Computer Science Assessment Report

2022-23

Learning Outcomes for Computer Science:

1. Students will be able to write correct and robust software.

2. Students will use well-known algorithms and computational techniques to solve problems.

3. Students will analyze the interaction between hardware and software.

4. Students will be able to apply their technical knowledge and critical thinking 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.

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 has switched 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									
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20*	2020-21**	2021-22	2022-23
Runtime Correctness	85%	100%	62%	72%	95%	60%	45%	42%	19%	61%
Problem Solving	100%	75%	92%	83%	80%	85%	70%	78%	69%	96%

*Note that the instrument was changed in 2019.
**Note that 2020 was a fully remote 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. In 2021 we began assessing in CSC2052 rather than CSC2054 which is the midpoint in the class for computer science students (CSC2052 is cross listed with CSC2054 and is the first quad of CSC2054) but the end of the class for information systems, mathematics and data science students. We are seeing improvement in the runtime correctness scores but need to watch them.

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). To capture the data for students in mathematics, data science, and information systems, we have moved the assessment to the mid-term point in the semester (see explanation above). The scores are improving as we are moving past the impact of the pandemic, but we need to continue to monitor these scores.

CSC 2054 Signature Assignment

	Unsatisfactory (1)	Satisfactory (2)	Good (3)	Excellent (4)
Runtime Correctness	• Less than 60% correct	• Between 60% – 79% correctness	• 80% - 89% correct	• 90% – 100% correct
Problem Solving	• Analysis of program source code indicates that program is NOT close to working, and could NOT easily be modified to work given additional time.	• 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.	• Analysis of program source code indicates that program is close to working, and could be modified to work given additional time.	• 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.

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will use the theory of algorithms and computation to solve problems.

Outcome Measure:
After 2021: Signature Assignment in CSC3023 Software Engineering (alternating year class).

Before 2020: Annual: ETS Major Field Test in Computer Science: Structures and Algorithms subscore.

Criteria for Success:
After 2021: 80% of the students will score at least 2.5 out of 4 on the class rubric (under development).

Before 2020: The department subscore will be at the 65th 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:

	Percent of Students at or Above 2.5
	2022-23
Problem Solving	80%

Year	Percentile
2014-15	90
2015-16	92
2016-17	95
2017-18	42
2018-19	36
2019-20	No score
2020-21	No score
2021-22	No score

Conclusions Drawn from Data: The ETS MFT data was a challenge to interpret for several reasons: some years our sample size is too small for ETS to provide the subscore and our sample size is sufficiently small that the standard deviation is relatively large. But in 2017-18 the test had some changes. We made a decision to change assessment methods and we have

placed a signature assignment in CSC3023. The first time it was assessed was Fall 2022 and the students hit our benchmark.

Changes to be Made Based on Data: The most significant change that we made was to switch assessment methods. We will now monitor these results for the next few cycles.

Rubric Used:

Scoring done by ETS on the Major Field Test. New rubric for signature assignment under development.

CSC3023 Rubric/Scoring
Rubric:

Item	Points
Identifying the Fibonacci sequence and attempting to calculate a value	1
Writing a dynamic program to do the computation (something that is either a function call with an argument, or using a variable in the iterative structure)	1
Writing a viable program (or pseudo-code) that has an iterative structure	1
The program having a variable with the nth Fibonacci number to return or present to the user	1

Assessment Data Mathematical, Information and Computer Sciences

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									
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Hardware/software interaction understanding	82%	92%	88%	75%	69%	100%	92%	44%	62%	59%

Conclusions Drawn from Data: There is some variation in the data and some of it appears to be related to sample size. However, in 2020-21 the score dropped significantly. This could be due to this assessment being 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. The scores improved in 2021-22 and 2022-23 but are still lagging behind historical values.

Changes to be Made Based on Data: Continue to require operating systems (CSC3014) of all CS and IS students. The 2022-23 assessment was changed and we have an analysis by question. This will help us to better understand patterns of what is being missed. There are two questions that were missed by at least 75% of the students and we need to drill into the questions and the associated topics.

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

Assessment Data Mathematical, Information and Computer Sciences

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

Outcome Measure: Alternating Year**:** CSC4093 Software Project (alternating year course). Signature Assignment related to constructing a software application.

Previous: ETS Proficiency Profile: Critical Thinking.

Criteria for Success: CSC4093: 80% of the students will score at least 70%.

Previous: 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 70% or Higher					
	2012-13	2014-15	2016-17	2018-19	2020-21	2022-23
Problem Solving and Critical Thinking	67%	86%	77%	86%	74%	85%

Previous:

ETS Proficiency Profile	Percentage of Students Marginal or Proficient								
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
ETS Proficiency Profile Level 2 Critical Thinking	92%	100%	84%	92%	76%	79%	80%	88%	79%

Conclusions Drawn from Data: CSC4093: In 2013, 2015 and 2017 changes in the course were made. At each adjustment, the questions were updated. The data from the spring of 2021 was gathered during the COVID pandemic and students were both tired and stressed by the third semester of course disruption. The students are meeting our standards.

Changes to be Made Based on Data: The prompt for the assignment has been modified based on student questions. We continue the need to engage in careful software development processes and the change from waterfall to agile development methodology was made in 2016-17. We are seeing consistent patterns in data and will continue to monitor outcomes.

Rubric Used

We will score the questions according to the following table:

Questions	Maximum Points
1. Briefly describe the problem you were trying to solve.	0
2. Give one functional requirement by cutting and pasting from your user stories.	1
3. Give one non-functional requirement by cutting and pasting from your user stories.	1
4. From your software test plan, give one test case that you developed for each of the requirements given in #2 and #3 above. Cut and paste the two test cases from your software test document.	2
5. Attach the source code listing for the relevant portions of the code which satisfy the functional requirement given in #2 above. Please use a highlighter to highlight the relevant functions/code.	0
6. Did your final project iteration pass these two test cases? If not, why not?	0
7. Out of _____ tests in the Software Test Plan, _____ tests passed for the final project.	3
8. How many core requirements did you have in the User Stories? _____. How many were implemented in the final version of the software? _____	3
9. Explain the functionality of your final delivered code (1 point), highlighting similarities and differences with the initial problem requirements (1 point).	2
10. What programming language(s) did you use and why?	1
11. What operating system did you use and why?	1
12. What software tools (e.g. programming IDE, automated test tools, CASE tools, etc.) did you use and why?	1
13. Did you reuse software? Describe what libraries, frameworks, etc. you used and why.	1
14. Customer Satisfaction Rating.	4
	20

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

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.

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	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Background	92%	100%	95%	100%	100%	95%	100%	100%	95%	100%
Organization	100%	100%	100%	92%	94%	100%	100%	94%	100%	94%
Oral Presentation Skills	92%	100%	95%	100%	100%	95%	100%	100%	100%	100%
Presentation Tools	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Ability to Field Questions	100%	89%	100%	100%	100%	94%	94%	100%	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.

Oral Presentation Rubric Update (4/12/17)

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

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.

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.

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	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Bibliography and Support	100%	100%	89%	100%	76%	89%	81%	88%	58%	81%
Organization	100%	100%	100%	92%	94%	100%	100%	100%	100%	88%
Grammar and Spelling	92%	89%	84%	100%	88%	94%	94%	94%	89%	88%
Depth of Information	77%	78%	89%	85%	76%	83%	94%	94%	95%	94%
Clarity of Writing	77%	78%	89%	85%	88%	94%	88%	100%	89%	94%

Conclusions Drawn from Data: In general, the students have been performing reasonably well in writing technical reports.

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 (12/31/22)

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

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:

Information Literacy	Percentage of Students at 2.5 or Higher							
	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
References	95%	100%	71%	89%	81%	94%	74%	81%
Citation	84%	92%	76%	89%	81%	88%	74%	75%
Synthesis	84%	85%	82%	78%	81%	94%	95%	81%

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

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. 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.

Criteria	Outstanding		High Satisfactory		Low Satisfactory		Unsatisfactory	
Bibliography and supporting documents	☐	Multiple references from distinct reputable sources	☐	Most references from distinct reputable sources	☐	Some references from reputable sources	☐	No bibliography or all references from untrusted sites on the internet
	☐	References cited in the body of the document	☐	Some citation of references in the body of the document	☐	Limited citation of references in the body of the document	☐	No citation of references in the body of the document
Organization	☐	Conveys a central theme with all ideas connected, arrangement of ideas clearly related to topic	☐	Conveys a central idea or topic with some ideas connected to the topic	☐	Attempts to focus on an idea or topic with many ideas not connected to the topic	☐	Has little or no focus on central idea or topic
	☐	Clear introduction, body (with sections), and conclusion includes summary and closure	☐	Includes introduction, body and conclusion	☐	Introduction, body, conclusion detectable but not clear	☐	Introduction, body or conclusion absent
	☐	Includes both an abstract and table of contents	☐	Includes abstract and table of contents (one partial and one complete)	☐	Includes partial abstract and partial table of contents	☐	No abstract or table of contents
Grammar and spelling	☐	No use of first-person tense	☐	Few uses of the first-person tense	☐	Several uses of the first-person tense	☐	Written in first-person tense
	☐	No grammatical or spelling errors	☐	Few grammatical and spelling errors	☐	Some grammatical and spelling errors	☐	Many grammatical and spelling errors
Depth of information	☐	Highly accurate and substantive content	☐	Content is accurate, though key concepts are missing	☐	Content is flawed, and/or a significant number of key concepts are missing	☐	Content is significantly flawed and/or content is trivial
	☐	Appropriately synthesizes information from multiple distinct sources	☐	Synthesis of information from at least three distinct sources	☐	Synthesis of information from at least two distinct sources	☐	Summary reporting of information without synthesis
	☐	Draws conclusions and personal insights from synthesis	☐	At least two personal insights or conclusions stated	☐	At least one personal insight or conclusion stated	☐	No personal insights
	☐	Has the minimum number of pages including penalty pages; subject coverage is excellent	☐	Has the minimum number of pages including penalty pages; subject coverage is good	☐	Has the minimum number of pages including penalty pages; subject coverage is adequate	☐	Does not have the minimum number of pages including penalty pages
Clarity of writing	☐	Sentences flow	☐	Good sentence structure	☐	Occasional poor sentence structure	☐	Frequent poor sentence structure
	☐	Smooth transitions between paragraphs	☐	Adequate transitions between paragraphs	☐	Transitions between paragraphs unclear	☐	Lacked transitions between paragraphs
	☐	Any and all terms and acronyms are defined	☐	Most terms and acronyms are defined	☐	Some terms and acronyms are defined	☐	Many terms and acronyms are undefined
	☐	Provides evidence to support points	☐	Lacks support for some points	☐	Provides minimal support for points	☐	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 ISS3042 Project Management – evaluation of group while working on a project (2016-17 and beyond).

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 ISS3042	Fall 2018 ISS3042	Fall 2020 ISS3042	Fall 2022 ISS3042
Contributes to team meetings	86%	80%	90%	100%	100%	100%
Encourages team members	93%	84%	N/A	100%	100%	100%
Contributes individually outside of team meetings	93%	88%	86%	100%	100%	100%
Attitude	100%	96%	N/A	100%	100%	100%
Fosters constructive team climate	100%	92%	N/A	100%	100%	100%
Responds to conflict	100%	100%	90%	100%	100%	100%

Conclusions Drawn from Data: The students are performing well as members 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	☐ Helps the team move forward by articulating the merits of alternative ideas or proposals.	☐ Offers new suggestions to advance the work of the group.	☐ Shares ideas but does not advance the work of the group.	☐ Sits quietly in team meetings and does not contribute.
Encourages members of the team	☐ Actively seeks to find opportunities to encourage all members of the team.	☐ Offers encouragement to all members of the team.	☐ Offers words of encouragement to friends.	☐ Does not offer word of encouragement to anyone.
Individual contributions outside of team meetings	☐ Completes all assigned tasks by deadline; work accomplished is thorough. Proactively helps other team members complete their assigned tasks.	☐ Completes all assigned tasks by deadline; work accomplished is thorough.	☐ Completes all assigned tasks by deadline.	☐ Does not complete all assigned tasks by deadline.
Attitude	☐ Demonstrates (comments, facial expressions, etc.) a negative attitude **rarely** and helps others to become more positive.	☐ Demonstrates (comments, facial expressions, etc.) a negative attitude **rarely**.	☐ Demonstrates (comments, facial expressions, etc.) a negative attitude **less** often than a positive attitude.	☐ Demonstrates (comments, facial expressions, etc.) a negative attitude **more** often than a positive attitude.

Fosters constructive team climate	☐ Supports a constructive team climate by doing **all** of the following: • 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.	☐ Supports a constructive team climate by doing any **two** of the following: • 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.	☐ Supports a constructive team climate by doing any **one** of the following: • 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.	☐ Supports a constructive team climate by doing **none** of the following: • 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	☐ Identifies and acknowledges conflict and acknowledges that relationships can be damaged. Seeks to restore relationships.	☐ Identifies and acknowledges conflict and acknowledges that relationships can be damaged.	☐ Identifies and acknowledges conflict but will not acknowledge that relationships can be damaged.	☐ 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: 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).

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

Criteria for Success: 80% of the students will score a 2.5 or higher on the rubric for MTH3083 and ISS4014

Previous: 90% of the students will be Marginal or Proficient at Level 2.

Aligned with DQP Learning Areas (circle one or more):
1. Specialized Knowledge
2. Broad Integrative Knowledge
3. <mark>Intellectual Skills/Core Competencies</mark>
4. Applied and Collaborative Learning, and
5. Civic and Global Learning

Longitudinal Data:

ISS4014: First administration in spring 2024

MTH3083:

	MTH3083 Percentage of students at 2.5 or higher
	2022-23
Students will be able to formulate a mathematical model from a verbal description of a problem.	100%
Students will be able to construct solutions to problems using computational techniques.	100%
Students will be able to interpret visual data.	20%

Previous:

	Percentage of Students Marginal or Proficient									
ETS Proficiency Profile	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
ETS Proficiency Profile Level 2 Mathematics	100%	100%	100%	100%	92%	82%	95%	93%	81%	90%

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. In spring of 2023 we pilot tested the new assessment in MTH3083 and the results were mixed. We need to examine how the visual interpretation question was asked.

Changes to be Made Based on Data: We do not believe that the ETS exam is accurately measuring student quantitative ability in the department disciplines. Starting the 2022-23 academic year we will be measuring quantitative reasoning in the following classes: Computer Science and Information Systems: ISS4014 Data Base Systems and Web Integration (first administration will be in the spring of 2024) and for Mathematics and Data Science: MTH3083 Mathematical Probability and Statistics (first administration Spring 2023).

Rubrics:

ETS Proficiency Profile (no rubric involved)
ISS4014: Rubric under development
MTH3083: Rubric below

	Unsatisfactory (0)	Low Satisfactory (1)	Satisfactory (2)	High Satisfactory (3)	Outstanding (4)
Students will be able to formulate a mathematical model from a verbal description of a problem.	Completely incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct
Students will be able to construct solutions to problems using computational techniques.	Completely incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct
Students will be able to interpret visual data.	Completely incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct

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:
Alternating year: ISS3042 Signature Assignment
Alternating year: CSC3023 Signature Assignment
Alternating year: ISS4012 Signature Assignment
Annual: CSC4133 Signature Assignment
Annual: ISS4072 Signature Assignment

Note that this list is long because there is no single class that captures all CS and IS majors.

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

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	
	2020-21 for ISS3042	2022-23 for ISS3042
Average from both scenarios (ISS3042)	62%	74%

	Percent of Students at or Above 2.5
	2022-23 for CSC3023
Can identify an ethical issue in a problem or scenario.	27%
Can make and support plausible ethical decision(s).	80%

	Percent of Students at or Above 2.5
	2022-23 for ISS4072
Can identify an ethical issue in a problem or scenario.	100%
Can apply an ethical framework to ethical issue (virtue, utilitarianism, deontology, analogies) to scenario.	67%
Can make and support plausible ethical decision(s).	100%

Conclusions Drawn from Data: The students did not meet our standards in the early assessments. The three students in ISS4072 in 2022-23 were assessed in the spring of 2023 and these three students had also been part of the assessment in ISS3042 in the fall of 2022. So hopefully we are seeing improvement.

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 with 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. As can be seen by the data, we are using a few different rubrics and it will simplify our analysis by getting all assessments on the same rubric.

Ethics Rubric (ISS3042 and CSC3023)

	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 supported by an ethical framework (explicit or clearly implied with a deontology framework). Response is a reasoned "we should do this" but is still a 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 supported by an ethical framework (explicitly stating a deontology framework). Response is a reasoned "we should do this" but express a clear justification, 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 an inconvenience to users and does not create actual harm or violate a rule or law.	The response identifies an ethical issue or at least implies (clearly implied or explicitly) an ethical framework. But not both.	The response identifies an ethical issue and at least implies an appropriate ethical framework that correctly relates to the issues and contains a good explanation of why the framework applies to the issue.	The response identifies a clearly ethical issue and explicitly and correctly relates the issue to ethical framework along with explaining why the two are related.	The response identifies a clearly ethical issue 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 the issue is an ethical problem.

CSC3023

	Unsatisfactory (1)	Satisfactory (2)	Good (3)	Excellent (4)
Can identify an ethical issue in a problem or scenario. (Ethical Issue Recognition)	Student is unable to identify the core ethical issue of the scenario.	Student identifies a concern of the scenario, but not a core ethical issue.	Student identifies a core ethical issue, but not a secondary concern.	Student identifies a core ethical issue along with secondary concerns.
Can make and support plausible ethical decision(s). (Informed Judgement)	Student is unable to form and support a plausible ethical decision.	Student forms a plausible ethical decision, however no support is given.	Student forms a plausible ethical decision and provides minimum support.	Student forms a plausible ethical decision and provides strong support.

For MICS: Student will understand the professional, ethical and social issues and responsibilities with implementation and use of technology.

MTH4062, MTH4072, CSC/ISS/ MTH4133, ISS4012

	Unsatisfactory (1)	Satisfactory (2)	Good (3)	Excellent (4)
Can identify an ethical issue in a problem or scenario. (Ethical Issue Recognition)	Student is unable to identify the core ethical issue of the scenario.	Student identifies a concern of the scenario, but not a core ethical issue.	Student identifies a core ethical issue, but not a secondary concern.	Student identifies a core ethical issue along with secondary concerns.
Can apply an ethical framework to an ethical issue (virtue, utilitarianism, deontology, analogies) to scenario. (Application of Ethical Perspectives/Concepts)	Student is unable to state an ethical framework.	Student states an ethical framework and makes an attempt to apply it to the scenario.	Student states an ethical framework and is mostly correct in applying it to the scenario.	Student states an ethical framework and can correctly apply it to the scenario.
Can make and support plausible ethical decision(s). (Informed Judgement)	Student is unable to form and support a plausible ethical decision.	Student forms a plausible ethical decision, however no support is given.	Student forms a plausible ethical decision and provides minimum support.	Student forms a plausible ethical decision and provides strong support.