MEMO

To: Kerry Fulcher
From: Maria Zack
Date: June 2015
RE: Annual Update on Program Review MOU Progress

The following recommendations resulting from the MICS Program Review ((Phase I: https://portal.pointloma.edu/web/mathematical-information-and-computer-sciences/programreviewi and Phase II: https://portal.pointloma.edu/web/mathematical-information-and-computer-sciences/programreviewii):

1. Revise the curriculum in the Information Systems Major and transform it into a more efficient major in Computer Information Systems.
2. Update the Computer Science and Mathematics curricula to reflect the changes described in the body of the MICS Program Review Phase I and Phase II.
3. Develop in partnership with the other departments in Rohr Science (Biology, Chemistry, and Physics and Engineering) a minor in Computational Science
4. Develop and test hybrid components for existing classes in the department.
5. Phase in the additional assessments of program learning outcomes as describe in our updated assessment plan.

For reference the MOU is attached at the end of this report.

Here is the progress to date on each of the items:

1. Completed by Fall 2011

2. Completed by Fall 2011

3. The joint proposal for the Computational Science Minor has been implemented. As a result we are seeing a doubling in our introductory programming class. The majority of the interest in the program is coming from Biology majors and we have now had several service learning projects and joint honors projects related to computational science. In a new development, the Psychology Department is interested in becoming part of the computational science minor. We will be investigating this possibility in the 2015-16 academic year.

4. During the fall of 2011 and the spring of 2012 the technologically mediated material developed during the summer of 2011 for MTH121, MTH131 and MTH203 was tested. The conclusions of the tests are as follows:
    - MTH121 – Most of the modeling projects developed for this lab worked well. However one of them was too complex for students who were learning Calculus I and will need to be revised. (This revision was completed over the summer of 2012).
    - MTH131 – the new labs worked well and if we are successful in switching to Maxima, the university will be able to eliminate the cost of the license for the Maple software. (The department will make the determination about Maple this fall).
    - MTH203 – the material developed did not work well, it did not achieve the desired pedagogical aim, was frustrating for students and was too time consuming for faculty. In addition the MapleTA platform was difficult to work with.

    During the summer of 2012, faculty continued work on developing hybrid material. The team began the summer with:
    - Reviewing what had been learned from the 2011-12 experiments
    - Reading recent publications on “flipping” the classroom (this is the focus of our hybrid work)

- Reviewing the results from small-scale experiments conducted in other classes during the academic year (e.g. using YouTube videos with students, having students process textual material in some different ways such as turning in outlines, working with other technology platforms).
- Looking at a number of models on the internet for presenting mathematical material.
- Playing with technology which included recording explanations written by hand on a pad, recording demonstrations giving on a black board, using an iPad to record explanations (written and vocal), making use of student generated videos, reviewing professionally generated videos and narrating Powerpoint presentations. We quickly learned that the styluses currently available for iPads are not sufficiently sensitive to produce clear results when writing complex mathematical equations.
- It is interesting to note that the experiments that we did with students during the spring of 2012, indicate that the students have a clear preference for things that appear to be "home grown" as opposed to commercially produced. Many enjoyed explanations that were recordings of a faculty member writing on a pad and explaining a computational technique (the camera was focused on the pad).

In the 2012-13 Academic year:

- A complete redesign of MTH203 as a hybrid using Carnegie Mellon (now Acrobatiq) material with a successful pilot test in the summer of 2013.
- Background work to construct MTH303 as a hybrid. The department encountered several obstacles with the Pearson material that was selected. While a great deal of development was done in the summer of 2013, the integration between Pearson and Canvas was not working effectively. This led to a decision to run MTH303 in the Fall of 2013 as "electronically mediated" and not to reduce the seat time. Pearson promises that the integration problems will be solved by January of 2014.
- Our experiments with free software have gone well. This has allowed us to move to using Maxima as a replacement for Maple. ITS was able to give up the Maple license and thus save PLNU money. We have also begun investigating using R, a statistical package, as a replacement for some costly software packages such as SPSS and MatLab.

In the 2013-14 Academic Year:

- MTH203 Statistics was piloted as a hybrid/blended class in Spring of 2014. This pilot informed course redesign over the summer.
- MTH303 Problem Solving as hybrid/blended was piloted in the Spring of 2014. This pilot informed course redesign over the summer.
- In the Summer of 2014 MTH203 and MTH303 were refined as blended/hybrid classes. MTH213 Fundamentals of Elementary Mathematics I and CSC143 Introduction to Computer Programming were also constructed.

In the 2014-15 Academic Year:

- Fall 2014: MTH203 and MTH303 were continued as hybrids for all sections. MTH213 and CSC143 were pilot tested as hybrids. Student learning outcome and attitudinal data was gathered. Preliminary data indicates that students have some distance to go in adapting to the new learning modality but they liked the flexibility in the coursework (see appendix). Our preliminary learning outcome data indicates that students are doing roughly as well in the hybrid format as they are in the face to face format.
- Fall of 2014: MTH223 Fundamentals of Elementary Mathematics II was created as a hybrid.
- Spring 2015: MTH223 pilot tested as a hybrid, MTH203 and MTH303 continue as hybrids.

Future work:

- Refine all classes over the summer: MTH203, MTH303, MTH213, MTH223 and CSC143. All faculty members have identified things that they would like to change.
- Develop a version of MTH113 Intermediate Algebra and MTH203 Statistics as a synchronous online course for Extended Learning.
- Continue to gather learning outcome data on hybrids and refine them.
- Publish our research on course development and student learning. We have discovered that our department's approach to team development of hybrid courses taught by multiple is quite different from what is in the literature. We have given presentations on our work at the Joint Mathematics Meetings (January 2015) and the Association of Christians in the Mathematical Sciences (May 2015).

5. The new assessments for our MICS assessment program were developed and implemented at the end of the Fall 2011 and Spring 2012 semesters. We have added new learning outcomes and means of assessment to address PLNU's need to assess core competancies for WASC. We have also partnered with the Fermanian School of Business to significantly revise the information systems major which will produce the need to develop a modified assessment plan in the 2015-16 school year. This plan will incorporate learning outcomes from both departments.

Program Review Memorandum of Understanding
Mathematical, Information and Computer Sciences Department
November 2010

Plan for Improvement: Recommendations from the Program Review:
The following recommendations emerged from the MICS Program Review:

6. Revise the curriculum in the Information Systems Major and transform it into a more efficient major in Computer Information Systems.
7. Update the Computer Science and Mathematics curricula to reflect the changes described in the body of the MICS Program Review Phase I and Phase II.
8. Develop in partnership with the other departments in Rohr Science (Biology, Chemistry, and Physics and Engineering) a minor in Computational Science
9. Develop and test hybrid components for existing classes in the department.
10. Phase in the additional assessments of program learning outcomes as describe in our updated assessment plan.

Action Steps for Implementing Improvements:
The timeline for implementing these changes can be seen in the timeline appendix. Details of the steps needed can be found in the program review (Phase I: https://portal.pointloma.edu/web/mathematical-information-and-computer-sciences/programreviewi and Phase II: https://portal.pointloma.edu/web/mathematical-information-and-computer-sciences/programreviewii) and in the attached detail for work on hybrid/flipped classes.

Assessment Measures:

- The changes in curriculum for Computer Information Systems, Computer Science and Mathematics will be assessed via the program assessment system for each major. Details can be found in the MICS assessment documents (https://portal.pointloma.edu/web/institutional-effectiveness/assessment/mics).

Financial Implications of the Action Steps:
The numbers below correspond to the number of the recommendation above.

1. The Computer Information Systems major makes use of several classes in the Computer Science major. This change has the effect of a net reduction of one half of a full-time equivalent (FTE) faculty member in the department. Because of recent departures and upcoming retirements, this change will be absorbed by not refilling a faculty position in the department.
2. The updates in the Computer Science and Mathematics curricula are cost neutral since the changes involved the elimination as well as the addition of courses and making some previously elective courses required.
3. The development of the Computational Science minor is also cost neutral. Many of the courses in the minor already exist in one of the four departments in the building. There are a limited number of MICS courses needed to be added to the curriculum (Matlab, Python Scripting, Databases for Computational Science) and in revising the curriculum for Math and CS (recommendation 2) the department was able to free up the units needed for this purpose.
4. Develop and test hybrid components for existing classes in the department. This recommendation has a cost associated with it. The main expense is funding for faculty during the summer to develop the hybrid components. There will be limited costs for software and other technical tools that will be paid out of department funds. It is anticipated that the process of creation, experimentation and testing will take 4-5 years. The details related to this process can be seen in the hybrid attachment.
5. Phasing in the additional assessments in the department is cost neutral.

The Provost and the MICS Department mutually agree to pursue these recommendations for the MICS Department. The Provost will provide material and administrative support for the actions taken as the result of the recommendations provided that the MICS Department makes satisfactory annual progress on the initiatives. MICS Department will carry out these actions and submit and annual report of progress.

Signed:

Kerry Fulcher, Ph.D., Provost	Maria Zack, Ph.D., Chair MICS

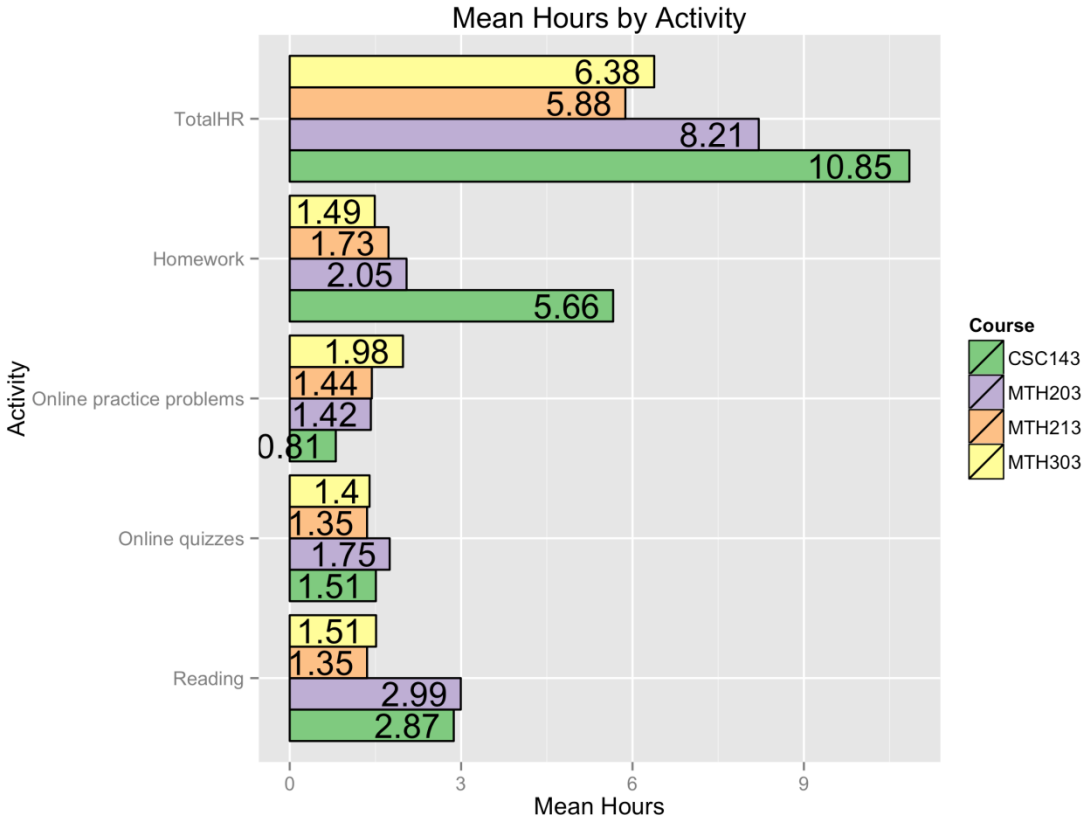
Five-Year Timeline for Recommendations

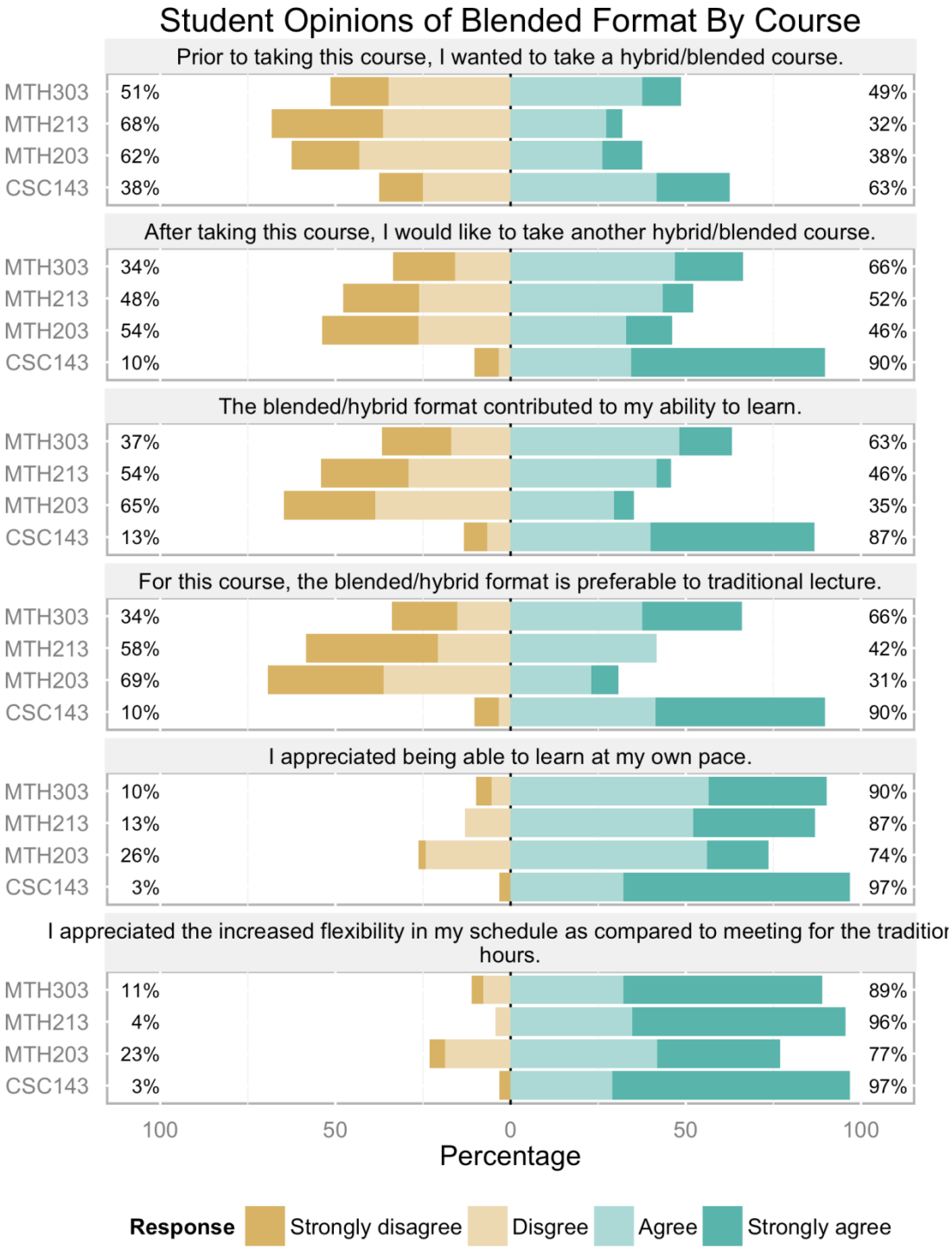
	Curriculum	Computational Science	Assessment	Hybrids
2010-11	• Complete Program Review • Turn in curriculum proposal to the Academic Policies Committee	• Discuss details of a computational science minor with the other departments in the building	• CSC254 Signature Assignment and Rubric (develop) • MTH242 Signature Assignment and Rubric (develop) • ISS424 Signature Assignment and Rubric (develop) • Annual Assessment	Summer 2011 • Convert MTH131, MTH121, CSC133 and MTH203
2011-12	• Implement curriculum with needed transitional schedules for students	• Map out and submit needed curricular changes if the computational science minor is to proceed	• Senior Seminar Societal Role Assignment and Rubric (develop) • MTH382 Signature Assignment and Rubric (develop) • ISS414 Signature Assignment and Rubric (develop) • Annual Assessment	Fall 2011 • Trial run with MTH121 and CSC133 • Trial run with randomized treatments in MTH203 Spring 2012 • Trail run with MTH131 • Trial run with randomized treatments in MTH203 Summer 2012 • Evaluate what was learned from the 2011-12 trials • Convert CSC181 and MTH303
2012-13	• Finish implementing new curriculum	• Implement new computational science minor	• CSC494 Signature Assignment and Rubric (develop) • Annual Assessment	Fall 2012 • Second trial run with MTH121 and CSC133 • Trial run with randomized treatments with CSC181 and MTH303 Spring 2013 • Second trial run with MTH131 • Trial run with randomized treatments with CSC181 and MTH303 Summer 2013 • Evaluate what was learned from the 2012-13 trials • Adjust classes as needed

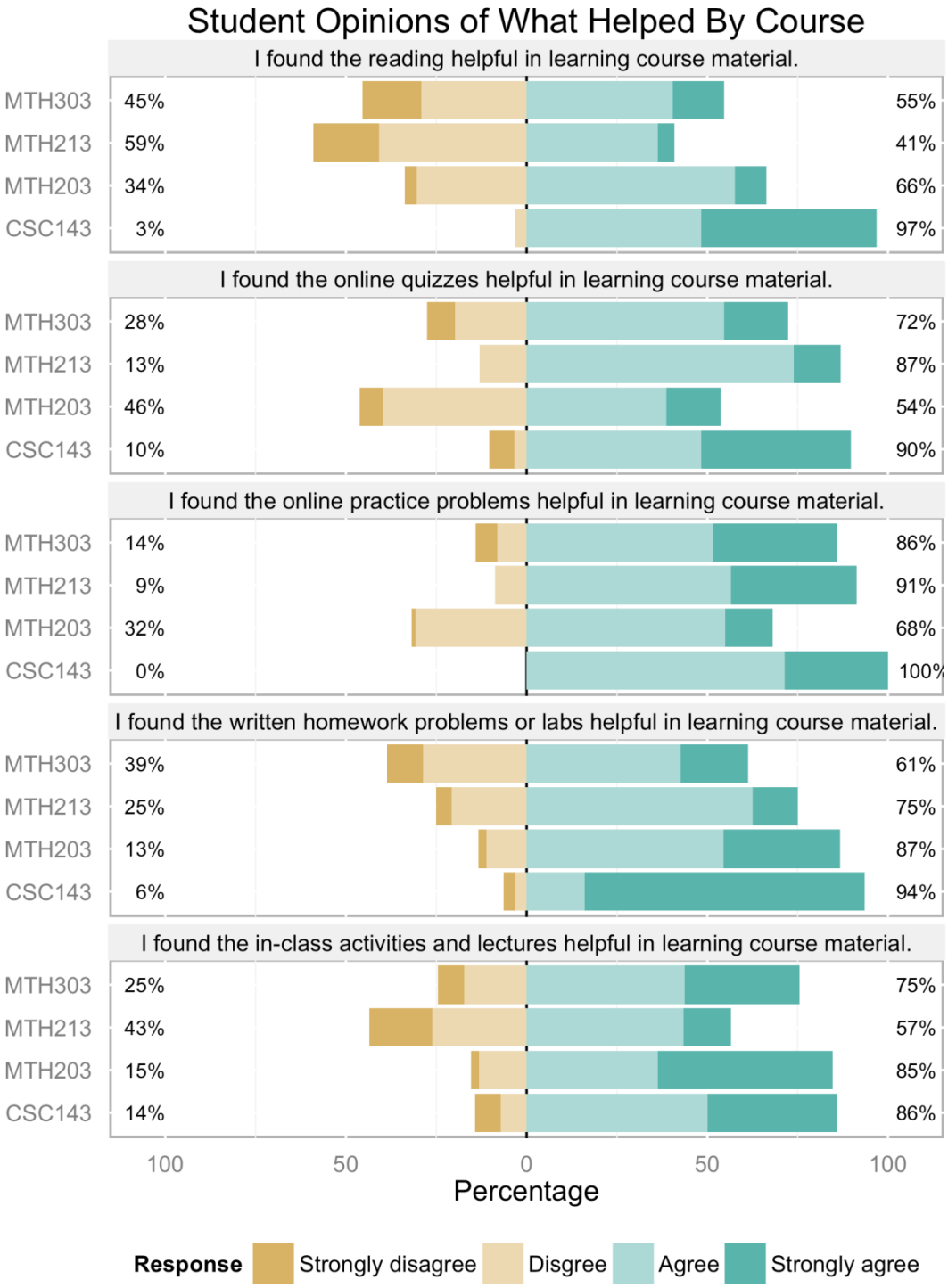
	Curriculum	Computational Science	Assessment	Hybrids
2013-14	• Assess new curriculum	• Implement new computational science minor	• Annual Assessment	Fall 2013 • Continue gathering data in CSC181, MTH121, MTH203 and MTH303 Spring 2014 • Continue gathering data in CSC181, MTH131, MTH203 and MTH303 • Make determination about continuing the use of hybrids • Write journal articles on what we have learned about learning outcomes with these hybrid
2014-15	• Assess new curriculum	• Preliminary assessment of new computational science minor	• Annual Assessment	• Implement decisions about the continuing use of hybrids for these classes

Blended Course Survey Results Fall 2014

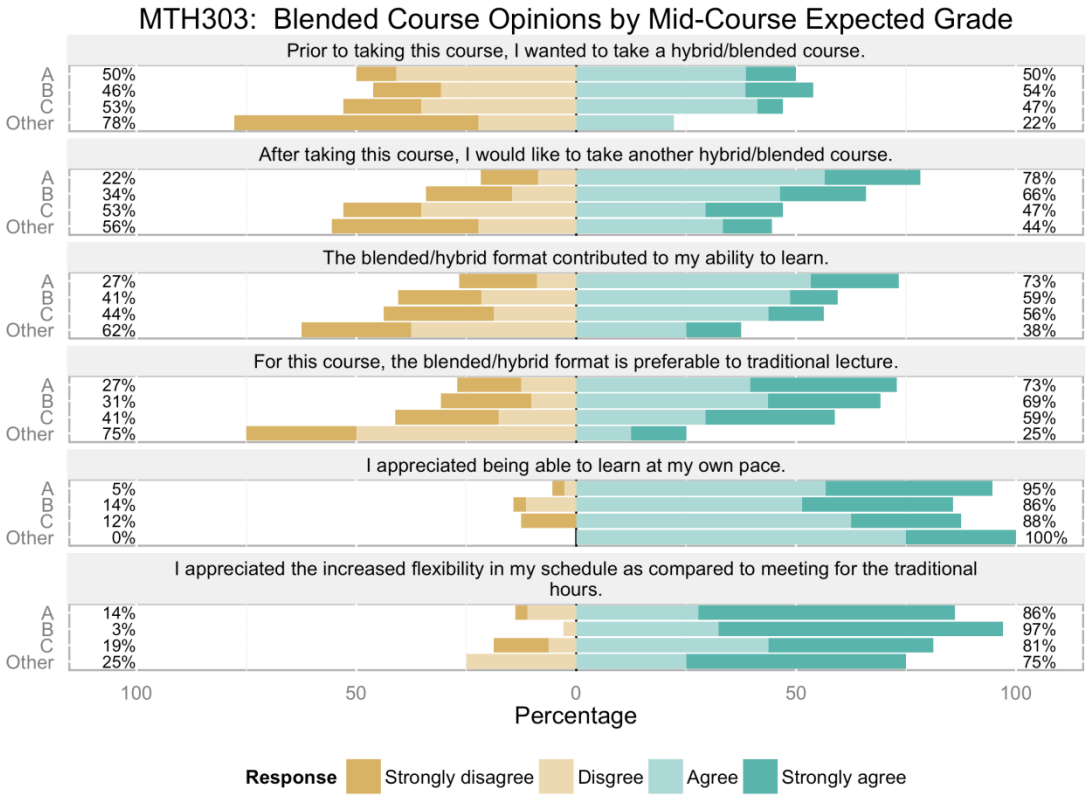
Breakdown by Course

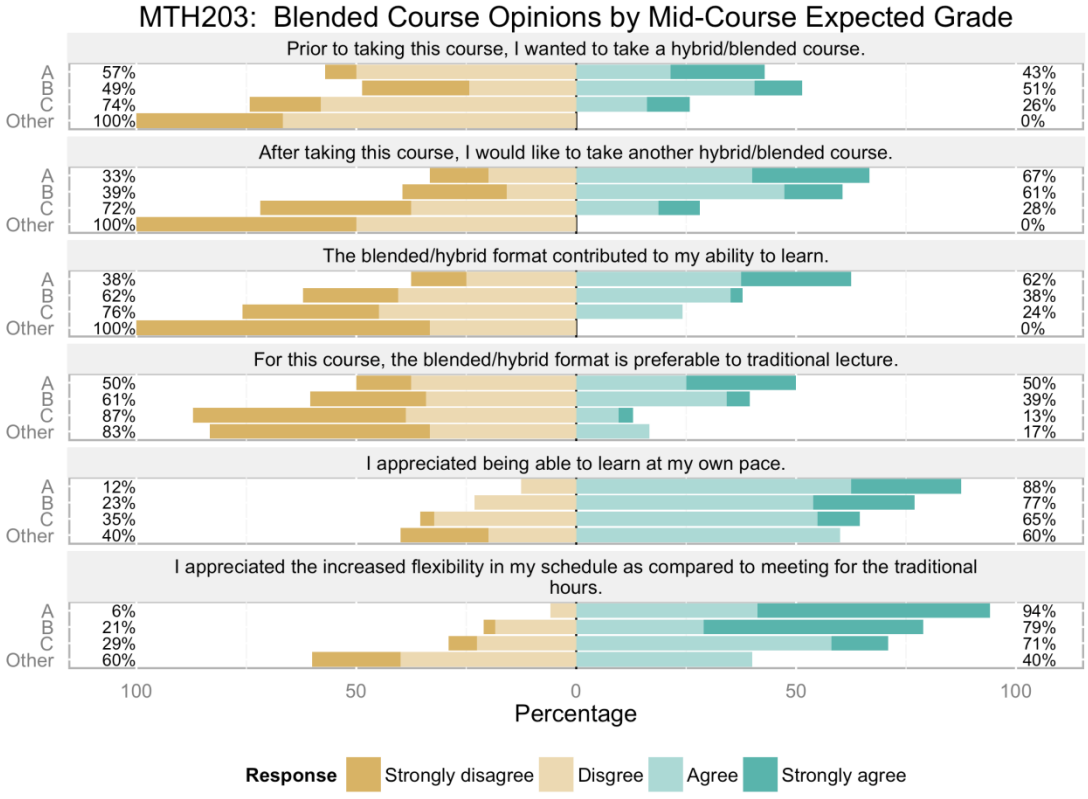


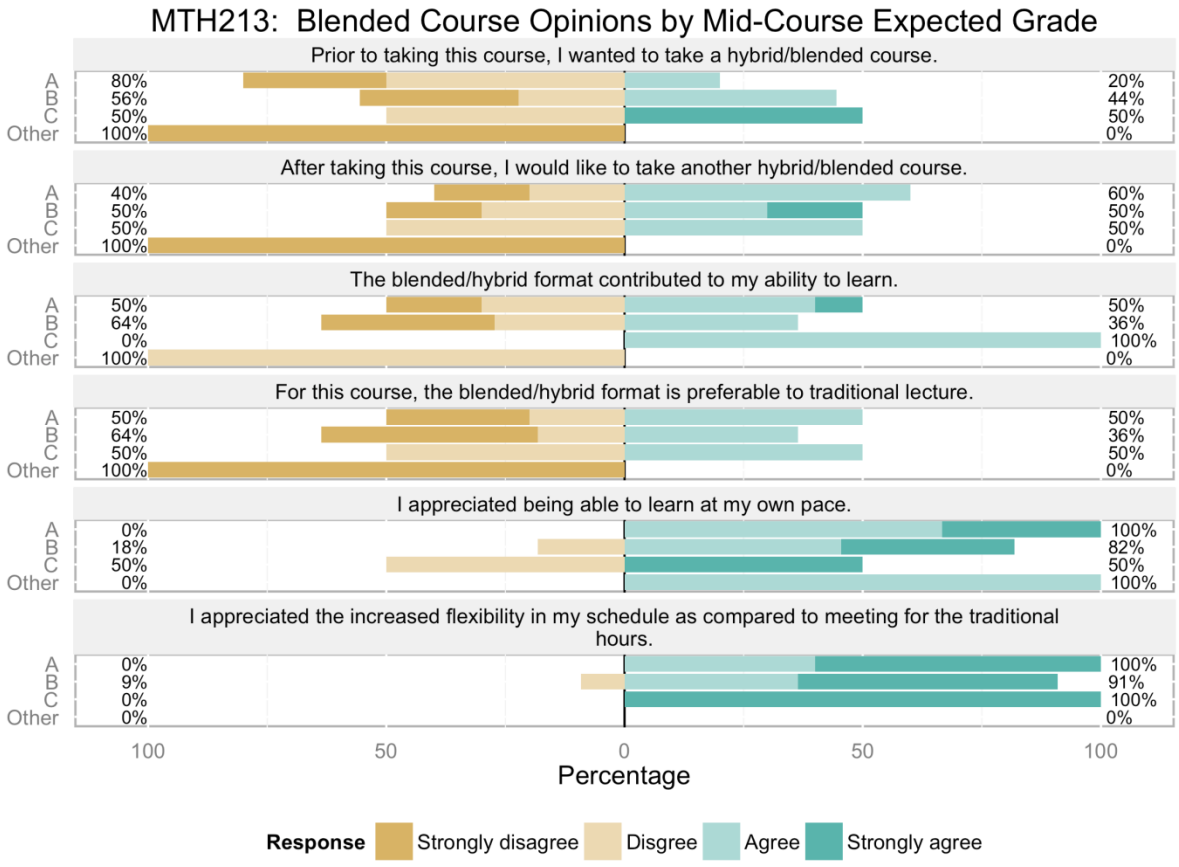

Student Opinions of Blended Format By Course
Prior to taking this course, I wanted to take a hybrid/blended course.
MTH303 51% 49%
MTH213 68% 32%
MTH203 62% 38%
CSC143 38% 63%
After taking this course, I would like to take another hybrid/blended course.
MTH303 34% 66%
MTH213 48% 52%
MTH203 54% 46%
CSC143 10% 90%
The blended/hybrid format contributed to my ability to learn.
MTH303 37% 63%
MTH213 54% 46%
MTH203 65% 35%
CSC143 13% 87%
For this course, the blended/hybrid format is preferable to traditional lecture.
MTH303 34% 66%
MTH213 58% 42%
MTH203 69% 31%
CSC143 10% 90%
I appreciated being able to learn at my own pace.
MTH303 10% 90%
MTH213 13% 87%
MTH203 26% 74%
CSC143 3% 97%
I appreciated the increased flexibility in my schedule as compared to meeting for the traditio
hours.
MTH303 11% 89%
MTH213 4% 96%
MTH203 23% 77%
CSC143 3% 97%
100
50
0
50
100
Percentage
Response
Strongly disagree
Disgree
Agree
Strongly agree

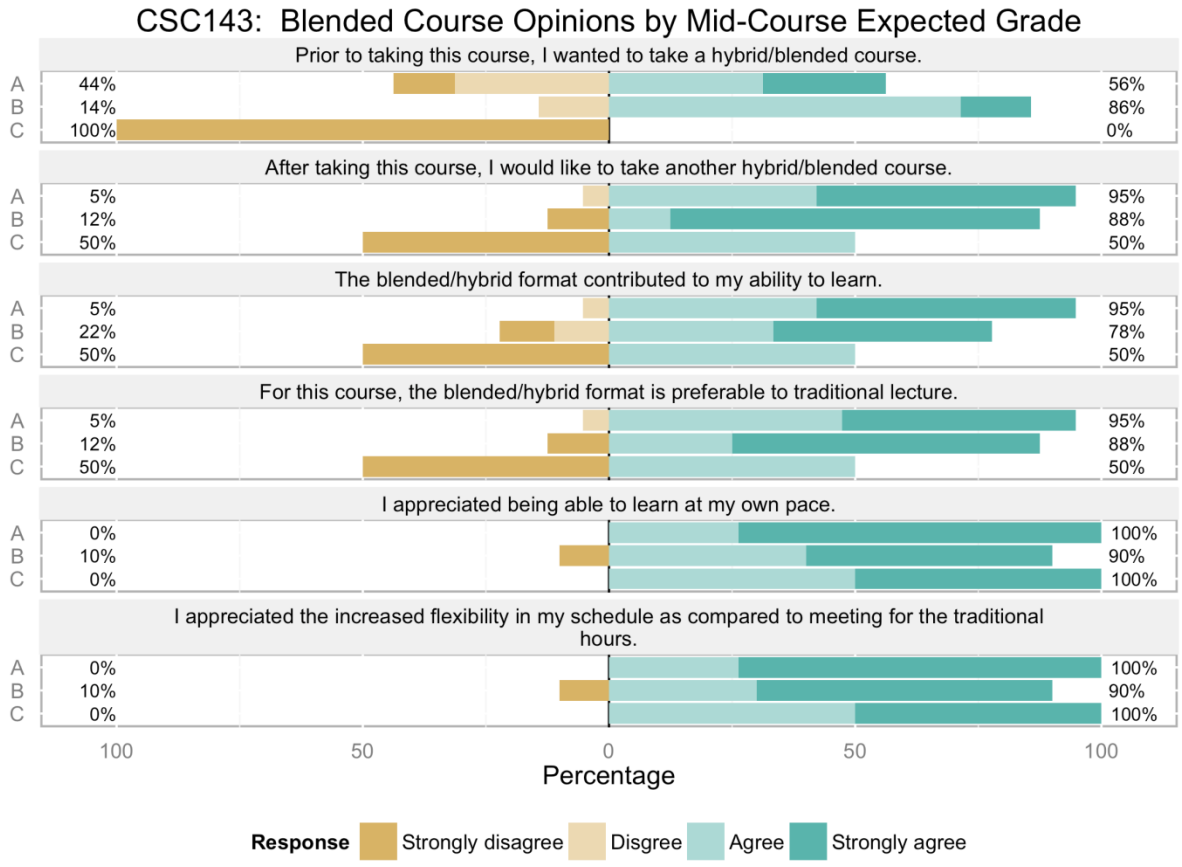

Student Opinions of What Helped By Course
I found the reading helpful in learning course material.
MTH303 45% 55%
MTH213 59% 41%
MTH203 34% 66%
CSC143 3% 97%
I found the online quizzes helpful in learning course material.
MTH303 28% 72%
MTH213 13% 87%
MTH203 46% 54%
CSC143 10% 90%
I found the online practice problems helpful in learning course material.
MTH303 14% 86%
MTH213 9% 91%
MTH203 32% 68%
CSC143 0% 100%
I found the written homework problems or labs helpful in learning course material.
MTH303 39% 61%
MTH213 25% 75%
MTH203 13% 87%
CSC143 6% 94%
I found the in-class activities and lectures helpful in learning course material.
MTH303 25% 75%
MTH213 43% 57%
MTH203 15% 85%
CSC143 14% 86%
100
50
0
50
100
Percentage
Response
Strongly disagree
Disgree
Agree
Strongly agree

Blended Course Survey Results Broken down by Mid-Term Expected Grade






MTH213: Blended Course Opinions by Mid-Course Expected Grade
Prior to taking this course, I wanted to take a hybrid/blended course.
A 80% 20%
B 56% 44%
C 50% 50%
Other 100% 0%
After taking this course, I would like to take another hybrid/blended course.
A 40% 60%
B 50% 50%
C 50% 50%
Other 100% 0%
The blended/hybrid format contributed to my ability to learn.
A 50% 50%
B 64% 36%
C 0% 100%
Other 100% 0%
For this course, the blended/hybrid format is preferable to traditional lecture.
A 50% 50%
B 64% 36%
C 50% 50%
Other 100% 0%
I appreciated being able to learn at my own pace.
A 0% 100%
B 18% 82%
C 50% 50%
Other 0% 100%
I appreciated the increased flexibility in my schedule as compared to meeting for the traditional hours.
A 0% 100%
B 9% 91%
C 0% 100%
Other 0% 0%
100
50
0
50
100
Percentage
Response
Strongly disagree
Disgree
Agree
Strongly agree


CSC143: Blended Course Opinions by Mid-Course Expected Grade
Prior to taking this course, I wanted to take a hybrid/blended course.
A 44% 56%
B 14% 86%
C 100% 0%
After taking this course, I would like to take another hybrid/blended course.
A 5% 95%
B 12% 88%
C 50% 50%
The blended/hybrid format contributed to my ability to learn.
A 5% 95%
B 22% 78%
C 50% 50%
For this course, the blended/hybrid format is preferable to traditional lecture.
A 5% 95%
B 12% 88%
C 50% 50%
I appreciated being able to learn at my own pace.
A 0% 100%
B 10% 90%
C 0% 100%
I appreciated the increased flexibility in my schedule as compared to meeting for the traditional hours.
A 0% 100%
B 10% 90%
C 0% 100%
100
50
0
50
100
Percentage
Response
Strongly disagree
Disgree
Agree
Strongly agree