

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will be able to write correct and robust software.

Outcome Measure: Annual: CSC2054 Signature Assignment. This assessment will switch to being in CSC2052 which is the first half of CSC2054. This will enable us to capture this outcome for mathematics and data science majors.

Criteria for Success: 80% of the students should have an average score of at least 2 in each of the major areas.

Aligned with DQP Learning Areas (circle one or more):

1. Specialized Knowledge
2. Broad Integrative Knowledge
3. Intellectual Skills/Core Competencies
4. Applied and Collaborative Learning, and
5. Civic and Global Learning

Longitudinal Data:

	Percentage of Class at 2 or Higher								
	2012	2013	2014	2015	2016	2017	2018	2019*	2020**
Compilation	100%	92%	75%	100%	94%	90%	75%		
Runtime Correctness	58%	85%	100%	62%	72%	95%	60%	45%	42%
Problem Solving	100%	100%	75%	92%	83%	80%	85%	70%	78%

*Note that the instrument was changed in 2019.

**Note that 2020 was a fully remotes semester due to COVID.

Conclusions Drawn from Data: The students find the run-time correctness the most challenging. This is because this is the area of programming that is the most detail oriented. The instrument was changed in 2019, the “compilation” test was removed because the rest of the work can not be evaluated if the program does not compile.

Changes to be Made Based on Data: Continue to emphasize the need to carefully de-bug computer code during development. The rubric was modified to clarify the definition of run-time correctness which has made scoring simpler (Fall 2017). We are continuing to work with students on the detail work needed for accurate computer programs.

CSC 2054 Signature Assignment

	Unsatisfactory (1)	Satisfactory (2)	Good (3)	Excellent (4)
Runtime Correctness	<ul style="list-style-type: none">• Less than 60% correct	<ul style="list-style-type: none">• Between 60% – 79% correctness	<ul style="list-style-type: none">• 80% - 89%	<ul style="list-style-type: none">• 90% – 100%
Problem Solving	<ul style="list-style-type: none">• Analysis of program source code indicates that program is NOT close to working, and could NOT easily be modified to work given additional time.	<ul style="list-style-type: none">• Analysis of program source code indicates that the student partially understands the problem solution or understands the solution but could not efficiently translate the solution to C++ code.	<ul style="list-style-type: none">• Analysis of program source code indicates that program is close to working, and could be modified to work given additional time.	<ul style="list-style-type: none">• All tasks execute correctly indicating that the code is both correct and robust (can catch user input errors).

Criterion: 80% of students will average 2 in Runtime Correctness and Problem Solving.

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Learning Outcome: Students will analyze the interaction between hardware and software.

Outcome Measure: Annual (CS and IS): CSC3014 Signature Assignment.

Criteria for Success: CSC3014 Assignment: 80% of the students should have an average score of at least 7.

Aligned with DQP Learning Areas (circle one or more):

1. Specialized Knowledge
2. Broad Integrative Knowledge
3. Intellectual Skills/Core Competencies
4. Applied and Collaborative Learning, and
5. Civic and Global Learning

Longitudinal Data:

	Percentage of Class at 7 or Higher									
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Hardware/software interaction understanding	85%	89%	82%	92%	88%	75%	69%	100%	92%	44%

Conclusions Drawn from Data: Students have been able to successfully master the material in the CSC3014 assessment. For most years, the variations appear to be related to sample size. However in 2020-21 the score dropped significantly. However this assessment was part of a final exam given in the Spring of 2021 during the COVID pandemic. Students were very tired and this score may be an indication of that fact as much as an indication of their knowledge.

Changes to be Made Based on Data: Continue to require operating systems (CSC3014) of all CS and IS students. Monitor the results in the 2021-22 to year to confirm that 2020-21 data was an aberration.

Note that we have discontinued using the ETS Major Field Test in Computer Science since it was not providing a useful measure of student learning, and will now rely on assessing this outcome using just an embedded assignment in a course.

Rubric Used (CSC3014): The scoring for this assignment is purely points based.

	Unsatisfactory (1)	Satisfactory (2)	Good (3)	Excellent (4)
Points gained by showing understanding of software/hardware interaction in answering question	6 and below	7	8	9-10

Rubric Used (ETS): Scoring done by ETS on the Major Field Test.

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Learning Outcome: Students will be able to apply their technical knowledge and critical thinking to solve problems.

Outcome Measure: Alternating Year: ISS4014 Signature Assignment using data bases.

ETS Proficiency Profile: Critical Thinking/Reading Portion.

Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

ETS PP: 85% of the students will be marginal or proficient at Level 2 Reading/Critical Thinking.

Aligned with DQP Learning Areas (circle one or more):

1. Specialized Knowledge
2. Broad Integrative Knowledge
3. Intellectual Skills/Core Competencies
4. Applied and Collaborative Learning, and
5. Civic and Global Learning

Longitudinal Data:

	Percentage of Class at 2.5 or Higher				
	2011-12	2013-14	2015-16	2017-18	2019-20
Relevant Information Chosen	100%	100%	88%	89%	88%
Query Correctness	25%	100%	48%	41%	83%

ETS Proficiency Profile	Percentage of Students Marginal or Proficient								
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
ETS Proficiency Profile Level 2 Critical Thinking	80%	92%	100%	84%	92%	76%	79%	80%	88%

*ETS is for the full department.

Conclusions Drawn from Data: ISS4014 Assignment: The 2012 class was relatively small and that led to a fairly large standard deviation. Seventy-five percent of the class would have passed query correctness if the benchmark had been 2.3. We once again saw some problems with query correctness in 2015-16 and in 2017-18. In both cases, had the threshold for success be lowered slightly (2 vs 2.5), many more students would have succeeded. In 2019-20 we saw an improvement in query correctness. The assignment was modified a bit to be clearer for students.

ETS: The students are generally hitting our benchmark in this area, with small sample sizes hitting or missing the benchmark can be a matter of a single person's score.

Changes to be Made Based on Data: Spend more time in class emphasizing queries. This class is being revised in light of some new curricular changes. In 2015-16 the class was changed significantly. It focused on both data bases and website construction. Less time is being spend on data bases. In 2017-18 the course content was adjusted again. We need to continue to review this signature assignment in light of the changed course content. The signature was updated in 2019-20 based on the review of content.

Rubric Used

	Unsatisfactory (1)	Satisfactory (2)	Good (3)	Excellent (4)
Recognition of relevant information	3 errors (an error is defined as missing a relevant database field or listing an irrelevant field)	2 errors (an error is defined as missing a relevant database field or listing an irrelevant field)	1 error (an error is defined as missing a relevant database field or listing an irrelevant field)	All relevant database fields are listed and no irrelevant fields are listed for both queries
Query correctness	3 mistakes in the 2 queries	2 mistakes in the 2 queries	1 mistake in the 2 queries	No mistakes in the two queries

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Learning Outcome: Students will be able to understand and create arguments supported by quantitative evidence, and they can clearly communicate those arguments in a variety of formats (Quantitative Reasoning).

Outcome Measure:

Before 2022: Annual: Each student will participate in the ETS Proficiency Profile exam.

After 2022:

Annual: Each student will participate in the ETS Proficiency Profile exam.

Annual: MTH3083 Mathematical Probability and Statistics Signature Assignment (Math and Data Science Majors)

Alternating Year: ISS4014 Database and Web Signature Assignment (CS and IS Majors)

Criteria for Success: 90% of the students will be Marginal or Proficient at Level 2. Note that we dropped the criteria of success so that it is possible for the department to pass even if a single student misses the criteria.

Aligned with DQP Learning Areas (circle one or more):

1. Specialized Knowledge
2. Broad Integrative Knowledge
3. Intellectual Skills/Core Competencies
4. Applied and Collaborative Learning, and
5. Civic and Global Learning

Longitudinal Data:

ETS Proficiency Profile	Percentage of Students Marginal or Proficient								
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
ETS Proficiency Profile Level 2 Mathematics	100%	100%	100%	100%	92%	82%	95%	93%	81%

Conclusions Drawn from Data: Students are in general meeting our criteria. The variation often comes down to a single student because of small sample sizes. The Spring of 2021 was during COVID and students were exhausted by the time that they took the ETS exam, so this may explain the lower score for that year.

Changes to be Made Based on Data: None at this time. We will continue to monitor the results.

Rubrics: ETS Proficiency Profile (no rubric involved). New rubrics for signature assignments under development.

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Learning Outcome: Information Systems graduates will be adequately prepared for entry into graduate school or jobs in the computing profession.

Outcome Measure: Annual: Require students to take the ETS Major Field Test in Computer Science as the mid-term exam for the capstone course, ISS4081, Senior Seminar in Information Systems. Note that we are in the process of changing this to the Peregrine Test and in 2017-18 piloted a collection of questions.

Annual: Internship supervisor evaluations

Every 5 Years: Alumni will be surveyed every five years. They will be asked at least the following questions:

1. If you have a job in Computer Science: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Computer Science curriculum at PLNU prepared you for your work in the field?
2. If you are going to graduate school or went to graduate school: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Computer Science curriculum at PLNU prepared you for graduate school?

Criteria for Success: ETS MFT: 50% of our students achieve above the 25th percentile on the exam.

Peregrine Test: 70% of students will score a 70% or higher on the exam (when there are national norms, this will be adjusted).

Internship Supervisor Evaluation: 80% of the students will score an average score of 4 or more in the following areas:

- Ability to learn
- Ability to problem solve
- Quality of work
- Initiative
- Responsibility
- Ability to work with others
- Relations with others
- Ability to use computing to solve problems

Alumni Survey: 75% of the respondents say they were well prepared or higher.

Aligned with DQP Learning Areas (circle one or more):

1. Specialized Knowledge
2. Broad Integrative Knowledge
3. Intellectual Skills/Core Competencies
4. Applied and Collaborative Learning, and
5. Civic and Global Learning

Longitudinal Data: ETS Major Field Test: Most recent 10 years of data.

Year	Overall Benchmark
2007-08	N
2008-09	Y
2009-10	N
2010-11	Y
2011-12	N
2012-13	N
2013-14	Y
2014-15	N/A
2015-16	N
2016-17	Y

*Sample size too small to be given indicator scores.

*ETS changed the CS exam in 2011-12.

Peregrine Exam:

	2017-18	2018-19	2019-20	2020-21
Percentage of students scoring 70% or higher	100%	N/A	N/A	N/A

*Note that there were no Information Systems majors in Senior Seminar in 2018-19.

**COVID-19 made it extremely difficult to hold our second pilot in the senior seminar (it would have been March 2020) and this complexity continued into 2020-21.

Internship Supervisor Evaluation:

*Supervisors for small sample of students (2) didn't return reports.

**COVID-19 year, it was a challenge to get supervisors to respond to the survey.

Alumni Data: In the spring of 2017, the department surveyed alumni who had graduated in the last 15 years. The survey is data used to inform the department's program review. Below are the components of the survey relevant to our assessment plan for information systems.

How well did the undergraduate curriculum prepare you for:

	Well or higher	OK	Poorly
Work in the field (if went into the field)	61.5%	23.1%	15.4%
Graduate school	100%	0%	0%

Conclusions Drawn from Data: ETS Results: We continue to evaluate if the ETS exam in computer science is the best measure or ability for computer information systems/information systems students. We are considering moving to the Peregrine exam in Business for these

students since our newly adopted IS curriculum has a larger business component and Peregrine will work with us to design IS questions.

Peregrine Results: The students met the benchmark in 2018, the year that we tested the first round of questions that were designed. There were no information systems students in senior seminar in 2019 so we have not revalidated the questions. Because of COVID-19 it was not possible to run the second pilot test of the questions in March/April 2020 and we encountered similar problems in the Spring of 2021. We hope to run our second pilot in the Spring of 2022.

Internship Supervisor Survey: We have just begun using this survey, but the preliminary results indicate that the supervisors believe that our student interns are well prepared. We have had some challenges getting supervisors to respond to the survey, we need to look at the instrument and see if we can simplify it and that is on the list of department assessment tasks for Fall 2021.

Alumni Survey: The program met the benchmark for those who went to graduate schools but missed the benchmark for those who went into industry. The majority of these students earned their degree before the Information Systems curriculum was significantly changed to include a more cohesive set of business coursework. It is expected that those changes will be reflected in an improvement in the next round of survey data.

Changes to be Made Based on Data: ETS Results: We have made curricular changes in the last few years to update our department coursework to align with new standards from the Association of Computing Machinery as well as to respond to assessment data. As part of this process we did a complete overhaul in the curriculum in this area. In 2015-16 we launched an updated IS curriculum in partnership with the School of Business. This increased the amount of business course work completed by these students. We determined that the ETS in CS and the ETS MFT in Business were not well suited for assessing these students. We have moved to using an evaluation from Peregrine, however we are having to work with them to design the questions. We are in the midst of that process. See our APC proposals for the specific descriptions of curricular changes made.

Survey: We expect to see changes in alumni survey results due to the significant changes made in the Information Systems curriculum. We need to modify this survey so that it is quicker and easier for internship supervisors to give us feedback.

Rubric: ETS: The ETS provides the data.

Peregrine: We are currently developing questions for Peregrine so scoring the exam by hand. Once we complete a few years of pilot testing, Peregrine plans on using our information to build an online test that is part of their testing suite.

Internship Supervisor Evaluation: This is a survey instrument so there is no rubric.

Alumni Survey: This is not rubric scored, but the data is tabulated.