

April 26, 2016

Dear GEC,

I am writing in response to the additional feedback I received about my request for GE Area B1 designation for Geography 110: Introduction to Physical Geography. I appreciate the committee's careful review of the form, and hope that my remarks here, coupled with the edits to the GE form (attached), and my previous email (attached) regarding additional information about section B1.4 of the GE form will address the comments forwarded to me by the Chair of GEC and result in approval of this request.

I can see that there are important curricular questions at stake here. As I understand them, these questions appear to stem from concerns that the subject matter covered in the course does not permit students to acquire an understanding of physical science principles; this concern arises in no small part from the assumption that Physical Geography is an *application* of physical science, rather than a field of physical science in and of itself. It is my hope that the information I provide below will overturn that assumption. After speaking with Ed Price, I have also gone back and revised the GE form in order to more clearly show that physical geography, as a field, addresses the core concerns of an LDGE B1 course; please note that different fields within the physical sciences may use slightly different terminology and strategies to teach about the physical world. Physical Geography takes a systems approach rooted nevertheless in scientific principles. I tried to clarify these issues in my revisions.

Before addressing the specific comments that I have received from the chair of GEC, I want to take this opportunity to point out a few key facts that are important to include in your consideration as you review my request for GE B1 designation.

First, the course will be taught by Dr. Elizabeth Ridder, a physical geographer who will become a new tenure track assistant professor on this campus in the fall and who is well versed in physical science. She was a Fulbright Scholar and held a special NSF scholarship for teaching this course; she is currently a visiting assistant professor at University of Iowa. I attach an example of the syllabus she currently uses at Iowa where the course is part of their general education program.

Second, it is typical within the academy for an introductory physical geography course to be accepted for physical science credit. This can clearly be seen in a review of geography curriculum within the CSU, where we find that there are very few campuses that have geography programs that don't use a version of physical geography in their general education program for fulfilling area B1 of the GE program (please see Appendix 1, which lists CSU campuses on which physical geography is offered for B1 credit). In fact, as we pointed out in conversations with members of the College of Science last year when the question arose whether Geography could even offer a physical science course, Physical Geography is a well-

established field of scientific research and education generally, and is understood not only within the field of Geography, but in disciplines such as Physics, Chemistry, and Earth Science, to be a discipline of physical science. The fact that Physical Geography fulfills Area B1 on other CSU campuses reflects this recognition.

In addition, The CSU Chancellor's General Education Advisory Committee publishes a report titled "Guiding Notes for General Education Course Reviewers" (available at <http://www.calstate.edu/app/geac/documents/ge-reviewers-guiding-notes.pdf> -- Read the top of page 26) which states that physical geography courses "almost always" fulfill Area B1. It is worth pointing out that this publication indicates that this is not the case for other geography courses which often deal with more human related topics. But it is the case for physical geography specifically. Thus, we are not making the case, now or for the future, that Geography as a whole is a physical science discipline – only that those geography courses which focus on physical geography fall within that designation. Given this philosophy and recommendation at the system level, it is not surprising to find that lower division physical geography courses satisfy GE B1 Physical Science on 17 campuses in the Cal State System. Within our service area, both Palomar and Mount San Jacinto College teach physical geography with the B1 attribute; this means, among other things, that our transfer students can and do take physical geography to satisfy this requirement.

Physical Geography is, in its entirety, part of Earth Sciences research and education. In 2012, The National Council for Geographic Education defined an "essential element" of geography to be physical systems. In the Geosystems text, which will be used in this course, Physical Geography is defined as:

"...the spatial analysis of all the physical elements, processes, and systems that make up the environment: energy, air, water, weather, climate, landforms, soils, animals, plants, microorganisms and Earth itself. Today in addition to its place in the geographic continuum, physical geography also forms part of the broad field of Earth systems science, the area of study that seeks to understand Earth as a complete entity, an interacting set of physical, chemical and biological systems."

And many of the "Big Ideas" associated with the Earth Science Literacy Initiative are quite clearly part of this curriculum (The guide is available at <http://www.earthscienceliteracy.org>). This document discusses these ideas as "principles." Funded by the National Science Foundation, the initiative sought to define key learning goals for earth science curriculum given the complexity of discerning information from multiple sources and the need for citizens literate about the Earth's systems and interactions between them. The report provides in easy to read format key material that students should be taught in K-16 education and is based on surveys with scientists and educators across the country. Physical Geography courses fulfill many of these dimensions of earth science literacy.

In short, it seems that the concerns are more about language and phrasing, and knowledge of physical geography, than about the question of scientific

fundamentals. And to that point, I would ask GEC members to consider that the language used to describe physical geography courses varies widely from campus to campus. I have found very general descriptions in course catalogs. For example, at Palomar College, where the course carries B1 credit, the description is as follows:

“GEOG 100 Physical Geography (3)

3 hours lecture

Transfer acceptability: CSU; UC

C-ID GEOG 110

A study of earth’s physical environment with emphasis on weather, climate, landform, soils, and natural vegetation and the interrelationship between these elements within unique physical landscapes.”

At SDSU, where the course is also included in the general education program for physical science, the description is as follows:

“GEOG 101. Earth’s Physical Environment (3) [GE] Earth systems and the global environment to include weather and climate, water, landforms, soils, and ecosystems. Distribution of physical features on Earth’s surface and interactions between humans and environment, especially those involving global change. Note: Cannot be used for General Education in combination with Anthropology 101.”

Chico State has perhaps the most closely matched description to what the GEC would like to see in the GE form, in the description of their course GEOG 101: Physical Geography (Chico State also use the same text in their course as the one proposed for the course on our campus, though their text is an earlier edition):

“This course is a survey of the basic processes that determine flows of energy through the atmosphere and examines the subsequent interactions among water, landforms, soil, and vegetation that create and modify the surface of the earth. Students develop a recognition of landscape patterns, as well as an understanding of the physical, chemical, and biological principles and functions that create those patterns, in order to understand the natural environment in which we live and the role of humans affecting that environment. 2 hours lecture, 2 hours activity. This is an approved Writing Intensive course. This is an approved General Education course.”

At the University of Iowa, the course description is as follows:

“Climate change and interactions between atmosphere and geological, hydrological, and biological systems; response of these systems to climate change and how such responses affect atmospheric processes through feedbacks (e.g., flows of energy, cycles of carbon and water); how geographic differences in such interactions create ecological patterns around the world (e.g., rainforests, prairies). GE: Natural Sciences without Lab.”

And here is the way the course description appears in a Spring 2016 syllabus from the University of Iowa written and taught by Dr. Ridder, who starts this fall in our department:

“This course introduces you to current global environmental topics that range from local (e.g., soil conditions and characteristics) to global. Earth Sciences and Physical Geography are the study and synthesis of selected areas within the natural sciences and address the Earth’s four major environments: the atmosphere, the lithosphere, the hydrosphere, and the biosphere. We will focus on the connections between these environments, how phenomena at the global scale influence events locally (and vice-versa), and the use of the scientific tools of observation, analysis, and inference as a means of understanding the world around us. By the end of the semester, you are expected to demonstrate the following objectives through the completion of assignments, quizzes, and exams:

- * Describe the major concepts of earth systems science
- * Develop a vocabulary to understand and discuss course material and related content
- * Recognize, describe, and provide examples of interrelated system processes
- * Explain and exemplify human-environmental interactions
- * Apply the scientific method to develop questions, generate data, and derive conclusions”

While these courses may use different textbooks and are taught by different professors and instructors, they all fulfill the same introductory physical science requirement. And they each cover topics such as how energy flows through the earth system, how and why carbon cycles through different parts of the earth system, and how water cycles through the system, among other topics. This is exactly the sort of course that will benefit not only liberal studies students, but many others on the campus. And I would argue that this course can also help build earth science curriculum on the campus in part because it is part of the earth sciences.

Below are my responses to the specific questions sent to the GEC Chair and forwarded to me at my request. Prior to developing this response, I took the opportunity to meet with both Ed Price (Chair of Physics) and Jose Mendoza (Chair of Chemistry) to ensure my understanding of their departments’ concerns. At the end of our conversations, it appeared to me that, presuming the amended GE form addressed these concerns, this course would move forward with the B1 designation, in alignment with more general CSUSM practice.

1) Comment: *“I think the answer for B1.1 is problematic. I would imagine that “Earth as an Open and Closed System” involves principles of matter conservation and thermodynamics, but I would be much happier seeing “conservation of matter” and “thermodynamics” as the principles and theories being discussed and assessed. I’m not*

sure the sorting of the Earth's contents into Geosphere, Atmosphere, Biosphere and Hydrosphere really constitute a "modern physical or chemical principle or theory;" it is a convenient interpretive framework but not really a physical principle or theory. The "Role of the Sun's Energy in Shaping the Earth System," once again, sounds like an application of thermodynamics, but I see no assessment of students' understanding of basic thermodynamic principles. The example given for assessment, of asking students to differentiate between component systems of the Earth system and to explain their role in the carbon cycle, doesn't satisfy me that the students' understanding of the physical or chemical principles underlying the carbon cycle are being assessed.

I have some reservations about the other responses as well, but I think B1.1 is the one I'd be most concerned about. "

Response: I have changed that answer in the GE form to try and address this issue of physical science fundamentals. I would disagree a bit about exactly what these fundamentals are given that physical geography has its own approach and course content, is not a physics course, and is a physical science in its own right, but I see their concerns, have done my best to address them and I think the input from GEC improves the GE form. I would also point out that Dr. Ridder's syllabus addresses this issue in her description of the text providing basic concepts in an accessible manner.

2) Comment: *"If you look at the courses currently approved for B1, they are courses that aren't constrained by a focus on a particular **application** of the physical sciences. Faculty in the non-science-major courses are free to apply the fundamentals to whatever applications they think are appropriate, but I would worry that a course that has particular SLOs related to a particular application, such as geography, may not have sufficient time devoted to the fundamentals. I guess I would like to see that the SLOs for the course address the understanding of physical science fundamentals."*

Response: Physical geography is not an application of physical science, nor is it a non-science major. It is a physical science. The lack of recognition on this campus of Physical Geography as part of the earth sciences is a reflection of a broader lack of understanding about geography. On other campuses, this has not come up because geography is already a recognized part of the curriculum. A foundational program of the CSU, Geography is a discipline that includes both social and physical sciences; physical geography rests on the physical sciences side of the discipline. Moreover, this course has already been approved. We are only asking for GE B1 because that is what is the standard across the CSU system and in other universities across the country. I believe that, in consultation with Dr. Ridder, an SLO could be added to the syllabus regarding fundamentals.

3) Comment: *For perspective: Last year we signed off on having GEOG 110 count for Earth Science credit for LBST majors. Our department has been offering Earth Science 100 (ES 100) to fill this niche for over a decade, but we have never asked for B1 credit for this course.*

Response: Geography 110 is used for Earth Science credit at SDSU as well. At the same time, it is included among the courses that are part of the Area B1 list from which SDSU students choose their general education classes. That the Chemistry Department has not seen fit to apply for B1 credit has no bearing on whether Physical Geography on this campus does have this credit. (We note that our transfer students are already able to take the equivalent of ES 100 at Palomar, with LDGE B1 credit.) Again, on 17 campuses across the CSU, Physical Geography is used as one of the courses that fulfill the Area B1 requirement.

4) Comment: *My concern is that GEOG 110 is not sufficiently broad to count for B1.*

Response: It is unclear to me exactly what is meant here by “not sufficiently broad”. That said, Physical Geography courses (which cover the same material as the course proposed here and even use the same text) typically count for LDGE B1 credit across the CSU system and physical geography courses in the community colleges do so as well. In fact, we have numbered our course GEOG 110 to align with the community colleges’ transfer packages.

5) Comment: *For me, critical principles for physical science include the relationship between force and motion (newton’s laws), conservation of energy, waves/light/EM, and molecular-kinetic theory.*

Response: As stated earlier in this document, as with all disciplines that fall under a broad heading such as physical science, there may be issues and theories that are specific to one discipline or preferred by certain researchers, but not another, or that are approached differently in different subdisciplines.

6) Comment: *GEOG applies some of these [principles] in understanding earth and earth systems, but I’m not sure how thoroughly they treat the fundamentals. I’m not saying to vote against it, necessarily, but these are the concerns I would have in reviewing.*

Response: I completely agree with this comment that physical geography applies fundamentals perhaps differently or in different ways in its curriculum but this does not suggest or mean that it does not cover the fundamentals. I would recommend voting in favor of the GE request because this version of GEOG 110 is no different from physical geography courses offered at regional community colleges and at many other CSU campuses across the state.

7) Comment: *Incidentally, since there’s a lab, wouldn’t they want B4 credit too?*

Response: In the curriculum review process, a committee suggested removing the lab and we agreed. It will be added in at a later date once our new faculty member has settled in and become part of the curriculum development process. After the deletion of the lab component, the review committee did not notice that the title

also needed to be changed. We are working on this issue. But I think the proper designation for a lab in the Mathematics and Natural Sciences (Area B) section of GE is B3. B4 concerns mathematics and quantitative reasoning.

8) Comment: *I would check with Mike Schmidt too, he's very familiar with the course and was involved when we reviewed the C form*

Yvonne Meulemans suggested contacting Jose Mendoza in lieu of Mike Schmidt. I will contact him as well.

I hope this email answers the questions that GEC has raised in their prior communications and provides the necessary context for evaluating how physical geography fits into the CSU General Education Program from both a local and systemwide perspective. I am as always happy to respond to any questions that members may have. I do recognize that GEC is completing their agenda for the semester and I would be happy to attend Thursday's meeting if that would be helpful. We are keen to have GEC approve this course for our new faculty member.

Thank you for your consideration and help in improving the GE form for GEOG 110. I hope you can accept GEOG 110 into the General Education Program on our campus.

Sincerely,

Greig Tor Guthey

Appendices:

Below is a list of data from the CSU, updated forms, and communication with GEC Chair Yvonne Meulemans. Also included is a syllabus from University of Iowa where our new faculty member currently teaches. We expect her actual syllabus to be similar to this one.

1. List of CSU Campuses Using Physical Geography in their GE programs for B1

Cal Poly Pomona	GEOG 101: Physical Geography
CSU Chico	GEOG 101: Physical Geography
CSU Dominguez Hills	GEO 200: Physical Geography
CSU East Bay	GEOG 2100: Physical Geography
CSU Fullerton	GEOG 11: Physical Geography
CSU Long Beach	GEOG 101: The Global Environment
CSU Los Angeles	GEOG 1600: Physical Geography
CSU Monterey Bay	GEOG 110: Introduction to Physical Geography
CSU Northridge	GEOG 101: The Physical Environment
CSU Sacramento	GEOG 1: Physical Geography
CSU San Bernardino	GEOG 103: Physical Geography
CSU Stanislaus	GEOG 2010: Introduction to Physical Geography
Humboldt State University	GEOG 106: Physical Geography
San Diego State University	GEOG 101: Earth's Physical Environment (Also satisfies ES 100 req for Liberal Studies)
San Francisco State University	GEOG 101: Our Physical Environment
San Jose State University	GEOG 001: Geography of Natural Environments
Sonoma State University	GEOG 201: Global Environmental Systems

2. Updated GE Form for Geog 110

3. Dr. Elizabeth Ridder's Syllabus

4. Email to Yvonne Meulemans regarding additional information for Question B1.4 of the GE form for Geog 11

4) Email to Yvonne Meulemans regarding additional information for B1.4

Re: GEC review of GEOG 100

Thu 4/21/2016 1:44 AM

1 attachment (47 KB)

GEOG 110 LDGE B1 form.docx;

Hi Yvonne

Thanks to GEC for reviewing Geog 110 promptly. For the purposes of clarity allow me to restate the learning outcome b1.4. The question for learning outcome b1.4 is (1) whether students will be able to identify areas in which ethics directs or limits physical science research or (2) whether students will be able to identify areas in which ethics is informed by the products of this research.

There are a number of ways in which Introduction to Physical Geography accomplishes this learning outcome. I'll list three here.

First, students learn about a variety of ways in which humans have impacts on the environment. Urban Heat Island Effect is the name for the ways in which cities absorb heat and increase the temperature of cities above outlying areas . Cities absorb additional heat from the sun increasing urban temperatures.. Understanding this issue from a science basis, can lead to the ethical question: "Should cities be designed differently to reduce urban heat island effect and improve residents quality of life, for example, by reducing the effect of summer heat waves?" Students are asked to consider this question as part of a class discussion and short paper assignment. They are asked on exams to explain and define urban heat island effect.

Another example that addresses both dimensions of ethics in physical science in the learning outcome is climate change. First, the research has been directed to consider the scientific basis for climate change by the ethical issues raised by human impacts on the environment, do humans shape the climate of earth and if so, should they take steps to mitigate their impacts? Students learn the science of climate change in Introduction to Physical Geography and the various ways in which climate has changed in the past. They learn about positive and negative feedbacks in the climate system and are then able to understand the science behind contemporary debates concerning climate change. The issue from an ethical perspective is should anything be done now that scientists have identified the causes of contemporary climate change? Here we raise questions about the so-called "Green Economy" which has an ethical dimension to it which is rooted in physical science. In class, students discuss the scientific evidence of human-induced climate change and how to mitigate its effects by reducing our carbon footprint. Should we reduce our carbon footprint in a variety of ways in light of the evidence of human induced climate change and its likely effects on society? How will people do this? Exam questions ask students to explain or identify the mechanisms of climate change both in the past and in the present.

A third example is fracking. Students learn about how shale can contain pores in it that store natural gas which humans can use as a fuel and study the geography of shale gas deposits in the United States. Fracking is the process of hydraulic fracturing of shale bedrock to break up the rock and release the stored methane. The process is controversial because it can lead to ground water contamination, air quality problems around drilling sites, increased methane (a greenhouse gas) released into the atmosphere, irradiation of water from radon, among other effects. In class, students will discuss the science behind fracking and debate the issue of its environmental impacts in class, then write a reflection on whether they think fracking should be banned. On exams, students will be asked to explain what

shale gas is, where it is located (its geography), and how it is accessed.

I think these three topics and discussion assignments are great ways for students to learn to identify areas where ethics shapes scientific inquiry in physical science and to learn to identify areas where physical science research informs ethics.

Does this answer the question GEC has? I am happy to provide additional details if necessary. I am attaching a revised GEC form to this email containing similar language regarding Learning outcome b1.4.

Thanks

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food project: http://www.csusm.edu/liberalstudies/Food_Project.html

From: Yvonne Meulemans

Sent: Thursday, April 14, 2016 11:48 AM

To: Greig Guthey

Subject: Re: GEC review of GEOG 100

Hi Greig:

GEC reviewed GEOG 110 today and had only one request for clarification:

For the learning outcome B1.4 (Students will be able to identify areas in

which ethics either (1) directs or limits physical science research or (2) is informed by the products of this research.), the committee asks for further information in your responses in the 2nd column (Human Impacts on Earth Systems) and 3rd column. The committee felt that the responses didn't fully address the learning outcome, but certainly could. That is, the committee certainly sees how ethics could color research on human impacts on the earth system, so just needs further detail about this in the second column and then, in the third column how the students are asked to demonstrate they understand this.

I hope this make sense. I'm happy to talk f2f or by phone if you would think its helpful.

Thanks,
Yvonne

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