

Computer Science Program

Evidence of Student Learning

Use of Evidence of Student Learning

2016-17

Assessment Data Mathematical, Information and Computer Sciences

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

Outcome Measure: Annual: CSC254 Signature Assignment

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					
	2011	2012	2013	2014	2015	2016
Compilation	100%	100%	92%	75%	100%	94%
Runtime Correctness	86%	58%	85%	100%	62%	72%
Problem Solving	100%	100%	100%	75%	92%	83%

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 detailed oriented.

Changes to be Made Based on Data:

Continue to emphasize the need to carefully de-bug computer code during development.

CSC 254 Signature assignment

	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 use the theory of algorithms and computation to solve problems.

Outcome Measure: Annual: ETS Major Field Test in Computer Science: Structures and Algorithms subscore

Criteria for Success: 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

This is the most recent 10 years of data.

Year	Percentile
2007-08	95
2008-09	70
2009-10	70
2010-11	90
2011-12	63
2012-13	*
2013-14	53
2014-15	90
2015-16	92
2016-17	95

* Sample size too small to be given indicator scores.
ETS changed the CS exam in 2011-12.

Conclusions Drawn from Data:

This data is 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. We have been hitting our target most years, however we dropped after the CS exam was changed in 2011-12, yet showed improvement in the last few years.

Changes to be Made Based on Data:

We need to evaluate the test questions to determine if this remains a valid measurement tool that is aligned with our curriculum. We are also making curricular changes that will have students exposed to algorithms earlier in the curriculum. We have noticed that there may be a correlation between this data and our curricular cycle. We teach several key classes in alternating years and it appears that students are more successful in the years when the algorithms class is taught – this will be a topic for analysis in our upcoming program review. We will also be discussing whether or not the ETS Major Field Test is the most effective tool for measuring student learning in this area.

Rubric Used

Scoring done by ETS on the Major Field Test.

Longitudinal Data:

	2013-14		2012-13		2011-12		2010-11		2009-10	
	Score	Percentile								
Computer Science										
Department Average	154	65	139	14	155.3	64	156.3	70	153.5	65
Percent of Students Above 50th Percentile		67%		0%		57%		71%		60%
Number of Students Taking the Test		6		2		7		7		5
Programming Fundamentals	52	55	*	*	51	46	64	65	65	70
Computer Org/Arch/Oper Sys	49	82	*	*	53	89	39	65	49	90
Structures and Algorithms	40	53	*	*	43	63	56	90	49	70

	2008-09		2007-08		2006-07		2005-06		2004-05	
	Score	Percentile								
Computer Science										
Department Average	162.8	90	167.3	95	166.3	95	158.6	80	152.3	55
Percent of Students Above 50th Percentile		100%		100%		100%		75%		100%
Number of Students Taking the Test		4		3		3		8		3
Programming Fundamentals	73	95	68	85	73	85	*	*	*	*
Computer Org/Arch/Oper Sys	54	95	52	44	52	90	*	*	*	*
Structures and Algorithms	50	70	77	95	59	90	*	*	*	*

* Sample size too small to be given indicator scores.
ETS changed the CS exam in 2011-12.

Conclusions Drawn from Data:

This data is 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. We have been hitting our target most years, however we dropped after the CS exam was changed in 2011-12.

Changes to be Made Based on Data:

We need to evaluate the test questions to determine if this remains a valid measurement tool that is aligned with our curriculum. We are also making curricular changes that will have students exposed to algorithms earlier in the curriculum.

Rubric Used

Scoring done by ETS on the Major Field Test.

Assessment Data Mathematical, Information and Computer Sciences

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

Outcome Measure:

Annual (CS and IS): CSC314 Signature Assignment

Annual (CS): ETS CS Exam Computer Organization, Architecture and Operating Systems Subscore.

Criteria for Success:

CSC314 Assignment: 80% of the students should have an average score of at least 7.

ETS: 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:

	Percentage of Class at 7 or Higher					
	2012	2013	2014	2015	2016	2017
Hardware/software interaction understanding	85%	89%	82%	92%	88%	75%

ETS Subscore:

Here are the most recent 10 years of data:

Year	Percentile
2007-08	44
2008-09	95
2009-10	90
2010-11	65
2011-12	89
2012-13	*
2013-14	82
2014-15	94
2015-16	86
2016-17	61

* Sample size too small to be given indicator scores.
ETS changed the CS exam in 2011-12.

Conclusions Drawn from Data:

Students have been able to successfully master the material in the CSC314 assessment.

This data from the ETS subscore is a challenge to interpret for several reasons: some years our sample size is too small for ETS to provide the subscore and in all years our sample size is sufficiently small that the standard deviation is relatively large. We have been hitting our target most years

Changes to be Made Based on Data:

Continue to require operating systems (CSC314) of all CS and IS students.

We need to evaluate the ETS test questions to determine if this remains a valid measurement tool that is aligned with our curriculum. We have noticed that there may be a correlation between this data and our curricular cycle. We teach several key classes in alternating years and it appears that students are more successful in an alternating year cycle. We need to investigate this further as part of our upcoming program review. We will be also be evaluating whether or not the ETS MFT is the best way to measure this learning objective.

Rubric Used (CSC314)

The scoring for this assignment is purely points based.

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

Rubric Used (ETS)

Scoring done by ETS on the Major Field Test.

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: CSC493 Signature Assignment related to constructing a software application.

ETS Proficiency Profile: Critical Thinking

Criteria for Success:

CSC493: 85% of the students will score at least 70%

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		
	2013	2015	2017
Problem solving	67%	86%	77%

	Percentage of Students Marginal or Proficient				
	2012-13	2013-14	2014-15	2015-16	2016-17
ETS Proficiency Profile Level 2 Critical Thinking	80.0%	92.3%	100.0%	84.2%	91.7%

*Critical thinking data is for the full department.

Conclusions Drawn from Data:

CSC493: In 2013, the students did not seem aware that a detailed response was expected for questions 2, 3 and 4. This confusion caused lower scores, in 2015 the questions were improved and this seems to have improved scores. Because new software development methodology is being used in this course, the questions were once again updated. While the students met the target, we may need to refine the questions further.

ETS: Students are meeting the standard for this basic skill.

Changes to be Made Based on Data:

The prompt for the assignment has been modified to address the confusion about questions 2-4. We continue the need to engage in careful software development processes and the change from waterfall to agile development methodology was made in 2017.

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 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

ETS: The score comes from ETS

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	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Background	94%	88%	100%	95%	100%	100%	92%	100%	95%	100%
Organization	94%	94%	100%	85%	100%	100%	100%	100%	100%	92%
Oral presentation skills (2010)			100%	90%	100%	100%	92%	100%	95%	100%
Presentation Tools	88%	94%	100%	100%	100%	100%	100%	100%	100%	100%
Ability to field questions	81%	100%	100%	100%	83%	100%	100%	89%	100%	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
Organization	100%	100%	100%	100%	92%
Language	100%	92%	100%	100%	100%
Delivery	100%	92%	100%	95%	100%
Supporting Material	100%	100%	100%	100%	100%
Central Message	100%	100%	89%	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. Looking at the scores, it is possible to see the times when alterations have been made:

- 2008-09 Standards tightened
- 2009-10 Rubric expanded to include more detailed instructions

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 paragraphed; 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 <input type="checkbox"/> Engages audience in content multiple time 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 makes an uses inflection for emphasis <input type="checkbox"/> Engaged audience through eye contact <input type="checkbox"/> Engaged 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)	9	Delivery
Is clearly heard in the room and uses inflection for emphasis	10	Delivery
Engaged audience through eye contact	11	Delivery
Engaged 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	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Bibliography and support	69%	75%	88%	55%	93%	100%	100%	100%	89%	100%
Organization	100%	88%	63%	65%	93%	100%	100%	100%	100%	92%
Grammar and Spelling	94%	75%	81%	60%	79%	100%	92%	89%	84%	100%
Depth of Information	81%	88%	88%	50%	93%	91%	77%	78%	89%	85%
Clarity of Writing	94%	69%	81%	70%	79%	91%	77%	78%	89%	85%

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
Organization	100%	100%	100%	89%	92%
Language	100%	92%	100%	89%	85%
Delivery	100%	92%	100%	100%	85%
Supporting Material	100%	100%	100%	89%	100%
Central Message	100%	100%	89%	84%	85%

	Percentage of Students Marginal or Proficient				
	2012-13	2013-14	2014-15	2015-16	2016-17
ETS Proficiency Profile Level 2 Writing	60.0%	84.6%	100.0%	89.5%	83.3%

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 speak at a professional level. Looking at the scores, it is possible to see the times when alterations have been made:

- 2008-09 Standards tightened
- 2009-10 Rubric expanded to include more detailed instructions
- In 2014-15 we instituted a literature review assignment to strengthen the students' capacity for using resources and identifying why the resources are relevant. This assignment needs to be adjusted, but seems to have helped students to understand their work.

In addition, the university has just changed general education requirements so that students will take an upper division literature class. We hope that this further exposure to formal writing later in their academic career will help to strengthen our students' writing.

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 tasks(s) (e.g., begins to show awareness of audience's perceptions and assumptions).	Demonstrates minimal attention to context, audience, purpose, and to the assigned tasks(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 (capstone) to 1 (benchmark) 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 3 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				
	2012-13	2013-14	2014-15	2015-16	2016-17
References				95%	100%
Citation				84%	92%
Synthesis				84%	85%
Determine the Extent of Information Needed	100%	62%	78%		
Access the Needed Information	91%	69%	100%		
Evaluate Information and its Sources Critically (carefully explains the reasons for the choice of source) (added 2014-15)			33%		
Use Information Effectively to Accomplish a Specific Purpose	91%	85%	89%		
Access and Use Information Ethically and Legally	91%	77%	100%		

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.

Conclusions Drawn from Data:

The students are meeting our expectations. For the first two years we applied the AAC&U rubric to the student's final senior paper to measure their use of information. The quality of the use of information was uneven and we had not made our expectations clear. The students much more clearly understand the expectations regarding information literacy that are embedded in our writing rubric.

Changes to be Made Based on Data:

We have tried a variety of approaches, using the AAC&U IL rubric and expanding on that rubric. After looking at the AAC&U results in parallel with the departmental writing rubric, it was clear that the difference in results were insignificant. It is a great deal less work for the department and clearer for the students to simply use the departmental writing rubrics IL components to assess students' IL.

Rubric

Next Page

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:

Annual: CSC324 Signature Assignment – evaluation of group while working on a project (before 2015-16) and ISS342 Project Management – evaluation of group while working on a project (2016-17 and beyond)

Annual: MTH352 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 3.0		
	Fall 2012 CSC324	Fall 2014 CSC324	Fall 2016 ISS342*
Contributes to team meetings	86%	80%	90%
Encourages team members	93%	84%	N/A
Contributes individually outside of team meetings	93%	88%	86%
Attitude	100%	96%	N/A
Fosters constructive team climate	100%	92%	N/A
Responds to conflict	100%	100%	90%

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

	MTH352 Percent of students with average at least 3.0		
	Spring 2013	Spring 2015	Spring 2017
Contributes to team meetings	91%	86%	100%
Encourages team members	91%	93%	100%
Contributes individually outside of team meetings	82%	93%	100%
Attitude	100%	100%	100%
Fosters constructive team climate	91%	100%	100%
Responds to conflict	91%	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.

<p>Fosters constructive team climate</p>	<p><input type="checkbox"/> Supports a constructive team climate by doing <u>all of the following</u>:</p> <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. 	<p><input type="checkbox"/> Supports a constructive team climate by doing <u>any two of the following</u>:</p> <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. 	<p><input type="checkbox"/> Supports a constructive team climate by doing <u>any one of the following</u>:</p> <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. 	<p><input type="checkbox"/> Supports a constructive team climate by doing <u>none of the following</u>:</p> <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.
<p>Responds to conflict</p>	<p><input type="checkbox"/> Identifies and acknowledges conflict and acknowledges that relationships can be damaged. Seeks to restore relationships.</p>	<p><input type="checkbox"/> Identifies and acknowledges conflict and acknowledges that relationships can be damaged.</p>	<p><input type="checkbox"/> Identifies and acknowledges conflict but will not acknowledge that relationships can be damaged.</p>	<p><input type="checkbox"/> Will not acknowledge that conflict has occurred or that relationships can be damaged.</p>

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

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:

	Percentage of Students Marginal or Proficient				
	2012-13	2013-14	2014-15	2015-16	2016-17
ETS Proficiency Profile Level 2 Math	100.0%	100.0%	100.0%	100.0%	91.7%

Conclusions Drawn from Data:

Students are in general meeting our criteria.

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)

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Computer Science 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, Computer Science 481, Senior Seminar in Computer Science.

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 or Computer Information Systems: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Computer Information Systems 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 Information Systems curriculum at PLNU prepared you for graduate school?

Criteria for Success: 1

MFT: 50% of our students achieve above the 50th percentile on the exam.

Alumni Survey: An average response of 2 for each question.

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	Programming Fundamentals	Computer Organization, Architecture, Operating Systems	Structures and Algorithms
Year		Percentile	Percentile	Percentile
2007-08	Y	85	44	95
2008-09	Y	95	95	70
2009-10	Y	70	90	70
2010-11	Y	65	65	90
2011-12	Y	46	89	63
2012-13	N	*	*	*
2013-14	Y	55	82	53
2014-15	Y	84	94	90
2015-16	Y	89	86	92
2016-17	Y	54	61	95

* Sample size too small to be given indicator scores.

ETS changed the CS exam in 2011-12.

Alumni Data:

In the spring of 2010, the department surveyed alumni who had graduated in the last 15 years. The response rate on the survey was 31.7% with the majority (80.9%) of the respondents having graduated in the last decade. A detailed summary analysis of the data can be found in Appendix: 2010 Alumni Survey Results Summary of our department's Program Review. Below are the components of the survey relevant to our assessment plan.

How well did the undergraduate curriculum prepare you for:

	Well or higher	OK	Poorly
Work in the field (if went into the field)	85.2%	14.8%	0.0%
Graduate school	76.5%	5.9%	17.6%
Teaching	80.0%	20.0%	0.0%

Conclusions Drawn from Data:

ETS Results:

Our scores show that our benchmark is being met for overall performance on the test. We are continuing to evaluate the changes made by ETS in 2011-12 to determine if we are concerned about any the changes in student results. It may be that they are now including questions on some material that we do not teach. We have noticed a cyclical patten in some subscore results and are investigating to if this correlates with our two year rotation of upper division courses.

Alumni Survey:

Overall, our alumni believe that they were well prepared. Further investigation indicates that the students (3) who said that they were "poorly" prepared for graduate school are all mathematics majors who are employed as teachers and appear to be getting education-related masters degrees while working full-time. The hypothesis is that the "lack of preparation" may be in education coursework and not mathematics. We will be conducting another survey in 2016-17 as part of program review preparation.

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. This has included increasing students' exposure to data bases and information security. See our APC proposals for the specific descriptions of curricular changes made.

Survey:

In 2005 our department instituted three changes that seem to have had an impact on developing critical skills in our graduates:

- Increasing the expectations for written and oral presentations in senior seminar (this is in addition to the writing and oral presentations that are threaded throughout our curriculum)
- Requiring all seniors in our department to take the senior seminar class
- Requiring an "integrative experience" (internship, year-long service learning project or year-long honor research project) of all of our majors.

This has a direct impact on five skills listed in the table below. The question on the survey is listed above the table.

Please tell us if your departmental course work enhanced your abilities in the listed areas:

		Very much enhanced	Much enhanced	Enhanced	Not enhanced and N/A
Think analytically and logically	2000-2004	53.8%	26.9%	15.4%	3.8%
	2005-2009	64.0%	36.0%	0.0%	0.0%
Write effectively in the discipline	2000-2004	11.5%	23.1%	42.3%	23.1%
	2005-2009	16.0%	36.0%	36.0%	12.0%
Effective oral communication	2000-2004	3.8%	23.1%	46.2%	26.9%
	2005-2009	12.0%	12.0%	60.0%	16.0%
Solve problems using technology	2000-2004	19.2%	46.2%	26.9%	7.7%
	2005-2009	32.0%	56.0%	8.0%	4.0%
Integrate knowledge from different sources	2000-2004	15.4%	34.6%	38.5%	11.5%
	2005-2009	8.0%	52.0%	32.0%	8.0%

Data from the Alumni Survey says that our graduates believe that their coursework in our department has also enhanced:

- Their ability to write effectively (88% for those who graduated in 2005-09, 77% for those who graduated in 2000-04)

- Their ability to communicate orally in the discipline (84% for those who graduated in 2005-09, 73% for those who graduated in 2000-04)
- Their ability to solve problems using technology (96% for those who graduated in 2005-09, 92% for those who graduated in 2000-04)

Rubric:

ETS:

The ETS provides the data.

Alumni Survey:

This is not rubric scored, but the data is tabulated.