

Mathematics Assessment Report

2020-21

Learning Outcomes for Mathematics:

1. Students will be able to demonstrate facility with analytical and algebraic concepts.
2. Students will be able to write proofs.
3. Students will be able to apply their mathematical knowledge and critical thinking to solve problems.
4. Students will be able to use technology to solve problems.
5. Students will be able to speak about their work with precision, clarity and organization.
6. Students will be able to write about their work with precision, clarity and organization.
7. Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand.
8. Students will collaborate effectively in teams.
9. Students will be able to understand and create arguments supported by quantitative evidence.
10. Students will understand the professional, ethical and social issues and responsibilities with the implementation and use of technology.
11. Graduates will be prepared for careers that use mathematics in business, industry, government and the non-profit sector; graduate study in fields related to mathematics; and teaching mathematics and computer science at the secondary level.

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will be able to demonstrate facility with analytical and algebraic concepts.

Outcome Measure: Annual: ETS Major Field Test in Mathematics: Algebra and Calculus subscores (note that this will be changing in 2021-22)

Criteria for Success: The department subscore will be at the 50th percentile 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: This is the most recent 10 years of data:

Algebra:

Year	Percentile
2010-11	90
2011-12	85
2012-13	72
2013-14	49
2014-15	*
2015-16	42
2016-17	8
2017-18	*
2018-19	32
2019-20	N/A

Calculus:

Year	Percentile
2010-11	70
2011-12	99
2012-13	38
2013-14	72
2014-15	*
2015-16	16
2016-17	13
2017-18	*
2018-19	57
2019-20	N/A

*Insufficient students for score to be calculated

Note the ETS changed the Mathematics test in 2012-13.

Conclusions Drawn from Data: Before the change in the exam in 2013, the students were meeting our expectations, since the exam changed they have not. The review of the exam indicates that it no longer meets our needs. We are in the process of developing signature assignments embedded in classes to assess this outcome.

Changes to be Made Based on Data: We made curricular adjustments around 2008-09 to reduce the amount of abstract algebra (two semesters to one) in order to create space for additional course work. We did increase the amount of linear algebra that we are requiring each student to take, so that may have balanced the reduction in abstract algebra.

The drop in the scores that corresponds to the change in the ETS test has us concerned. Based on a review that was part of our program review, we have determined that this test is not serving us well. Starting in 2021-22 our data will be gathered from signature assignments in key courses.

Rubric Used: None. The scores are computed by ETS.

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will be able to write proofs.

Outcome Measure: Annual - MTH242/MTH3012 Signature Assignment
 Alternating Years - MTH424/MTH4024 and MTH444/MTH4044 Signature Assignment

Criteria for Success: 80% of the students to score a 2.5 or higher (on a scale of 1-4) in each of the four areas:

- Statement of the problem
- Logic
- Symbolism
- Justification

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:

	MTH242/3012 Percentage of Class at 2.5 or Higher								
	2013	2014	2015	2016	2017	2018	2019	2020	2021
Statement of Problem	100%	100%	100%	100%	89%	100%	100%	100%	100%
Logic	100%	100%	100%	100%	89%	100%	100%	100%	100%
Symbolism	100%	100%	100%	100%	100%	100%	100%	100%	100%
Justification	100%	83%	88%	100%	78%	100%	100%	100%	67%

*Note that MTH242 was renamed MTH3012 in institutional catalog changes.

	MTH4024 Percentage at 2.5 or higher			
	Fall 2013	Fall 2015	Fall 2017	Fall 2019
Statement of Problem	92%	100%	90%	83%
Logic	92%	89%	90%	83%
Symbolism	100%	100%	90%	100%
Justification	77%	67%	60%	100%

*Note that MTH424 was renamed MTH4024 in institutional catalog changes.

	MTH4044 Percentage at 2.5 or higher				
	Fall 2012	Fall 2014	Fall 2016	Fall 2018	Fall 2018
Statement of Problem	92%	100%	83%	100%	63%
Logic	92%	100%	0%	100%	100%
Symbolism	100%	100%	67%	100%	100%
Justification	77%	100%	67%	100%	100%

*Note that MTH444 was renamed MTH4044 in institutional catalog changes.

Conclusions Drawn from Data: The place where the students continue to struggle the most is in the area of justification in their proofs. These classes are small so the difference between meeting, or not meeting the benchmark may be the performance of single student. The 2016-17 data in MTH444/MTH4044 is somewhat surprising – the low scores are primarily due to the particular problem chosen and the instructions given. There was a dip in the category “Statement of the Problem” but Fall 2020 was fully online due to COVID so it is hard to identify if this was an anomaly.

Changes to be Made Based on Data: We continue to emphasize the need for strong justification of every step in a proof and to more clearly reinforce that in assignments in all proof writing classes. Since making those changes, we seem to be seeing fewer weak justifications in proofs.

Proof Writing Rubric (MTH3012, MTH4024, MTH4044)

	Unsatisfactory	Low Satisfactory	High Satisfactory	Outstanding
Statement of the Problem	Can not determine what is given and what needs to be proved	Misses one part of the hypothesis or the conclusion	Makes one minor error in identifying the hypothesis or the conclusion	Understands what is given and what is to be proved
Logic	Proof has major flaws that make it invalid	Proof misses more than one major element	Proof has the main flow of the logic correct but misses one major element	Statements flow logically from one to another
Symbolism	There are many errors in the use of symbolic notation	There are more than two errors in symbolic notation	There are two or fewer minor errors in symbolic notation (e.g. missing parentheses)	All symbols are used correctly
Justification	There are several errors in the justification	There is one major mistake in the justification or more than two minor errors	There are two or fewer minor errors in the justification for the steps	Every logical step has the appropriate reason (theorem, definition, lemma, etc.)

Assessment Data Mathematical, Information and Computer Sciences

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

Outcome Measure: ETS Major Field Test in Mathematics: Applied subscore (Annual). Note that we are changing this measure to be a signature assignment embedded in a course.

ETS Proficiency Profile – Reading/Critical Thinking (Annual).

Criteria for Success: ETS MFT: The department subscore will be at the 50th percentile or higher.

ETS Proficiency Profile: 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: This is the data from the most recent 10 years.

Year	Percentile
2010-11	70
2011-12	96
2012-13	60
2013-14	39
2014-15	*
2015-16	55
2016-17	55
2017-18	*
2018-19	32
2019-20	N/A

* Insufficient students for score to be calculated.

Note the ETS changed the Mathematics test in 2012-13.

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%

*This data is for the entire department, not just mathematics.

Conclusions Drawn from Data: MFT: There have been significant variations in our outcomes over the years, however our sample size is relatively small. We are concerned about the drop in the scores with the exam change in 2012-13, however they seem to have recovered in the last few years.

Proficiency Profile: The students are meeting our criteria with the expected variation based on sample size.

Changes to be Made Based on Data: MFT: We have increased the amount of applied mathematics problems in our coursework, so the ETS results are somewhat puzzling. Based on some analysis that we did as part of our program review, we have concluded that the MFT is not meeting our needs.

The department has decided to discontinue using the ETS MFT. We are in the process of aligning this learning outcome with a signature assignment in a class and that will begin in the 2021-22 academic year.

Proficiency Profile: No changes at this time. The students are generally meeting our expectations.

Rubric Used: None. The scores are computed by ETS.

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will be comfortable using technology to solve problems.

Outcome Measure: Annual: MTH392/MTH3083 Signature Assignment and CSC254 Signature Assignment (through 2014-15), CSC2052 Signature Assignment (starting in 2021-22)

Criteria for Success: MTH392/MTH383: 80% of the students should have an average score of at least 2.5 in each of the major areas.

Fall 2014 and before: CSC254: 80% of the students should have an average score of at least 2 in each of the major areas.

Fall 2015 and later: Mathematics majors are now taking CSC252 (the first half of CSC254) and are not being assessed at the end of CSC254.

Fall 2021: Mathematics majors will be assessed in CSC2052.

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:

	MTH383 Percentage of students at 2.5 or higher								
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Students will be able to use technology to solve problems	100%	skipped	100%	78%	100%	100%	100%	100%	
Computational Correctness									100%
Graphical Tool									86%
Interpretation									86%

Note that the assignment and rubric were changed in 2019-20

	CSC254 Percentage of students at 2 or Higher			
	2011	2012	2013	2014
Compilation	100%	100%	92%	100%
Runtime Correctness	86%	58%	85%	75%
Problem Solving	100%	100%	100%	100%

Conclusions Drawn from Data: MTH392/MTH3083: Students have been able to satisfactorily analyze data using technology.

Changes to be Made Based on Data: MTH392/MTH3083: The signature assignment was updated to better measure students' facility with the current technology that we are using in the course. That change can be seen in the data.

MTH3083 Signature Assignment Rubric (Spring 2021)

	Unsatisfactory (1)	Low Satisfactory (2)	High Satisfactory (3)	Outstanding (4)
Computation correctness	More than one major error including completely incorrect.	Made a major error	Made a minor error	Completely correct
Use of graphical tool	Graph is not connected to the data	Poor choice of graph and not well-labeled	One of: Correct choice of graph Graph well-labeled	Graph is correct and is well-labeled
Interpretation	Explanation is not connected to the information	Explanation is partially correct and partially clear	Explanation is correct but not clear	Explanation is clear and correct

Criterion: 80% of students will score at or above 2.5.

Use Computational Tool: Mean and Standard Deviation

Uses a graphical tool: Scatter Plot

Interprets problem correctly: narrative box

CSC 254 Signature Assignment Rubric

	Unsatisfactory (1)	Satisfactory (2)	Good (3)	Excellent (4)
Compilation	<ul style="list-style-type: none"> Compiles with errors. 	<ul style="list-style-type: none"> Compiles with no errors, but has linking errors. 	<ul style="list-style-type: none"> Compiles with no syntax errors or linking errors, but has warnings. 	<ul style="list-style-type: none"> Compiles and links with no errors.
Runtime correctness	<ul style="list-style-type: none"> No correct response to any test case from the sample data provided. 	<ul style="list-style-type: none"> Executes correctly on at least one test case from the sample data provided. 	<ul style="list-style-type: none"> Executes correctly on the given sample data, but not accepted by the online judge (no need to look at source code in this case). 	<ul style="list-style-type: none"> Accepted by the online judge, indicating that it has passed numerous independent test cases unknown to the student.
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. 	<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"> Accepted by judge.

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

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will be able to speak about their work with precision, clarity and organization (Oral Communication).

Outcome Measure: Annual: Each student will be required to give an oral presentation on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:

- Command of background material
- Organization
- Oral presentation skills (added as part of the new rubric in the spring of 2010)
- Use of presentation tools
- Ability to field questions from the audience

Note that the department has a mapping between its rubric and the AAC&U Oral Communication Value Rubric.

Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas in the department rubric. This translates to 80% of the students being above a 3.5 in the AAC&U rubric.

Our translation from our data to the AAC&U is included. Our department continues to provide the students with our departmental rubric because it has been developed over many years and works effectively with our majors.

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:

Oral Presentation	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Background	95%	100%	100%	92%	100%	95%	100%	100%	95%	100%	100%
Organization	85%	100%	100%	100%	100%	100%	92%	94%	100%	100%	94%
Oral Presentation Skills	90%	100%	100%	92%	100%	95%	100%	100%	95%	100%	100%
Presentation Tools	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Ability to Field Questions	100%	83%	100%	100%	89%	100%	100%	100%	94%	94%	100%

AAC&U “translation” (we have only done this for the years that PLNU has been making use of the DQP)

Oral AAC&U	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Organization	100%	100%	100%	100%	92%	94%	100%	100%	94%
Language	100%	92%	100%	100%	100%	100%	95%	100%	100%
Delivery	100%	92%	100%	95%	100%	100%	95%	100%	100%
Supporting Material	100%	100%	100%	100%	100%	100%	100%	100%	100%
Central Message	100%	100%	89%	100%	100%	100%	94%	100%	100%

Conclusions Drawn from Data: In general, the students have been performing reasonably well in the area of giving oral presentations. We attribute this to the fact that we intentionally have students presenting technical material in front of others starting in their freshman year.

Changes to be Made Based on Data: Over time we have increased our standards and expanded the rubric to increase clarity for students and to push them to speak at a professional level. We have been incorporating more oral presentations into classes and saw an improvement once we began doing that (before 2010). While we have been making a conversion to the AAC&U Value Rubric, it seems that this data is not being used institutionally and our focus has been on our department’s rubric.

Oral Presentation Rubric Update (4/12/17)

Criteria	Outstanding	High Satisfactory	Low Satisfactory	Unsatisfactory
Command of background material	<input type="checkbox"/> Clearly knows material and key facts by memory <input type="checkbox"/> Expands on PPT slides <input type="checkbox"/> Content appropriate for audience	<input type="checkbox"/> Clearly knows key facts with a few memory slips <input type="checkbox"/> Some expansion on PPT slides <input type="checkbox"/> Partial audience adaptation of content	<input type="checkbox"/> Reads some information; knows some facts from memory <input type="checkbox"/> No expansion of PPT slide content <input type="checkbox"/> Little audience adaptation of content	<input type="checkbox"/> Reads sentences from slides <input type="checkbox"/> Dependent on notes <input type="checkbox"/> Lacks audience adaptation of content
Organization	<input type="checkbox"/> Clear and concise outline <input type="checkbox"/> Relevant graphics and key text items on slides <input type="checkbox"/> Presentation is between 10-15 minutes	<input type="checkbox"/> Clear outline <input type="checkbox"/> Too much information on slides (not concise) <input type="checkbox"/> Presentation 1 minute outside of the range (10-15 minutes)	<input type="checkbox"/> Some sense of outline <input type="checkbox"/> Too much detailed information on slides <input type="checkbox"/> Presentation 2 minutes outside of the range (10-15 minutes)	<input type="checkbox"/> No clear outline <input type="checkbox"/> Slides are in paragraphs; too much detailed information on one slide <input type="checkbox"/> Presentation 3 minutes outside of the range (10-15 minutes)
Oral presentation skills	<input type="checkbox"/> Clearly has practiced several times; smooth transitions Engages audience in content multiple times and engagement is well connected to talk (questions, examples, etc.) <input type="checkbox"/> Free of disfluencies (ah, umh) <input type="checkbox"/> Is clearly heard in the room and uses inflection for emphasis <input type="checkbox"/> Engages audience through eye contact <input type="checkbox"/> Engages audience through gestures	<input type="checkbox"/> Has practiced but transitions are not smooth <input type="checkbox"/> Engages audience at least twice in content (questions, examples, etc.) <input type="checkbox"/> A few disfluencies (ah, umh, er) <input type="checkbox"/> Can be understood most of the time and uses some inflection <input type="checkbox"/> Some engagement of audience through eye contact <input type="checkbox"/> Some engagement of audience through gestures	<input type="checkbox"/> Has practiced presentation but cannot verbally make transitions between slides <input type="checkbox"/> Audience engagement at least once with content (questions, examples, etc.) <input type="checkbox"/> Many disfluencies (ah, umh, er) <input type="checkbox"/> Can sometimes be understood and uses little inflection <input type="checkbox"/> Infrequent eye contact <input type="checkbox"/> Distracting gestures or mannerisms	<input type="checkbox"/> Clearly did not practice presentation; Does not anticipate content of next slide <input type="checkbox"/> No audience involvement <input type="checkbox"/> Disfluencies (ah, umh, er) detract from presentation <input type="checkbox"/> Can not be heard and/or speaks in a monotone <input type="checkbox"/> Little audience awareness or eye contact <input type="checkbox"/> Frequent distracting gestures or mannerisms
Use of presentation tools	<input type="checkbox"/> PPT background is matched to content, legible font, seamless transitions <input type="checkbox"/> Graphics imbedded and matched to topic, necessary hyperlinks work	<input type="checkbox"/> Appropriate PPT slide backgrounds, transitions & font <input type="checkbox"/> Most graphics imbedded and matched to topic, most necessary hyperlinks work	<input type="checkbox"/> Distracting PPT slide backgrounds and transitions, font hard to read <input type="checkbox"/> Some inappropriate graphics or use of PPT embellishments, necessary hyperlinks don't work	<input type="checkbox"/> No attention given to PPT slide backgrounds and transitions, font illegible <input type="checkbox"/> Distracting use of embellishments, graphics not connected to topic
Ability to field questions	<input type="checkbox"/> Able to answer questions clearly and without hesitation and prepared material to answer anticipated questions	<input type="checkbox"/> Can answer all questions with some hesitation	<input type="checkbox"/> Able to answer half of the questions with hesitation	<input type="checkbox"/> Unable to answer any questions

Translation between MICS and AAC&U Rubric

MICS Category	MICS Item Position in Rubric	AAC&U Category
Clear and concise outline	4	Organization
Relevant graphics and key text items on slides	5	Organization
Presentation length is +/- 30 seconds of time limit	6	Organization
Expands on PPT slides	2	Language
Content appropriate for audience	3	Language
Engages audience	8	Language
Transitions	7	Delivery
Free of disfluencies (ah, uhm, er)	9	Delivery
Is clearly heard in the room and uses inflection for emphasis	10	Delivery
Engages audience through eye contact	11	Delivery
Engages audience through gestures	12	Delivery
PPT background is matched to content, legible font, seamless transitions	13	Delivery
Relevant graphics and key text items on slides	5	Supporting
Graphics imbedded and matched to topic, necessary hyperlinks work	14	Supporting
Clearly knows material and key facts by memory	1	Central Message
Able to answer questions clearly and without hesitation	15	Central Message

AAC&U Value Rubric

	Capstone 4	Milestones 3	Milestones 2	Benchmark 1
Organization	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the presentation.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the presentation.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the presentation.
Language	Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience.
Delivery	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable.
Supporting Material	A variety of types of supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's credibility/authority on the topic.	Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that generally supports the presentation or establishes the presenter's credibility/authority on the topic.	Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially supports the presentation or establishes the presenter's credibility/authority on the topic.	Insufficient supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that minimally supports the presentation or establishes the presenter's credibility/authority on the topic.
Central Message	Central message is compelling (precisely stated, appropriately repeated, memorable, and strongly supported.)	Central message is clear and consistent with the supporting material.	Central message is basically understandable but is not often repeated and is not memorable.	Central message can be deduced, but is not explicitly stated in the presentation.

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will be able to write about their work with precision, clarity and organization (Written Communication).

Outcome Measure: Annual: Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:

- Bibliography and other supporting documentation
- Organization
- Grammar and spelling
- Depth of information
- Clarity of writing

Note that the department has a mapping between its rubric and the AAC&U Written Communication Value Rubric.

Annual: ETS Proficiency Profile.

Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas in the department rubric. This translates to 80% of the students being above a 3.5 in the AAC&U rubric.

ETS: 85% of our students will be marginal or proficient on the Level 2 Writing test.

Our translation from our data to the AAC&U is included. Our department continues to provide the students with our departmental rubric because it has been developed over many years and works effectively with our majors.

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:

Written Report	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Bibliography and Support	55%	93%	100%	100%	100%	89%	100%	76%	89%	81%	88%
Organization	65%	93%	100%	100%	100%	100%	92%	94%	100%	100%	100%
Grammar and Spelling	60%	79%	100%	92%	89%	84%	100%	88%	94%	94%	94%
Depth of Information	50%	93%	91%	77%	78%	89%	85%	76%	83%	94%	94%
Clarity of Writing	70%	79%	91%	77%	78%	89%	85%	88%	94%	88%	100%

AAC&U “translation” (we have only done this for the years that PLNU has been making use of the DQP)

Written AAC&U	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Context and Purpose for Writing	100%	100%	100%	89%	92%	94%	100%	100%	100%
Content Development	100%	92%	100%	89%	85%	76%	83%	94%	94%
Genre and Disciplinary Conventions	100%	92%	100%	100%	85%	94%	100%	81%	94%
Sources and Evidence	100%	100%	100%	89%	100%	76%	89%	88%	88%
Control of Syntax and Mechanics	100%	100%	89%	84%	85%	88%	94%	100%	94%

Written ETS	Percentage at Marginal or Proficient								
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
ETS Proficiency Profile Writing Level 2	60%	85%	100%	89%	85%	76%	84%	93%	88%

Conclusions Drawn from Data: In general, the students have been performing reasonably well in writing technical reports. We still have some weaknesses in the quality of their writing and the use of their source material. The sample size for ETS in the first year was extremely small so we are not particularly concerned about the fact that the score was below the benchmark. The balance of the ETS scores are at or near benchmark (due to small sample sizes, the difference can often be a single person).

Changes to be Made Based on Data: Over time we have increased our standards and expanded the rubric to increase clarity for students and to push them to write at a professional level. The current rubric has been in use for the last 11 years. We have instituted more formal faculty reviews of their draft papers and are trying to give more specific feedback, particularly about the use of references and that seems to be helping with the quality of the papers.

MICS Written Presentation Rubric

Criteria	Outstanding	High Satisfactory	Low Satisfactory	Unsatisfactory
Bibliography and supporting documents	<input type="checkbox"/> Multiple references from distinct reputable sources <input type="checkbox"/> References cited in the body of the document	<input type="checkbox"/> Most references from distinct reputable sources <input type="checkbox"/> Some citation of references in the body of the document	<input type="checkbox"/> Some references from reputable sources <input type="checkbox"/> Limited citation of references in the body of the document	<input type="checkbox"/> No bibliography or all references from untrusted sites on the internet <input type="checkbox"/> No citation of references in the body of the document
Organization	<input type="checkbox"/> Conveys a central theme with all ideas connected, arrangement of ideas clearly related to topic <input type="checkbox"/> Clear introduction, body (with sections), and conclusion includes summary and closure <input type="checkbox"/> Includes both an abstract and table of contents	<input type="checkbox"/> Conveys a central idea or topic with some ideas connected to the topic <input type="checkbox"/> Includes introduction, body and conclusion <input type="checkbox"/> Includes abstract and table of contents (one partial and one complete)	<input type="checkbox"/> Attempts to focus on an idea or topic with many ideas not connected to the topic <input type="checkbox"/> Introduction, body, conclusion detectable but not clear <input type="checkbox"/> Includes partial abstract and partial table of contents	<input type="checkbox"/> Has little or no focus on central idea or topic <input type="checkbox"/> Introduction, body or conclusion absent <input type="checkbox"/> No abstract or table of contents
Grammar and spelling	<input type="checkbox"/> No use of first-person tense <input type="checkbox"/> No grammatical or spelling errors	<input type="checkbox"/> Few uses of the first-person tense <input type="checkbox"/> Few grammatical and spelling errors	<input type="checkbox"/> Several uses of the first-person tense <input type="checkbox"/> Some grammatical and spelling errors	<input type="checkbox"/> Written in first-person tense <input type="checkbox"/> Many grammatical and spelling errors
Depth of information	<input type="checkbox"/> Appropriately synthesizes information from multiple distinct sources <input type="checkbox"/> Draws conclusions and personal insights from synthesis <input type="checkbox"/> Has the minimum number of pages including penalty pages; subject coverage is excellent	<input type="checkbox"/> Synthesis of information from at least three distinct sources <input type="checkbox"/> At least two personal insights or conclusions stated <input type="checkbox"/> Has the minimum number of pages including penalty pages; subject coverage is good	<input type="checkbox"/> Synthesis of information from at least two distinct sources <input type="checkbox"/> At least one personal insight or conclusion stated <input type="checkbox"/> Has the minimum number of pages including penalty pages; subject coverage is adequate	<input type="checkbox"/> Summary reporting of information without synthesis <input type="checkbox"/> No personal insights <input type="checkbox"/> Does not have the minimum number of pages including penalty pages
Clarity of writing	<input type="checkbox"/> Sentences flow <input type="checkbox"/> Smooth transitions between paragraphs <input type="checkbox"/> Any and all terms and acronyms are defined <input type="checkbox"/> Provides evidence to support points	<input type="checkbox"/> Good sentence structure <input type="checkbox"/> Adequate transitions between paragraphs <input type="checkbox"/> Most terms and acronyms are defined <input type="checkbox"/> Lacks support for some points	<input type="checkbox"/> Occasional poor sentence structure <input type="checkbox"/> Transitions between paragraphs unclear <input type="checkbox"/> Some terms and acronyms are defined <input type="checkbox"/> Provides minimal support for points	<input type="checkbox"/> Frequent poor sentence structure <input type="checkbox"/> Lacked transitions between paragraphs <input type="checkbox"/> Many terms and acronyms are undefined <input type="checkbox"/> Ideas not supported

Translation between MICS and AAC&U Rubric

MICS Category	MICS Item Position in Rubric	AAC&U Category
Conveys a central theme with all ideas connected, arrangement of ideas clearly related to topic	3	Purpose
Appropriately synthesizes information from multiple distinct sources	8	Development
Draws conclusions and personal insights from synthesis	9	Development
Has the minimum number of pages including penalty pages; subject coverage is excellent	10	Development
Provides evidence to support points	14	Development
Clear introduction, body (with sections), and conclusion includes summary and closure	4	Genre
Includes both an abstract and table of contents	5	Genre
Multiple references from distinct reputable sources	1	Source
References cited in the body of the document	2	Source
No use of first-person tense	6	Syntax
No grammatical or spelling errors	7	Syntax
Sentences flow	11	Syntax
Smooth transitions between paragraphs	12	Syntax
Any and all terms and acronyms are defined	13	Syntax

AAC&U Written Communication Value Rubric

	Capstone 4	Milestones 3	Milestones 2	Benchmark 1
Context of and Purpose for Writing <i>Includes considerations of audience, purpose, and the circumstances surrounding the writing task(s).</i>	Demonstrates a thorough understanding of context, audience, and purpose that is responsive to the assigned task(s) and focuses all elements of the work.	Demonstrates adequate consideration of context, audience, and purpose and a clear focus on the assigned task(s) (e.g., the task aligns with audience, purpose, and context).	Demonstrates awareness of context, audience, purpose, and to the assigned task(s) (e.g., begins to show awareness of audience's perceptions and assumptions).	Demonstrates minimal attention to context, audience, purpose, and to the assigned task(s) (e.g., expectation of instructor or self as audience).
Content Development	Uses appropriate, relevant, and compelling content to illustrate mastery of the subject, conveying the writer's understanding, and shaping the whole work.	Uses appropriate, relevant, and compelling content to explore ideas within the context of the discipline and shape the whole work.	Uses appropriate and relevant content to develop and explore ideas through most of the work.	Uses appropriate and relevant content to develop simple ideas in some parts of the work.
Genre and Disciplinary Conventions <i>Formal and informal rules inherent in the expectations for writing in particular forms and/or academic fields (please see glossary).</i>	Demonstrates detailed attention to and successful execution of a wide range of conventions particular to a specific discipline and/or writing task(s) including organization, content, presentation, formatting, and stylistic choices.	Demonstrates consistent use of important conventions particular to a specific discipline and/or writing task(s), including organization, content, presentation, and stylistic choices.	Follows expectations appropriate to a specific discipline and/or writing task(s) for basic organization, content, and presentation.	Attempts to use a consistent system for basic organization and presentation.
Sources and Evidence	Demonstrates skillful use of high-quality, credible, relevant sources to develop ideas that are appropriate for the discipline and genre of the writing.	Demonstrates consistent use of credible, relevant sources to support ideas that are situated within the discipline and genre of the writing.	Demonstrates an attempt to use credible and/or relevant sources to support ideas that are appropriate for the discipline and genre of the writing.	Demonstrates an attempt to use sources to support ideas in the writing.
Control of Syntax and Mechanics	Uses graceful language that skillfully communicates meaning to readers with clarity and fluency, and is virtually error-free.	Uses straightforward language that generally conveys meaning to readers. The language in the portfolio has few errors.	Uses language that generally conveys meaning to readers with clarity, although writing may include some errors.	Uses language that sometimes impedes meaning because of errors in usage.

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand (Information Literacy).

Outcome Measure: Annual: Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance and their paper will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:

- References: Multiple references from distinct reputable sources
- Citation: References cited in the body of the document
- Synthesis: Appropriately synthesizes information from multiple distinct sources

Criteria for Success: 80% of the students should have an average score of at least 2.5 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 Students at 2.5 or Higher					
Information Literacy	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
References	95%	100%	71%	89%	81%	94%
Citation	84%	92%	76%	89%	81%	88%
Synthesis	84%	85%	82%	78%	81%	94%

Note that in 2015-16 we returned to gathering information literacy data from our writing rubric. The AAC&U rubric was not working well for our purposes. The data shown is just for 2015 and later.

Conclusions Drawn from Data: The students are meeting our expectations. This is still one of the areas with which the students have the most challenges.

Changes to be Made Based on Data: We found that we needed to be very specific about our expectations for the use and citation of information in papers. As we have improved the rubric, the students have improved. We continue to work with students in giving them clear feedback about the need to do a better job with references in technical papers.

Rubric: Next Page.

MICS Information Literacy Presentation Rubric

Criteria	Outstanding	High Satisfactory	Low Satisfactory	Unsatisfactory
Bibliography and supporting documents	<input type="checkbox"/> Multiple references from distinct reputable sources <input type="checkbox"/> References cited in the body of the document	<input type="checkbox"/> Most references from distinct reputable sources <input type="checkbox"/> Some citation of references in the body of the document	<input type="checkbox"/> Some references from reputable sources <input type="checkbox"/> Limited citation of references in the body of the document	<input type="checkbox"/> No bibliography or all references from untrusted sites on the internet <input type="checkbox"/> No citation of references in the body of the document
Organization	<input type="checkbox"/> Conveys a central theme with all ideas connected, arrangement of ideas clearly related to topic <input type="checkbox"/> Clear introduction, body (with sections), and conclusion includes summary and closure <input type="checkbox"/> Includes both an abstract and table of contents	<input type="checkbox"/> Conveys a central idea or topic with some ideas connected to the topic <input type="checkbox"/> Includes introduction, body and conclusion <input type="checkbox"/> Includes abstract and table of contents (one partial and one complete)	<input type="checkbox"/> Attempts to focus on an idea or topic with many ideas not connected to the topic <input type="checkbox"/> Introduction, body, conclusion detectable but not clear <input type="checkbox"/> Includes partial abstract and partial table of contents	<input type="checkbox"/> Has little or no focus on central idea or topic <input type="checkbox"/> Introduction, body or conclusion absent <input type="checkbox"/> No abstract or table of contents
Grammar and spelling	<input type="checkbox"/> No use of first-person tense <input type="checkbox"/> No grammatical or spelling errors	<input type="checkbox"/> Few uses of the first-person tense <input type="checkbox"/> Few grammatical and spelling errors	<input type="checkbox"/> Several uses of the first-person tense <input type="checkbox"/> Some grammatical and spelling errors	<input type="checkbox"/> Written in first-person tense <input type="checkbox"/> Many grammatical and spelling errors
Depth of information	<input type="checkbox"/> Appropriately synthesizes information from multiple distinct sources <input type="checkbox"/> Draws conclusions and personal insights from synthesis <input type="checkbox"/> Has the minimum number of pages including penalty pages; subject coverage is excellent	<input type="checkbox"/> Synthesis of information from at least three distinct sources <input type="checkbox"/> At least two personal insights or conclusions stated <input type="checkbox"/> Has the minimum number of pages including penalty pages; subject coverage is good	<input type="checkbox"/> Synthesis of information from at least two distinct sources <input type="checkbox"/> At least one personal insight or conclusion stated <input type="checkbox"/> Has the minimum number of pages including penalty pages; subject coverage is adequate	<input type="checkbox"/> Summary reporting of information without synthesis <input type="checkbox"/> No personal insights <input type="checkbox"/> Does not have the minimum number of pages including penalty pages
Clarity of writing	<input type="checkbox"/> Sentences flow <input type="checkbox"/> Smooth transitions between paragraphs <input type="checkbox"/> Any and all terms and acronyms are defined <input type="checkbox"/> Provides evidence to support points	<input type="checkbox"/> Good sentence structure <input type="checkbox"/> Adequate transitions between paragraphs <input type="checkbox"/> Most terms and acronyms are defined <input type="checkbox"/> Lacks support for some points	<input type="checkbox"/> Occasional poor sentence structure <input type="checkbox"/> Transitions between paragraphs unclear <input type="checkbox"/> Some terms and acronyms are defined <input type="checkbox"/> Provides minimal support for points	<input type="checkbox"/> Frequent poor sentence structure <input type="checkbox"/> Lacked transitions between paragraphs <input type="checkbox"/> Many terms and acronyms are undefined <input type="checkbox"/> Ideas not supported

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will collaborate effectively in teams.

Outcome Measure: Alternating year: CSC324 Signature Assignment – evaluation of group while working on a project (before 2015-16) and ISS342/ISS3042 Project Management – evaluation of group while working on a project (2016-17 and beyond).

Alternating year: MTH3052 Signature Assignment – evaluation of group while working on a project.

Criteria for Success: 80% of the students should have an average score of at least 2.5 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:

	Percent of students with average at least 2.5				
	Fall 2012 CSC324	Fall 2014 CSC324	Fall 2016 ISS342*	Fall 2018 ISS342	Fall 2020 ISS3042
Contributes to team meetings	86%	80%	90%	100%	100%
Encourages team members	93%	84%	N/A	100%	100%
Contributes individually outside of team meetings	93%	88%	86%	100%	100%
Attitude	100%	96%	N/A	100%	100%
Fosters constructive team climate	100%	92%	N/A	100%	100%
Responds to conflict	100%	100%	90%	100%	100%

*Note that the full group work rubric will be used in future years.

	MTH352 Percent of students with average at least 2.5				
	Spring 2013	Spring 2015	Spring 2017	Spring 2019	Spring 2021
Contributes to team meetings	91%	86%	100%	100%	100%
Encourages team members	91%	93%	100%	100%	100%
Contributes individually outside of team meetings	82%	93%	100%	100%	100%
Attitude	100%	100%	100%	100%	100%
Fosters constructive team climate	91%	100%	100%	100%	100%
Responds to conflict	91%	100%	100%	100%	100%

Conclusions Drawn from Data: The students are performing well as member of teams.

Changes to be Made Based on Data: Continue to make use of group activities throughout the curriculum.

MICS Teamwork Rubric

Definition

Teamwork is behaviors under the control of individual team members (effort they put into team tasks, their manner of interacting with others on team, and the quantity and quality of contributions they make to team discussions.)

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet unsatisfactory (cell one) level performance.

The purpose of this is to evaluate individual team members. Although no team member will ever see your evaluation of them, please take it seriously.

Directions:

- **Do not put your own name anywhere on this form, the evaluations are to be anonymous.**
- **Please write the name of the person you are evaluating here**_____
- **Please fill out one copy of this form for every person who was on your team, including one for yourself.**
- **For each row, place a checkmark in the box that best describes your teammate's performance.**

	Outstanding	High Satisfactory	Low Satisfactory	Unsatisfactory
Contributes to team meetings	<input type="checkbox"/> Helps the team move forward by articulating the merits of alternative ideas or proposals.	<input type="checkbox"/> Offers new suggestions to advance the work of the group.	<input type="checkbox"/> Shares ideas but does not advance the work of the group.	<input type="checkbox"/> Sits quietly in team meetings and does not contribute.
Encourages members of the team	<input type="checkbox"/> Actively seeks to find opportunities to encourage all members of the team.	<input type="checkbox"/> Offers encouragement to all members of the team.	<input type="checkbox"/> Offers words of encouragement to friends.	<input type="checkbox"/> Does not offer word of encouragement to anyone.
Individual contributions outside of team meetings	<input type="checkbox"/> Completes all assigned tasks by deadline; work accomplished is thorough. Proactively helps other team members complete their assigned tasks.	<input type="checkbox"/> Completes all assigned tasks by deadline; work accomplished is thorough.	<input type="checkbox"/> Completes all assigned tasks by deadline.	<input type="checkbox"/> Does not complete all assigned tasks by deadline.
Attitude	<input type="checkbox"/> Demonstrates (comments, facial expressions, etc.) a negative attitude rarely and helps others to become more positive.	<input type="checkbox"/> Demonstrates (comments, facial expressions, etc.) a negative attitude rarely .	<input type="checkbox"/> Demonstrates (comments, facial expressions, etc.) a negative attitude less often than a positive attitude.	<input type="checkbox"/> Demonstrates (comments, facial expressions, etc.) a negative attitude more often than a positive attitude.

Fosters constructive team climate	<input type="checkbox"/> Supports a constructive team climate by doing <u>all</u> of the following: <ul style="list-style-type: none"> • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it. 	<input type="checkbox"/> Supports a constructive team climate by doing <u>any two</u> of the following: <ul style="list-style-type: none"> • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it. 	<input type="checkbox"/> Supports a constructive team climate by doing <u>any one</u> of the following: <ul style="list-style-type: none"> • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it. 	<input type="checkbox"/> Supports a constructive team climate by doing <u>none</u> of the following: <ul style="list-style-type: none"> • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it.
Responds to conflict	<input type="checkbox"/> Identifies and acknowledges conflict and acknowledges that relationships can be damaged. Seeks to restore relationships.	<input type="checkbox"/> Identifies and acknowledges conflict and acknowledges that relationships can be damaged.	<input type="checkbox"/> Identifies and acknowledges conflict but will not acknowledge that relationships can be damaged.	<input type="checkbox"/> Will not acknowledge that conflict has occurred or that relationships can be damaged.

Assessment Data Mathematical, Information and Computer Sciences

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.

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will understand the professional, ethical and social issues and responsibilities with the implementation and use of technology.

Outcome Measure: This is a new outcome and we have just begun developing the signature assignment for measurement. It will be in MTH3083.

Criteria for Success: 80% of the students should have an average score of at least 2.5 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:

No data. First data will be gathered in the Spring of 2022.

Conclusions Drawn from Data: N/A

Changes to be Made Based on Data: We are in the process of constructing a set of modules that will be embedded in several MICS classes and the intent that students will have multiple exposures to ethics-related issues and case studies. Our hope is that this scaffolding will ultimately support well-developed ethical responses in the classes where we gather data.

Ethics Rubric

	1	2	3	4	5
Question 1	Activity is found to be ethical and no other supporting information is provided.	Activity is found to be unethical, but the support for this behavior is limited and lacks an implied defined framework. Response is a simple, "we shouldn't do this" with a harsh feeling.	Activity is found to be unethical and is support by an ethical framework (explicit or clearly implied with a deontology framework). Response is a reasoned "we should do this" but is still somewhat harsh response.	Activity is found to be unethical and is support by an ethical framework (explicitly stating a deontology framework). Response is a reasoned "we should do this" but is tempered with keeping the issue private between the two people.	Activity is found to be unethical and is support by an ethical framework (explicitly stating a deontology framework). Response is a reasoned "we should do this" but express a clear justification and is not overly reactive and is kept private.
Question 2	The response does not identify an ethical issue with system reliability and does not clearly apply an ethical framework. The reliability issue is more of inconvenience to users and does not create actual harm or violate a rule or law.	The response identifies an ethical issues or at least applies (clearly implied or explicitly) an ethical framework. But not both.	The response identifies an ethical issues and at least implies an appropriate ethical framework the correctly relates to the issues and contains a good explanation of why the framework applies to the issue.	The response identifies a clearly ethical issues and explicitly and correctly relates the issue to ethical framework along with explaining why the two are related.	The response identifies a clearly ethical issues and explicitly and correctly relates the issue to ethical framework along with explaining why the two are related. The response goes on to give examples of why issues is an ethical problem.

Assessment Data Mathematical, Information and Computer Sciences

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.

	Overall Benchmark
Year	
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:

	2016-17	2017-18	2018-19	2019-20	2020-21
Percentage of students with an average of 4 or more	100%	N/A*	100%	N/A**	N/A**

*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. Starting in 2015-16 we will be launching a newer IS curriculum in partnership with the School of Business. This will increase the amount of business course work completed by these majors. We will need to evaluate if the CS MFT test is reasonable to use for our IS majors, or if the MFT in business is more suitable, or if we should use a different measure. 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.