Subject Area Committee Name: Geography

Core Outcome Being Reassessed: Professional Competence

Contact Person:

Name	*e-mail*
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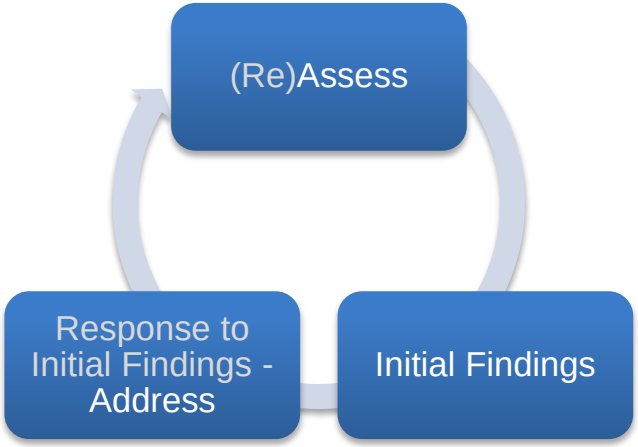
Use this form if your assessment project is a follow-up reassessment of a previously completed initial assessment. The basic model we use for core outcome assessment at PCC is an "assess – address – reassess" model.



The primary purpose for yearly assessment is to improve student learning. We do this by seeking out areas of concern, making changes, reassessing to see if the changes helped.

- Refer to the help document for guidance in filling out this report. If this document does not address your question/concern, contact Nora Stevens to arrange for coaching assistance.
- Please attach all rubrics/assignments/etc. to your report submissions.
- **Subject Line of Email:** Assessment Report Form (or ARF) for <your SAC name> (Example: ARF for MTH)
- **File name:** SACInitials_ARF_2018 (Example: MTH_ARF_2018)
- SACs are encouraged to share this report with their LAC coach for feedback before submitting.
- Make all submissions to **learningassessment@pcc.edu.**

Due Dates:

- **Planning Sections of LAC Assessment or Reassessment Reports: November 27th, 2017**
- **Completed LAC Assessment or Reassessment Reports: June 16th, 2018**

Please Verify This Before Beginning this Report:

☒ *This project is the second stage of the assess/reassess process (if this is not a follow-up, re-assessment project, use the LAC Assessment Report Form LDC. Available here.)*

Initial Assessment Project Summary (previously completed assessment project)

*Briefly summarize the main findings of your **initial** assessment. Include either 1) the frequencies (counts) of students who attained your benchmarks and those who did not, or 2) the percentage of students who attained your benchmark(s.)*

No benchmarks were established in the initial assessment. The goal of the initial year of the two-year assessment cycle was to develop and test the use of a quantitative GIS assessment, which would in turn lead to the potential establishment of benchmarks relating to the expected attainment/retention of GIS knowledge as specifically related to the use of ArcGIS software.

Another underlying conceptual goal was to measure improvement of GIS knowledge over the course of the PCC GIS Certificate program, specifically relative to comparisons of assessment scores of beginner students (i.e., little or no prior GIS experience) and advanced students (i.e., moderate or extensive GIS experience).

For the purposes of assessment, a proxy for GIS experience has been established as being the presence of GIS prerequisites for the class in which the assessment is assigned. In other words, if the course does NOT have a GIS prerequisite, there is no expectation of prior GIS knowledge. Conversely, classes with GIS prerequisites assume a certain degree of proficiency.

Despite not establishing official benchmarks in the initial assessment, an arbitrary tentative benchmark was proposed, such that less than 5% of the students would achieve less than 80% correct responses on the skills-test. This tentative benchmark was not phrased precisely enough to be meaningful. Taken literally, the average score for all 78 students (i.e., 81 responses altogether with three students repeating the assessment in consecutive terms) was only 57%, and 84% of students achieved less than 80% correct responses.

In assessing GIS knowledge, the potential benchmark should be framed relative to students who have moderate or extensive GIS experience, since the goal of the assessment is to determine whether or not the curriculum and pedagogical approach is effective. With that in mind, the 21 students with the most PCC GIS experience averaged 75% on the assessment, and 52% achieved less than 80% correct responses.

Briefly summarize the changes to instruction, assignments, texts, lectures, etc. that you have made to address your initial findings:

Since the goal of the initial year of the two-year assessment cycle was to develop and test the use of a quantitative GIS assessment, and since no official benchmarks were established, potential implementation of changes to instruction, assignments, texts, lectures, etc., in the Geography SAC was postponed until completion of the 2017-2018 reassessment..

If you initially assessed students in courses, which courses did you assess:
Winter Term: GEO 265 and GEO 246 (no GIS prerequisites); Spring Term: GEO 265 (no GIS prerequisites) and GEO 266 (with GIS prerequisites).

If you made changes to your assessment tools or processes for this reassessment, briefly describe those changes here:
The most significant changes in the 2-year assessment/re-assessment cycle occurred relative to the content, structure, and implementation of the assessment tool. The format was changed from analog (i.e., paper) to digital (i.e., online) format, which enabled easier delivery of questions and collection of answers.

In the introductory notes of the initial 2016-2017 assessment, students were instructed to skip questions they did not feel confident answering, so as to avoid the chance of guessing correct responses. In the 2017-2018 reassessment, the response of "I don't know" was included on each question. Additionally, the candidate pool of questions was expanded, due to sourcing a larger amount of questions from Esri Entry, Associate, and Advanced GIS certification exams. Due to some of the potential vagueness of the questions in the 2016-2017 assessment, and as a result of internal discussion among Geography SAC faculty, the questions sourced from AAG spatial thinking tests were not included in the 2017-2018 reassessment. Altogether, as a result of the increase in the candidate pool of Esri questions, the amount of questions overall in the 2017-2018 reassessment increased to 25, as compared with 18 on the 2016-2017 assessment.

Also, the number and type of background questions presented at the beginning of the 2017-208 reassessment increased, in order to potentially differentiate between the effect of GIS experience attained prior to enrollment at PCC versus GIS experience attained while enrolled at PCC, as well as to better understand the potential effect of particular PCC GIS electives on assessment performance.

(For SACs that participated in the Multi-State Collaborative): Will this reassessment "close the loop" on an assessment you conducted in 2014 – 2015, 2015 – 2016, or 2016 – 2017 for the Multi-State Collaborative?

☐ *Yes*
☐ *No*

1. Core Outcome

1A. PCC Core Outcome: Professional Competence

1B. How does your discipline interpret the outcome you are reassessing?

An ability to provide correct responses on a multiple-choice knowledge exam of technical skills related to the use of GIS software (specifically Esri ArcGIS), as compared with length of GIS experience prior to enrollment in and near completion of the PCC GIS Certificate program.

1C. Briefly describe how this outcome is/might be important/useful to your students.

Professional competence, as specifically interpreted as software proficiency in GIS (especially proficiency in the industry standard software, Esri ArcGIS) is particularly useful in the future academic or professional careers of students enrolled in the PCC GIS Certificate program. An ability for outgoing students to conceptually solve spatial or geographic problems by conceptualizing linear, parallel, or iterative geospatial workflows, as well as an ability to utilize the requisite technical or software-oriented tools, is an expectation of both the students and faculty of the PCC GIS Certificate program.

2. Project Description

2A. Assessment Context

Check all the applicable items:

☐ **Course-based assessment.**
Course names and number(s):
Type of assessment (e.g., essay, exam, speech, project, etc.):

Are there course outcomes that align with this aspect of the core outcome being investigated? ☐ Yes ☐ No
If yes, include the course outcome(s) from the relevant CCOG(s):

☐ **Common/embedded assignment in all relevant course sections.** An embedded assignment is one that is already included as an element in the course as usually taught. Please attach the activity in an appendix. If the activity cannot be shared, indicate the type of assignment (e.g., essay, exam, speech, project, etc.):

☒ **Common – but not embedded - assignment used in all relevant course sections.** Please attach the activity in an appendix. If the activity cannot be shared, indicate the type of assignment (e.g., essay, exam, speech, project, etc.):

☐ **Practicum/Clinical work.** Please attach the activity/checklist/etc. in an appendix. If this cannot be shared, indicate the type of assessment (e.g., supervisor checklist, interview, essay, exam, speech, project, etc.):

☐ **External certification exam.** Please attach sample questions for the relevant portions of the exam in an appendix (provided that publically revealing this information will not compromise test security). Also, briefly describe how the results of this exam are broken down in a way that leads to nuanced information about the aspect of the core outcome that is being investigated.

☐ **SAC-created, non-course assessment.** Please attach the assessment in an appendix. If the assessment cannot be shared, indicate the type of assignment (e.g., essay, exam, speech, project, etc.):

☐ **Portfolio.** Please attach sample instructions/activities/etc. for the relevant portions of the portfolio submission in an appendix. Briefly describe how the results of this assessment are broken down in a way that leads to nuanced information about the aspect of the core outcome that is being investigated:

☐ **Survey**

☐ **Interview**

☐ **Other.** Please attach the activity/assessment in an appendix. If the activity cannot be shared, please briefly describe:

In the event publicly sharing your assessment documents will compromise future assessments or uses of the assignment, do not attach the actual assignment/document. Instead, please give as much detail about the activity as possible in an appendix.

2B. How will you score/measure/quantify student performance?

☐ **Rubric** (used when student performance is on a continuum - if available, attach as an appendix – if in development, attach to the completed report that is submitted in June)
☐ **Checklist** (used when presence/absence rather than quality is being evaluated - if available, attach as an appendix – if in development, attach to the completed report that is submitted in June)
☐ **Trend Analysis** (often used to understand the ways in which students are, and are not, meeting expectations; trend analysis can complement rubrics and checklist)
☒ **Objective Scoring** (e.g., Scantron-scored examinations)
☐ **Other** – briefly describe:

2C. Type of assessment (select one per column)

☒ **Quantitative** ☒ **Direct Assessment**
☐ **Qualitative** ☐ **Indirect Assessment**

If you selected 'Indirect Assessment', please share your rationale:

Qualitative Measures: projects that analyze in-depth, non-numerical data via observer impression rather than via quantitative analysis. Generally, qualitative measures are used in exploratory, pilot projects rather than in true assessments of student attainment. Note that the **use of a numerical rubric is considered quantitative analysis**, even if the artifacts under consideration are not based on quantitative calculations (e.g. an essay scored by a rubric counts as quantitative in the context of assessment).

Indirect assessments (e.g., surveys, focus groups, etc.) do not use measures of direct student work output. These types of assessments are also not able to truly document student attainment.

2D. Check any of the following that were used by your SAC to create or select the assessment/scoring criteria/instruments used in this project:

☒ Committee or subcommittee of the SAC collaborated in its creation
☒ Standardized assessment
☐ Collaboration with external stakeholders (e.g., advisory board, transfer institution/program)
☐ Theoretical model (e.g., Bloom's Taxonomy)
☒ Aligned the assessment with standards from a professional body (for example, The American Psychological Association Undergraduate Guidelines, etc.)
☐ Aligned the benchmark with the Associate's Degree-level expectations of the Degree Qualifications Profile
☐ Aligned the benchmark to within-discipline post-requisite course(s)
☐ Aligned the benchmark to out-of-discipline post-requisite course(s)
☐ Other (briefly explain:)

2E. In which quarter will student artifacts (samples of student work) be collected? If student artifacts will be collected in more than one term, check all that apply.

☒ **Fall** ☒ **Winter** ☒ **Spring** ☐ **Other** (e.g., if work is collected between terms)

2F. What student group do you want to generalize the results of your assessment to? For example, if you are assessing performance in a course, the student group you want to generalize to is 'all students taking this course.'

The results will be generalized to students enrolled in GIS classes at PCC, which will include two comparisons: (1) GIS knowledge as compared with length of GIS experience near the beginning of the PCC GIS Certificate program, and (2) GIS knowledge as compared with length of GIS experience near the end of the PCC GIS Certificate program.

2G. There is no single, recommended assessment strategy. Each SAC is tasked with choosing appropriate methods for their purposes. Which best describes the purpose of this project?

☐ **To measure established outcomes and/or drive programmatic change**
☐ **To participate in the Multi-State Collaborative for Learning Outcomes Assessment**
☒ **Preliminary/Exploratory investigation**

If you selected 'Preliminary/Exploratory', briefly describe your rationale for selecting your sampling method:
The 2016-2017 Geography assessment was a preliminary attempt to introduce and standardize annual introductory and exit assessments in the PCC GIS Certificate program, in order to measure the level of GIS knowledge of students entering the program as compared with the level of GIS knowledge achieved near the end of the program. This comparison, in turn, provides evidence of GIS proficiency and spatial reasoning ability, as well as general preparedness for continued academic or professional work.

The 2017-2018 reassessment is conceptually a continuation of the exploratory phase of understanding if a quantitative GIS assessment can functionally measure professional competence, specifically regarding the establishment of benchmarks. Since the 2017-2018 reassessment is (1) primarily focused on understanding if the adjustments made to the assessment tool have been effective and (2) secondarily focused on increasing sample size (especially of students in classes with GIS prerequisites), the efficacy of the establishment and continued use of benchmarks will be evaluated at the end of the 2017-2018 reassessment cycle.

The sampling method for the 2017-2018 reassessment cycle is to assess students during Fall, Winter and Spring terms. As previously discussed, any GIS courses that do not have significant enrollment overlap with other courses (i.e., GEO 170 with GEO 265) will be selected for assessment, which will insure the feasibility of a comparison between students that are near the beginning of the program with students near completion.

2H. Which will you measure?

☐ **the population** (all relevant students – e.g., all students enrolled in all currently-offered sections of the course)
☒ **a sample** (a subset of students)

If you are using a sample, select all of the following that describe your sample/sampling strategy (refer to the Help Guide for assistance):

☐ **Random Sample** (student work selected completely randomly from all relevant students)

☐ **Systematic Sample** (student work selected through an arbitrary pattern, e.g., 'start at student 7 on the roster and then select every 5th student following'; repeating this in all relevant course sections)
☐ **Stratified Sample** (more complex, consult with an LAC coach if you need assistance)
☐ **Cluster Sample** (students are selected randomly from meaningful, naturally-occurring groupings (e.g., SES, placement exam scores, etc.)
☐ **Voluntary Response Sample** (students submit their work/responses through voluntary submission – e.g., via a survey)
☒ **Opportunity/Convenience Sample** (only some of the relevant instructors are participating)

The last three options in bolded red have a high risk of introducing bias. If your SAC is using one or more of these sample/sampling strategies, please share your rationale:
The 2017-2018 reassessment is attempting to measure the population of PCC GIS students. Some of the required courses have significant enrollment overlap (i.e., GEO 170 and GEO 265). The GIS program also offers a broad selection of elective courses. In order to avoid undo repetition of assessments of individual students in a single term, GEO 170 is being omitted from the 2017-2018 reassessment, since the same students will also be required to take GEO 265 at some point during the year.

2J. Briefly describe the procedure you will use to select your sample (including a description of the procedures used to ensure student and instructor anonymity).
Assessments will be assigned to any GIS classes in Fall, Winter, and Spring terms that do not have a large duplication of students enrolled. For example, for Fall term we chose both GEO 265 courses (without GIS prerequisites) and the single GEO 266 course (with GIS prerequisites), because very few students will be taking two of the three courses. We omitted GEO 170, because enrollment overlaps significantly with GEO 265.

For Winter term, we will assign the assessment in GEO 240, GEO 246, and GEO 266 (all with GIS prerequisites), as well as GEO 265 (without GIS prerequisites), again omitting GEO 170 in order to avoid undo replication of assessment of individual students.

For Spring term, we will assign the assessment in GEO 265 (without GIS prerequisites), and GEO 267, GEO 244, GEO 266, GEO 242, and GEO 252 (all with GIS prerequisites), again omitting GEO 170 as described before.

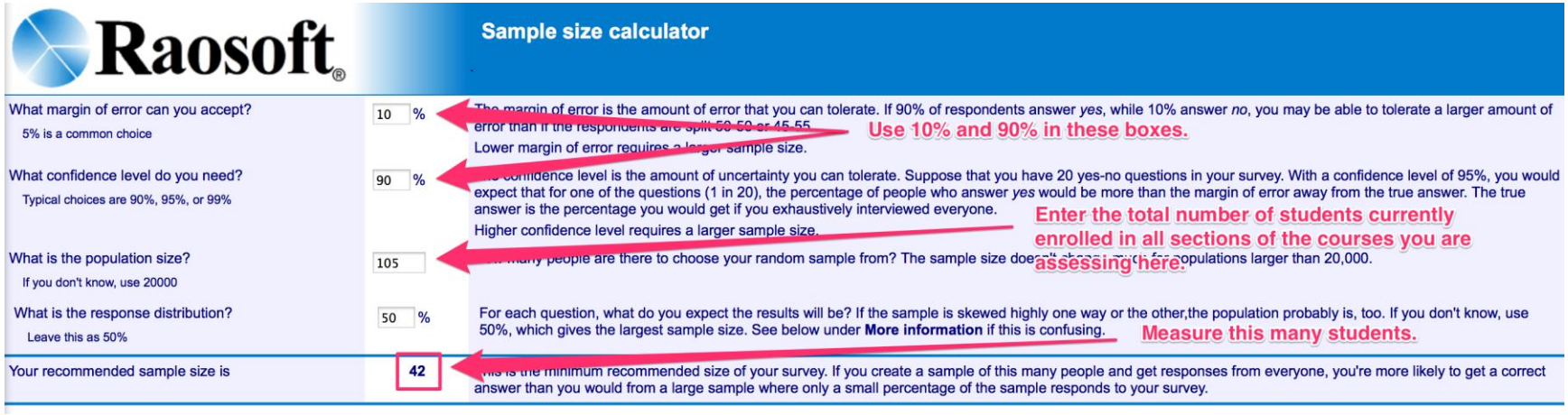
In order to have the potential to study longitudinal trends of individual students, as well as study the effects of specific required and elective courses on GIS knowledge retention, student and course information is collected during the assessment. All individual student and course information is anonymized during tabular analysis, and only aggregate figures are provided in the final assessment report.

2K. Follow this link to determine how many artifacts (samples of student work) you should include in your assessment: http://www.raosoft.com/samplesize.html (see screen shot below).

Start with the number of students you estimate will be enrolled in the course(s) from which you will draw the sample – that is your "population." Enter the other numbers as indicated in the screenshot. The sample size calculator will tell you how many artifacts you need to collect. Enter that number below:

There were 192 students who took GIS classes in Fall, Winter, or Spring terms, which necessitates a sample size of 129 in order to achieve 95% confidence with a 5% margin of error. This sample will be used to measure the improvement of GIS students in the assessment as a result of having previously completed one or more PCC GIS courses (i.e., comparing students taking courses with or without PCC GIS prerequisites).

There were 73 students who took GIS classes with PCC GIS prerequisites in Fall, Winter, or Spring terms, which necessitates a sample size of 62 students in order to achieve 95% confidence with a 5% margin of error. This sample will be used to measure students' achievement of the aforementioned tentative benchmark of 70% success on the assessment.



3. Project Mechanics

3A. Does your project utilize a rubric for scoring? ☐ **Yes** ☒ **No**

If 'No', proceed to section B. If 'Yes', complete the following:

Which method of ensuring consistent scoring (inter-rater reliability) will your SAC use for this project?

☐ **Agreement** – the percentage of raters giving each artifact the same/similar score in a norming session; ideally, that will be 75% agreement or greater.

If you are using agreement, describe your plan for plan for conducting the "norming" or "calibrating" session:

☐ **Consensus** - all raters score all artifacts and reach agreement on each score

☐ **Consistency*** – raters' scores are correlated: this captures relative standing of the performance ratings - but not precise agreement. Briefly describe your plan:

Notes: the agreement method is the most frequently used for assessment, but the **calculation of inter-rater reliability is also among the more challenging issues** within assessment as a whole. If your SAC is unfamiliar with norming procedures, contact your assessment coach, or if you don't know who your coach is, contact LAC Vice Chair Chris Brooks to arrange for coaching help for your SAC's norming session.

The consistency method is not generally recommended; see the help guide for details.

3B. Have performance benchmarks been specified?

The fundamental measure in educational assessment is the number of students who complete the work at the expected/required level. We are calling this SAC-determined performance expectation the 'benchmark.'

☐ **Yes**

☒ **No**

If yes, briefly describe your performance benchmarks, being as specific as possible (if needed, attach as an appendix):

If no, what is the purpose of this assessment? (For example, this assessment will provide information that will lead to developing benchmarks in the future; or, this assessment will lead to areas for more detailed study; etc.)

The purpose of the assessment is three-fold: (1) quantify improvement of students' GIS knowledge as a result of enrollment in the PCC GIS Certificate program, (2) identify the efficacy of the assessment tool for establishing minimum performance benchmarks of outgoing students, and (3) identify problematic subject areas in order to adjust curriculum accordingly.

Last year, our tentative proposed benchmarks were probably too high (i.e., less than 5% of sampled students achieving less than 80% correct responses). One major adjustment that will help with the evaluation of the usefulness of the assessment tool is a significant increase in the number of classes sampled with GIS prerequisites (i.e., from 1 last year to 3-5 this year). Additionally vague AAG spatial thinking questions have been removed, and additional Esri technical questions have been added.

Despite the adjustments, it is perhaps advisable to lower the expectation of what an acceptable benchmark might be for outgoing students, especially regarding the conceptual and technical complexity of GIS methods and software. In other words, perhaps a single year of exposure to GIS should be appropriately viewed as providing a broad or introductory level understanding of GIS. With that in mind, and given that introductory students without prior GIS knowledge understandably tended to get less than 30% of the questions correct in the 2016-2017 assessment, perhaps a suitable minimum benchmark for the 2017-2018 reassessment would be less than 10% of samples students achieving less than 70% correct responses. A positive phrasing would be more than 90% of students achieving greater than 70% correct responses.

3C. The purpose of this assessment is to have SAC-wide evaluation of student work, not to evaluate a particular instructor or student. Before evaluation, remove student-identifying information (and, when possible remove instructor-identifying information). If the SAC wishes to return instructor-specific results, see the Help Guide for suggestions on how to code and collate. **Please share your process for ensuring that all identifying information has been removed.**

Unique randomized IDs will be automatically assigned to both students and courses in tabular analysis (e.g., Excel), and only aggregate results will be included in 2017-2018 reassessment report.

3D. Will you be coding your data/artifacts in order to compare student sub-groups? ☒ **Yes** ☐ **No**

If yes, select one of the boxes below:

☐ **student's total earned hours** ☐ **previous coursework completed** ☐ **ethnicity** ☐ **other**

Briefly describe your coding plan and rationale (and if you selected 'other', identify the sub-groups you will be coding for):

Students will be grouped into ordinal beginner and advanced student groups based on self-assessments of (1) length of GIS experience prior to enrolling in PCC GIS courses and (2) number of PCC GIS courses completed.

*3E. Ideally, student work is **evaluated** by both full-time and adjunct faculty, even if students being assessed are taught by only full-time and/or adjunct faculty. Further, more than one rater is needed to ensure inter-rater reliability. If you feel only one rater is feasible for your SAC, please explain why:*

Who will be assessing student work for this project? Check all that apply.

- ☒ PCC Adjunct Faculty within the program/discipline
- ☐ PCC FT Faculty within the program/discipline
- ☐ PCC Faculty outside the program/discipline
- ☐ Program Advisory Board Members
- ☐ Non-PCC Faculty
- ☐ External Supervisors
- ☐ Other:

End of Planning Section – Complete the remainder of this report after your assessment project is complete.

Beginning of End-of-Year Reporting Section – complete the following sections after your assessment project is complete.

4. Changes to the Assessment Plan

Have there been changes to your project since you submitted the planning section of this report? ☐ ***Yes*** ☒ ***No***

If so, summarize those changes below:

5. Narrative

Broadly, what did your SAC learn this year from the assessment of the selected core outcome?

Not surprisingly, we learned that students who have previously taken PCC GIS courses show a substantial improvement on the assessment as compared with incoming students who have not taken a PCC GIS class and who are understandably expected to have a minimal understanding of GIS.

We also learned that a significant percentage of students who have completed one or more PCC GIS courses prior to taking the assessment achieve satisfactory results on the GIS skills assessment, which is a proxy for the core outcome of professional competence and the expectations of what is required to succeed in an introductory or beginner professional GIS position.

6. Results of the Analysis of Assessment Project Data

6A. Quantitative Summary of Sample/Population
How many students were enrolled in all sections of the course(s) you assessed this year? 192 students were enrolled in one or more GIS classes in Fall, Winter, or Spring term, and 73 students were enrolled in one or more GIS classes with prerequisites in Fall, Winter, or Spring term.
If you did not assess in a course, report the number of students that are in the group you intend to generalize your results to.

How many students did you actually assess in this project? 139 students were assessed who were enrolled in one or more GIS classes in Fall, Winter, or Spring term, and 70 students were assessed who were enrolled in one or more GIS classes with prerequisites in Fall, Winter, or Spring term
Did you use a recommended sample size (see the Sample Size Calculator linked to in section 2J)? ☒ ***Yes*** ☐ ***No***

If you did not use a recommended sample size in your assessment, briefly explain why:

6B. Did your project utilize a rubric for scoring? ☐ ***Yes*** ☒ ***No***
If 'No', proceed to section C. If 'Yes', complete the following:

How was inter-rater reliability assured? (Contact your SAC's LAC Coach if you would like help with this.)

☐ **Agreement** – the percentage of raters giving each artifact the same/similar score in a norming session
☐ **Consensus** - all raters score all artifacts and reach agreement on each score
☐ **Consistency** – raters' scores are correlated: this captures relative standing of the performance ratings - but not precise agreement
☐ **Inter-rater reliability was not assured.**

If you utilized agreement or consistency measures of inter-rater reliability, report the level here:

W6C. Brief Summary of Benchmark Achievement (frequencies and/or averages)

1. *If you used frequencies of benchmark achievement, report those here. For example, "46 students attained or exceeded the benchmark level in written communication and 15 did not." If necessary, provide detailed results in an appendix.*

2. *If you used percentages of the total to identify the degree of benchmark attainment in this project, report those here. For example, "75% of 61 students attained or exceeded the benchmark level over-all in written communication."*

In large part, the purpose of this assessment / re-assessment cycle was to identify whether or not a succinct quantitative skills-based GIS assessment could capture the breadth of GIS knowledge assumed to be attained during the GIS certificate program, as well as to identify appropriate and representative benchmarks of success on the assessment. Regarding the latter point, we are

still debating between 70% or 80% being the sufficient benchmark of success on the assessment. With a 25-question assessment, the difference in performance between the two benchmarks hinges upon only two questions, which can in turn be a result of having included poorly chosen questions (e.g., vaguely worded, referencing overly specific subject domains).

That said, we were pleased with the achievement of students on either of the potential benchmarks. 74% of the 70 students who had previously completed one or more PCC GIS prerequisites achieved 80% correct responses, and 91% achieved 70% correct responses. If were simply to assume that a compromise between the two benchmarks might be a sufficient benchmark in and of itself, then we'd see that 89% achieved 75% correct responses.

We are happy with approximately 90% of students achieving 75% correct responses, but an aspirational goal would be to have 80% of students achieve 80% correct responses.

An additional point of interest was to look at improvement of knowledge as evidenced by a comparison of scores for students in classes without GIS prerequisites and classes with GIS prerequisites. The average score for beginner students was 22%, and the average score for more experienced students was 82%. We also took into account the effect of GIS knowledge acquired prior to PCC enrollment by comparing Pearson's coefficients for both variables (i.e., pre-PCC GIS experience, PCC GIS experience). Pre-PCC GIS experience had a weak correlation with performance (0.26 Pearson's), whereas PCC GIS experience had a very strong correlation with performance (0.9 Pearson's). There was a very small positive effect of having taken the assessment twice (i.e., as a beginner student early in the year and as an advanced student later in the year), but the correlation for students who took the assessment only once as advanced students was still very strong (0.86 Pearson's).

3. *Compare your students' attainment of your expectations/benchmarks in this reassessment with their attainment in the initial assessment. Briefly summarize your conclusions.*

Part of the improvement process during the re-assessment phase was to increase the sample size for experienced students (i.e., classes with PCC GIS prerequisites). Last year the sample size of experienced students was insufficient for robust statistical inference. That said, comparison between the two years tentatively shows a positive trend, perhaps as a result of improvements in assessment design or in student achievement. Last year the average score for experienced students was 75%, as compared with 82% this year. Last year 48% of experienced students achieved a score of 80% or greater, as compared with 74% this year.

6D. If possible, attach a more detailed description or analysis of your results (e.g., rubric scores, trend analyses, etc.) as an appendix to this document. Appendix attached? ☐ ***Yes*** ☒ ***No***

6E. Do the results of this project suggest that additional academic changes might be beneficial to your students (changes in curriculum, content, materials, instruction, pedagogy etc.)? ☒ *Yes* ☐ *No*

If you answered 'Yes,' briefly describe the changes to improve student learning below. If you answered 'No', detail why no changes are called for.

Several questions were challenging for students with GIS experience, which suggests a need to address or focus upon a few specific GIS skills or subject areas, including the appropriate use of the Identify tool (as compared specifically with the Measure tool), methods of online map publication, the identification of latitude and longitude coordinates, and the importation of existing coordinate systems for new feature classes.

All of these skills or subject areas are touched upon in existing curricula, but current assessment results suggest that a more nuanced or detailed explanation will be useful in future lectures and assignments.

If you are planning changes, when will these changes be fully implemented?

These changes will be implemented in lectures and labs in GEO 265 (Introduction to GIS) courses in Fall 2018.

6F. Has all identifying information been removed from your documents? (Information includes student/instructor/supervisor names/identification numbers, names of external placement sites, etc.)

☒ ***Yes*** ☐ ***No***

7. SAC Response to the Assessment Project Results

7A. Assessment Tools & Processes: Indicate how well each of the following worked for your assessment:

Tools (rubrics, test items, questionnaires, etc.):

☒ *very well* ☐ *some small problems/limitations to fix* ☐ *notable problems/limitations to fix* ☐ *completely inadequate/failure*

Please comment briefly on any changes to assessment tools that would lead to more meaningful results if this assessment were to be repeated (or adapted to another outcome).

The only potential area for improvement is insuring that all of the questions are as relevant as possible. For example, one question in particular regarding online map publication has been somewhat outdated by recent software developments. Additionally, insuring that the questions are conceptually as mutually exclusive as possible is important, in order to cover as much breadth in the field as possible in a succinct 25-question assessment. For example, two current questions regarding longitude and latitude are somewhat redundant, and more value could be added by including another GIS subject area instead.

Processes (faculty involvement, sampling, norming, inter-rater reliability, etc.):

☒ *very well* ☐ *some small problems/limitations to fix* ☐ *notable problems/limitations to fix* ☐ *tools completely inadequate/failure*

Please comment briefly on any changes to assessment process that would lead to more meaningful results if this assessment were to be repeated (or adapted to another outcome).

There are no particular changes to the assessment process that would lead to more meaningful results. The assessment was provided online, which made it easy to administer and analyze. Additionally, a group of five part- and full-time faculty members coordinated over the three terms to insure that the assessment was administered in relevant classes.

8. Follow-Up Plan

8A. How will the changes detailed in this report be shared with all FT/PT faculty in your SAC? *(select all that apply)*

☒ *email*
☐ *phone call*
☐ *workshop*
☐ *campus mail*
☒ *face-to-face meeting*
☐ *other*
☐ *no changes to share*

If 'other,' please describe briefly below.

8B. Is further collaboration/training required to properly implement the identified changes? ☐ *Yes* ☒ *No*

If 'Yes,' briefly detail your plan/schedule below.

8C. Sometimes reassessment projects call for additional reassessments. These can be formal or informal. How will you assess the effectiveness of the changes you plan to make?

- ☐ *follow-up project in next year's annual report*
- ☐ *in a future assessment project*
- ☒ *on-going informal assessment*
- ☐ *other*

If 'other,' please describe briefly below.

8D. SACs are learning how to create and manage meaningful assessments in their courses. This development may require SAC discussion to support the assessment process (e.g., awareness, buy-in, communication, etc.). Please briefly describe any successful developments within your SAC that support the quality assessment of student learning. If challenges remain, these can also be shared.

All of the faculty have expressed ongoing interest in learning which subject areas need additional focus. There is a lot to cover in GIS (both in terms of technical software skills and geographic concepts) and we are eager to identify any blind spots in the curriculum, such as, for example, the aforementioned confusion regarding methods of accessing lat/long coordinates.

All in all, the two-year process of developing this assessment has truly been a team effort. After implementing the first year's assessment, multiple faculty provided feedback during our annual SAC meeting regarding improvements, including method of administration, background questions that would provide greater differentiation regarding GIS experience, and which questions worked well and which were confusing or irrelevant.