Review</td>
<td>3.8</td>
<td>4.3</td>
<td>4.0</td>
<td>9</td>
</tr>
<tr>
<td>Methodology Choice and Description</td>
<td>4.2</td>
<td>4.5</td>
<td>4.0</td>
<td>4</td>
</tr>
<tr>
<td>Presentation of Results (Data and Analysis)</td>
<td>4.3</td>
<td>4.2</td>
<td>4.0</td>
<td>6</td>
</tr>
<tr>
<td>Graphics</td>
<td>4.5</td>
<td>4.6</td>
<td>4.5</td>
<td>1</td>
</tr>
<tr>
<td>Discussion of Findings</td>
<td>4.0</td>
<td>4.3</td>
<td>4.1</td>
<td>6</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>---</td>
</tr>
<tr>
<td>Overall Written Expression</td>
<td>4.5</td>
<td>4.8</td>
<td>4.5</td>
<td>2</td>
</tr>
</tbody>
</table>

TOTAL SCORE (out of 35 possible) | 29.8 | 31.2 | 29.4 |

This table suggests that the most challenging areas for this group of students were the literature review, the presentation and analysis of data, and the discussion of findings. Reflections on the course collected in two of the sections did reveal that many students felt they struggled with identifying an appropriate research question, and course instructors felt likewise. Still, average project scores equated to a “B” grade.

5. Regarding each outcome and method discussed in items 2 and 4 above, please provide examples of how findings from the learning outcomes process have been utilized to address decisions to revise or maintain elements of the curriculum (including decisions to alter the program’s desired outcomes). If such decision-making has not yet occurred, please describe the plan by which it will occur.

a) Identify and describe basic concepts and patterns in physical and human geography.

In general, it should be noted that overall student scores on the baseline knowledge quiz show the most improvement (between the scores of entering juniors and those of graduating seniors) in the area of maps and other geographic techniques. Lesser improvements are shown in the areas of physical and human geography. This is consistent with the fact that more students choose our techniques concentration than any other, and that every student takes coursework in techniques to complete their concentration, while physical geography students do not take additional human geography courses and human geography and metro area planning students do not take additional physical courses beyond what is required for the core.

Our responses to poor performance on baseline quiz questions have been varied. In some cases, the relevant faculty members have made efforts to cover that material more carefully or in more than one class. For example, insufficient student familiarity with the standard Koeppen classification of climates, which is used in various physical geography courses, led to its increased use by faculty teaching regional courses, thus providing additional opportunities for students to learn it. In another example, students did poorly in recognizing the types of spatial diffusion; faculty teaching human and regional courses pledged to use these terms more regularly. In other cases, poor performance led us to modify questions, making them clearer. In a few cases, we have removed questions entirely, realizing that they were not getting at sufficiently important concepts or facts.

b) Demonstrate competency in geographic tools/techniques for data collection, display, and analysis.

Poor performance on the baseline knowledge quiz, in the early years it was given, on the questions relating to mapping, contributed to the decision to create a new lower-division course, GEOG 3 (Introduction to Mapping and Geographical Technologies). This course
introduces geography students early on to paper maps, digital mapping/imagery programs such as Google Earth, GPSs, GISs, data visualization, and some basic statistics. The overall direction of geography toward more spatial technology also underlined the need to get started on this material at the lower division level.

c) Show written competency in the description and analysis of geographic subject matter.

Over the years, geography students have done pretty well on this learning outcome, and we have not felt compelled to make curricular changes to improve their performance. Partly this is because students in the research seminar write a draft section of the text for their papers and posters each week and receive lots of feedback from peers and faculty on the way to their final versions. A related learning outcome, which is not one of the four chosen for this report, which requires students to “analyze and evaluate scholarly writing within the discipline,” has led to the greater use of original research articles in other courses, as well as to the development of a new assignment in GEOG 102 (Ideas and Skills in Geography), requiring a written critique of a scholarly research article in geography. The resulting greater exposure to professional geographic writing has likely helped student geographic writing as well.

d) Synthesize geographic models, data, and methodologies in research design and execution.

As noted at the outset of this report, the biggest curricular change in geography in the past five years was the makeover of GEOG 190 from a seminar on the history of geographic thought to a student research seminar. This has permitted students to cap their geographical studies with a project demanding the integration of all their geographic skills and also many general skills such as time management, creative thinking, and ethical practice. It has also become our predominant assessment tool.

The main change to the senior research seminar since its inception has been the addition of the requirement that students produce a research poster displaying their results. This was done for several reasons, including (1) to further develop (and assess) student graphical skills, (2) to encourage peer interaction and mentoring (it is easier and more fun to help a fellow student with a poster than with a paper), and (3) to give students a product that was more likely to be presented at a scholarly meeting or be shown in a job interview.

A second curricular change to the senior research seminar was a recent decision to remove the remaining history of geographic thought material from the course. When the seminar was switched away from geographic thought toward student research projects, some material on modern geography was retained in the seminar, while the rest of the historical material was moved over to GEOG 102, Ideas and Skills in Geography. This year, the decision was made to remove the rest of the history material, to allow students to put their full energies into the steps of their research projects, the overall quality of which is not bad, but which we would like to see improved. This move also means that all students will receive the same history of geographic thought; when it was taught in various sections of the seminar, there was considerable variation
among the geographic thought content delivered, making it difficult to use the baseline quiz to assess how well it was being learned.

6. Has the program systematically sought data from alumni to measure the longer-term effects of accomplishment of the program’s learning outcomes? If so, please describe the approach to this information-gathering and the ways in which the information will be applied to the program’s curriculum. If such activity has not yet occurred, please describe the plan by which it will occur.

Our assessment plan includes five assessment measures, one of which is a periodic alumni survey. It is most relevant to the last of our eight learning outcomes: “acquire the overall competencies necessary to success in post-graduate education and careers.” The results of our first alumni survey were summarized in our 2008-2009 assessment report. While we only received 5 replies from a short survey e-mailed to 41 recent grads, the comments on what should be added to our curriculum are part of our discussion about what our next new GIS course will look like and also are part of a growing file that will help guide us in future decisions about faculty hires.

The Office of Institutional Research helped us conduct a larger and more complex alumni survey in 2010, part of our Self Study/Program Review. We received feedback on levels of satisfaction with our curriculum as preparation for graduate school and employment, and more usefully, on how the curriculum could be improved to those ends:

When asked an open-ended question about how the geography program could be strengthened, 27 people responded. *One-third made general or specific comments in favor of more GIS training. Six wanted students to have more help in getting jobs, and five recommended more internships. Four suggested more field work. The rest of the comments were quite diverse, although several called for more quantitative and technical training.*

Our techniques faculty was strengthened in 2008-2009 with the hiring of a third faculty member who teaches GIS and spatial analysis. We also have a new contact in the Career Center who is strengthening our ability to help students find jobs and internships. We believe that our senior research seminar may be encouraging more of our grads to continue their studies, as we have at least five strong applicants currently applying to graduate school, which is a high number for us.

In addition to our assessment efforts, Dean Trainer of NSM has organized the six departments in the college to administer a common survey to all graduating seniors. While not many geography students graduate with a professional job in hand, the dean’s NSM survey has helped us document the high number of internships our students get. This could be considered another metric of our effort to help students “acquire the overall competencies necessary to success in post-graduate education and careers.”
7. Does the program pursue learning outcomes identified by an accrediting or other professional
discipline-related organization as important? Does the set of outcomes pursued by your
program exceed those identified as important by your accrediting or other professional
discipline-related organization?

The American scholarly/professional geography organizations (Association of American
Geographers, National Council for Geographic Education, National Geographic Society,
American Geographical Society) have not produced recommended geography baccalaureate
student learning outcomes. Often working together, and sometimes with the National Research
Council, they have produced various reports on the state of American geography and
geographical education, such as those published by the National Academies Press:
Rediscovering Geography (1997), Learning to Think Spatially (2006), and Understanding the
Planet: Strategic Directions for the Geographical Sciences (2010). Our student learning
outcomes are consistent with these reports’ calls for (1) maintaining geography’s integrative
study of humans and the environment, (2) getting students ready for a world of increasingly
sophisticated spatial data bases and digital spatial analysis and display, and (3) teaching students
how to conduct research.

The Association of American Geographers has published The Geographic Information Science
and Technology Body of Knowledge. It is highly detailed (containing 1,600 “formal educational
objectives”) and is not suited for the assessment of a broad geography major. However, we
have used it to identify which topics are covered in each of our individual geotechniques courses
(this can be found on our webpage: http://www.csus.edu/geog/GIS.html), where use of these
very specific learning outcomes is more appropriate.

8. Finally, what additional information would you like to share with the Senate Committee on
Instructional Program Priorities regarding the program’s desired learning outcomes and
assessment of their accomplishment?

The first newsletter produced by Interim University Faculty Assessment Coordinator Amy Liu in
Fall 2011 featured a discussion of three annual assessment reports, one of which was
Geography’s. Here is a quotation from that newsletter: “Although not perfect, Geography,
Chemistry, and the College of Business have done an excellent job in their annual assessment
and produced high-quality annual assessment reports. Our conversation with them has
indicated that they are continuously making great progress.”
ATTACHMENT 1: Baseline Geographic Knowledge Quiz

Class __________
Name__________________
Semester ______

This is just a quick test of basic geographic knowledge. It serves as part of the Geography Department’s assessment process. The test is anonymous and won’t affect your—or anybody else’s—grade for anything. Thanks!

I. Physical Geography.

A. Fill in the correct term or value for each of the following:

1. ___________ Give the current best estimate of the age of the earth (+/- 300 million years).

2. ___________ is Wegener’s name for the hypothetical supercontinent to which all landmasses belonged about 200 million years ago.

3. ___________ is the term for the line of contact between two air masses of different temperature.

4. ___________ is the name for the circulation pattern (similar to a giant convection cell) that dominates atmospheric circulation in low latitudes.

B. Circle the best answer

1. During which of the four northern hemisphere seasons is the earth farthest from the sun?
   a) winter       b) spring       c) summer       d) fall

2. How has the global surface temperature index changed since the early 20th century?
   a) increased by about 8°C       d) decreased by about 1°C
   b) increased by about 1°C       e) decreased by about 8°C
   c) no significant change
3. Which of the following is not a tectonic process?
   a) folding  b) faulting  c) volcanism  d) erosion

4. The amount of water flowing down a stream channel in a given period of time is referred to as:
   a) capacity.  c) discharge.
   b) competence.  d) gradient.

5. Which first-letter category in the Köppen climate system is not based on temperature patterns?
   a) A  b) B  c) C  d) D  e) E

6. When, approximately, was the end of the last Pleistocene glaciation?
   a) 5000 years ago  c) 100,000 years ago
   b) 10,000 years ago  d) 1,000,000 years ago

7. Clouds generally are made of:
   a) water vapor  c) solid water
   b) liquid water  d) sublimated water

8. By definition an endemic organism:
   a) is geographically restricted.
   b) is infected with a pathogen.
   c) has a narrow range of ecological tolerances.
   d) has a wide range of ecological tolerances.

C. Answer the following questions about the two sample climographs (A and B) below.
1. Which of the two climographs most likely represents a northern hemisphere location? ___

2. Would the month of maximum rainfall occur during that location’s summer or winter?

II. Geographic Dimensions.

*Fill in the correct term or value for each of the following:*

1. ________________________ Give the approximate diameter (in miles or kilometers) of the Earth.

   *(Within 1000 miles/2000 kilometers)*

2. ________________________ Name the place with the highest elevation in California.
3. _________________________ Name the place with the lowest elevation in North America.

4. _________________________ Name the place with highest elevation on Earth.

5. _________________________ What is the elevation of the Earth’s highest location. (#4 above)

  *(Within 3000 feet/1000 meters)*

III. Geographic Techniques.

1. Which of the following statements is generally true for large scale maps?
   a. more area shown with less map detail
   b. more area covered with more map detail
   c. less area shown with less map detail
   d. less area shown with more map detail

2. Which of the following three expressions of scale is still correct when the map is reduced by 50% on a copy machine?
   a. Representative Fraction (RF)
   b. Written expression such as “1 inch = 5 miles”
   c. Graphical (or bar) scale

3. Which common summary number is least affected by a few unusually extreme values in a data set?
   a. the mean
   b. the mode
   c. the median
   d. the range

4. Modern maps are often created in a computer using a Geographic Information System, or GIS. Typically, the geographic data is organized:
   a. So that each individual feature, such as a road or a river, is stored in its own folder and must be recalled for display as an individual item.
   b. As simple graphics such as a JPG or BMP file on which text is placed to identify features such as roads or cities.
   c. Exactly like a telephone book.
   d. As a series of map layers, where each layer contains a class or type of map feature: roads, rivers, states and so on.
5. The following figure represents the monthly percent of annual revenue earned for three separate businesses: a grocery store, an air conditioning company, and a ski lodge. Which line most likely represents the grocery store?

![Graph showing monthly percent of annual revenue for three businesses]

6. Use the information on the number of pollen types found in lake sediment cores given in the figure below to answer the following two questions:

![Bar chart showing number of pollen types for different lakes]

6. Which of the following lakes had the fewest number of pollen types identified?
   a. Bear Lake
   b. Cedar Lake
   c. Hidden Lake
   d. Big Carmen Lake
7. What was the average number of pollen types identified in Brad Lake, Divide Lake, and Hidden Lake? 

8. Which of the following projections best represents the true area of land masses?

![A](image1.png) ![B](image2.png) ![C](image3.png)

9. Which of the following histograms shows a distribution of household incomes, where most incomes are similar, but a small number of households have much higher incomes?

![A](image4.png) ![B](image5.png) ![C](image6.png)

The following maps show the distributions of gas stations, churches and temples, and automobile dealerships. Use the information in these maps to answer the next two questions:

![A](image7.png) ![B](image8.png) ![C](image9.png)
10. Which map shows the distribution of gas stations?

11. Which map best exhibits a single spatial cluster?

12. Which of the following is a choropleth map?

13. Which area on the following map has a steeper gradient?

14. The overall purpose of cartographic map design should be to:
   a. make the prettiest possible map for wall display
   b. optimize the communication of information to the reader
   c. put the maximum possible detail on the map
   d. use design principles so that the map will have a long period of usability, or ‘shelf life’

15. When using a GPS in conjunction with other data sources such as maps, it is important to keep in mind that:
   a. The basic coordinate system, or datum, of the GPS may not agree with the other data sources
   b. The GPS will always locate the user to within one half meter of their exact location on the globe
   c. GPS accuracy can be improved by moving underneath forest cover
   d. Surveyed data on maps is never as accurate or as legally reliable as a GPS coordinate
Human/Cultural Geography.

Fill in the blank

1. ________________ is the estimated human population of the world today, to the nearest billion.
2. ________________ is the term for someone who migrates out of a country.
3. ________________ is the general term for a spatial process of which relocation, contagious, and hierarchical are specific types.

Multiple choice

4. The language family that is the most widespread and has the largest number of speakers is
   a. Austronesian
   b. Afro-Asiatic
   c. Indo-European
   d. Sino-Tibetan

5. The concentric zone model, the sector model, and the multiple nuclei model are all models of
   a. agricultural land use
   b. industrial location
   c. the shape of political territories
   d. urban land use

6. Which of the following is NOT an example of a universalizing religion?
   a. Islam
   b. Judaism
   c. Buddhism
   d. Christianity

7. Human civilization based on agriculture and cities, such as existed in ancient Sumeria and Egypt, is approximately
   a. 5,000 years old
   b. 10,000 years old
   c. 20,000 years old
   d. 100,000 years old

8. For the population of a developing country with a high growth rate,
   a. The birth rate will be high and only slightly below the death rate.
   b. The death rate will be significantly lower than the birth rate.
   c. Migration will likely be the principal cause of population growth.
   d. The rate of population growth is likely to exceed 7% per year.

9. A region delimited by commuting patterns is
   a. a formal region
   b. a functional region
   c. a vernacular region
10. In the context of geographical analysis, which of the following describes a *site characteristic* of a hypothetical location?
   a. the impact of a new type of transportation on a town’s trade  
   b. the most economically competitive place for growing wheat  
   c. the natural vegetation of a place  
   d. the place is located 90 miles from both Lake Tahoe and San Francisco

11. The economic advantages for an enterprise forming part of a spatial cluster of firms doing similar or related work are called
   a. Urbanization economies  
   b. Kondratiev economies  
   c. Modernization economies  
   d. Localization economies

12. The current center of population for the United States is located in
   a. Missouri  
   b. Central Ohio  
   c. Eastern Colorado  
   d. Near Blanco, Texas

13. The most highly and persistently segregated group in American urban history has been
   a. The elderly  
   b. The rich  
   c. African Americans  
   d. The poor

14. The process of middle-class people buying and renovating deteriorated property in the inner city is called
   a. gentrification  
   b. central place theory  
   c. suburbanization  
   d. exurbanization

15. What transportation mode would you choose in order to maximize high capacity, long distance (global reach), and low price?
   a. automobile  
   b. maritime transport  
   c. air transport  
   d. rail
Geographic Theory.

C. Match each of the following post-World War II approaches to human geography with the statement that best represents it.

1. _____ Spatial science  
   2. _____ Behavioral geography

3. _____ Humanistic geography  
   4. _____ Marxist geography

5. _____ Postmodern geography

A. Geography must be law-seeking and model-building.
B. All meta-narratives (“big theories”) are suspect.
C. To understand surface appearances you need to go below them to the underlying structures.
D. Many people are satisficers, not maximizers; thus, many locations are “good enough” rather than optimal.
E. Meaning is a legitimate subject of geographic inquiry.

About your previous Geography background...

Circle the appropriate answer.

1. Did you have a geography or Earth science course in high school?  YES  NO
2. Did you take any prior geography courses at a college or university?  YES  NO
3. Did you take a prior Physical Geography course at a college or university?  YES  NO
4. Did you take a prior Human/Cultural Geography course at a college or university?  YES  NO
5. Did you take a prior Regional Geography course at a college or university?  YES  NO
6. Did you take a prior course in Mapping, GIS, or some other geographic techniques at a college or university?  YES  NO
### ATTACHMENT 2: Rubric for Evaluating Projects in GEOG 190, Senior Research Seminar in Geography

<table>
<thead>
<tr>
<th>Elements of the Paper/Poster</th>
<th>Scoring Scale (5-4-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement of Research Questions or Hypotheses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 Clearly stated and clearly geographical; suitable for senior project (given constraints)</td>
</tr>
<tr>
<td></td>
<td>4 Present, but somewhat unclear; geographical aspects not explicit; possibly unsuitable</td>
</tr>
<tr>
<td></td>
<td>3 Not present or quite unclear; not geographical; clearly not suitable</td>
</tr>
<tr>
<td>Literature Review</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 Relevant, thorough, well-organized</td>
</tr>
<tr>
<td></td>
<td>4 Generally relevant; some extraneous material and/or key sources missed; organization needs tightening</td>
</tr>
<tr>
<td></td>
<td>3 Merely lists studies; little or no logic to selection of sources; poorly organized</td>
</tr>
<tr>
<td>Methodology Choice and Description</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 Highly appropriate methods selected; detailed description of methods; logically connected to research questions</td>
</tr>
<tr>
<td></td>
<td>4 Weak methods or insufficient description of methods</td>
</tr>
<tr>
<td></td>
<td>3 Inappropriate methods selected</td>
</tr>
<tr>
<td>Presentation of Results (Data and Analysis)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 Data are complete, properly reported, and correctly analyzed</td>
</tr>
<tr>
<td></td>
<td>4 Data are appropriate but some mistakes in reporting and/or analysis are evident; may be less than complete</td>
</tr>
<tr>
<td></td>
<td>3 Data are seriously incomplete or improperly reported; major gaps and/or mistakes appear in the analysis</td>
</tr>
<tr>
<td>Graphics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 Maps, charts, graphs, photos, and other images have a high degree of relevance, completeness, and quality</td>
</tr>
<tr>
<td></td>
<td>4 Graphics are generally relevant, fairly complete, and of acceptable quality</td>
</tr>
<tr>
<td></td>
<td>3 Graphics are inappropriate, missing, and/or of poor quality</td>
</tr>
<tr>
<td>Discussion of Findings</td>
<td>5</td>
</tr>
<tr>
<td>------------------------</td>
<td>----</td>
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<td></td>
<td>4</td>
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<td>3</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Written Expression</th>
<th>5</th>
<th>Few if any mechanical writing or formatting errors; writing is clear and well-organized; logic of arguments presented is unassailable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>Minor mechanical writing or formatting errors; writing is competent but has some problems with clarity and organization; logic has some minor weaknesses</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Serious mechanical writing or formatting errors; writing is unclear and poorly organized; logic has serious flaws</td>
</tr>
</tbody>
</table>

Total points possible = 35. If a student got all 4s, his/her score would be 28/35 (80%), if all 3s, 21/35 (60%).

This rubric was based largely on a model that the Center for Teaching and Learning posted on their website under “NEW! Assessing Student Learning” in Spring 2008. I also consulted the assessment portions of the department’s 2005 Self-Study (pp. 22-24) and Tom Krabacher’s “Assignment Grading Guidelines” for GEOG 193B.
ATTACHMENT 3: Example of Physical Geography concentration student research project poster (on following page).
Changing Frequencies of North Wind Events in the Sacramento Valley

James Stillens

Abstract

California’s Sacramento Valley occasionally experiences an unusual wind event known as a north wind event. These events are driven by large scale atmospheric pressure differences with higher pressure to the north and lower pressure locally and further south. The focus of the current study is what are the frequency of north wind events and how have they changed through time. The current thought is that north wind events are becoming more frequent. A 30 year numerical weather dataset (1980-2009) were compiled and analyzed to see various frequencies of north wind events (raw number, frequency duration, total duration) using a specific criteria. Regression analysis to time and annual rainfall data show how north wind events are changing.

Though the trend of north wind events has not changed, the data shows the duration of these events are increasing through time. The analysis to rainfall data showed there was a weak to weakly moderate trend of fewer north wind events during wetter years. This study could be helpful to future studies on climate change and local weather patterns

Introduction

California’s Sacramento Valley, the northern third of the great central valley, is subject to many significant weather and climatologic events. Wind events are common in the Sacramento Valley. Most are either strong south to south easterly winds ahead of major storms in the winter and spring months or strong delta breeze events in the summer. Occasionally, the Sacramento Valley experiences an unusual wind event known as a north wind event.

North winds originate over land as opposed to the typical sea breeze front (Fosberg and Schroder 1966) and as a result can be warmer and are drier. Large atmospheric processes are the main cause of north wind events. The main driver of these events are higher pressure to the north and lower pressure locally and farther south coupled with a north/south jet stream following the passage of a trough (Kareem and Grodman 2008) as depicted in this synoptic weather map in figure one which can occur anytime of the year (Carroll and Zaromb 1999). Figure two illustrates a north wind event from 3/5/2011 to 3/8/2011. Note the diurnal variation as the winds die down for a brief time and pick up shortly the next day.

The focus of the current study is to provide a detailed analysis on what the frequencies of north wind events are over the time period from 1980-2009. Current thought is that these frequencies are changing; they are becoming more frequent and longer in duration.

The study site is the Sacramento Executive airport located in Sacramento, California in the southern Sacramento Valley. This is a popular site for hourly weather observations. Figure three shows the region with the black caption box depicting the Airport in figure 3.

Methodology

• Analyzing a 30 year hourly weather dataset, various frequencies of north winds (raw numbers, total frequency duration, and average frequency duration)

• A specific criteria was used and such events were extracted and expressed graphically.

• Parameters consist of sustained winds of 10-15 mph with maximum wind speeds at least 15 miles per hour with a minimum duration of 10 hours from start to finish

• Regression analyses to time and annual rainfall data will show how frequencies are changing.

This data was taken from National Weather Service observations as well as from the National Climate Data Center

Results

Figure 1: Regional map of wind events during the time period, note the rise in spring and fall seasons.

Figure 2: Total number of north wind events over the time period. Note the time period may not be suggesting a trend.

Figure 3: Regression analysis, number of events to time, note there is no suggesting a trend

Figure 4: Regression analysis, number of events to annual rain, note there is no suggesting a trend

Discussion

Figure 5: Regression analysis: total frequency hours for the time period. Note the strong upward trend.

Figure 6: Total hours

Figure 7: Total hours

Figure 8: Total hours

Figure 9: Total hours

Figure 10: Total hours

Figure 11: Total hours

The frequency of north wind events were identified and tabulated as seen in Figure 4. The frequency based on raw numbers over the time period shows many spikes and dips. A noticeable downward trend was identified through the eighties, along with a rebound and leveling through the nineties. More recently, a return to this trend and dip was identified.

As a whole, north wind events are seasonal as illustrated in figure 5. Peak occurrences are were identified through the Spring and Fall months with a very low frequency during the summer months.

Using a series of regression analyses starting with figure 6, the raw number of events as a function of time shows a flat trend suggesting no real change in the numbers of north wind events.

A regression to the total frequency (in hours) of north wind events as a function of time in figure 7 shows a moderately strong upward trend suggesting north wind events are becoming longer in duration.

This is further supported by regression in figure 8, the average frequency duration as a function of time shows an even stronger upward trend.

Regression analyses to annual rainfall were conducted to suggest patterns of north wind frequencies.

Figure 9 shows a regression of the number of north wind events as a function of annual rainfall, the downward trend suggests times of increased precipitation, north wind events decrease.

This similar pattern is seen in figures 10 and 11. Figure 10 shows total frequency duration to precipitation, and figure 11, the average frequency duration to precipitation. Both suggest times of shorter north wind events correlate to higher precipitation.

• Although these correlations are not very strong, it bears significance on the overall trend

Conclusions

This study analyzed the frequency of north wind events using hourly weather data during the 30 year period from 1980-2009. The timing of such events is primarily the transitional seasons (Spring and Fall). Typical synoptic events during a north wind event are higher pressure to the north and lower pressure locally or further south. After identifying several hundred north wind events and tabulating the raw frequency, total duration and average frequency duration, a series of regression analyses were conducted to time and rainfall data. While the occurrences of north wind events are not changing, the duration of such events are becoming more frequent. When compared to rainfall data, the trend showed wetter years tended to yield fewer north wind events, as well as shorter duration of such events when compared with frequency duration data.

That being said, this study can potentially be helpful to current and future studies on climate change in relation to large scale atmospheric processes at work. Future work can consist of analyzing a specific atmospheric process over a much longer times span by comparing it to climate or precipitation data alone and how it can influence the local climate of a region.

References

Acknowledgements

I would like to thank Dr. Jim Wanket for his advice and feedback and contribution to the completion of the study, and all the professionals in the geography department and others. Thank you.