GEOGRAPHY PROGRAM REVIEW

2018

Contents

Executive Summary

In the last five years, the Geography Subject Area Committee (SAC) at Portland Community College (PCC) has experienced new opportunities, growth and uncertainties. Since our last program review in 2013, we designed and developed 10 new Geography courses; increased our part-time faculty capacity; revised curriculum in several courses to meet current geographic thought and advances in technology; lost one of our two full-time faculty members, leaving the future of that position unknown; created partnerships with other PCC departments and externally with industry community partners; and exposed over 7,000 students to geographic thought between 2012 and 2017.

This report presents our assessment of the SAC over the last five years, to see where we have been and where we are going. It contains both quantitative and qualitative data from many sources, including: students, Geography full and part-time faculty, PCC colleagues and departments, community partners, and the GIS advisory committee. Data were obtained through student surveys, assessments, and evaluations; faculty and advisory meeting notes; and demographic data from the Office of Institutional Effectiveness. Using a variety of data sources and analytical methods allowed us to look at SAC trends, as well as individual needs within the SAC.

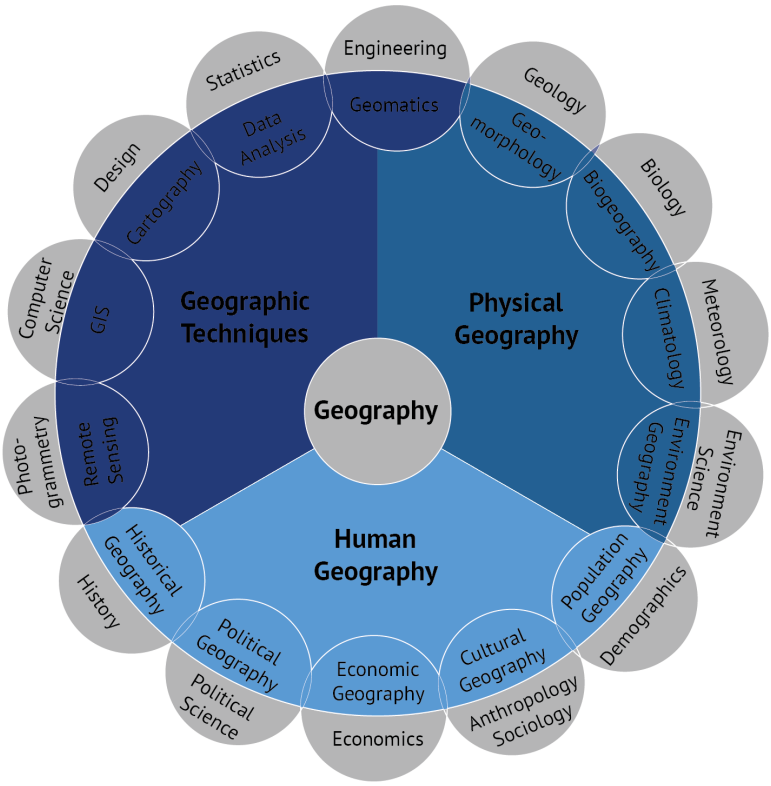
The report was compiled by the Geography SAC Chair, Christina Friedle, with direct contributions from Dimitar Dimitrov, Joe Gordon, Eric Roberts, Tuba Kayaarasi, Lindsay Skog, and Masoud Kheirabadi. Other members of the SAC participated in data gathering and reporting.

1. PROGRAM/DISCIPLINE REVIEW OUTLINE

A. WHAT ARE THE EDUCATIONAL GOALS OR OBJECTIVES OF THIS PROGRAM/DISCIPLINE? HOW DO THESE COMPARE WITH NATIONAL OR PROFESSIONAL PROGRAM/DISCIPLINE TRENDS OR GUIDELINES? HAVE THEY CHANGED SINCE THE LAST REVIEW, OR ARE THEY EXPECTED TO CHANGE IN THE NEXT FIVE YEARS?

GEOGRAPHIC EDUCATION:

Geography is not just about places on a map. Geography is about local and global connections between people, cultures, politics, economics, and the environment, amongst other things. Geography is the basis for understanding our interconnected world. Studying Geography gives us a chance to make observations about the world around us and to analyze the relationships between the natural environment, human life and social constructs. Modern Geography goes beyond its original Greek definition, to write about the Earth. Geographers have a unique approach to studying the Earth because they look at it from a spatial perspective and an interdisciplinary angle.



A study published in the International Research in Geographical and Environmental Education Journal, which focuses on the future of geography education, comes to the following conclusion:

"More than other disciplines, geography offers the opportunity to acquire knowledge and skills to see clearer how things are running on planet Earth and what we can do differently on a local as well as on a global scale in the time to come. Therefore, geography should be a compulsory element in education all over the world."

(Source: International Research in Geographical and Environmental Education. Volume 24, 2015 - Issue 4: Future Geographies and Geography Education www.tandfonline.com/doi/full/10.1080/10382046.2015.1086106)

Although what we find in the United States, and in Oregon in particular, is just the opposite. According to a study on the status of 6-12th grade geography education in the United States, states can either: 1) require a stand-alone geography course, 2) not require a stand-alone geography course, or, 3) allow local school districts to decide on course requirements. Seventeen states require a standalone Geography course in middle school and 10 states require this at the high school level - Oregon does not require a stand-alone Geography course at either level. This demonstrates the lack of clear educational goals for geography in Oregon. It also creates a challenge for Geography at PCC, since we are tasked with providing students with what might be their first and only exposure to Geographic concepts and thought.

(Source: Status of Geography Education in the United States. A Report for the National Geographic Society Education Foundation. National Geographic. Education Foundation, Washington DC, 2014.)

Nationwide there are growing concerns that we are not properly preparing our youth to have adequate skills to deal with modern workforce needs, including the growing use of geographic information and the use of location-based technologies. This is especially troubling in the light of the fact that:

"According to the Department of Labor, the employment of geography specialists is projected to grow 29 percent from 2012 to 2022 – much faster than the average 11 percent growth for all occupations."

(Source: US Students are really bad at Geography - https://www.usnews.com/news/articles/2015/10/16/us-students-are-terrible-at-geography)

EDUCATIONAL GOALS & OBJECTIVES:

The educational goals of the Geography program at PCC align with the Geography for Life: National Geographic Standards (http://ncge.org/geography-for-life), updated by the Geography Education National Implementation Project (GENIP) in 2012, as well as the Geospatial Technology Competency Model (GTCM) developed through a collaborative effort involving the Employment and Training Administration (ETA), the GeoTech Center, and industry experts (https://www.careeronestop.org/CompetencyModel/competency-models/geospatial-technology.aspx). Both of these standards are the foundation and driving force for the Geography and GIS Certificate program's goals to prepare students for entry-level geospatial careers and/or to transfer to a four-year University or college to continue their study in Geography or related field.

We place a high value on 'Doing Geography', which is demonstrated through our local community partnerships and having students participate in real-world projects outside of the classroom. We also place a high value on Cultural Awareness and integrate a global understanding of cultures throughout all of our courses. One of the core goals of a Geography education is to develop Geography skills by asking questions, acquiring and organizing Geographic Information, and analyzing Geographic Information to answer questions. This approach allows us to draw upon critical thinking skills such as inferring, analyzing, hypothesizing, and predicting.

FIVE YEAR TREND:

The overarching goals of the Geography and GIS program have not fundamentally changed over the last five years, nor will they change drastically over the next five years. What will change is our approach to teaching these underlying concepts. We continually modify and update our curriculum to incorporate the evolving needs of our industry partners, changes in geospatial technologies, to reflect the changes in our local and global communities, and to incorporate tools that allow us to understand the world around us.

B. BRIEFLY DESCRIBE CURRICULAR, INSTRUCTIONAL, OR OTHER CHANGES THAT WERE MADE AS A RESULT OF YOUR SAC'S RECOMMENDATIONS IN THE LAST PROGRAM REVIEW AND/OR ADMINISTRATIVE RESPONSE. (THE ADMINISTRATIVE RESPONSE CAN BE FOUND OPPOSITE YOUR SAC'S LISTING AT THE WEB PAGE WHERE THE PROGRAM REVIEWS ARE POSTED – LOOK FOR THE "AR" PDF)

In the last Geography Program Review, there were five main suggestions and recommendations made by the administration. Below is a summary of those recommendation and how we addressed those in our SAC.

ASSESSMENT FOR BOTH GEOGRAPHY (LDC) AND GIS (CTE):

Although assessment in the Geography SAC continues to be a struggle, we have made some progress towards assessing both Geography outcomes and our GIS Certificate program. Although it is not feasible to do both assessments each year because of our limited full-time Faculty, after assessing the full range of Core Outcomes in Geography, we moved to assessing Learning Outcomes for the GIS program in the last two years.

DEDICATED COMPUTER LAB FOR GIS CERTIFICATE PROGRAM

Up until Fall 2014, the GIS classes were offered in various computer labs around each of the campuses. We now have a dedicated lab on Sylvania campus (SS 110), priority scheduling in a lab on Rock Creek (7-112), and have reliable access to a lab at Southeast (SC200/202).

RECOGNITION OF A CTE PROGRAM

Since the GIS Certificate program resides in Geography, a LDC program, there was some initial confusion about whether or not it qualified as a CTE program. Clarification on this issue has been resolved and the GIS Certificate is recognized as CTE although we are still not eligible for Perkins funding or resources.

ISSUES WITH FINANCIAL AID

Working with Financial Aid, the GIS Certificate program is now an eligible program under financial aid.

LOOK INTO PERKINS ELIGIBILITY & CONNECTIONS WITH HS (STILL A WORK IN PROGRESS)

The GIS Certificate program is still not a Perkins-eligible CTE program, mostly because it is a less-than-one-year Certificate. There are a number of obstacles to working with High Schools on GIS course offerings including:

- Geography is only offered at a handful of high schools in Oregon
- It is difficult to find High School teachers that meet our Instructor Qualifications for Geography or GIS courses
- GIS specific courses are dependent on software and technology that is not always available to K-12 schools.

We have made some connections with High School students in an informal setting. This includes hosting a GIS workshop for high school girls through Chick Tech, bringing Benson High School students to a GIS Day event hosted by Metro, and working with Rosemary Anderson High School faculty to offer an introduction to GIS class to a small group of students (through Dual Credit). Christina Friedle has been working with Sara Callies, Science Coordinator, at Portland Public Schools to find creative ways to integrate Geography & GIS into science curriculum.

2. OUTCOMES AND ASSESSMENT: REFLECT ON LEARNING OUTCOMES AND ASSESSMENT, TEACHING METHODOLOGIES, AND CONTENT IN ORDER TO IMPROVE THE QUALITY OF TEACHING, LEARNING AND STUDENT SUCCESS.

A. COURSE-LEVEL OUTCOMES: THE COLLEGE HAS AN EXPECTATION THAT COURSE OUTCOMES, AS LISTED IN THE CCOG, ARE BOTH ASSESSABLE AND ASSESSED, WITH THE INTENT THAT SACS WILL COLLABORATE TO DEVELOP A SHARED VISION FOR COURSE-LEVEL LEARNING OUTCOMES

i. What is the SAC process for review of course outcomes in your CCOGs to ensure that they are assessable?

The GEO SAC regularly reviews our CCOG's to ensure that courses are current and up-to-date. In the last five years, we have made changes to seven of our courses to make sure that course outcomes reflect current course content, are assessable, and address any new developments in our discipline. Additionally, we have created ten new courses in the last five years, all of which were created with a focus on ensuring that our outcomes are assessable. The SAC continues to review all of our courses on a regular basis to ensure that the learning outcomes are both assessable and assessed.

ii. Identify and give examples of changes made in instruction, to improve students' attainment of course outcomes, or outcomes of requisite course sequences (such as are found in in MTH, WR, ESOL, BI, etc.) that were made as a result of assessment of student learning.

Geography faculty use a variety of assessment tools to evaluate student learning, which include exams/ quizzes, term papers, term projects, in-class activities, presentations, labs, essays, and class discussions. The technical courses that we offer as part of the GIS Certificate program are designed to be project-based and therefore the assessments in those courses focus on hands-on and real-world applications of skills. Below are a couple of examples to changes made in our instruction to improve students' attainment of course outcomes:

- Incorporating peer assessment into the classroom design has been an effective method for improving student success. One example of this is in the Cartography class, where students regularly conduct peer map critiques on mapping projects.
- Some instructors have 'flipped' the classroom to focus on discussions and activities during class meetings, and reading through the lecture and supporting materials as homework. This approach requires that student attend class and come prepared to actively participate on activities focused on the course content.
- One practice used by many of our instructors is "monitor & adjust." This means that we are constantly monitoring students success and adjusting materials when it is not at the level we expect. One example of this is in the Intro to GIS class, where we have updated labs to include more detail, simplified examples, when it became apparent students were struggling with it (based on the performance on the midterm or final assessments).

B. ADDRESSING COLLEGE CORE OUTCOMES:

i. Update the Core Outcomes Mapping Matrix. http://www.pcc.edu/resources/academic/core-outcomes/mapping-index.html For each course, choose the appropriate Mapping Level Indicator (0-4) to match faculty expectations for the Core Outcome for passing students. (You can copy from the website and paste into either a Word or Excel document to do this update, and provide as an Appendix).

Table 1. Geography Core Outcomes Mapping Matrix

Mapping level indicators		**Core Outcomes**	
0	Not Applicable	CO1	Communication
1	Limited demonstration or application of knowledge and skills	CO2	Community & Environmental Responsibility
2	Basic demonstration or application of knowledge and skills	CO3	Critical Thinking and Problem Solving
3	Demonstrates comprehension and is able to apply essential knowledge and skills	CO4	Cultural Awareness
4	Demonstrates thorough, effective and/or sophisticated application of knowledge and skills	CO5	Professional Competence
		CO6	Self-Reflection

#	Course Name	CO1	CO2	CO3	CO4	CO5	CO6
Geo 105	Human Geography	2	3	3	4	3	3
Geo 106	World Regional Geography	2	3	3	4	3	3
Geo 110	Natural Environment	2	3	4	4	3	3
Geo 170	Maps & Geospatial Concepts	3	2	4	2	4	3
Geo 202	Geography of Europe	3	3	4	4	3	3
Geo 204	Geography of Middle East	3	3	4	4	3	3
Geo 206	Geography of Oregon	3	3	4	4	3	3
Geo 209	Physical Geography: Weather & Climate	2	2	3	2	3	2
Geo 212	Geography of Global Issues	2	3	3	4	3	3
Geo 215	Geography of Latin America	3	3	4	4	3	3
Geo 221	Field Geography: Local Landscape	4	4	4	4	3	3
Geo 223	Field Geography: GPS & GIS	4	4	4	2	4	3
Geo 230	Geography of Race & Ethnic Conflicts	3	3	4	4	3	3

#	Course Name	CO1	CO2	CO3	CO4	CO5	CO6
Geo 240	Cartographic Principles & Application	4	3	4	4	4	4
Geo 242	GIS Programming	4	2	4	2	4	4
Geo 244	Interactive Map Design	4	2	4	3	4	4
Geo 246	Remote Sensing & Image Analysis	4	2	4	2	4	4
Geo 248	UAS Concepts, Operations & Applications	4	2	4	2	4	4
Geo 250	Geography of Africa	3	3	4	4	3	3
Geo 252	UAS Data Integration & Interpretation	4	2	4	2	4	4
Geo 265	Introduction to GIS	4	3	4	2	4	3
Geo 266	GIS Analysis	4	3	4	2	4	3
Geo 267	Application Topics in GIS	4	4	4	2	4	3
Geo 270	Creating a Map Portfolio	4	2	4	2	4	4
Geo 280A	Cooperative Education: Geography	4	4	4	2	4	4
Geo 298	Independent Study: Geography	4	4	4	2	4	4

C. LOWER DIVISION COLLEGIATE (TRANSFER) AND CAREER TECHNICAL EDUCATION: ASSESSMENT OF COLLEGE CORE OUTCOMES, AND DEGREE AND CERTIFICATE OUTCOMES.

i. Briefly describe the evidence you have that students are meeting your Degree and/or Certificate outcomes.

We are currently in the middle of our first assessment project aimed directly as assessing the professional competency of students entering and completing the PCC GIS certificate program, as specifically measured by the use of a quantitative assessment pulled from a combination of Entry, Associate, and Advanced Certificate study exams published by Esri, the primary provider of GIS software to PCC. Initial results will not be ready until the end of the 2017-18 academic year.

Being a SAC that is both LDC and CTE, and with one full-time Faculty member, it has been difficult for us to assess both programs each academic year. We focused on assessing PCC core outcomes for the first few years and are now focused on assessing the GIS certificate program directly to better understand how we are meeting our outcomes.

ii. Reflecting on the last five years of assessment, provide a brief summary of one or two of your best assessment projects, highlighting efforts made to improve students' attainment of the Core Outcomes. (If including any summary data in the report or an appendix, be sure to redact all student identifiers)

One notable assessment project was focused on critical thinking, which had students interpret data visualizations (e.g., charts, graphs, maps) related to the relationship between socioeconomics and

geography. The initial phase of the assessment involved a line of questioning that was too vague and thus invited too much interpretation on the part of the students. The re-assessment phase sought to more narrowly focus the questions and help guide the students toward critical engagement with the material. The questions were centered on three themes (and related types of data visualizations), including (a) population (with an evaluation of economic and cultural differences as reflected in population pyramid bar charts), (b) geographic concepts (with an evaluation of differences in economic development, land use, transportation, and climate impacts as reflected in nighttime maps of lit urban areas), and (c) regions (with an evaluation of the relationship between international trends in urban/rural population patterns and income over time).

iii. Do you have evidence that the changes made were effective by having reassessed the same outcome? If so, please describe.

The results of the assessment cycles for 2013-2014 and 2014-2015 showed an increase of 4.75% in the number of students achieving minimum assessment benchmarks, which was due in large part to curriculum changes related to the assessment itself. Questions were re-worked in order to be more specific, due to feedback from faculty that the original assessment questions were too vague to obtain useful answers. Secondarily, faculty was instructed to spend an additional 30-35 minutes of class time prior to the administration of the assessment discussing examples of population pyramids and helping students understand how data visualizations can be used to infer socioeconomic conditions about a place.

The current assessment cycles of 2016-2017 and 2017-2018 has implemented a number of changes to the format and delivery of assessment itself, in order to improve upon several issues that were identified at the end of the initial year. Additional background demographic questions were introduced into the assessment in order to more precisely differentiate between the effect of GIS experience obtained prior to PCC enrollment from GIS experience obtained specifically as a result of enrollment in the PCC GIS Certificate program. Additional knowledge questions were introduced as well, and the candidate pool of questions was broadened both in magnitude and topic, as sourced from multiple years' worth of Esri Entry, Associate, and Advanced Certificate study exams.

iv. Evaluate your SAC's assessment cycle processes. What have you learned to improve your assessment practices and strategies?

An important lesson learned in the 2013-2014 assessment cycle was that assessment questions need to be discrete or focused enough to garner measurable answers, which are in turn focused on the desired aspect of the subject. When the questions are too vague or open-ended, there is an increased chance for students to loosely interpret the focus of the question and perhaps answer an altogether different question or not engage sufficiently with the material. This is particularly problematic when the core outcome being evaluated is Critical Thinking, which would seem to suggest the suitability of a certain degree of open-endedness in order to provide ample conceptual space for exploration of the subject material. However, perhaps counter-intuitively, abstract concepts can be handled or approached with increasingly discrete terms, such as the case with the 2014-2015 re-assessment phase, when the original question for the geographic concepts theme was substantially expanded upon, and the expectation of which variables to discuss was made explicit (i.e., economic development, land use, transportation, and climate). Simply put, better questions invite better answers.

Other important lessons have been learned from the current assessment cycle regarding the mechanism of assessment itself. In the original 2016-2017 assessment phase, the assessment was delivered and collected on paper, which made standardization of responses difficult (e.g., no names, multiple responses selected) as well as implementation of the survey among multiple faculty members, classes, and campuses. In 2017-2018, the knowledge survey was implemented online, which improved upon the aforementioned issues. Additionally, inclusion of an explicit "I don't know" response decreased the amount of chance correct guesses, which we wanted to avoid since our goal was to measure knowledge acquisition and retention over the course of the certificate program. Lastly, broadening the scope and increasing the specificity of background questions allowed us to more precisely differentiate between the effects of GIS experience gained prior to enrollment at PCC as compared with GIS experience gained as a result of our curricula, as well as providing insight into which combination of GIS electives is providing the most skill-based knowledge benefit.

v. Are there any Core Outcomes that are particularly challenging for your SAC to assess? If yes, please identify which ones and the challenges that exist.

There are none that are particularly difficult. In the last five years, Communication, Community and Environmental Responsibility, Critical Thinking and Problem Solving, and Professional Competence have all been effectively assessed. Geography and GIS are both interdisciplinary fields and lend themselves well to evaluation of all of the core outcomes.

3. OTHER INSTRUCTIONAL ISSUES

A. PLEASE REVIEW THE DATA FOR COURSE ENROLLMENTS IN YOUR SUBJECT AREA. ARE ENROLLMENTS SIMILAR TO COLLEGE FTE TRENDS IN GENERAL, OR ARE THEY INCREASING OR DECREASING AT A FASTER RATE? WHAT (IF ANY) FACTORS WITHIN CONTROL OF YOUR SAC MAY BE INFLUENCING ENROLLMENTS IN YOUR COURSES? WHAT (IF ANY) FACTORS WITHIN CONTROL OF THE COLLEGE MAY BE INFLUENCING ENROLLMENTS IN YOUR COURSES?

The Geography program at PCC has experienced some variability in our headcounts over the last five years. A total of 7,087 students enrolled in at least one Geography course from 2012-2017, a 50% increase from the number of students who took a class between 2007-2012. Overall, the collegewide headcount has decreased by about 19% over the last five years, while the Geography SAC has seen a 7.8% decrease.

Table 2. Geography Enrollment, 2012-2017

Academic Year	College-Wide Headcounts	% change from previous year	Geography Headcounts	% change from previous year
2012-13	33,679.2	n/a	1,180	-0.9
2013-14	31,940.2	-5.2	1,140	-3.4
2014-15	30,170.0	-5.5	1,156	1.4
2015-16	28,018.7	-7.1	1,076	-6.9
2016-17	27,270.0	-2.7	1,088	1.1
Total 5-year Change	-6,409.2	-19.03	-92	-7.8

When we look at Geography SFTE numbers there is a slightly different story. In the table below, we break it down into two categories - All Geography courses and GIS courses (Technical courses that are core to the GIS Certificate). Geography SFTE has gone up by 17% since 2012-13 (the college as a whole has a decreased 6.79% in SFTE from 2012/13 to 2016/17), while GIS SFTE has increased 116%.

Table 3. Geography SFTE, 2012-2018

Academic Year	All Geography	% Change Geography	GIS	% Change GIS
2012-13	147.67	n/a	33.39	n/a
2013-14	147.6	-0.05	38.71	15.93
2014-15	153.3	3.86	50.55	30.59
2015-16	144.41	-5.8	52.16	3.18
2016-17	153.61	6.37	57.08	9.43
2017 - 18	172.89	12.55	72.14	26.38
Total 6-year Change	25.22	17.08	38.75	116.05
*These numbers are the best estimate we have for 2017-18. It includes data from week 2 of spring term.				

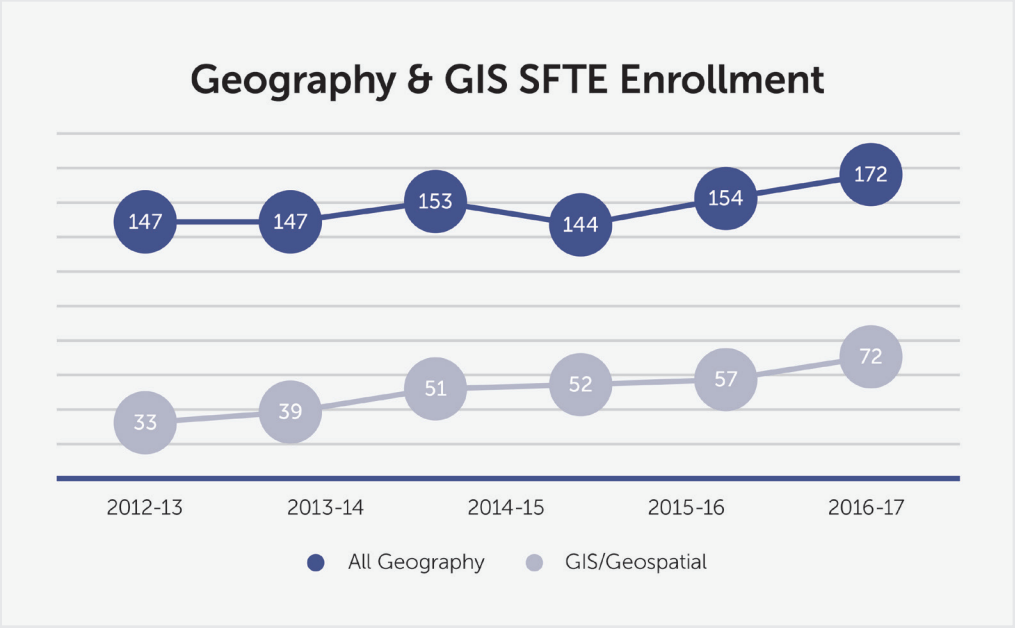


Figure 1. Geography & GIS SFTE

The increase in our enrollments can be largely attributed to the GIS Certificate program drawing students into our technical classes. Since the 2012-13 academic year, we added six new GIS specific courses and are now offering 11 more sections of classes. The SAC can also attribute this growth in enrollment to the reputation and popularity of the GIS Certificate program in the local GIS community. Each year, more and more students are referred to PCC as the best place in the Portland metro area to pursue a GIS Certificate and education.

As Geographers, we also like to look at enrollment from a spatial perspective. We mapped out where Geography students are coming from at three different scales (from 2012-2017): the United States, Oregon, and the Portland Metro Area.

Geography students were represented in 41 out of 50 states, which shows how geographically diverse our students are. There have also been Geography students from at least five different countries.

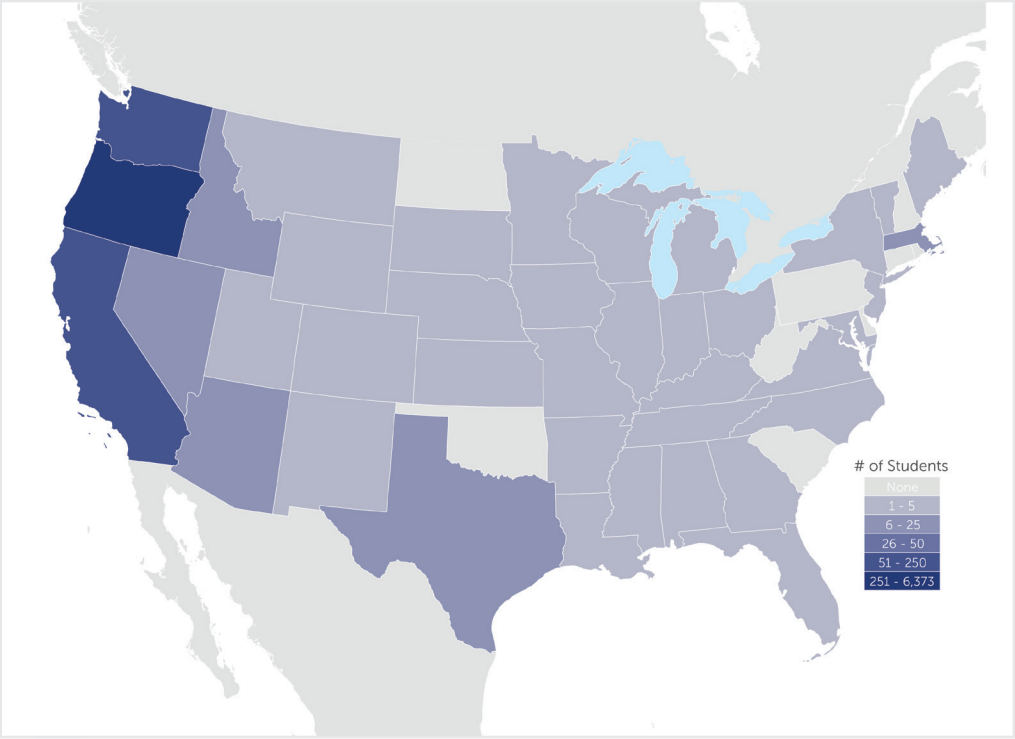


Figure 2. Geography student by State, 2012-2017

This map (Figure 3) shows the county-by-county distribution of Geography students in Oregon. The Portland Metro area is clearly where most students are coming from, although we have students from all but three counties in the state.

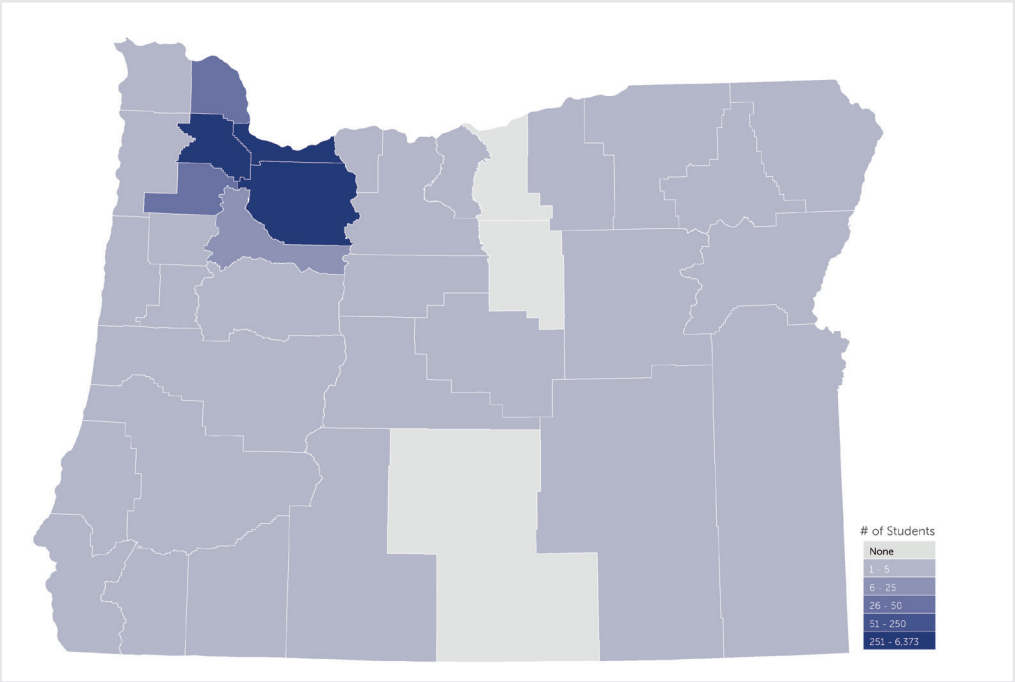


Figure 3. Geography students by Oregon County, 2012-2017

To focus more deeply on the Portland Metro area, we mapped the region, broken down into 1-mile hexagons. We also created two maps - one showing all Geography students and one showing just those students that took our technical GIS courses. We found that the spatial pattern was quite different for the two. When looking at all Geography students, we found that students are distributed fairly evenly between west and east sides of the metro area (Figure 4).

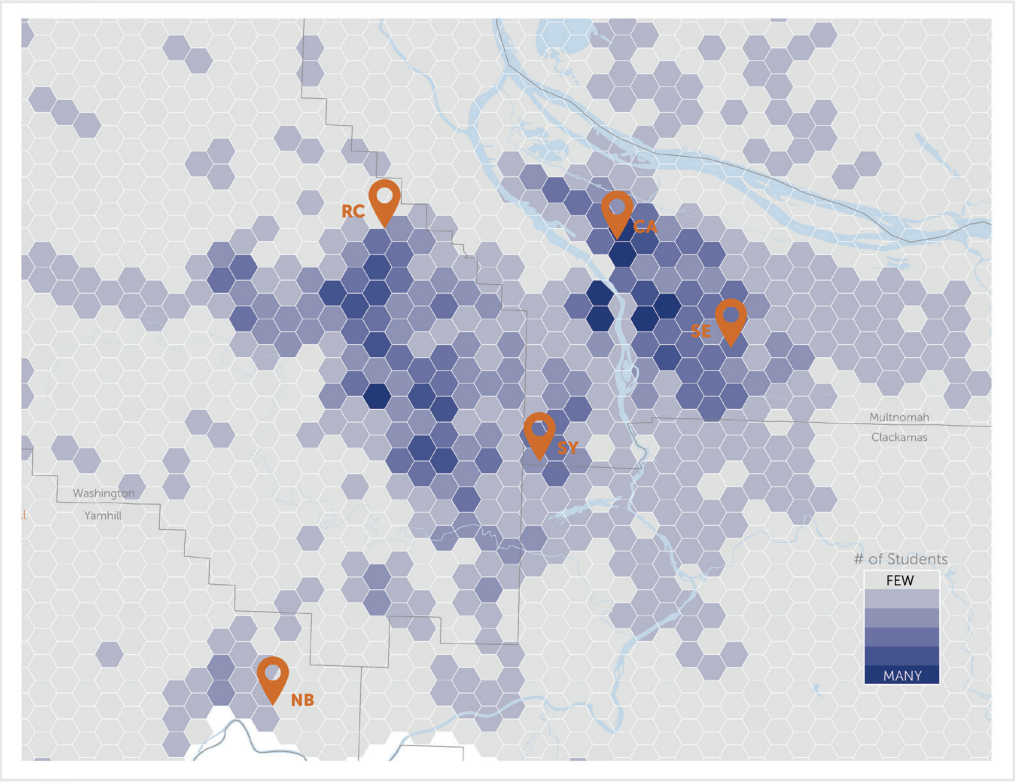


Figure 4. Geography students in Portland metro, 2012-2017

When examining just the GIS students, we find that there is a large concentration on the eastside, with some thinner densities on the westside.

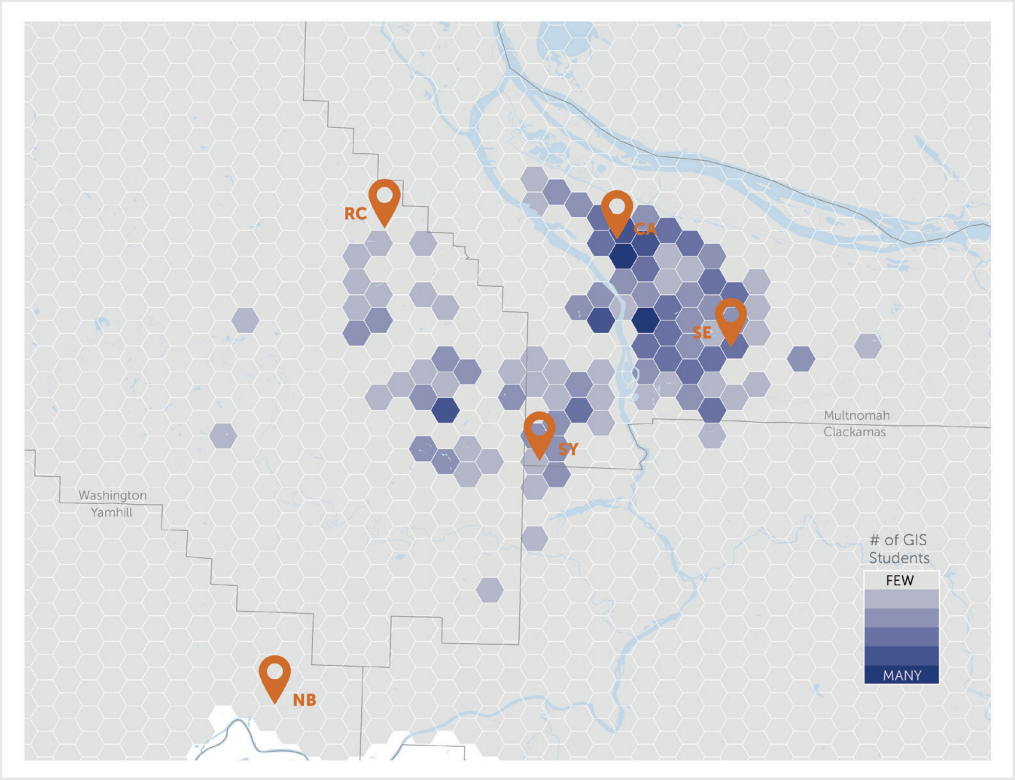


Figure 5. GIS students in Portland Metro, 2012-2017

Generally speaking, we found that Geography students are dispersed across the Portland metro area, state, country and world - which isn't overly surprising. We are excited to know that the reach of Geography at PCC is wide and diverse.

B. PLEASE REVIEW THE GRADES AWARDED FOR THE COURSES IN YOUR PROGRAM. WHAT PATTERNS OR TRENDS DO YOU SEE? ARE THERE ANY COURSES WITH CONSISTENTLY LOWER PASS RATES THAN OTHERS? WHY DO YOU THINK THIS IS THE CASE, HOW IS YOUR SAC ADDRESSING THIS?

In the Geography SAC, we have an average pass rate of 83.81% over the last five years, which we believe is fairly high. In Figure 6, we show the average pass rate by each course from the last five years. There are two classes that fall noticeably below average – Geo 204 (Geography of the Middle East) and Geo 230 (Geography of Race and Ethnic Conflict). These are the only two classes that are offered exclusively online and as 5-week summer courses. We believe the combination of the three factors (online, summer, 5-week intensive) are the reason for the lower pass rates. There are a number of things already being done to address this issue, including course improvement, required introduction emails, and online discussions to engage students.

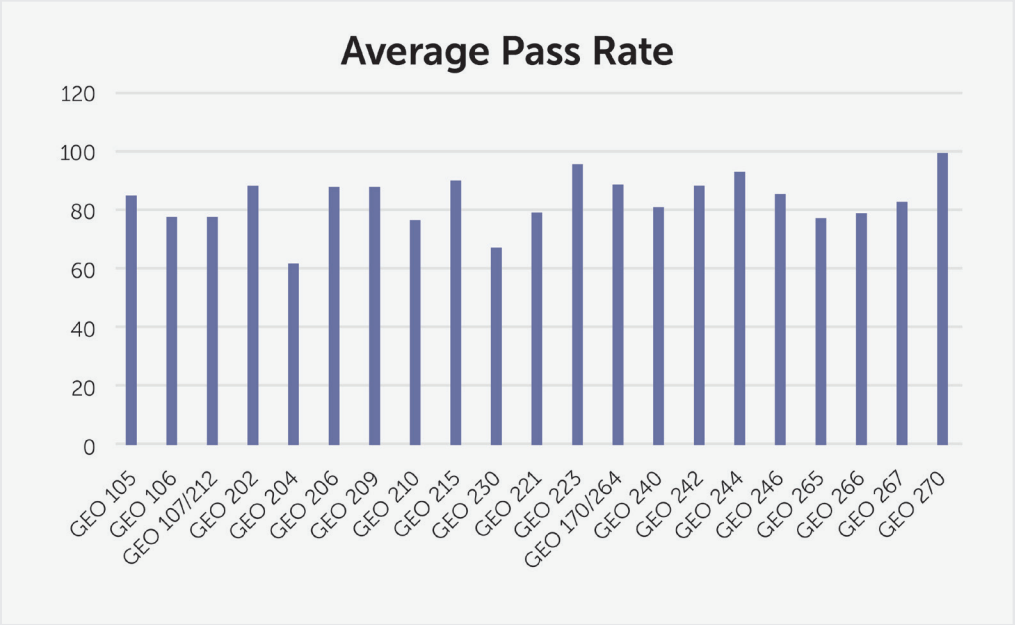


Figure 6. Geography Course Pass Rates

We did not include Geo 298 (Independent Study) and Geo 280A (Cooperative Ed) in this graph because both classes are unique in the way they are offered and implemented. For example, the numbers in Geo 280A look frightening, but that is only because students are working in an internship capacity to earn credit towards the GIS Certificate and they rarely line up perfectly with an academic quarter. That being the case, almost all students earn a CIP (Course in Progress) when grades are due, but there has never been a student that hasn't completed the credits with a passing grade.

C. WHICH OF YOUR COURSES ARE OFFERED ONLINE AND WHAT IS THE PROPORTION OF ON-CAMPUS AND ONLINE? FOR COURSES OFFERED BOTH VIA DL AND ON CAMPUS, ARE THERE DIFFERENCES IN STUDENT SUCCESS? IF YES, DESCRIBE THE DIFFERENCES AND HOW YOUR SAC IS ADDRESSING THEM.

In Geography, 9 out of 26 courses are offered online (Table 4), and one class is consistently offered as a hybrid course (Geo 267). Of the GIS/technical courses, only Geo 170, Maps and Geospatial Concepts (still in development) is offered online and Geo 267, Applications in GIS is offered as a hybrid.

Table 4. Online Course offerings

Geo 105, Human Geography
Geo 106, World Regional Geography
Geo 107 / Geo 212, Geography of Global Issues
Geo 110 / Geo 210, Natural Environment
Geo 170, Maps and Geospatial Concepts (will be offered for the first time Summer 2018)
Geo 202, Geography of Europe
Geo 204, Geography of Middle East
Geo 215, Geography of Latin America
Geo 230, Geography of Race and Ethnic Conflict

In 2016-17, we offered 65 sections of Geography classes. Of those classes, 38% (25) were offered online and 62% (40) were offered on campus as face-to-face classes. This is fairly representative proportion of what we offer on an annual basis for online and face-to-face.

There are only four courses that are offered in both online and face-to-face modalities, and there is no significant difference in student success.

D. HAS THE SAC MADE ANY CURRICULAR CHANGES AS A RESULT OF EXPLORING/ADOPTING EDUCATIONAL INITIATIVES (E.G., COMMUNITY-BASED LEARNING, INTERNATIONA

Community-based learning, inquiry, and internationalization are all fundamental to Geographic education. We routinely incorporate these initiatives into our coursework through fieldwork/data collection, collaborating with community partners on mapping projects, and using the inquiry method for analyzing geographic/spatial questions. Through our Geo 267, Applications in GIS class, students in the GIS program have worked with over 50 community organizations to complete a GIS/mapping project. Students work with their community partner over the course of the Spring term and include projects such as: quantifying the change in Oregon State Forests over the last 20 years, analyzing legislative redistricting possibilities in Oregon, conducting landslide analysis for the Terwilliger parkway, and conducting demographic analysis for the Sandy River watershed. A selection of student work samples for the Geo 267 projects are included in Appendix A.

In an effort to provide more instruction on sustainability and sustainable development, we expanded our offerings in GEO 110 The Natural Environment, to both online and face-to-face modalities at Newberg Center, Sylvania, Cascade, and Rock Creek. Another example of this, is the development of two new regional Geography courses, Geo 202 Geography of Europe and Geo 215 Geography of Latin America, which address the increasing role of the process of globalization of economy and culture. We also constantly update our core geography courses as to reflect the changes and tendencies in global politics and economics. For example, the two discussion topics in the online version of GEO 202 Geography of Europe, were Brexit and Immigration Crisis in Europe.

E. ARE THERE ANY COURSES IN THE PROGRAM THAT ARE OFFERED AS DUAL CREDIT AT AREA HIGH SCHOOLS? IF SO, DESCRIBE HOW THE SAC DEVELOPS AND MAINTAINS RELATIONSHIPS WITH THE HS FACULTY IN SUPPORT OF QUALITY INSTRUCTION.

The Geography SAC at PCC has established a fruitful collaboration with Gaston High School. Starting in the 2016-17 academic year, we started offering Geo 105, Human Geography, and Geo 106, World Regional Geography, as Dual Credit at Gaston High School. The Dual Credit high school classes were visited multiple times and the courses were evaluated in accordance with the PCC Dual Credit Course Assessment Forms.

In order to support high quality instruction at Gaston High School the Geography SAC assists the teacher with the development of the syllabi, and formally approves it after it is reviewed by SAC members. The SAC has supplied the teacher with information about open-source educational material and eBooks, as well as shared course materials used by Instructors in the Geography SAC teaching the same classes.

SAC members attend Dual Credit professional meetings and workshops in order to enhance collegial interactions, and communicate relevant SAC information to the high school teacher.

The Dual Credit courses have been properly assessed annually through regular meetings and site visits.

F. PLEASE DESCRIBE THE USE OF COURSE EVALUATIONS BY THE SAC. HAVE YOU DEVELOPED SAC-SPECIFIC QUESTIONS? HAS THE INFORMATION YOU HAVE RECEIVED BEEN OF USE AT THE COURSE/PROGRAM/DISCIPLINE LEVEL?

The Geography SAC has developed a set of nine questions to include on student evaluations that focus on understanding a student's perceptions of their own learning about culture, cultural understanding, physical

environment, and global awareness. These questions were included on Geography course evaluations for the first time in Winter 2018. It is too early to provide a summary of results with just one quarter of student data. Included in Appendix B is a selection of student responses from the SAC questions from Winter. A comprehensive summary will be provided in our next program review, or earlier if requested.

Individual instructors add course-specific questions on course evaluations to get a better understanding on how students value textbooks or course materials, the effectiveness of class assignments for learning, the best components of the class, areas of improvement, and the preparedness levels for final projects. The results of these evaluations are used to make Instructor-level changes in specific courses, including the incorporation of Open Educational Resources or other no-cost resources in place of a textbook; pedagogical approaches such as a flipped classroom; or changes to assignments to focus on areas that need improvement.

4. NEEDS OF STUDENTS AND THE COMMUNITY

A. HAVE THERE BEEN ANY CHANGES IN THE DEMOGRAPHICS OF THE STUDENT POPULATIONS YOU SERVE? IF THERE HAVE BEEN CHANGES, HOW HAS THIS IMPACTED CURRICULUM, INSTRUCTION OR PROFESSIONAL DEVELOPMENT?

Since our last program review, Geography students have gotten older. The mean age of Geography students from 2012-2017 was 30.7 years old (five years older than 2007-2012 when the mean 25.9). The median age was 28 (versus 24 in 2007-2012) and the mode was 27 (it was 19 in 2007-2012).

When we break out just the technical Geography courses (GIS), the mean age for students between 2012-2017 was 34.7, which is 3 years older than in 2007-2012. The median age was 33 (it was 30 in 2007-2012) and the mode was 27 (it was 24 in 2007-2012).

Although there is still a male majority in our GIS classes, it is more balanced in the last five years than it was in 2007-2012.

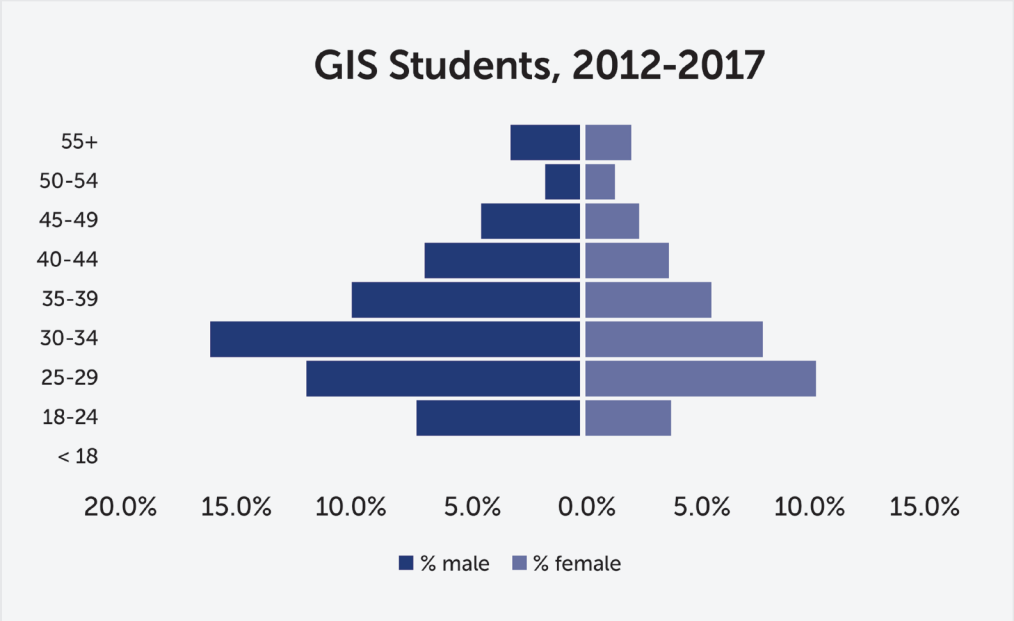


Figure 7. GIS Student Population Pyramid, 2012-2017

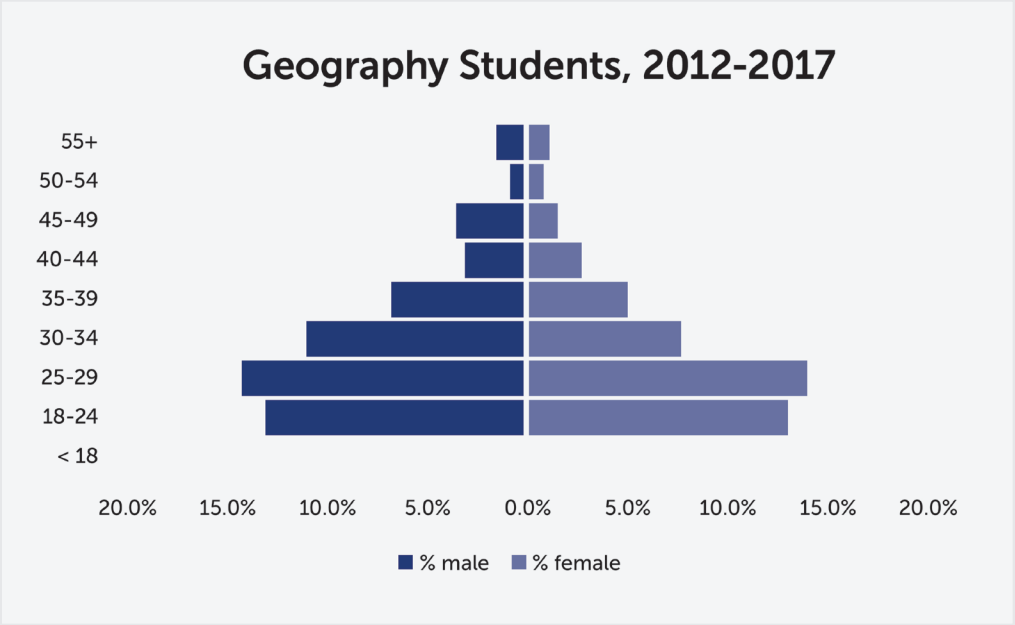


Figure 8. Geography Student Population Pyramid, 2012-2017

In Geography we have about 68% of our students identifying as Caucasian. It is a higher Caucasian population than the college as a whole, which in 2016 was 58%.

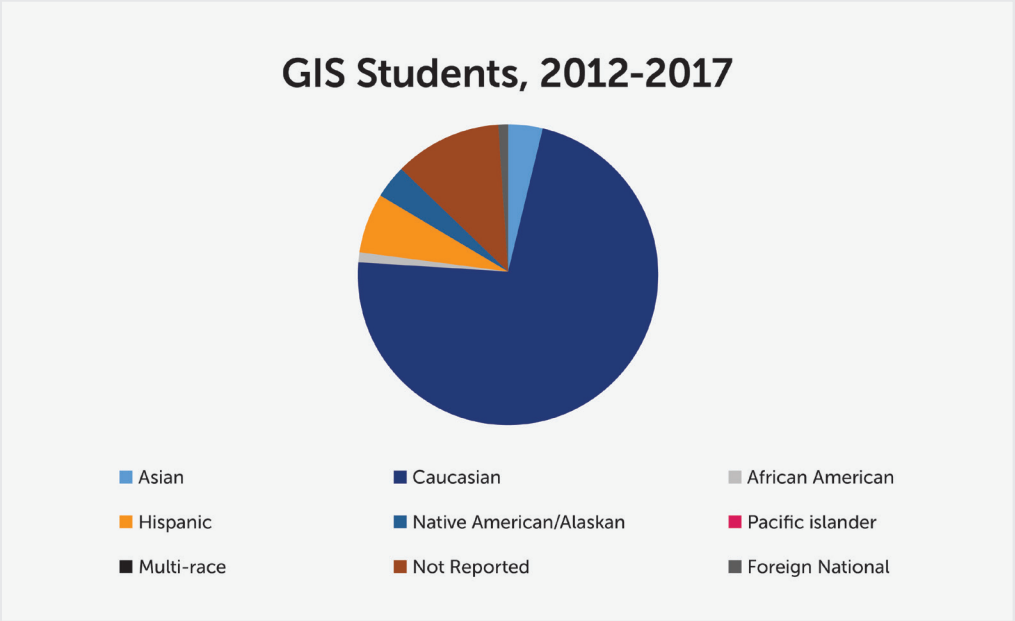


Figure 9. GIS Students Racial and Ethnic Demographics, 2012-2017

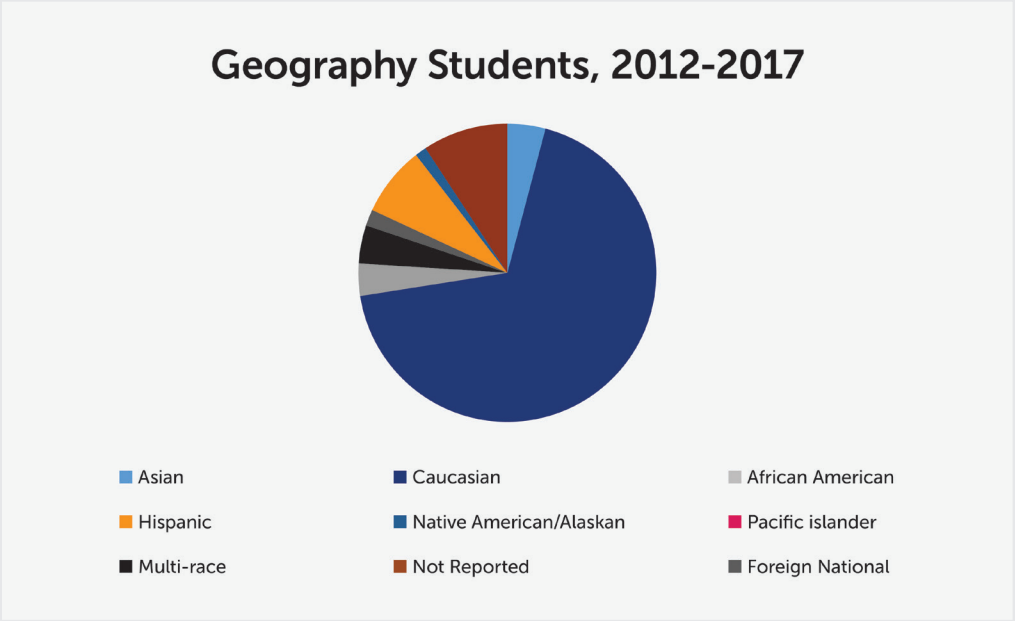


Figure 10. Geography Students Racial and Ethnic Demographics, 2012-2017

B. WHAT STRATEGIES ARE USED WITHIN THE PROGRAM/DISCIPLINE TO FACILITATE SUCCESS FOR STUDENTS WITH DISABILITIES? IF KNOWN, TO WHAT EXTENT ARE YOUR STUDENTS UTILIZING THE RESOURCES OFFERED BY DISABILITY SERVICES? WHAT DOES THE SAC SEE AS PARTICULARLY CHALLENGING IN SERVING THESE STUDENTS?

On the broadest scale, the SAC ensures that all online classes are accessible using the Quality Matters (QM) rubric.

In 2015, two Geography part-time faculty, Tuba Kayaarasi-Rodriguez and Randy Morris, conducted the Geography Subject Area Accessibility Study. Faculty worked closely with Disabilities Services and Distance Learning to study and find possible solutions for the challenges faced by visually impaired students in Geography classes since they rely heavily on maps and mapping applications, photo images, videos, infographics, and histograms. The full report on the study making geography courses accessible "Accessibility and Distance Learning in Geography" can be accessed in https://www.pcc.edu/resources/instructional-support/access/documents/BestPracticesforGeography.pdf.

C. WHAT STRATEGIES ARE USED WITHIN THE PROGRAM/DISCIPLINE TO FACILITATE SUCCESS FOR ONLINE STUDENTS? WHAT DOES THE SAC SEE AS PARTICULARLY CHALLENGING IN SERVING ONLINE STUDENTS?

Geography faculty take advantage of the resources and trainings offered by Distance Learning to improve course delivery. A well designed course often leads to student success. Below are a few examples of strategies used by Geography faculty to facilitate student success online.

- As the instructor, have a consistent and regular presence online and in the class.
- Create a course shell that is easy to maneuver, well-organized, and clear for students.
- Include a well-written syllabus with clear rules, efficient and appropriate communication guidelines, and reasonable expectations.
- Provide opportunities for students to engage with their peers through group discussions.

- Provide multimedia resources (articles, films, audio files, photos) relevant to the course topic that help students with their quest to learn more about a topic, critical thinking development, research process, preparation for their assignments, and overall knowledge of the course main themes.
- Include creative class activities that are timely and include current events.
- Create a positive class atmosphere, encouraging a constructive discussion environment and discouraging unproductive conversations.

D. HAS FEEDBACK FROM STUDENTS, COMMUNITY GROUPS, TRANSFER INSTITUTIONS, BUSINESS, INDUSTRY OR GOVERNMENT BEEN USED TO MAKE CURRICULUM OR INSTRUCTIONAL CHANGES (IF THIS HAS NOT BEEN ADDRESSED ELSEWHERE IN THIS DOCUMENT)? IF SO, DESCRIBE.

The Geography SAC has used feedback from students to makes changes to curriculum (Section 3F), and from community groups, GIS Advisory committee, transfer institutions, business, industry, or government (Section 7A).

5. FACULTY: REFLECT ON THE COMPOSITION, QUALIFICATIONS AND DEVELOPMENT OF THE FACULTY

Currently, the PCC Geography faculty is comprised of one full-time instructor, and eleven adjunct instructors (Tables 5 & 6). In 2016, we lost one full-time Geographer at Rock Creek. In 2017-18, Dimitar Dimitrov stepped into a temporary, one-year position, at the same time that a Faculty hiring freeze was announced. The status of the full-time Geography position at Rock Creek is still uncertain, although Dimitar will continue in a temporary full-time position in 2018-19.

Table 5. Full Time Faculty

Name	Campus	Degree	Specialty Area
Christina Friedle	SY	MS, Geography	GIS, Cultural Mapping, Latin America, Cartography, Interactive Mapping

Table 6. Part Time Faculty

Name	Campus	Degree	Specialty Area
Michael Boeder	SY	MS, Geography GIS Certificate	Climate Science, water resources, spatial analysis, LiDAR
Dimitar Dimitrov	RC (Temp, Full-time in 2017-18 Academic Year), SY, CA, Newberg	Ph.D. Geography	Asia, Europe (EU), Political Geography
Joe Gordon	SY	MS, Geography	GIS, demography, remote sensing
Chris Grant	SY, RC	Ph.D. Chemistry GIS Graduate Certificate	GIS, geospatial analysis, computational methods
Tuba Kayaraasi	SY, CA	MA International Relations MS Geography MS Education	Political Economy of the Environment, Cultural geography, Feminist Political Ecology, Ecological Literacy
Masoud Kheirabadi	RC	Ph.D. Geography	Middle East, Contemporary Geopolitical Issues
Bryan Kilburn	SY, SE	MS, Geospatial Information Systems/ Science	Planning, Demography, Forestry, Precision Agriculture
James Manzione	SY	MS, Geography	GIS, Water Resource Management, Physical Geography
Kerry Pataki	SY	MA, Geography Ph.D. Anthropology	Statistical Geography, Migration, Melanesia
Eric Roberts	SY, SE, RC	BS, Environmental Studies GIS Certificate	GIS, Remote Sensing

Name	Campus	Degree	Specialty Area
Lindsay Skog	SY, CA	Ph.D. Geography MA, Geography MS, Education Administration	Environment-Society Geography, Political Ecology, Cultural Geography, Asia, Pacific Northwest, Development

A. PROVIDE INFORMATION ON HOW THE FACULTY INSTRUCTIONAL PRACTICES REFLECT THE STRATEGIC INTENTIONS FOR DIVERSITY, EQUITY AND INCLUSION IN PCC'S STRATEGIC PLAN, THEME 5. WHAT HAS THE SAC DONE TO FURTHER YOUR FACULTY'S INTER-CULTURAL COMPETENCE, AND CREATION OF A SHARED UNDERSTANDING ABOUT DIVERSITY, EQUITY AND INCLUSION?

In Geography, we have an advantage when it comes to teaching with a Diversity, Equity, and Inclusion lens since our discipline is rooted in understanding both physical and cultural environments from around the world. As Geographers, we are trained in intercultural understanding and it is at the core of our teaching and pedagogical approach. For example, in our Geography of Race and Ethnic conflict class, students examine the history of race relations in the United States and the current status of race and ethnic relations/conflicts within the United States and globally. In our GIS classes, we cover the GISP Code of Ethics, which include specific language about using GIS technology and skills to benefit society, and to enhance the well-being of individuals and groups of all backgrounds.

All Geography faculty has gone through the federally-mandated training on Diversity and Inclusion, as well as other professional development focused on LGBTQIA, Cultural literacy, and accessibility. This translates into the classroom in a variety of ways. Faculty develops instructional materials on race, ethnicity, gender and sexuality; incorporates course readings and materials from female, LBGTQIA, Indigenous, and/or non-Western authors; assigns reading that directly addresses race, hetero-normative assumptions, and the politics of the production of knowledge; and develops assignments directly aimed at allowing the diverse voices and experiences of students to emerge in the classroom. These professional development opportunities have also provided our faculty with the skills to create a classroom environment where students feel safe and confident to express their opinions.

B. REPORT ANY CHANGES THE SAC HAS MADE TO INSTRUCTOR QUALIFICATIONS SINCE THE LAST REVIEW AND THE REASON FOR THE CHANGES. (CURRENT INSTRUCTOR QUALIFICATIONS AT: HTTP://WWW.PCC.EDU/RESOURCES/ACADEMIC/INSTRUCTOR-QUALIFICATIONS/INDEX.HTML)

We are in the process of revising our Instructor Qualifications for our Unmanned Aerial Systems (UAS) specific courses. This change is being made to specify that Instructors teaching these classes (Geo 248 & Geo 252) are licensed drone pilots. We also added more classes in the section for Technical Geography courses since we have developed a number of new courses since 2013 when we last made IQ changes.

C. HOW HAVE PROFESSIONAL DEVELOPMENT ACTIVITIES OF THE FACULTY CONTRIBUTED TO THE STRENGTH OF THE PROGRAM/DISCIPLINE? IF SUCH ACTIVITIES HAVE RESULTED IN INSTRUCTIONAL OR CURRICULAR CHANGES, PLEASE DESCRIBE.

All of the Geography Faculty (both full and part-time) continue to participate in a number of Professional Development opportunities. The type of professional development can be broken down into two categories: Online teaching training and Subject-specific training. These areas are discussed in more detail below, including how these opportunities have strengthened Geography at PCC and any changes that

resulted from the training.

ONLINE TEACHING:

Of our human and physical Geography Instructors, all six faculty that have gone through online training. In addition to going through the formal online training for PCC, our faculty members have gone through additional training sessions put on by the DL department focused on improving online courses. For instructors that only teach our Technical Geography courses, only two (out of six) faculty have gone through online training. This low number is largely because only one of our Technical courses are offered as a DL class.

Having faculty trained to teach DL has strengthened our program because it has allowed us to take advantage of each of our Instructor's specialized areas (i.e. Middle East Geography) and offer classes that may not get enough students at any one campus. Although we do offer our introductory courses as DL, we also offer the majority of our more regional-specific classes as DL. This gives us a chance to teach PCC students about different regions of the world (Latin America, Middle East, Europe, and Africa), and gives our students more flexibility and access to a wide-range of Geographic topics (Race & Ethnic Conflicts, Global Issues).

SUBJECT-SPECIFIC (PROFESSIONAL PRESENTATIONS & CONFERENCE ATTENDANCE):

Geography faculty are also dedicated to staying on top of discipline trends and theory. This is important for our GIS/Technical Geography faculty because technology and software is in constant flux. Likewise, conference participation offers our Human and Physical faculty the opportunity to keep up-to-date on contemporary environmental, political, and social issues in our rapidly changing world. The professional presentations and conference attendance from our faculty demonstrates the diversity of our discipline and the dedication of our faculty to being lifelong learners. Below is a list of the conferences in which our faculty have attended and/or presented over the last several years:

- Oregon Academy of Sciences
- GIS In Action
- American Statistical Association Conference on Statistical Practice
- Google's Geo for Good User Summit
- Northwest GIS Conference
- NW E-Learning Conference
- Study Abroad Forum
- American Anthropological Association
- Hidden Lands in Himalayan Myth and History
- Trans-Asian Indigeneity
- Mountains and Sacred Landscapes Conference
- Association of American Geographers
- Himalayan Studies Conference
- Critical Geographies Conference
- Asian Studies in the Pacific Coast Conference
- Association of Pacific Coast Geographers Conference

- Portland Cartography Symposium
- Resistance GIS conference
- Google's Geo for Higher Ed Summit
- North American Cartographic Information Society conference

These professional development opportunities have strengthened our program is a wide variety of ways from developing entirely new courses to choosing course materials through a critical lens.

6. FACILITIES, INSTRUCTIONAL AND STUDENT SUPPORT

A. DESCRIBE HOW CLASSROOM SPACE, CLASSROOM TECHNOLOGY, LABORATORY SPACE, AND EQUIPMENT IMPACT STUDENT SUCCESS.

As of the 2017-2018 academic year, the Geography SAC offers classes at the four primary campuses in the district, as well as Newberg, and offers GIS classes at Sylvania, Rock Creek, and Southeast campuses. Additionally, the SAC offers a number of online classes using Desire2Learn (D2L) Brightspace.

In Winter of 2018, the SAC conducted a survey on classroom space, technology, and equipment. This online anonymous survey was given to 290 active and former students across both traditional geography and GIS classes. The survey provided fantastic insight into Geography classes with regards to classrooms/labs, technology, equipment, as well as perspectives on Student and Instructional Support. The results were employed to determine the status and needs at each campus, with a focus on Sylvania, Rock Creek, and Southeast campuses, where the GIS lab classrooms are located. This emphasis is a result of the special requirements and longer class sessions the GIS classes require.

Following are details about each lab the GIS program utilizes. Responses are ranked from 1 “Not at all Satisfied” to 5 “Very Satisfied”. Whenever a respondent indicated a “3” or below, a comment on what could be done to enhance that metric was solicited.

SYLVANIA:

The computer lab in SS110 is the primary classroom for the GIS program. This dedicated space was a direct result of the last Program Review. The lab contains 28 computers outfitted with all the specialized software the program curriculum requires. Among these are: ESRI ArcGIS, Trimble Pathfinder Office, QGIS, Google Earth, Agisoft, UCgs, and the Adobe Creative Suite. The lab received a significant hardware upgrade of all systems in the Summer of 2016, providing more robust computing power and storage, necessary for the resource-intensive GIS applications.

The lab also houses storage for materials the GIS courses uses, including: cabinets for hard copy maps and reference materials, storage for unmanned aircraft systems and components, and a Canon Large Format Printer/Plotter.

As the GIS Certificate program grows, the one dedicated GIS lab is no longer meeting our needs. The lab is currently occupied from 10 a.m. to 9 p.m. Monday - Thursday and we are struggling to add new sections of classes because it takes away from the GIS tutoring/Open Lab hours that we currently offer. One request we have is to get space in the newly remodeled HT building that includes two GIS labs, a larger storage capacity for our equipment, and space for instructor offices.

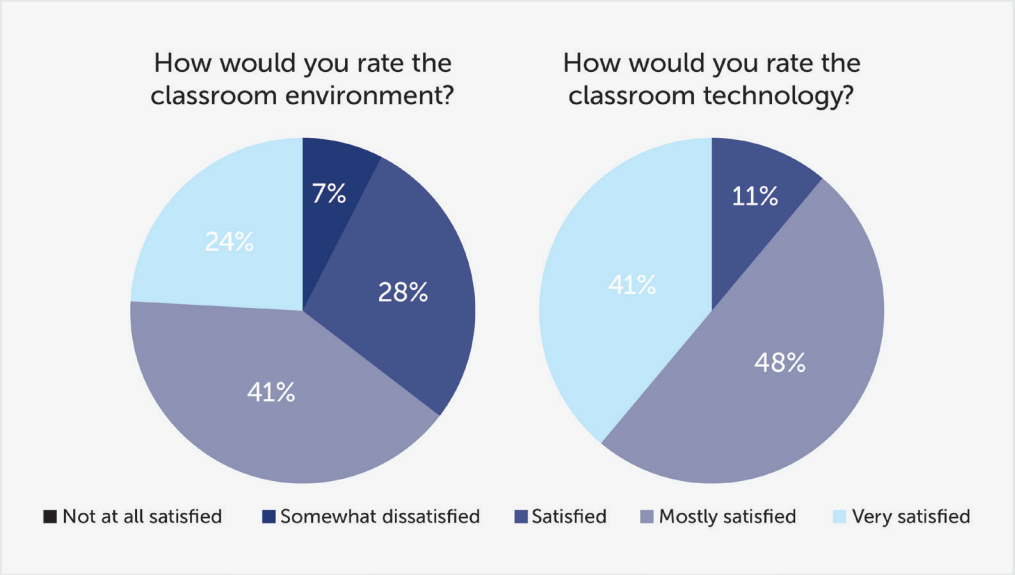


Figure 11. Student Feedback on Sylvania Classroom (SS110)

The majority of survey respondents expressed a generally favorable review of SS110's classroom environment and technology. However, there were trends regarding it's temperature, the cable management on computers, lack of windows, and especially the chairs. Students often spend 6-8 hours in the lab and stated the chairs were not the most comfortable or ergonomic. Otherwise, the overall sentiments are that SS110 is an excellent lab that the majority of students were satisfied with.

ROCK CREEK:

The classroom/computer lab at Rock Creek (BLDG 7, Rm. 112) is a shared classroom that includes 25 computers outfitted with most of the same specialized software that Sylvania's SS110 has for GIS coursework.

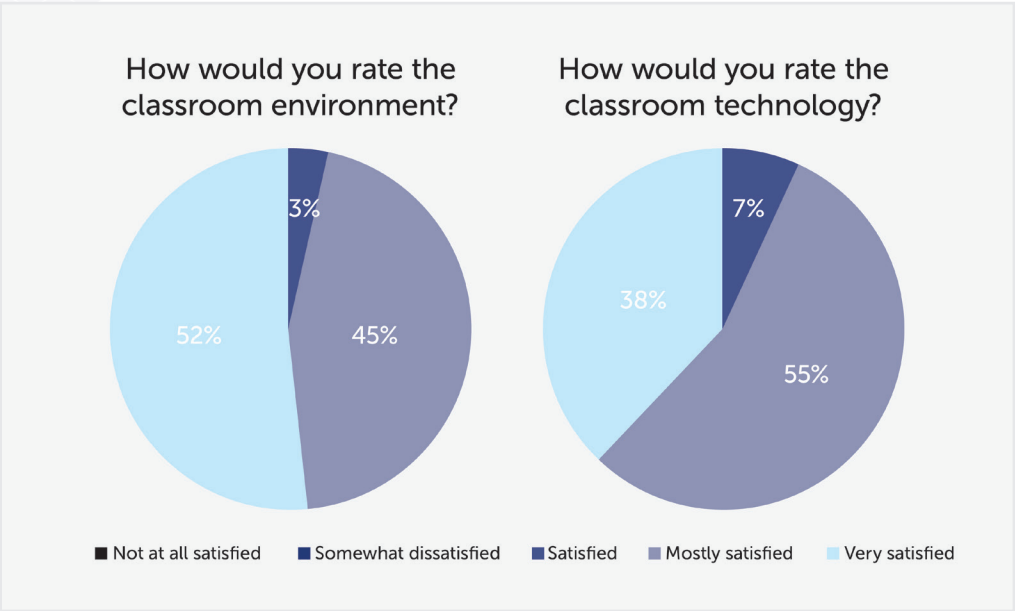


Figure 12. Student Feedback on Rock Creek Classroom (BLDG 7, Rm. 112)

Like Sylvania, the majority of survey respondents expressed a generally favorable review of Rock Creek's classroom environment and technology. If fact, there were no responses less than "Satisfied" and comments were sparse among the participants. There were a few comments regarding system lag on lab computers but no other negative trends were noted.

SOUTHEAST (SC200 AND 202):

The computer labs at Southeast (SC200 and 202) are also shared classrooms that both include 24 computers outfitted with most of the same specialized software required for GIS coursework. Access to this shared space has enabled the SAC to expand course offerings to include GIS classes at SE campus.

Recently, SC202 was reconfigured into a "U" shape. This arrangement of seats is not conducive to the demonstration nature of GIS instruction by which the instructor shows an action on the projector and the students follow along/replicate that action. However, SC200 has the more traditional rows of front-facing seating that is much more desirable.

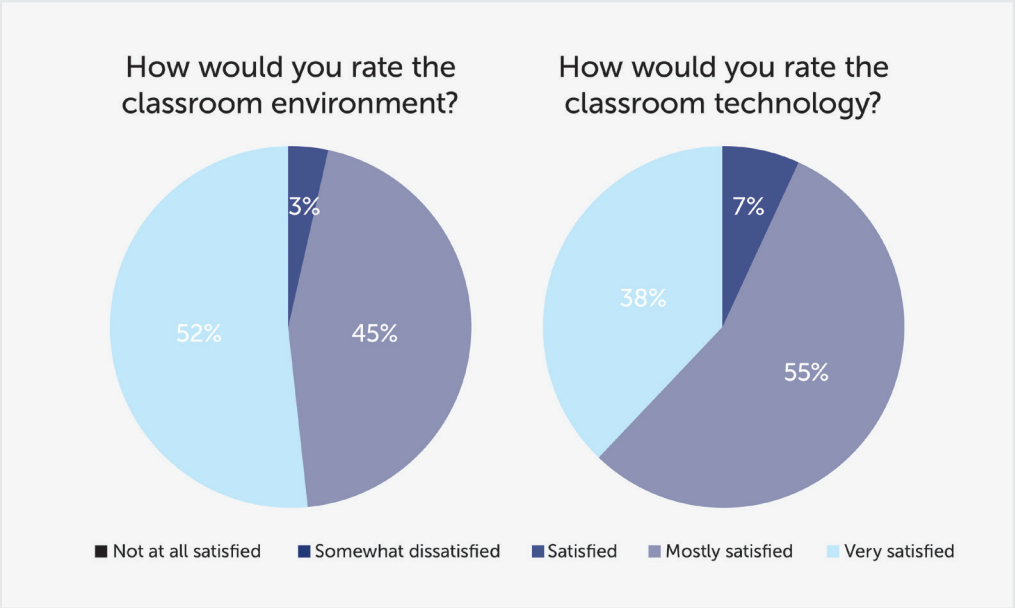


Figure 13. Student Feedback on Southeast Classrooms (SC200 and 202)

The majority of survey respondents expressed a mostly favorable review of Southeast's classroom environment and technology. Again, it is worth pointing out some of the negative trends regarding some of the technical aspects of both classrooms. Unlike Sylvania, the computers in Southeast's classrooms were not designed as GIS systems. This creates some issues with performance as GIS software typically requires more demand on system resources such as memory and processing power. Additionally, there are persisting issues with crashing and peculiar behavior with some software (i.e. Microsoft Word crashes intermittently). This is an evolving matter as instructors work with PCC IT to resolve issues as they arise. Otherwise, the overall sentiments are that SC200 and 202 are sufficient enough to at least hold introductory GIS courses that do not require the same computing power as the more advanced courses taught at Sylvania.

B. DESCRIBE HOW STUDENTS ARE USING THE LIBRARY OR OTHER OUTSIDE-THE-CLASSROOM INFORMATION RESOURCES (E.G., COMPUTER LABS, TUXTORING, STUDENT LEARNING CENTER). IF COURSES ARE OFFERED ONLINE, DO STUDENTS HAVE ONLINE ACCESS TO THE SAME RESOURCES?

LIBRARY AND COMPUTER RESOURCE CENTERS:

Campus libraries are a crucial service that our students use for additional study space and for when the classroom GIS labs are not available for assignment work. Students also use the campus libraries for printing, material checkout (Course Reserve Materials, etc), research assistance, and study room reservations.

The SAC works directly with our librarian, Meredith Farkas, for classroom support, to create class-based resource guides, and to make Geography-specific book purchases. Meredith also regularly visits the SAC

during In-Service to demonstrate new tools and resources provided from the library for both faculty and students.

The establishment of the SS110 GIS lab as well as the expansion of shared GIS classrooms throughout the district has likely reduced the demand Geography students place on computer resource centers and libraries for assignment work since the last Program Review in 2013. However, with expanded offerings comes expanded need for GIS software in campus computer resource centers and libraries, particularly Southeast and Rock Creek. At these campuses, tutoring is not offered specifically for GIS students and these facilities serve places students can work on lab assignments outside of class sessions. Survey respondents expressed a general dissatisfaction toward the effectiveness of library tutors for help with geography curriculum as well as availability of libraries/computer resource centers (hours) and geography-specific software (computers). Both of these issues could be resolved with an expanded geography tutor program (see below).

TUTORING:

Tutoring for GIS students continues to be a successful program that is critical to student success. The Winter 2018 survey solicited feedback on the utility of the tutoring services. The overall feedback from students captured in the survey was that tutoring greatly enhances the curriculum by providing hands-on and individualized attention. The tutors assist students with completing lab assignments and final projects while offering additional curriculum reinforcement. Currently, tutors are only available at Sylvania campus in both weekday and weekend sessions, which allows for increased access and opportunities to attend the sessions. Over 70% of respondents in the survey had utilized tutors while taking classes with 91% expressing high satisfaction with tutor services and the impact they had on academic success. The only negative trend resulting from the survey was that are not enough tutors/hours and the service is only offered at a single campus. Many survey respondents stated that not having the tutors available at more campuses, for more hours a week, and at more convenient times impacted their ability to take advantage of the service. Expanding the tutor program in these areas is critical to ensuring adaptability to growing enrollments. In Table 7, we have summarized the last two years of data collected from sign-ins during GIS tutoring (as of May 10, 2018).

Table 7. GIS Tutoring Summary

Total # of students served	Total # of individual sign-ins	Total # of hours spent in tutoring by GIS students	Likelihood of recommending GIS tutors to a classmate	Tutoring benefits in completing or understanding GIS coursework coursework?	Impact of tutoring in student success
76	1,580	4,910	4.88 / 5*	4.88 / 5*	4.7 / 5*
*5 is the highest score or rank					

In general, what we have found over the last five years is that if we increase the number of tutoring hours we offer, more students take advantage of it. Not only do students find the direct assistance from the tutor beneficial, but also the camaraderie from their peers all working together in the lab, learning and sharing with one another.

C. DOES THE SAC HAVE ANY INSIGHTS ON HOW STUDENTS ARE USING ACADEMIC ADVISING, COUNSELING, STUDENT LEADERSHIP AND STUDENT RESOURCE CENTERS (E.G., THE VETERANS, WOMEN'S, MULTICULTURAL, AND QUEER CENTERS)? WHAT OPPORTUNITIES DO YOU SEE TO PROMOTE STUDENT SUCCESS BY COLLABORATING WITH THESE SERVICES?

PCC provides a wide range of student-focused resources in various areas to help a student succeed while

enrolled. The Geography SAC used the Winter 2018 survey to attempt to capture how students use these services and their impact to student success. The overall trend was that students were aware of many of the services and used quite a few of them regularly. Over half of survey respondents used Academic Advising and/or Counseling Services at some point while taking geography classes. Similarly, over half of respondents took advantage of at least one Student Resource Center. 16% of students had not used any Student Support Services but were at least aware of them.

The SAC has discussed a number of options to increase awareness of these services, which include providing information in course syllabi and inviting representatives from some of the lesser-known/utilized services into classes for information sessions.

7. CAREER AND TECHNICAL EDUCATION (CTE) PROGRAMS ONLY. TO ENSURE THAT THE CURRICULUM KEEPS PACE WITH CHANGING EMPLOYER NEEDS AND CONTINUES TO SUCCESSFULLY PREPARE STUDENTS TO ENTER A CAREER FIELD:

A. EVALUATE THE IMPACT OF THE ADVISORY COMMITTEE ON CURRICULUM AND INSTRUCTIONAL CONTENT METHODS, AND/OR OUTCOMES. PLEASE INCLUDE THE MINUTES FROM THE LAST THREE ADVISORY COMMITTEE MEETINGS IN THE APPENDIX.

The Advisory Committee for the GIS Certificate Program meets regularly two times a year - generally once in the fall/winter and once in the spring. Since 2015, rather than a separate Advisory meeting, our committee attends our GIS Certificate End-of-Year event where Christina presents a "State of the GIS Program." Advisory committee members get to directly interact with our students, and see student presentations on projects done with community partners. The Advisory Committee currently consists of eleven members from the private, public, and academic GIS sectors (Table 8).

Table 8. GIS Certificate Program Advisory Committee Members

Name	Affiliation
Tommy Albo	Parks & Nature, GIS Coordinator @ Metro
David Banis	Instructor & Associate Director @ Center for Spatial Analysis and Research, Portland State University Department of Geography
Steven Jett	Geospatial Specialist @ Woolpert, Inc.
Kevin Martin	Tech Services/Smart Cities Manager @ City of Portland, Bureau of Planning and Sustainability
Molly Vogt	Information and Analysis Manager @ Metro,
Maria Schlangen	GIS Supervisor Information Services Department @ City of Hillsboro
Brian Shepard	GIS Analyst @ Clean Water Services
Bryan Kilburn	Agronomy Resource Analyst @ Keystone-Pacific, LLC
Eric Roberts	Geography Instructor @Portland Community College, Geography Department
Joe Gordon	GIS Specialist @ Metro, Data Research Center
Chris Grant	Geography Instructor @Portland Community College & Portland State University, Geography Departments

The Advisory Committee has provided guidance regarding curriculum, new course and program development, community partners, and specialized industry software, among other topics. Members have also come to various classes as guest speakers, met with students for Informational Interviews, and provided internship opportunities for students. All of our part-time faculty also serve on our Advisory Committee as representatives of their work outside of PCC. Our Advisory Committee continues to be a

valuable resource for our program in providing a connection to local industry and serving as a sounding board for any developments or ideas relative to the program.

Appendix C includes the meeting notes from the last three Advisory Committee Meetings from January 2018, January 2017, and December 2015 (This does not include the spring meetings when Advisory Committee join at the GIS Program End-of-Year event).

B. DESCRIBE CURRENT AND PROJECTED DEMAND AND ENROLLMENT PATTERNS FOR YOUR PROGRAM. INCLUDE DISCUSSION OF ANY IMPACT THIS WILL HAVE.

Current demand for the technical Geography (GIS) courses is steady and rising. Table 9 shows several variables of our enrollment over the last five years.

Table 9. GIS Course Enrollment Data, 2012-2017

Academic Year	# of Classes	# of Sections	Total Enrollment	SFTE	Students with declared GIS major	GIS Certificate Graduates
2012-13	7	12	258	33.39	22	9
2013-14	7	14	283	38.71	24	19
2014-15	8	19	364	50.55	37	14
2015-16	10	20	369	52.16	57	20
2016-17	11	21	385	57.08	64	21
2017-18	13	23	554	72.14*	83*	50*
	+6 courses	+11 sections	114.75%	116.05%	+19	133 Grads
*These numbers are the best estimate we have for 2017-18. It includes data from week 2 of spring term.						

Projected demand for the technical Geography (GIS) courses are expected to grow over the next few years for the following reasons:

- Geo 265 Intro to GIS and Geo 266 GIS Analysis will be added as required courses in the Civic Engineering Technology degree starting in 2019-20;
- Geography SAC, in collaboration with Engineering, has submitted an Initial Proposal for a new AAS degree in Geomatics, which will include at least 7 GIS courses;
- Geography SAC plans to create a less-than-one-year certificate in UAS, which will include 6 GIS courses;
- Based on the trend we are seeing over the last five years, we can expect that our program will continue to grow. This can largely be attributed to the reputation the GIS certificate program has in the local community, our strong ties to community partnerships, and a high demand from employers to have a workforce skilled in geospatial technologies and spatial reasoning.

C. HOW ARE STUDENTS SELECTED AND/OR PREPARED (E.G., PREREQUISITES) FOR PROGRAM ENTRY?

Currently there is no application process or requirements for entering the GIS Certificate Program other than meeting the standard prerequisites (RD 115, WR 115, MTH 20). Students are encouraged to speak with Christina Friedle, GIS Program Academic Advisor, prior to starting the program, for the purposes of advising

and course planning.

D. REVIEW JOB PLACEMENT DATA FOR STUDENTS OVER THE LAST FIVE YEARS, INCLUDING SALARY INFORMATION WHERE AVAILABLE. FORECAST FUTURE EMPLOYMENT OPPORTUNITIES FOR STUDENTS, INCLUDING NATIONAL OR STATE FORECASTS IF APPROPRIATE.

In Fall 2017, a survey was sent out to almost 900 students who had taken at least one of our GIS specific classes since Fall 2010. The survey was successfully delivered to 845 former students and we received 201 responses to the survey (24% response rate). The purpose of this survey was to gain a better understanding of employment after taking GIS classes or earning the GIS Certificate. Of the 201 respondents, 66 completed the GIS Certificate at PCC and 135 took one or more GIS classes at PCC. Additionally, see Appendix D for a detailed statement from a graduate of the program that discusses job preparedness.

Of the students who completed the survey and earned a GIS certificate (n=66), 76% are currently employed, 7% were not employed and seeking employment, and 17% were not employed and not seeking employment. Those figures are slightly higher for all respondents in the survey (Figure 14). 89% of all survey respondents who are seeking employment, are currently employed.

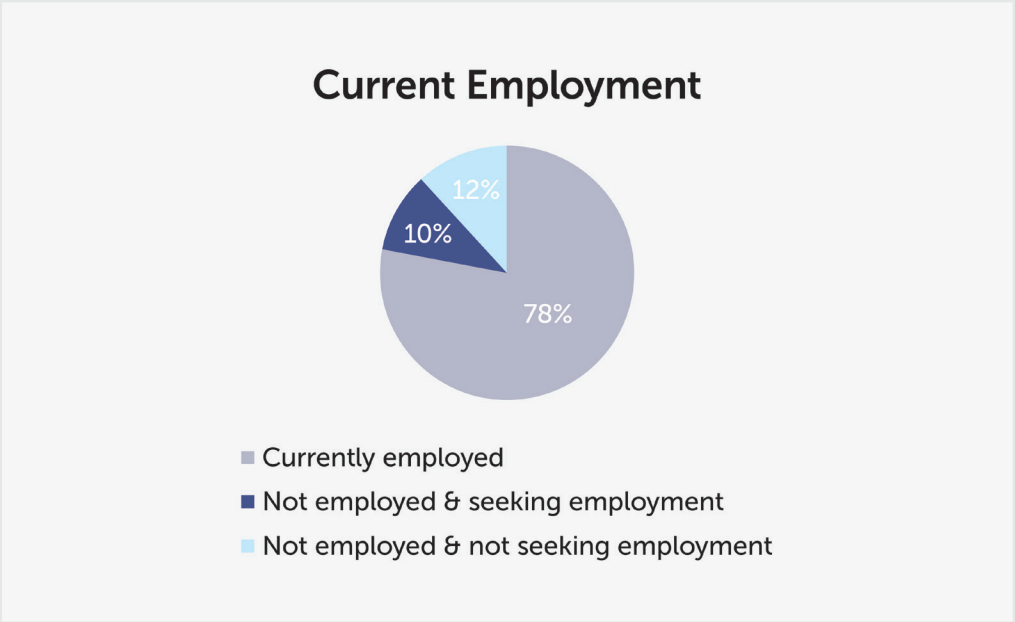


Figure 14. GIS Grad Employment Status

There were 86 respondents who are currently using GIS at their job and also provided information about their salary. Figure 15 shows the responses, with a majority of respondents earning somewhere between $40-$49,999. 8 out of the 13 respondents who are making less than $20,000, are working part-time.

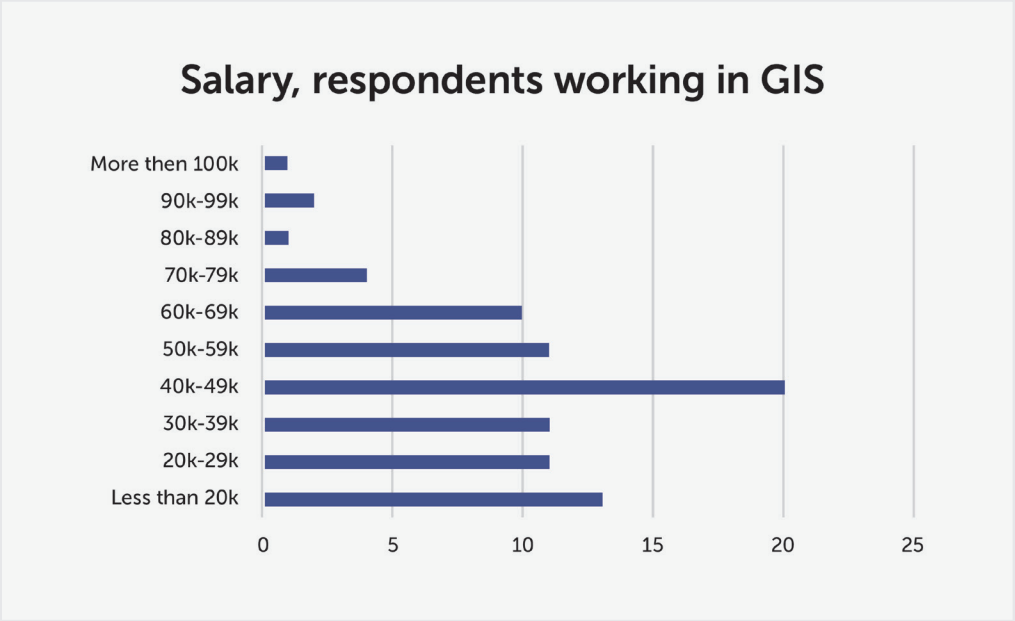


Figure 15. GIS Grad Job Salary Ranges

Through the survey, we found that former GIS students are working with almost 60 different employers, in all realms - government, private industry, non-profit, and academia (Figure 16).

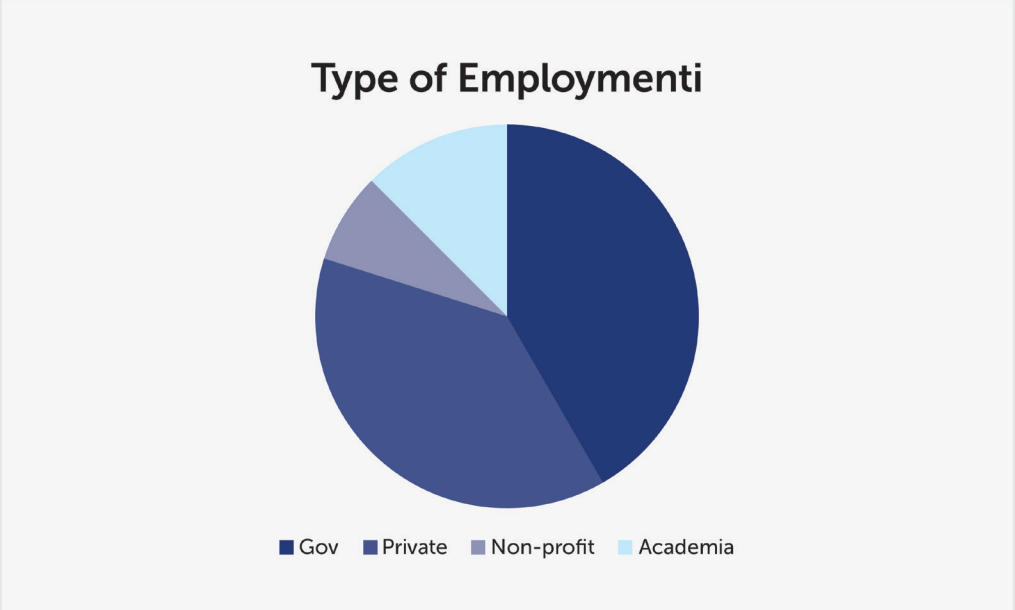


Figure 16. GIS Grad Employment Sectors

The Bureau of Labor Statistics (BLS) categorizes most GIS related jobs under Cartographers and Photogrammetrists. According to BLS, employment of Cartographers and Photogrammetrists is projected to grow 19% from 2016 to 2026. The average annual wage was $62,750 in May 2016, with the top industries in which they work are federal, local, and state Government; management, scientific and technical consulting services; and architectural, engineering and related services. Oregon is one of the top five states with the highest concentration of jobs for Cartography and Photogrammetry, and the Portland metro area is one of the top five metro area with the highest employment (in the nation).

Table 10 provides a summary of the BLS projected employment data for Surveyors, Cartographers, Photogrammetrists, Survey and Mapping Technicians, Environmental Scientists, Urban/Regional Planners, and Geographers - all industries with a strong GIS focus.

Table 10. Projected Employment for Industries with a Strong GIS focus (Bureau of Labor Statistics, Occupational Outlook Handbook, https://www.bls.gov/ooh/)

Occupational Title	Employment, 2016	Projected Employment, 2026	Mean Annual Wage, 2016
Cartographers & Photogrammetrists	12,600	15,000	$62,750
Geoscientists	32,000	36,500	$89,780
Geographers	1,500	1,700	$74,260
Survey & Mapping Technicians	60,200	66,600	$42,450
Environmental Scientist & Specialists	89,500	99,400	$68,910
Urban & Regional Planners	36,000	40,600	$70,020

E. PLEASE PRESENT DATA ON THE NUMBER OF STUDENTS COMPLETING DEGREE(S) AND/OR CERTIFICATE(S) IN YOUR PROGRAM. ANALYZE ANY BARRIERS TO DEGREE OR CERTIFICATE COMPLETION THAT YOUR STUDENTS FACE, AND IDENTIFY COMMON REASONS WHY STUDENTS MAY LEAVE BEFORE COMPLETION. IF THE PROGRAM IS AVAILABLE 100% ONLINE, PLEASE INCLUDE RELEVANT COMPLETION DATA AND ANALYSIS.

The data on graduates in the GIS Certificate program is included above in Table 9. Interestingly, even though our enrollment, SFTE, and declared GIS Certificate majors have all been increasing over time, the percentage of graduates (# of graduates / # of declared majors) has been decreasing over the last five years. There are a couple of reasons we believe this is happening:

- Students find a job before completing the GIS Certificate and therefore have accomplished their objective of taking classes to become more employable.
- Students take one or more GIS classes are part of another area of study such as Engineering, Environmental Science, or Geology.
- Students take one or more GIS classes at PCC with the intention of transferring to a four-year University or entering a Master's degree program.
- Students are in the program part-time, so we have a certain number of students enrolled, but only a portion of them graduate each year.

F. DESCRIBE OPPORTUNITIES THAT EXIST OR ARE IN DEVELOPMENT FOR GRADUATES OF THIS PROGRAM TO CONTINUE THEIR EDUCATION IN THIS CAREER AREA OR PROFESSION.

There are a number of opportunities that exist and in development for graduates of the GIS Certificate program to continue their education.

ONLINE RESOURCES

ESRI, the producer of the ArcGIS software used in the GIS Certificate program, provides several training opportunities through their Learn ArcGIS (https://learn.arcgis.com/en/) website. There are also resources

available through Udemy, Lynda.com, OpenCourseWare (free courses published by universities and make public online), Massive Open Online Courses (MOOC), Coursera, Codeacademy, and GeoAcademy, among others.

WORKSHOPS & CONFERENCES

There are several opportunities locally that graduates can participate in to continue to develop their GIS skills professionally. Alumnis of the GIS Certificate program are welcome to join any GIS technical skills workshop that the GIS / ASPRS club hosts at PCC. There is an annual GIS In Action conference held in Portland that includes technical workshops, as well as other opportunities such as the ASPRS Technical Exchange and Cartography Symposium, which occur on an annual basis.

GEOMATICS AAS

As mentioned previously in the document, the Geography SAC is in the preliminary stages of developing an AAS in Geomatics. This will be an opportunity for GIS Certificate grads to continue their education at PCC to obtain an Associate's degree is a related field.

LOCAL GIS COMMUNITY

In addition to the local workshops and conferences, Portland has a strong GIS community with other opportunities for graduates to engage. Some examples of this include the ASPRS quarterly social gathering, the Society for Conservation GIS monthly meeting, Open-Source GIS monthly meeting, and Portland State University's GIS Speaker series.

BACHELOR'S OR MASTER'S DEGREE

If students wish to continue their education in Geography or GIS, they can transfer to many four-year universities or colleges. In our GIS certificate program, there are a number of students that already have their Bachelor's degree. For example, of the 83 (unduplicated) students enrolled in one of the Fall 2016 GIS courses, 32 (38.5%) had a Bachelor's degree or higher. In some cases, students are in our program because they want to enhance their skill set before applying to a Master's degree program in an area like Urban Planning or Environmental Science.

8. RECOMMENDATIONS

A. WHAT IS THE SAC PLANNING TO DO TO IMPROVE TEACHING AND LEARNING, STUDENT SUCCESS, AND DEGREE OR CERTIFICATE COMPLETION, FOR ON-CAMPUS AND ONLINE STUDENTS AS APPROPRIATE?

CURRICULUM RECOMMENDATIONS:

We recommend several ways in which the Geography SAC can make improvements to our current curriculum offerings.

i. Unmanned Aerial Systems Certificate

Comprised of classes already being offered in Geography, we would like to package up 6 courses and offer them as a Career Pathways certificate in Unmanned Aerial Systems with a focus in geospatial applications.

ii. Associate's of Applied Sciences in Geomatics

Already in progress, an AAS in Geomatics would provide an opportunity for students to receive technical training in a field that has high demand and a high living wage. This is being done in collaboration with Engineering and is an opportunity to offer a degree that utilizes cutting-edge technology and methods for data collection.

iii. New Course Development

There are a number of new courses that the SAC would like to develop for both our Geography and GIS Programs. In Geography, we would like to develop a regional course focused on Asia (Geography of Asia), a Geography Field Studies course that could be built on a Community-based learning foundation, and a Geography of Food course focused on local and global food production and consumption. For the GIS Program, we would like to develop two additional GIS-specific electives: Remote Sensing course focused on just using LiDAR data, and a Demography course that teaches students accurately use Census and American Community Survey data to map communities.

iv. Incorporate New Technologies

We are committed to continue making updates to our GIS curriculum to incorporate changes in software, tools, and technologies. This is an ongoing task that requires updating our classroom materials, working with IT for changes to lab computers, and securing funding for new equipment. We are dedicated to ensuring that our program is leading the way with GIS technologies.

ACADEMIC ADVISING RECOMMENDATIONS:

With only one-full time Faculty member in the Geography SAC, providing academic advising to almost 200 students taking GIS classes annually is no small task. We have a couple of recommendations that will help provide students with more information about our programs, with an intention of improving student success and program completion.

i. GIS Certificate FAQ's

After providing academic advising for the last eight years, there are a number of questions that come up repeatedly that are specific to the GIS Certificate. We recommend the development of a Frequent Asked Question (FAQ) section on the GIS Certificate website as a resource for interested or new students in the program.

ii. Hold group advising sessions for course planning & questions

It would be beneficial to have a quarterly advising session for potential or current GIS Certificate students to be able to answer questions, discuss upcoming classes, and help students develop completion plans.

iii. Advertising

To bring more awareness to Geography as an area of study, and to our GIS Certificate, we need to become more involved with outreach to High Schools, participate more regularly in High School preview days across the district, and participate in Career Expos and fairs.

B. WHAT SUPPORT DO YOU NEED FROM ADMINISTRATION IN ORDER TO CARRY OUT YOUR PLANNED IMPROVEMENTS? (FOR RECOMMENDATIONS ASKING FOR FINANCIAL RESOURCES, PLEASE PRESENT THEM IN PRIORITY ORDER. UNDERSTAND THAT RESOURCES ARE LIMITED AND ASKING IS NOT AN ASSURANCE OF IMMEDIATE FORTHCOMING SUPPORT, BUT MAKING ADMINISTRATION AWARE OF YOUR NEEDS MAY HELP THEM LOOK FOR OUTSIDE RESOURCES OR ALTERNATIVE STRATEGIES FOR SUPPORT.)

For the last eight years, the GIS Certificate program has been operating with little to no budget. We are continually asked to work with less resources despite the fact that our program is growing during a time when the college has a whole has seen decreasing enrollments. We cannot continue to operate and run a program with such few resources.

i. Staffing / Faculty

This is the most pressing issues facing our SAC. If we do not have additional support for our SAC, few of the changes outlined in this document will be possible. We recommend that the college retains the full-time Geography position at Rock Creek who can focus on Geography (Human & Physical), and hire a 2nd full-time GIS Instructor or Academic Professional to support the growing needs of our GIS CTE program.

We also recommend that the college supports a Lab Tech that provides tutoring for students outside of class and manages the equipment (maintenance and checking out), lab facilities, technology, and software.

Lastly, we recommend that there is support for Academic Advising for the GIS program since no Perkins Advisor is available for our program.

ii. GIS Facilities & Equipment

With the current and anticipated growth of our GIS program, we are running out of space with our current GIS facilities. We recommend that in the HT building remodel, space is set aside for the GIS program that includes two computer labs, classroom/common space that does not include computers, GIS faculty offices, and a storage area for our equipment.

Additionally, we recommend that the college provide financial support to our program to be able to purchase equipment and/or software when necessary. It has been a real struggle for us to scrape together enough funds to buy equipment that is necessary to offering certain class (for example our new UAS classes).

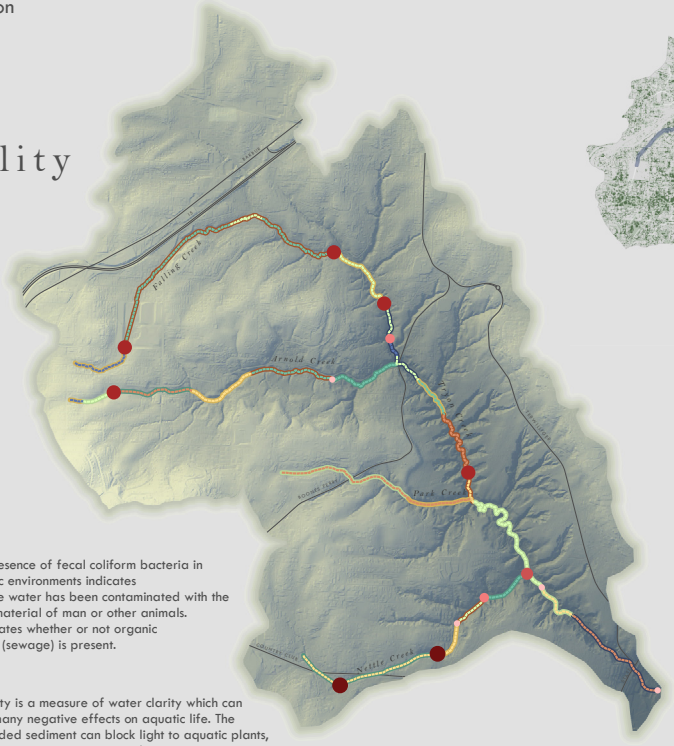
Macroinvertebrate Habitat IN THE TRYON CREEK WATERSHED

This project was in collaboration with the Tryon Creek Watershed Council, the purpose of this project is to find sites for future macroinvertebrate habitat restoration

WHY MACROINVERTEBRATES?

Macroinvertebrates play several important roles in maintaining the health of the Tyron Creek Watershed ecosystem. Aquatic macroinvertebrates are greatly affected by watershed conditions, making them ideal bioindicators for pollution and other changes in water conditions. They are consumers of algae and other organic matter, which help remove nutrients from streams. Macroinvertebrates that inhabit the mud, such as worms aerate the sediment which helps prevent the water from becoming turbid. Macroinvertebrates provide a great food source for animals higher up the food chain such as fish, frogs and birds.

Water Quality



Water Quality Variables

Coliform Bacteria

Low — High

The presence of fecal coliform bacteria in aquatic environments indicates that the water has been contaminated with the fecal material of man or other animals. It indicates whether or not organic matter (sewage) is present.

Turbidity

Low — High

Turbidity is a measure of water clarity which can have many negative effects on aquatic life. The suspended sediment can block light to aquatic plants, smother aquatic organisms, and carry contaminants. High turbidity can negativity affect gill function in some macroinvertebrates. Sources of turbidity include: soil erosion, waste discharge, urban runoff, eroding stream banks, and excessive algal growth.

Temperature (C)

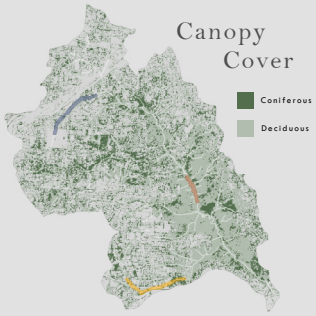
6 - 7
8 - 9
10
11
12

The metabolism of macroinvertebrates is affected by temperature. If the temperature changes too drastically, their metabolisms may not function as well, decreasing their ability to reproduce and survive. Optimal temperature ranges for organisms vary.

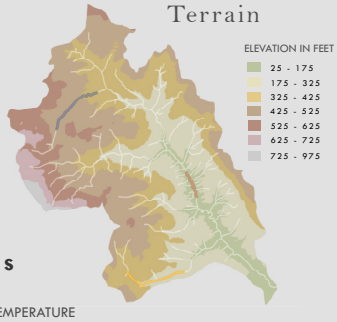
Data Collection

Coliform, turbidity and temperature data was collected by volunteers. Data used was from the months of November to April in order to reduce variation between seasons. Streams were classify by averaging temperature and turbidity between collection sites.

Canopy Cover



Terrain



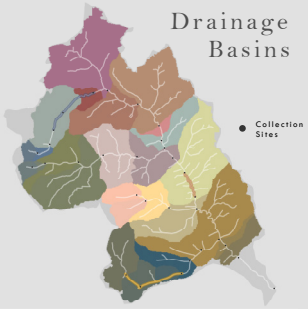
Results

HIGHEST TEMPERATURE AND TURBIDITY

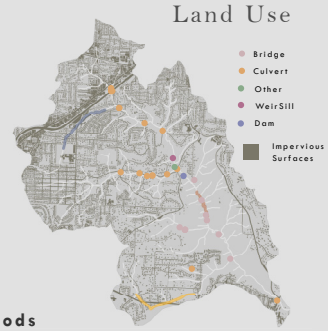
HIGHEST COLIFORM LEVELS

SECOND HIGHEST TEMPERATURE AND TURBIDITY

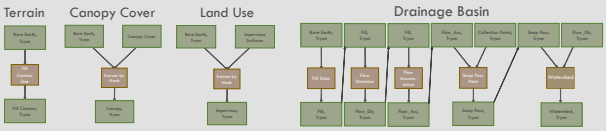
Drainage Basins



Land Use



Methods



Created by Kaitlin Sagdal, 2017

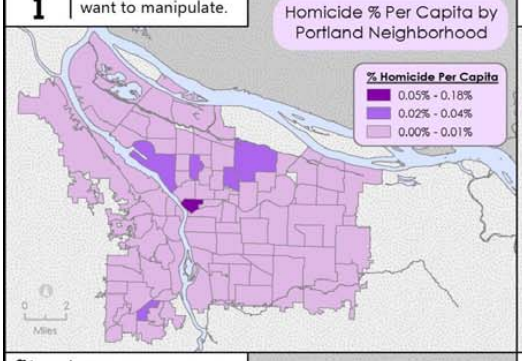
Sources: Tyron Creek Watershed Council, RLIS, RLIS Discovery, DoGAMI

How to Lie With Maps

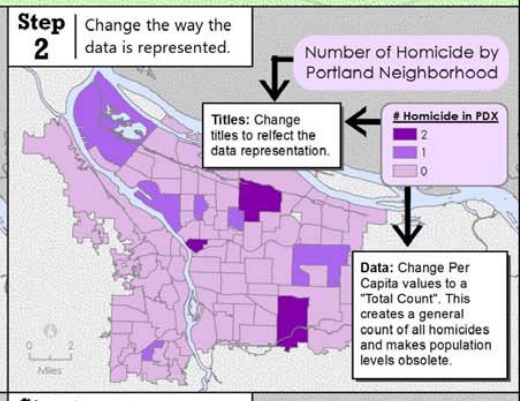
HK

6 Simple Steps to Manipulate Maps

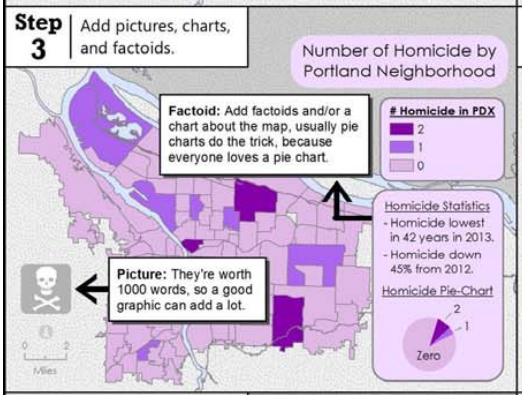
Step 1 | Find a map that you want to manipulate.



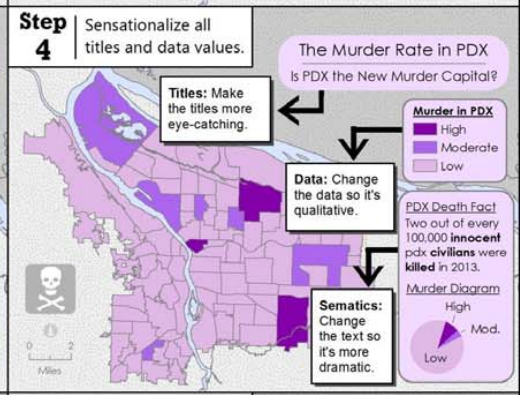
Step 2 | Change the way the data is represented.



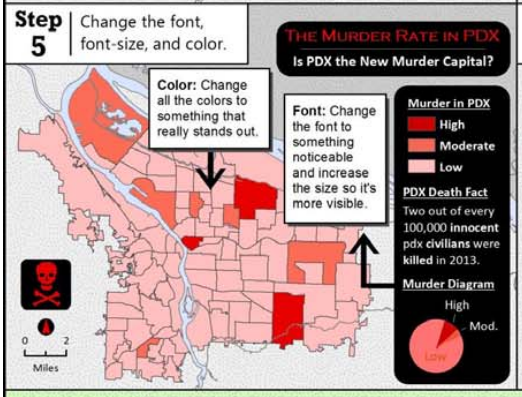
Step 3 | Add pictures, charts, and factoids.



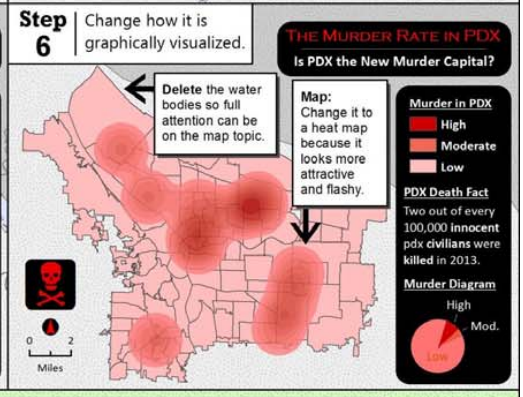
Step 4 | Sensationalize all titles and data values.



Step 5 | Change the font, font-size, and color.

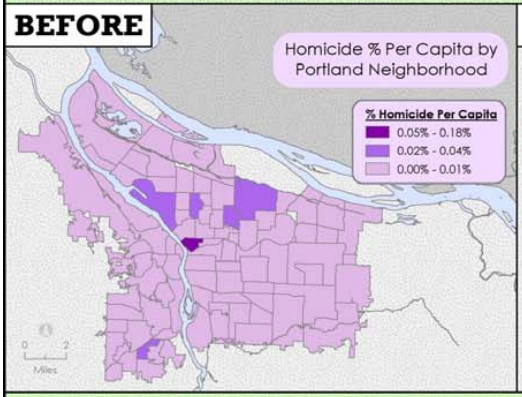


Step 6 | Change how it is graphically visualized.

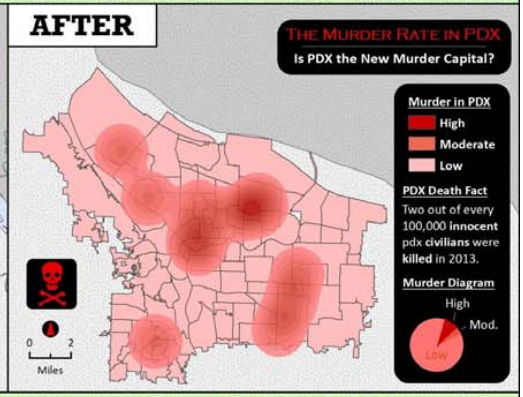


Compare The Original With The Manipulated Map

BEFORE

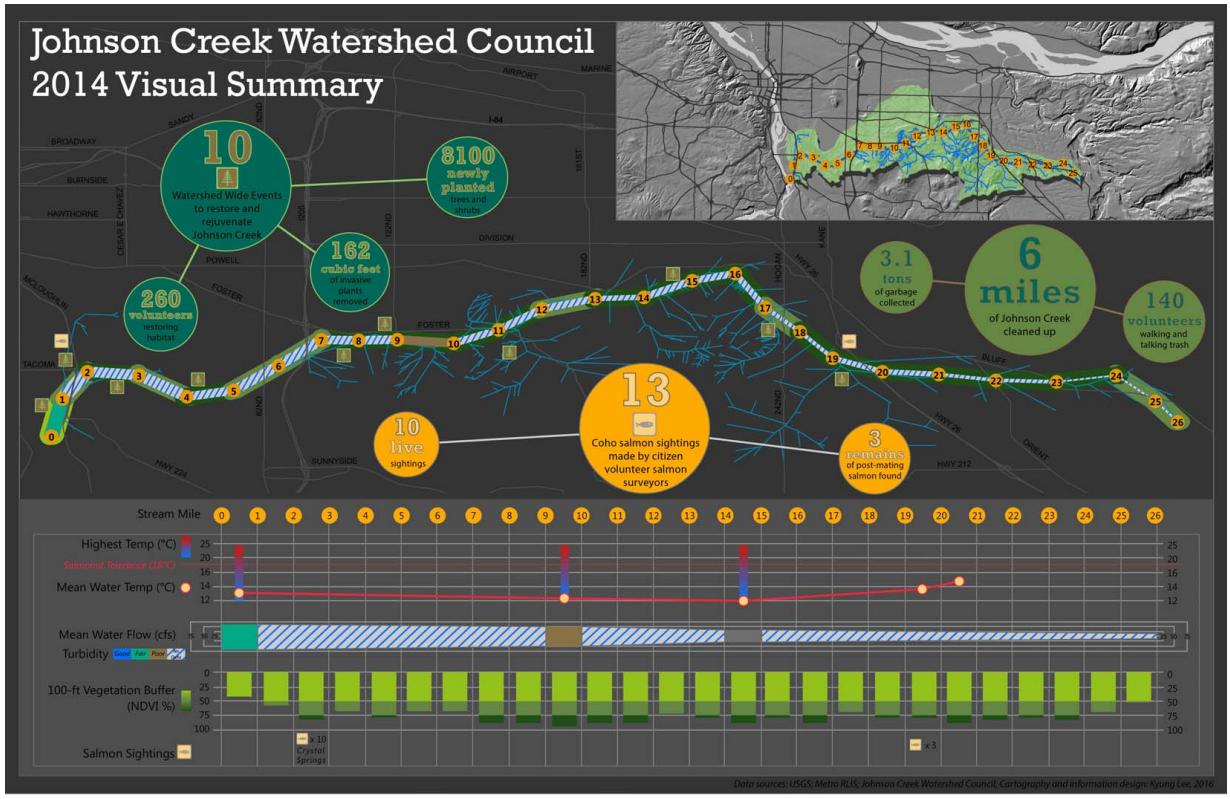


AFTER



About: **This infographic** demonstrates how to manipulate maps to anything the cartographer wants visualized. Even though the elements on the final map have been hyperbolized, it still shows how simple and drastic a map can be skewed using the **same exact dataset.** Crime data is from 2013 and is **100% factual, nothing was fabricated**, information was just... reconstructed to be viewed from a different perspective.

Sources: www.portlandoregon.gov, www.christinafriedle.com, www.civicapps.org, www.oregonlive.com, www.deathpenaltyinfo.org


Johnson Creek Watershed Council
2014 Visual Summary
10
Watershed Wide Events to restore and rejuvenate Johnson Creek
8100
newly planted
trees and shrubs
162
cubic feet
of invasive plants removed
260
volunteers
restoring habitat
3.1
tons
of garbage collected
6
miles
of Johnson Creek cleaned up
140
volunteers
walking and talking trash
10
live
sightings
13
Coho salmon sightings made by citizen volunteer salmon surveyors
3
redds
of post-mating salmon found
Stream Mile
Highest Temp (°C)
Salmonid Tolerance (18°C)
Mean Water Temp (°C)
Mean Water Flow (cfs)
Turbidity
Good
Fair
Poor
100-ft Vegetation Buffer (NDVI %)
Salmon Sightings
x 10
Crystal Springs
x 3
Data sources: USGS; Metro RLIS; Johnson Creek Watershed Council; Cartography and information design: Kyung Lee, 2016

WELCOME TO

Gabriel Park

Description

- Create Gabriel Park's Trail Map.
- Has to be Appealing and Functional.
- Must Include All Park Amenities.
- Has to Fit a 8.5" x 11" Paper Size.
- Black & White Version Needed.

Cartography

- Import All Available Data Layers.
- Create Icons For Amenities.
- Add All Required Park Features.
- Color Selection is Very Important.
- Convert Colors to Black & White.

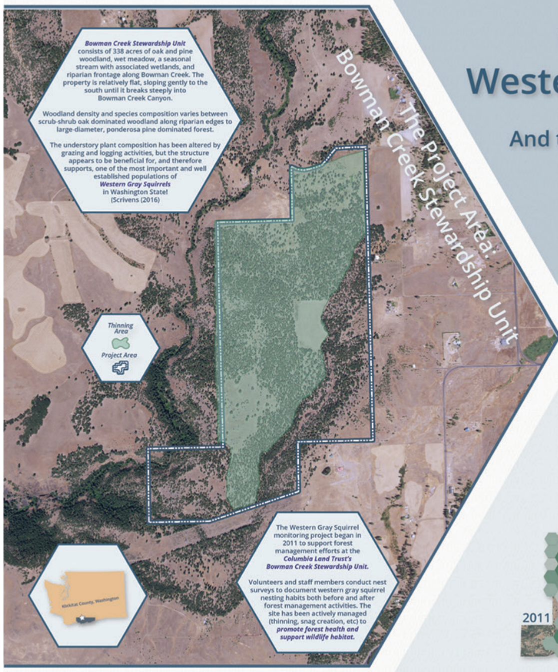
Final Product

- Park Map in Color Created.
- Park Map in Black & White Created.
- Map Contains All Park Amenities.
- All Necessary Features Added.
- All Maps Are 8.5" x 11".

A Partnership with the Columbia Land Trust to Analyze and Organize Western Gray Squirrel Nesting Data

And the Opportunity to Utilize Unique Approaches in Managing Inconsistent Yet Relevant Geospatial Data

The Project Area: Bowman Creek Stewardship Unit



Bowman Creek Stewardship Unit consists of 338 acres of oak and pine woodland, wet meadow, a seasonal stream with associated wetlands, and riparian frontage along Bowman Creek. The property is relatively flat, sloping gently to the south until it breaks steeply into Bowman Creek Canyon.

Woodland density and species composition varies between scrub-shrub oak dominated woodland along riparian edges to large-diameter, ponderosa pine dominated forest.

The understory plant composition has been altered by grazing and logging activities, but the structure appears to be beneficial for, and therefore supports, one of the most important and well established populations of ***Western Gray Squirrels*** in Washington State! (Scrivens (2016)

The Western Gray Squirrel monitoring project began in 2011 to support forest management efforts at the ***Columbia Land Trust's Bowman Creek Stewardship Unit.***

Volunteers and staff members conduct nest surveys to document western gray squirrel nesting habits both before and after forest management activities. The site has been actively managed (thinning, snag creation, etc) to ***promote forest health and support wildlife habitat.***

About the Project

Project Description: This project constitutes a collaboration between a Portland Community College GIS Certificate student (Eric Roberts) and the Columbia Land Trust (community partner) in the Spring of 2016. The goals of this project are to process and analyze a large volume of existing Western Gray Squirrel nesting data to answer key management questions and produce a framework for future monitoring efforts that will streamline data processing needs. In addition, general graphs and maps on annual efforts that are visually informative are needed to help guide future management decisions.

Five primary tasks were initially established by the community partner:
1) Process Data and Produce Composite Dataset
2) Produce Framework for Future Monitoring
3) Manage Georeferenced Photos
4) Mapping and Analysis
5) Statistical Analysis

Methods: This project involved using many tried and true geospatial methodologies while offering opportunities to explore new techniques and tools. Of note is the zonal analysis depicted in the "Mapping and Analysis" section as well as geostatistics and pivot tables that were used to coax out potential patterns. The project also required unique software solutions outside the standard ArcGIS suite. These include ArcPhoto (cataloging EXIF data in photos), X-Ray for Geodatabases Add-In (schema and domain management), and ArcScene/Adobe Illustrator (map and poster creation).

Findings/Results: The sections of this poster explain the various tasks and corresponding findings/results. In general, the key takeaways are as follows:

a) Data Management - The creation of both a framework for future monitoring and a composite dataset, as well as the geodatabase of georeferenced photos, was a success and will make future analysis and data integration that much easier.

b) Inaccuracies & Inconsistencies - Data collection protocols and technology for this project have evolved since its inception in 2011. Early surveys used paper forms and recreational GPS units to document nest locations and conditions. In recent years, monitoring efforts have utilized smart phones and tablets, in addition to paper forms and recreational hand-held GPS units. Additionally, the surveyors cross a spectrum of expertise to include both staff and volunteers. This is all reflected in the data! The inherent inaccuracies of the various position collection technologies coupled with inconsistent protocols and techniques across the survey years resulted in three datasets that were difficult to perform accurate 1-to-1 assessments with.

c) Spatial Distributions - As detailed in the "Mapping and Analysis" section, there were some interesting spatial patterns in the survey observations that may indicate a trend in nesting patterns. These may or may not be due to forestry management activities but do inspire the requirement for future analysis.

d) Nesting Trends - Both spatial and statistical analysis showed significant shifts in both nest composition and location. Recommend continued analysis pending additional surveys.

Conclusions: Overall, the project was incredibly interesting and enlightening! I was able to really push my personal knowledge envelope vis-a-vis GIS data management, exploration, and analysis as well as explore new visualization and presentation techniques. Community partner feedback indicates the project was a success within the context and nature of the data that was available. I "made it much farther than was thought possible with that "rats nest" of a dataset" and provided "awesome" maps and a database schema that will "get [the Columbia Land Trust] back on a trajectory that will allow future analysis of the data." Going forward, I hope to maintain at least an informal relationship with the Trust and an involvement in this particular project to see future survey data continue to develop interesting patterns and analysis!

Project Effort By The Numbers

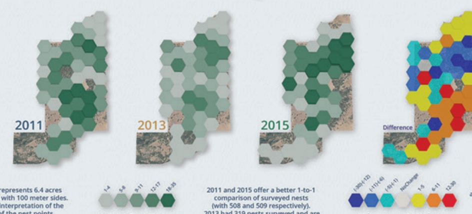
Activity	Hours Dedicated
Learning New Software	6
Creating Poster	13
Produce Framework for Future Monitoring	5.5
Formatting Survey Data	6
Manage Georeferenced Photos	3
Mapping and Spatial Analysis	16
Statistical Analysis	5
Collaborating with Partner	3

~60 hours total effort

Task: Mapping and Analysis

Task: Depict nesting locations and patterns; explore nest creation/abandonment patterns and nesting behavior in relation to forest management activities
Deliverable: Maps showing how nests are distributed throughout project area and any additional interesting spatial patterns in relation to forestry management practices
Challenges: Many! These are mostly due to inconsistency in the data (see "About the Project").
Processes: Primarily zonal/geostatistical analyses that visually summarize the spatial distributions of surveyed nests and selected attributes.
Results: Detailed below. This analysis can be seen as foundational and should be useful in the future (assuming consistent schema and collection methodologies are followed.)

Zonal Analysis of Nests



Each hexagon zone represents 6.4 acres (~26,000 sq. meters) with 100 meter sides. The zones allow for interpretation of the spatial distribution of the nest points despite the inaccuracies and inconsistencies detailed in "About the Project".

Nests Per Zone By Year

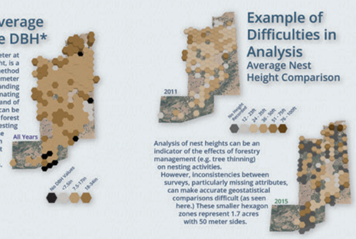
2011 and 2015 offer a better 1-to-1 comparison of surveyed nests (with 508 and 509 respectively). 2013 had 319 nests surveyed and are not included in the Difference map comparing changes between zones.

Change Within Zone

The Difference map reveals a clear and significant shift of observed nests within the project area. The shift is generally a net loss in the northeast and gain in the southeast. The shift could be around and due to the thinning activities (hypothesis).

Average Tree DBH*

*DBH, or diameter at breast height, is a standard forestry method of expressing the diameter of the trunk of a standing tree. It is used in estimating timber volume in a stand of trees. This metric can be useful in correlating forest density and nesting patterns. These smaller hexagon zones represent 1.7 acres with 50 meter sides.



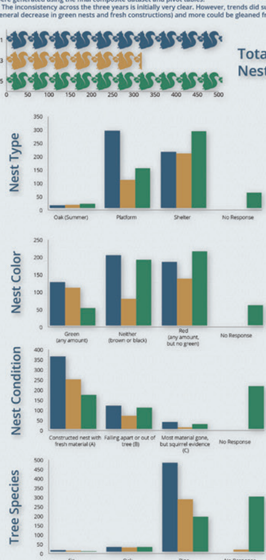
Example of Difficulties in Analysis

Average Nest Height Comparison

Analysis of nest heights can be an indicator of the effects of forestry management (e.g. tree thinning) on nesting activities. However, inconsistencies between surveys, particularly missing attributes, can make accurate geostatistical comparisons difficult (as seen here.) These smaller hexagon zones represent 1.7 acres with 50 meter sides.

Task: Statistical Analysis

Task: Explore and depict nest attributes and patterns before, during, and after forestry management activities
Deliverable: Graphs and maps showing how nests are distributed throughout project area and any interesting spatial patterns in relation to forestry management practices
Challenges: Many; mostly due to inconsistency in the data (see "About the Project").
Processes: The following graphs visually summarize the primary attributes collected about each nest data point. These were generated using the final composite dataset and pivot tables.
Results: The inconsistency across the three years is initially very clear. However, trends did surface (e.g. a general decrease in green nests and fresh constructions) and more could be gleaned from future surveys.



2011
2013
2015

Task: Produce Framework for Future Monitoring

Field Name	OBJECTID	Shape	Identifier	SurveyDate	ObservedSquirrels	NestStatus
Type	Object ID	Geometry	Text	Date	Text	Text
Length	Assigned	Assigned	15	N/A	3	25
Description	A unique, not null integer field used to uniquely identify rows in tables in a geodatabase	Indicates the type of geometry—point, line, polygon, multipoint, or multipatch (WGS Nests are Points)	Unique number to identify tree containing nest.	Date nest was surveyed	Were squirrels observed in tree or nest?	Added in 2015. Denotes whether observation is New Nest, Existing Nest, or Unknown
Domain	N	N	N	N	Y	Y

NestType	NestCondition	NestColor	NestHeight	TreeDBH	TreeSpecies	Surveyors
Text	Text	Text	Float	Float	Text	Text
100	100	100	N/A	N/A	100	100
Indicates nest type: Platform (P), Shelter (S), or Oak (O)	Three "condition classes": Fully Constructed (A) - appears intact and not deteriorating, Some Lost Material (B) - appears to have lost material, or Most Materials Gone (C) - most material is gone	Three color classes: G = green material visible in nest R = red or "rusty" material visible in nest N = neither green nor red material visible (all nest material is gray, brown, or black).	An estimate the height of the nest above the ground, in feet.	A measurement of the diameter at breast height of the nest tree, in inches.	The tree species: pine (P), fir (F), or oak (O).	Volunteers and staff members conducting survey of nest.
Y	Y	Y	N	N	Y	N

Comments	created_user	last_edited_user	created_date	last_edited_date	Latitude	Longitude
Text	Text	Text	Date	Date	Float	Float
200	255	255	N/A	N/A	N/A	N/A
Free field for general comments/observations.	Used by Editor Tracking. Each time an edit is made, information about editors is automatically recorded.	Used by Editor Tracking. Each time an edit is made, information about editors is automatically recorded.	Used by Editor Tracking. Each time an edit is made, information about editors is automatically recorded.	Used by Editor Tracking. Each time an edit is made, information about editors is automatically recorded.	Latitude of observation.	Longitude of observation.
N	N	N	N	N	N	N

Task: Review WGS nest data and generate a storage schema that will allow for tracking of nest characteristics in addition to nest usage/creation

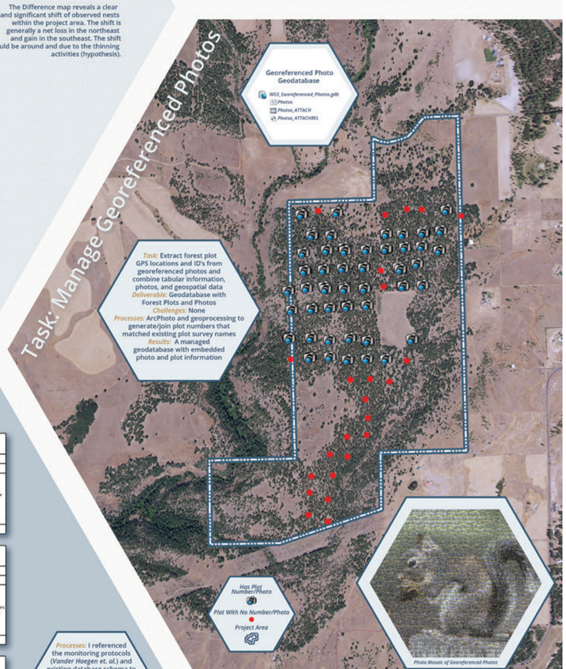
Deliverable: Recommended Feature Class Template/Schema

Challenges: None (once initial data analysis and composite dataset was complete)

Processes: I referenced the monitoring protocols (*Vander Haegen et. al.*) and existing database schema to provide a final recommended schema with field types and domains that matched the composite dataset I created for all previous survey years.

Results: An empty feature class template in a geodatabase (left)

Task: Manage Georeferenced Photos



Task: Extract forest plot GPS locations and ID's from georeferenced photos and combine tabular information, photos, and geospatial data
Deliverable: Geodatabase with Forest Plots and Photos
Challenges: None
Processes: ArcPhoto and geoprocessing to generate/join plot numbers that matched existing plot survey names
Results: A managed geodatabase with embedded photo and plot information

References

Scrivens, T. (2016, April 8). [Western Gray Squirrel Nest Monitoring Data - Student Project Description]. Unpublished raw data/information document.

Vander Haegen, M., Von Leuven, S., & D. A. (2004). Surveys For Western Gray Squirrel Nests On Sites Harvested Under Approved Forest Practice Guidelines (Rep. No. TFW-LWAG4-00-001). Washington Department of Fish and Wildlife - Wildlife Program - Wildlife Science Division. doi:January 2004

Linders, M. J., & Stinson, D. W. (2007). Western Gray Squirrel Recovery Plan (Rep.). Washington Department of Fish and Wildlife - Wildlife Program. doi:November 2007

Final Project Poster - GEO267, Spring 2016
Project Lead: Eric C. Roberts, Portland Community College
Community Partner: Tanner Scrivens, Columbia Land Trust

Same-sex Households across the U.S. 2009-2014

The one barometer to measure the changing climate of acceptance towards gays and lesbians is with the number of self-reported same-sex households reported to the U.S. Census.

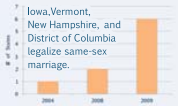
The number of same-sex households, normalized to the overall number of households is shown for 2009-2014. Included are facts about states that have legalized same-sex marriage.

Number of Same-Sex Households per 1,000
- 81 - 194
- 61 - 80
- 41 - 60
- 21 - 40
- 13 - 20

2004

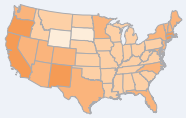
Massachusetts is the first state to legalize same-sex marriage.

2009



Iowa,Vermont, New Hampshire, and District of Columbia legalize same-sex marriage.

ALASKA has the 3rd lowest number of same-sex households at 752.



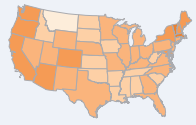
2010

2011

New York becomes the 7th state to legalize same-sex marriage.

The total number of same-sex households is 640,000.

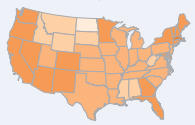
2012



2013

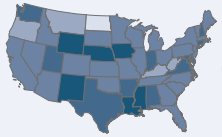
8 more states legalize same-sex marriage.

11 states removed bans on same-sex marriage, including Utah and West Virginia.



2014

Percent Increase in same-sex households 2009-2014



- 61 - 80%
- 41 - 60%
- 21 - 40%
- 1 - 20%
- -11.5 - 0%

2015

June 26: Same-sex marriage is LEGALIZED in the United States

APPENDIX B: COURSE EVALUATIONS

SAC QUESTION: CAN YOU PROVIDE AN EXAMPLE OF HOW THIS COURSE HAS INFLUENCED OR HIGHLIGHTED THE ROLE GEOGRAPHY PLAYS IN YOUR LIFE?

"This challenging class has deepened my appreciation of and concern for the geography of global issues. I already loved geography but this class has deeply inspired me to want to possibly pursue geography as a vocation."

- Geography student, Geo 212

"I think this course allowed me to think of places in a spatial way. How space and people are connected and interact with each other is important when analyzing human issues."

- Geography student, Geo 105

"I now care more about our environment and understand what happens when it rains or doesn't rain. Why the rain or snow is important to the landscape and the earth and the occupants on it."

- Geography student, Geo 110

"Mostly, I became even more aware of the damage to the environment that humans do. I even started to change some things in my lifestyle to lower the amount of resources I use and the amount of trash I generate."

- Geography student, Geo 212

"The class just really highlighted the distinctions between some of American cultural tendencies and the vast differences with so many other cultures on similar issues i.e. hunger for example."

- Geography student, Geo 212

"Integrating data in maps shows how connected we are. Displaying that data and adjusting for specific audiences deals with all of our differences."

GIS student, Geo 240

"The realization of how much more scientific/technological and systematic study opens up imagery beyond visual analysis."

- GIS Student, Geo 246

"Using drones to create maps and show progress on various building projects is becoming very common and will be even more important in the future. As time goes forward, technology is only going to become better. So, this means that drones will play an even bigger part of our life in the future. It is possible that: 1) batteries will be able to hold a longer charge, 2) cameras and LiDAR sensors will only be much better into terms of quality and weight ratio, and 3) there will be better versions of drones and maybe it will be easier to fly drones.

So, in the future, drones will play an even bigger part of our lives"

- GIS Student, Geo 248

"Being challenged to apply GIS principles to a real world final project. Taking an item from the headlines of a current geographical/environmental news article (like renewable energy) and further developing the ideas using GIS"

- GIS student, Geo 266

APPENDIX C: ADVISORY COMMITTEE MEETING NOTES

GIS Advisory Meeting - Monday December 7, 2015

6:00 - 7:30pm @ PCC CLIMB Center

Attendees: Christina Friedle (PCC), Dana Fuller (PCC), David Banis (PSU), Molly Vogt (City of Gresham), Tommy Albo (Metro)

1. 6:00 pm GIS Program updates

Christina informed the committee of updates in the program since our last meeting in the spring. This includes: PCC now has a student chapter of the ASPRS, Fall LiDAR workshop, new winter class on Remote Sensing, & recap of GIS Day 2015.

6:15 pm Interactive Map Design course

- What are the essential skills & tools?
- Software platforms

A review of what we discussed:

- Cartdb, Tile Mill, Google API
- David provided a contact at ESRI for assisting
- Web-based mapping - does it need to be interactive?
- Matthew Hampton could be a good contact for designing Base Maps

I needed to type up these notes a lot sooner because my notes from the meeting are not complete and there was much more discussed!

2. 7:00 pm GIS Certificate Program Marketing
    - Brainstorm ideas for promoting the program locally
    - Ways to engage students in the community

Brainstorming session ideas:

- Mapathon at PCC - either internally or externally to promote using GIS for good. No expertise needed and can bring in people from all backgrounds
- Work with other departments to show them how GIS can be used in their fields and to promote classes to students. This includes CAS/CIS, business, real estate, marketing, other sciences (already well connected)
- Visual displays around campus. Talk to Matt Constantino about display at Rock Creek and updating it; Helzer art gallery? Perhaps we can have a cartographic art display; Map of the month displayed in GIS Lab
- We didn't get too far on how to reach out to the working professional group. Christina is trying to get ideas on how to find businesses that are looking to get employees trained in GIS. Not too many ideas on this one.
- Workshops are a great way to bring in professionals & students outside of the GIS program if marketed correctly.

3. 7:25 PM Wrap-up

APPENDIX C: ADVISORY COMMITTEE MEETING NOTES

GIS Advisory Committee Meeting - January 26, 2017

6:00 - 7:30pm

Present: Christina Friedle (PCC), David Banis (PSU), Tommy Albo (Metro), Kevin Martin (City of Portland)

1. Welcome & introductions

We had a small group of attendees at this meeting; Need to reinvigorate the group and perhaps reevaluate our current mode of operating. Tommy Albo suggested a 'term limit' only so that we continue to get fresh ideas and new people at the table. This can be a discussion for our spring meeting - where to go with the Advisory Committee now that the

Certificate program is up and running and fairly stable.

2. Program Updates
    a. Current Program requirements
    b. GIS Club & Student Accomplishments
    c. Future considerations: Mapping Place
    d. Community Partners

Christina provided the Advisory committee with Program updates that included:

- Changes in full-time Faculty at Rock Creek campus
- ASPRS & GIS Club activities - QGIS series of workshops this year; Kyung Lee & Mike

Holscher winning the Geospatial Skills competition in 2016; new GIS Club t-shirts in current design phase; GIS In Action participation; collaborations with PSU GIS Club - Career panel with Recent Grads & Map Critique;

- Communications with Sociology & Stats on a class geared to non-GIS 'majors' on

Mapping place. This class could focus on data sources like the Census and other commonly used data for understanding place - this includes demographics, politics, economics, etc.

- GIS program is always looking for more community partners to the GIS Applications course, where students complete a project with a community organization/agency. This class is their 'capstone' and they volunteer to collect data, analyze data, and make maps for organizations with a need (but not necessarily the capacity).

3. GIS Skills Assessment
    a. Pre-post test

Christina presented the group with the pre-post test we are piloting this year in our GIS Certificate program to better understand how students are grasping curriculum and what our strengths & weaknesses with our curriculum & instruction. After reviewing, we got some good feedback:

- How are the questions tied to specific course outcomes? In order to understand where within our curriculum improvements need to be made, the questions on the exam should be clearly tied to specific course outcomes. Students should indicate on the exam what specific classes have been taken as well.
- Include some more open-ended questions or questions with more options i.e. Choose (or list) what functions can be done in ArcCatalog.
- Include a section that allows students to rate their own level of comfort with certain tasks/tools (self-assessment)

4. Unmanned Aerial Vehicles (UAV)

a. Course & Operator Certificate

We have started a conversation in the Geography/GIS SAC to purchase a UAV, develop a course on UAV operation, and to look at the feasibility of developing a UAV certificate. Christina informed the committee of this conversation and shared a grant proposal submitted to PCC for the development and research into this. The committee offered some great advice and contacts (as per usual!) outlined below:

- There are some local professionals that have been using UAVs in their work and could provide some helpful assistance in our efforts - Brian Shephard @ Clean Water Services, Michael Schindel @ Nature Conservancy, and Tyler Vick @ Flo Analytics
- The focus should be on not just operation of the UAV, but also the analysis of data, ethics & legality of use, and specific industry use (golf courses, wine, agriculture, fire & rescue, utilities)
- Make contacts with local industry - there are a couple of manufacturers of UAVs in Hood River & Woodburn

*****UPDATE SINCE MEETING*****

- Christina has been in touch with Aviation in an attempt to make this a multidisciplinary program. A couple years ago, an Oregon State Legislature from western oregon approached PCC (Aviation) to develop a program focused on UAVs. At the time there was still a lack of regulation and not much came of it. We are ready to initiate this again and see where we can go with developing a program. COCC has already done this (https://www.cocc.edu/aviation/uas-degree-program/).

5. Wrap-up

APPENDIX C: ADVISORY COMMITTEE MEETING NOTES

GIS Advisory Committee Meeting - January 22, 2018

CLIMB Center, Room 102 - 6:00 - 7:30pm

1. Welcome & introductions

Brian Shepard from Clean Water Services is the newest member of our Advisory Committee and he joined us for the first time. Other participants included: Molly Vogt (Metro), Maria Schlangen (City of Hillsboro), Chris Grant (PSU, PCC), David Banis (PSU), Tommy Albo (Metro), Bryan Kilburn (Pacific Foods, PCC), Steven Jett (EPA) and Christina Friedle (PCC).

2. Program Updates

    a. Current Program requirements (Geography v GIS Electives)

We had a discussion about whether or not to require students in the GIS Certificate program to take 2 Geography (human or physical) courses as part of their curriculum. Here are a few key points from the discussion:

- Is there a way to incorporate more Geographic concepts into GIS courses?
- There are many GIS professionals that do not have a Geography background - but a related field - and it does not affect their ability to understand how to use GIS effectively
- Geography is a core piece of GIS and because students may have never taken a Geography course before, they should have some basic understanding of what it is
- How would changing this requirement affect enrollment in Geography classes at PCC?
- 1 Geography course requirement would be sufficient, and that would allow for one additional GIS class to be required

    b. GIS Club Projects

Christina provided a brief description on the two projects the Club is focused on this year - Food Insecurity for PCC students, and collaborating with Makerspace to build a 3D model of Sylvania campus.

    c. Community Partners

We need more community partners for our Applications in GIS class (Geo 267 - capstone class for program). Christina has a nice long list of potential partners provided by everyone in the room (thank you!) and will follow up with individual committee members for contact info.

    d. Program Review - June 1 @ 11:30am

Every 5 years, every program at PCC goes through a Program Review process, which consists of a Report and a presentation. It would be great if some of our Advisory committee members could attend, show support for the program, and even speak briefly about their involvement in the program, and their interactions with students. Google Calendar invite coming soon. Please save the date!

    e. ArcPro transition

ESRI is putting the full-court press on transition to ArcPro, although they are still supporting ArcGIS indefinitely. Where is Industry with this transition? If we move to teach just ArcPro, will our students be entering a work environment that is still in ArcGIS desktop? Here is a summary of our discussion on this topic:

- Individuals have started using ArcPro at each agency/company/organization, but of all the groups represented in the meeting - none have done it at the institutional level.
- It would be difficult to fully transition to ArcPro right now because it still does not have full functionality
- There are some things that can only be done in ArcPro (i.e. Drone2Map is built in) and that is why individuals have started to use it.

- .mxd's cannot be opened in ArcPro - major issue for making the full transition
- Would be very difficult to teach students 2 software programs at once

Overall, the general consensus is that it is not yet time to make the full transition, but to start incorporating it into the curriculum for the specific tools tha Pro does better (3D, Drone).

f. Connecting to HS

There is a big push at PCC to make connections to High School students, and for CTE (career technical) programs have HS courses set-up for a pathway into PCC programs. Two major obstacles with Geography/GIS - HS teachers must meet our Instructor Qualifications (either a Master's in Geography or for our GIS class it could also be that they have a Bachelor's with at least 4 years experience in the field), and there are not many HS that offer Geography at all.

The group presented some ideas on who to connect to. Below is a summary:

- Hillsboro Online Academy - generally an innovative high school that is always open to new ideas (Maria has contact info)
- St. Mary's contacted PSU about a similar thing - didn't quite work out, but could be a good connection for PCC (David B has contact info)
- OSU Extension has 4H program & Tech Wizards through HIllsboro HS
- GeoMentors through ESRI - if there are teachers looking for GIS help, they can be found on the website
- Saturday Academy (housed at University of Portland)
- C-Geo - ask them to recommend HS teachers that they have worked with in the Portland Metro area

3. Geomatics - Associates degree
    a. Overview
    b. OIT & Curriculum map
    c. Demand

Geomatics is focused on data collection - either through surveying techniques or remote sensing (including GPS, UAS, or other methods). Christina has been working with Engineering faculty on whether or not offering a Geomatics degree at PCC is a good idea. We are doing some preliminary research & outreach to find out more. Here is what we know so far and a summary of what was discussed with the committee:

- The only community colleges that currently offer this are in southern Oregon, closer to OIT (which offers a 4-year degree in Geomatics)
- We already have a vast majority of the classes we would need to offer an AA in Geomatics between Geography, Engineering, Math, and other general education requirements (Social science, writing, communication, etc.).
- In our preliminary research, there is a greater demand for surveyors then there is supply
- Surveyors are a dying profession….and current surveyors are in their 'golden' years. Traditional surveying is being replaced with remote data collection methods
- Seems like the perfect time to start training the 'new generation' of surveying with skills in both land surveying and remote surveying methods!

4. Unmanned Aerial Vehicles
    a. New courses - Geo 248 & 252
    b. Short-term Certificate
    c. Required skills / job demand
    d. Equipment funding

PCC now officially has two UAS courses on the books - Geo 248 UAS Concepts, Operations and Applications, and Geo 252 UAS Data Integration & Interpretation. We are thinking about developing a short-term career pathways certificate which would consist of 6 classes (Intro to GIS, GIS Analysis, 2 UAS courses, Remote Sensing, & GPS) in UAS. Is there value? The general consensus was yes - a certificate is proof that a certain level of knowledge was obtained, students are prepared with the full range of knowledge to operate UAS, collect data, and integrate into GIS.

We ran out of time to discuss this in too much detail. We need equipment!! Anyone know of businesses that want to sponsor our program? We are looking for corporate sponsors and suggestions are always welcome!

If anyone has additional thoughts on:

- Where to find equipment /corporate sponsors
- What skills are essential to a UAS certificate
- How industry is using UAS - are they looking for employees with this skill? Are they sending current employees to be trained? Are they contracting out for this? Etc. Please send them to me. We are in the information gathering stage for both the UAS certificate and the Geomatics degree, so everything is valuable.

5. Wrap-up

APPENDIX D: GIS CERTIFICATE GRADUATE STATEMENT ON JOB PREPAREDNESS

"I entered the PCC GIS Certificate program with no prior GIS experience, with the goal of simply trying to determine if GIS would be a viable future career option. Beginning in Fall quarter, the program had a logical flow of course progression that ultimately prepared me to succeed in a paid GIS internship immediately following my completion of the program. In my current internship with a local city engineering department, I have the skills to complete the tasks assigned to me, and a strong grasp of the fundamental GIS concepts that allow me to solve the problems that require further knowledge of specialized GIS operations.

Throughout the program, the instruction was superb. My GIS-specific instructors (Grant, Friedle, Roberts, & Gordon) each leveraged their unique qualifications to provide a level of detail in their instruction that helped prepare me to enter the workforce. Furthermore, the tutoring lab played a key role in my education. I spent many hours in the lab receiving help from tutors and peers on lab-work and projects. This resource cut down the time that I would have had to spend solving minor issues, drastically, allowing me to spend more time learning valuable new skills.

While the GIS Certificate Program exceeded my expectations, there were some flaws. Some of the labs did not work correctly because of constant software updates. This required me to troubleshoot the task, and to be flexible with my expectations. Although annoying and time-consuming, this made me a better GIS technician, as I run into issues with my workflows very often, due to unexpected variables. Patience, resourcefulness, and diligence are just some of the soft-skills that I sharpened due to the "flaws" of the GIS Certificate Program.

As a final-note, throughout my journey in the GIS Certificate Program I felt like I had the support of my instructors, tutors, and most of all, our Department Chair, Christina. Christina goes out of her way to provide opportunities for GIS students to network and gain exposure to potential employers. This connection was certainly vital to my success in securing employment. As a direct result of a public speaking opportunity that Christina set-up for me, I made industry connections that opened the doors to future job opportunities."

Ian Amitin, GIS Intern

City of Lake Oswego, Engineering Dept