Analysis Questions and Analysis Answers

For Academic Programs

Informed by your assessment activities related to student learning, what changes have you made in your degree program in the last three to five years? Describe the changes (e.g., curriculum revision, new courses, faculty development), the general results that prompted the changes (e.g., student performance on an assessment measure), and any impact on student learning that you might attribute to these changes.

Since I am an interim chair of the mathematics department began January 1, 2014. I will summarize the assessment of spring semester 2014 only. The mathematics department offered 12 core courses of its 13 core courses in the spring 2014 semester because MATH 145 Honors Calculus I is only offered in the Fall semester. Those core courses are divided into three groups and assessment results from the three groups are shown in the following tables, respectively.

Group I: Courses offered in the Math Technology Learning Center
Group II: Calculus courses
Group III: Sophomore level core courses

Group I (MTLC): MATH 110, MATH 112, MATH 113, MATH 115, MATH 121

<table>
<thead>
<tr>
<th>Core Courses</th>
<th># of student who took final exam</th>
<th># of student who met the goal</th>
<th>% of students who met the goal</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 110</td>
<td>466</td>
<td>378</td>
<td>81%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>MATH 112</td>
<td>1,153</td>
<td>791</td>
<td>69%</td>
<td>Goal was almost met.</td>
</tr>
<tr>
<td>MATH 113</td>
<td>464</td>
<td>367</td>
<td>79%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>MATH 115</td>
<td>29</td>
<td>19</td>
<td>74%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>MATH 121</td>
<td>641</td>
<td>479</td>
<td>65%</td>
<td>Goal was not met.</td>
</tr>
</tbody>
</table>

Goal I:
70% of students who took final exam demonstrated the ability to analyze, synthesize, and evaluate quantitative data

<table>
<thead>
<tr>
<th>Core Courses</th>
<th># of student who took final exam</th>
<th># of student who met the goal</th>
<th>% of students who met the goal</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 110</td>
<td>466</td>
<td>314</td>
<td>67%</td>
<td>Goal was not met.</td>
</tr>
<tr>
<td>MATH 112</td>
<td>1,153</td>
<td>909</td>
<td>79%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>MATH 113</td>
<td>464</td>
<td>352</td>
<td>76%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>MATH 115</td>
<td>29</td>
<td>21</td>
<td>74%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>MATH 121</td>
<td>641</td>
<td>415</td>
<td>65%</td>
<td>Goal was not met.</td>
</tr>
</tbody>
</table>

Group II (Calculus): MATH 125, MATH 126, MATH 146, MATH 227, MATH 247.
<table>
<thead>
<tr>
<th>Student Learning Outcome Goal</th>
<th>Measurement Instrument</th>
<th>Core Courses</th>
<th># of students who took final exam</th>
<th># of student who met the goal</th>
<th>% of students who met the goal</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal</td>
<td></td>
<td>MATH 125</td>
<td>441</td>
<td>348</td>
<td>79%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>70% of students who took final exam demonstrated a basic understanding of fundamental concepts in mathematics in this course.</td>
<td>Common set of embedded questions for final exam at end of semester.</td>
<td>MATH 126</td>
<td>527</td>
<td>406</td>
<td>77%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>MATH 146</td>
<td></td>
<td>49</td>
<td>48</td>
<td></td>
<td>98%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>MATH 227</td>
<td></td>
<td>377</td>
<td>290</td>
<td></td>
<td>77%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>MATH 247</td>
<td></td>
<td>28</td>
<td>21</td>
<td></td>
<td>75%</td>
<td>Goal was met.</td>
</tr>
</tbody>
</table>

**Group III: MATH 237, MATH 238, MATH 301**

<table>
<thead>
<tr>
<th>Student Learning Outcome Goal</th>
<th>Measurement Instrument</th>
<th>Core Courses</th>
<th># of students taking final exam</th>
<th># of student who met the goal</th>
<th>% of students who met the goal</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal I</td>
<td></td>
<td>MATH 237</td>
<td>174</td>
<td>150</td>
<td>86%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>70% of students who took final exam demonstrated a basic understanding of fundamental concepts in mathematics in this course.</td>
<td>Common set of embedded questions for final exam at end of semester.</td>
<td>MATH 238</td>
<td>615</td>
<td>553</td>
<td>90%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>MATH 301</td>
<td></td>
<td>178</td>
<td>141</td>
<td></td>
<td>79%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>Goal II</td>
<td></td>
<td>MATH 237</td>
<td>174</td>
<td>148</td>
<td>85%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>70% of students who took final exam demonstrated the ability to apply Mathematical knowledge.</td>
<td>Common set of embedded questions for final exam at end of semester.</td>
<td>MATH 238</td>
<td>615</td>
<td>549</td>
<td>89%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>MATH 301</td>
<td></td>
<td>178</td>
<td>143</td>
<td></td>
<td>80%</td>
<td>Goal was met.</td>
</tr>
<tr>
<td>Goal III</td>
<td></td>
<td>MATH 237</td>
<td>174</td>
<td>111</td>
<td>64%</td>
<td>Goal was not met.</td>
</tr>
<tr>
<td>70% of students who took final exam demonstrated the ability to write Mathematical Proofs.</td>
<td>Common set of embedded questions for final exam at end of semester.</td>
<td>MATH 238</td>
<td>Not required</td>
<td>Not required</td>
<td>Not required</td>
<td>NA</td>
</tr>
<tr>
<td>MATH 301</td>
<td></td>
<td>178</td>
<td>143</td>
<td></td>
<td>80%</td>
<td>Goal was met.</td>
</tr>
</tbody>
</table>

The mathematics department did very well on core courses from MATH 125 and above. The department met all goals set for those courses except one. The goal to have 70% of MATH 237 students demonstrate the ability to write mathematical proofs was not met. The data showed only 64% of MATH 237 students possessed that ability. The department will have a committee to search for ways to improve the outcome under this goal.

The MTLC provides all instructions to the core courses below MATH 125. Among 10 goals set for those 5 core courses, 6 goals were met; one was almost met, and three did not meet their goals. The pedagogy and computer softwares used at MTLC evolves continuously. It showed signs of improvement in last few years. The department is confident that it will meet all goals in the near future.

**Mission / Purpose**
1. Provide high-quality and broad-based undergraduate and graduate education to our B.S., M.A. and PhD students in mathematics and to other students taking mathematics courses. 2. Conduct high-quality research and scholarly activities that will advance the state of knowledge in mathematics. 3. Contribute to the mathematics profession and our society through service and outreach activities.

**Student Learning Outcomes, with Any Associations and Related Measures, Targets, Findings, and Action Plans**

**SLO 1: Understanding of Fundamental Concepts**
Undergraduate students will demonstrate a basic understanding of fundamental concepts in mathematics. Student Learning Outcome #1 Improvement Action(s) to be advanced (copied from 2010-11 report). We will review and discuss MA237’s syllabus before the fall semester starts, and find ways to make mathematical proofs and abstractions easier to understand and to apply, especially for first-time students.

**Connected Documents**
- Curriculum Maps II-Maths B.S.
- Curriculum Maps I-Maths B.S.
- Rubrics of Topics-Maths B.S.

**Relevant Associations:**
The assessment results show that both MA237 and MA238’s outcomes are above the expectation. The revised syllabus for MA237 seems working. We will continue our effort to improve students’ ability for mathematical abstractions and proofs.

**Standard Associations**
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

**General Education/Core Curriculum Associations**
- Mathematics - SLO is related to the essential characteristics and basic processes of inquiry and analysis in the discipline, encourages the development of critical thinking and requires students to analyze, synthesize and evaluate knowledge

**Strategic Plan Associations**
- University of Alabama
  - 1.1 Promote and enhance areas of academic, scholarship, and research excellence.

**Related Measures**

**M 1: Exam of Matrix Theory**
75% of students will achieve 70% or higher on embedded questions on the final exam of the Matrix Theory course.*

Source of Evidence: Standardized test of subject matter knowledge
**Target:**
75% of students will achieve 70% or higher on embedded questions on the final exam of the Matrix Theory course.

Finding (2013-2014) - Target: Met
Finding (2013-2014) - Target: Met
Fall 2013: MA 237-001, 002, 003, 004, 005, and 006 were taught by Drs. Corson, Kwok, Lewis, Mai, Trace and Mr. Banjade. With 179 students took the final, 81.5% (or 146) made 70% or higher on the embedded problems.

Spring 2014: MA 237-001, 002, 003, 004, and 005 were taught by Drs. Trent, Liem, Evans, Belbas and Mr. Duong. With 174 students took the final, 86% (or 150) made 70% or higher on the embedded problems.

**M 2: Exam of the Differential Equation**
75% of students will achieve 70% or higher on embedded questions on the final exam of the Differential Equation course.

Source of Evidence: Standardized test of subject matter knowledge
**Target:**
75% of students will achieve 70% or higher on embedded questions on the final exam of the Differential Equation course.

Finding (2013-2014) - Target: Met
Finding (2013-2014) - Target: Met
Fall 2013: MA 238-001, 002, 003, 004, 005, 006, 007 were taught by Chataut, Acharyya, Ying, Duong, Tian, Dar Assi and Dr. Wang. With 343 students took the final, 77.5% (or 266) made 70% or higher on the embedded problems.

Spring 2014: MA 238-001, 002, 003, 004, 005, 006, 007, and 008 were taught by Liu, Banjade, Song, Chataut, Duong Ying, and Acharyya. With 615 students took the final, 90% (or 553) made 70% or higher on the embedded problems.

**M 3: Improved student learning of MA237**
Faculty who teaches MA237 will be asked to evaluate whether the student learning improves under the revised syllabus.

Source of Evidence: Academic indirect indicator of learning - other
**Target:**
75% of faculty who taught MA237 agree that the student learning improves under the revised syllabus.

Finding (2013-2014) - Target: Met
Finding (2013-2014) - Target: Somewhat Met
Fall 2013: 83.3% of instructors (or 5 out of 6) who taught MA237 agree that the student learning improves
under the revised syllabus.
Spring 2014: 50% of instructors (2 instructor agreed, 2 disagreed, 1 did not vote) who taught MA237 agree that the student learning improves under the revised syllabus.

SLO 2: Skills of Single and Multivariable Calculus
By the completion of Calculus III, undergraduate students will have proficient skills of single variable and multivariable calculus.

Connected Documents
Curriculum Maps I-Maths B.S.
Curriculum Maps I-Maths B.S.
Rubrics of Topics-Maths B.S.

Relevant Associations:
The assessment results show that our students, in general, have a basic understanding of single variable and multivariable calculus. The results are better than those of the previous assessment. We will certainly continue our effort.

Standard Associations
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations
8. Mathematics - SLO is related to the essential characteristics and basic processes of inquiry and analysis in the discipline, encourages the development of critical thinking and requires students to analyze, synthesize and evaluate knowledge

Strategic Plan Associations
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures

M 4: Exams of Calculus I and II
70% of students will achieve 70% or higher on one variable calculus problems embedded in the final exams of Calculus I and II.
Source of Evidence: Standardized test of subject matter knowledge

Target:
70% of students will achieve 70% or higher on one variable calculus problems embedded in the final exams of Calculus I and II.

Finding (2013-2014) - Target: Met
Target: Met
Fall 2013: MA125-001, 002, 003, 004, 006, 007, 008, 009, 010, 011, 012, 013 and MA126-001, 003, 004, 005, 006, 007, 008 are taught by Drs. Allen, Corson, Dexion, Evans, Hadji, Halpern, Hisia, Kown, Lee, Lewis, Moen, Moore, and Roberts. 822 students took the MA125 final exam and 79.7% (or 655) made 70% or higher on the embedded one variable calculus problems; 435 students took the MA126 final exam and 70.4% (or 319) made 70% or higher on the embedded one variable calculus problems.

Spring 2014: MA125-002, 003, 004, 005, 006, 007, 008, and MA126-001, 002, 003, 004, 005, 006, 007, 009 as well as MA 146 - 002 were taught by Drs. Allen, Moen, Mai, Roberts, Moore, Lee, Trace, Song, Zhu, P. Wang, Halpern, and Evans. 441 students took the MA125 final exam and 79% (or 348) made 70% or higher on the embedded one variable calculus problems; 527 students took the MA126 final exam and 77% (or 406) made 70% or higher; 49 students took the MA 146 final exam and 98% (or 48) on the embedded one variable calculus problems.

M 5: Exam of Calculus III
70% of students will achieve 70% or higher on multi-variable calculus problems embedded in the final exam of Calculus III.
Source of Evidence: Standardized test of subject matter knowledge

Target:
70% of students will achieve 70% or higher on multi-variable calculus problems embedded in the final exam of Calculus III.

Finding (2013-2014) - Target: Met
Target: Met
Fall 2013:
MA227-001, 002, 003, 004, 005, 006 were taught by Drs. Neggers, Trent, Trace, Liem, P. Wang, Hadji. 485 students took the MA227 final exam, and 81.6% (or 396) made 70% or higher on the embedded multi-variable calculus problems.

Spring 2014:
MA227-001, 002, 003, 004, 005, 006 and MA 247 were taught by Drs. Neggers, J. Wang, Sun, Trace, Corson, and Lewis. 377 students took the MA227 final exam, and 77% (or 290) made 70% or higher on the embedded multi-variable calculus problems. 28 students took the MA247 final exam, and 75% (or 21) made 70% or higher on the embedded multi-variable calculus problems.

SLO 3: Ability to Write Maths Proofs
Undergraduate students will demonstrate the ability to write mathematical proofs. Student Learning Outcome #3 Improvement Action(s) to be advanced (copied from 2010-11 report). We will review and discuss MA237’s syllabus before the fall semester starts, and find ways to make mathematical proofs and abstractions easier to understand and to apply, especially for first-time students.
Connected Documents
Curriculum Maps II-Maths B.S
Curriculum Maps I-Maths B.S
Rubrics of Topics-Maths B.S

Relevant Associations:
The assessment results show that our students in general have the ability to write mathematical proofs. The result for MA237 reflects the challenge for students writing proofs the first time. MA301 is a course where proofs are systematically studied and applied. The result shows that we have done a good job toward student learning. We will continue the effort to make mathematical proofs easier to understand and to apply in MA237.

Standard Associations
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations
8 Mathematics - SLO is related to the essential characteristics and basic processes of inquiry and analysis in the discipline, encourages the development of critical thinking and requires students to analyze, synthesize and evaluate knowledge

Strategic Plan Associations
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures

M 6: Exam of Matrix Theory
70% of students will achieve 70% or higher on embedded proof questions in the final exam of the Matrix Theory course.

Source of Evidence: Standardized test of subject matter knowledge

Target:
70% of students will achieve 70% or higher on embedded proof questions in the final exam of the Matrix Theory course.

Finding (2013-2014) - Target: Met
Target: Met
Finding (2013-2014) - Target: Not Met
Fall 2013: MA 237-001, 002, 003, 004, and 005, nd 006 were taught by Drs. Corson, Kwon, Lewis, Mai, Trace and Mr. Banjade. With 179 students took the final, 81.5% (or 146) made 70% or higher on the embedded proof questions in the final exam of the Matrix Theory course.
Spring 2014: MA 237-001, 002, 003, 004, 005, and 006 were taught by Drs. Trent, Liem, Evans, Belbas, and Mr. Duong. With 174 students took the final, 64% (or 111) made 70% or higher on the embedded proof questions in the final exam of the Matrix Theory course.

Related Action Plans (by Established cycle, then alpha):
For full information, see the Details of Action Plans section of this report.

Mathematical proofs
Established in Cycle: 2011-2012
We will continue our effort to improve students’ ability on mathematical proofs. A committee will be formed in the fall to discu...

M 7: Exam of Discrete Mathematics
75% of students will achieve 70% or higher on embedded proof questions in the final exam of the Discrete Mathematics course.

Source of Evidence: Standardized test of subject matter knowledge

Target:
75% of students will achieve 70% or higher on embedded proof questions in the final exam of the Discrete Mathematics course.

Finding (2013-2014) - Target: Met
No data available for fall 2013 semester.
Spring 2014: Math 301 - 001, 002, 003, 004, and 005 were taught by Drs. J. Wang, Kwon, Liem, and Corson. With 178 students took the final, 80% (or 143) made 70% or higher on the embedded proof questions in the final exam of Discrete Mathematics Course.

M 8: Improved student learning of MA237
Faculty who teaches MA237 will be asked to evaluate whether the student learning improves under the revised syllabus.

Source of Evidence: Academic indirect indicator of learning - other

Target:
75% of faculty who taught MA237 agree that the student learning improves under the revised syllabus.

Finding (2013-2014) - Target: Not Met
Among 5 instructors who taught math 237 in spring 2014, 2 of them agreed and 2 of them disagreed that the student learning improves under the revised syllabus. One instructor did not cast his opinion about this question.

SLO 4: Apply Maths Knowledge
Undergraduate students will demonstrate the ability to apply mathematical knowledge.
Relevant Associations:
The assessment results show that our students have the ability to apply mathematical knowledge. The results show a much better than expected learning outcome! Being able to apply the mathematical knowledge is one of the most important goals of our program. We are very satisfied with this outcome.

Standard Associations
SACS 3.3.1
3.3.1.1. Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations
8 Mathematics - SLO is related to the essential characteristics and basic processes of inquiry and analysis in the discipline, encourages the development of critical thinking and requires students to analyze, synthesize and evaluate knowledge

Strategic Plan Associations
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures

M 9: Tests of the Differential Equations
75% of students will achieve 70% or higher on embedded questions in the tests of the Differential Equations course.
Source of Evidence: Standardized test of subject matter knowledge

Target:
75% of students will achieve 70% or higher on embedded questions in the tests of the Differential Equations course.

Finding (2013-2014) - Target: Met
Fall semester 2013: not data available
Spring semester 2014: MATH238 – 001, 002, 003, 004, 005, 006, 007, and 008 were taught by Liu, Banjade, Song, Chataut, Duong, Ying, and Acharyya. With 615 students who took final exam, 89% (or 549) achieved 70% or higher on embedded questions in the tests of the Differential Equation course.

M 10: Tests of the Matrix Theory
75% of students will achieve 70% or higher on embedded questions in the tests of the Matrix Theory course.
Source of Evidence: Standardized test of subject matter knowledge

Target:
75% of students will achieve 70% or higher on embedded questions in the tests of the Matrix Theory course.

Other Outcomes, with Any Associations and Related Measures, Targets, Findings, and Action Plans

OthOtcm 5: Program Outcome: Improve the program and sustain the quality
The program will improve and sustain a high level of recognized quality.

Connected Documents
Maths Major Survey-Maths B.S.
Rubrics of Topics-Maths B.S.

Relevant Associations:
The survey results show that our program is in general highly valued by our students. We are able to offer all required courses at least once a year. We are starting a Research Experience Program, which will certainly add values to our program.

Related Measures

M 11: Offer courses at least once a year
All required math courses for majors will be offered at least once a year.

Source of Evidence: Academic indirect indicator of learning - other

Target:
All required courses will be offered at least once a year.

Finding (2013-2014) - Target: Met
All required courses are offered at least once a year. However, couple graduate level courses did not run due to the low enrollment.

M 12: Math Major Survey
An average of 4 points from the Math Major Survey conducted during the advising periods is a good indicator for a high level of recognized quality.

Source of Evidence: Student course evaluations on learning gains made

Target:
An average of 4 points from the Math Major Survey

Finding (2013-2014) - Target: Met
Out of 335 math major students, 52 responded to the Math Major Survey. The averages are: My rating of the Math B.S. Program: 3.56 The Math B.S. Program is highly valued to me: 4.17.

Related Action Plans (by Established cycle, then alpha):

Major survey
Established in Cycle: 2011-2012
We plan to conduct the major survey at least once a semester. If necessary, we will organize several focus group discussion.

For full information, see the Details of Action Plans section of this report.
OthOtcm 6: Program Outcome: Optimal enrollments and degree completions
The program will build and sustain an optimal level of annual program enrollments and degree completions.
Connected Documents
  Maths Major Survey-Maths B.S.
  Rubrics of Topics-Maths B.S.

Relevant Associations:
We have achieved both goals of increasing enrollment by 10% and double the graduation rate set by ACHE. We will continue our effort.

Related Measures

M 13: Increase the total maths majors
Increase the total math majors by 10%. Currently we have 100 math majors.
Source of Evidence: Academic indirect indicator of learning - other
Target: 110 math majors.
Finding (2013-2014) - Target: Met
The data provided by A&S indicated that we have 302 math majors at the end of spring 2014 copared with 294 math majors at the end of spring 2013, which is an 3% increase.

M 14: Double the degree completion requirement
Double the degree completion requirement set by ACHE: 7.5 graduates/year.
Source of Evidence: Academic indirect indicator of learning - other
Target: To have at least 15 B.S. degree completion for the academic year of 2011-12.
Finding (2013-2014) - Target: Met
We have produced 35 Baccalaureates during the academic year of 2013 - 2014.

OthOtcm 7: Program Outcome: Valued by graduates and others
The program will be highly valued by its program graduates and other key constituencies it serves.
Connected Documents
  Maths Major Survey-Maths B.S.
  Rubrics of Topics-Maths B.S.

Relevant Associations:
The survey shows that the Math B.S. Program is highly valued by our students and the quality of our undergraduate program is also evidenced by the fact that 100% of math majors accepted by UA graduate program among those applied.

Related Measures

M 15: Math Major Survey
An average of 4 points from the Math Major Survey conducted during the advising periods is a good indicator for the program being highly valued.
Source of Evidence: Student course evaluations on learning gains made
Target: At least a 4 point average on the survey question “Math B.S. Program is highly valued to me”
Finding (2013-2014) - Target: Met
The average for the question of “Math B.S. Program is highly valued to me” is 4.17

M 16: Acceptance rate of maths majors
Percentage of math majors accepted by UA graduate programs among those applied.
Source of Evidence: Graduate/professional school acceptance rate
Target: We will accept 100 percent of those applicants met the requirements.
Finding (2013-2014) - Target: Met
All math majors applied to our graduate program have been accepted. The feedback info also suggest that all math majors are accepted by UA graduate programs if they applied.

Details of Action Plans for This Cycle (by Established cycle, then alpha)

Major survey
We plan to conduct the major survey at least once a semester. If necessary, we will organize several focus group discussion.
Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High
Relationships (Measure | Outcome/Objective):
  Measure: Math Major Survey | Outcome/Objective: Program Outcome: Improve the program and sustain the quality

Mathematical proofs
We will continue our effort to improve students’ ability on mathematical proofs. A committee will be formed in the fall to discuss the detail. A plan is expected at the end of the fall semester.
Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: Hgh

Relationships (Measure | Outcome/Objective):
  Measure: Exam of Matrix Theory | Outcome/Objective: Ability to Write Maths Proofs
Mission / Purpose

1. Provide high-quality and broad-based undergraduate and graduate education to our B.S., M.A. and PhD students in mathematics and to other students taking mathematics courses. 2. Conduct high-quality research and scholarly activities that will advance the state of knowledge in mathematics. 3. Contribute to the mathematics profession and our society through service and outreach activities.

Student Learning Outcomes, with Any Associations and Related Measures, Targets, Findings, and Action Plans

SLO 1: Understanding of Fundamental Concepts
Undergraduate students will demonstrate a basic understanding of fundamental concepts in mathematics. Student Learning Outcome #1 Improvement Action(s) to be advanced (copied from 2010-11 report). We will review and discuss MA237's syllabus before the fall semester starts, and find ways to make mathematical proofs and abstractions easier to understand and to apply, especially for first-time students.

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Curriculum Maps I-Maths B.S.
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Relevant Associations:
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Standard Associations
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations

Strategic Plan Associations
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures

M 1: Exam of Matrix Theory
75% of students will achieve 70% or higher on embedded questions on the final exam of the Matrix Theory course.

Source of Evidence: Standardized test of subject matter knowledge

Target:
75% of students will achieve 70% or higher on embedded questions on the final exam of the Matrix Theory course.

Finding (2012-2013) - Target: Met
Fall 2012: MA 237-001, 002, and 004 are taught by Drs. Trace and Halpern. With 105 students took the final, 82% (or 86) made 70% or higher on the embedded problems. Spring 2012: MA 237-001, 002, and 004 are taught by Drs. Liem, Trent and Evans. With 96 students took the final, 82.3% (or 79) made 70% or higher on the embedded problems.

M 2: Exam of the Differential Equation
75% of students will achieve 70% or higher on embedded questions on the final exam of the Differential Equation course.

Source of Evidence: Standardized test of subject matter knowledge

Target:
75% of students will achieve 70% or higher on embedded questions on the final exam of the Differential Equation course.

Finding (2012-2013) - Target: Met
Spring 2013: MA 238-001, 002, 003, 004, 005 and 010 are taught by Drs. Roberts, Liem, Lee, and P. Wang. With 241 students took the final, 77.2% (or 186) made 70% or higher on the embedded problems

M 3: Improved student learning of MA237
Faculty who teaches MA237 will be asked to evaluate whether the student learning improves under the revised syllabus.

Source of Evidence: Academic indirect indicator of learning - other

Target:
75% of faculty who taught MA237 agree that the student learning improves under the revised syllabus.

Finding (2012-2013) - Target: Met
83.3% of faculty (or 5 our of 6) who taught MA237 agree that the student learning improves under the revised
SLO 2: Skills of Single and Multivariable Calculus
By the completion of Calculus III, undergraduate students will have proficient skills of single variable and multivariable calculus.

Connected Documents
Curriculum Maps II-Maths B.S.
Curriculum Maps I-Maths B.S.
Rubrics of Topics-Maths B.S.

Relevant Associations:
The assessment results show that our students, in general, have a basic understanding of single variable and multivariable calculus. The results are better than those of the previous assessment. We will certainly continue our effort.

Standard Associations
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations
8. Mathematics - SLO is related to the essential characteristics and basic processes of inquiry and analysis in the discipline, encourages the development of critical thinking and requires students to analyze, synthesize and evaluate knowledge

Strategic Plan Associations
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures
M 4: Exams of Calculus I and II
70% of students will achieve 70% or higher on one variable calculus problems embedded in the final exams of Calculus I and II.

Source of Evidence: Standardized test of subject matter knowledge

Target:
70% of students will achieve 70% or higher on one variable calculus problems embedded in the final exams of Calculus I and II.

Finding (2012-2013) - Target: Met
Fall 2012: MA125-003,004, 007, 008; MA126-001, 002, 005, 006 are taught by Drs. Allen, Hsia, Corson, Evans, Hadji, and Sidje. 298 students took the MA125 final from the four randomly selected sections, and 85.2% (or 254) made 70% or higher on the embedded one variable calculus problems; 277 students took the MA126 final from four randomly selected sections and 75.5% (or 209) made 70% or higher on the embedded one variable calculus problems.

Spring 2013: MA125-003, 004, 006; MA126-004, 006, 008 are taught by Drs. Allen, Hsia, Hadji, Evans, and Roberts. 243 students took the MA125 final from the three randomly selected sections and 76.5% (or 186) made 70% or higher on the embedded one variable calculus problems; 235 students took the MA126 final from three randomly selected sections, and 79.6% (or 167) made 70% or higher on the embedded one variable calculus problems.

M 5: Exam of Calculus III
70% of students will achieve 70% or higher on multi-variable calculus problems embedded in the final exam of Calculus III.

Source of Evidence: Standardized test of subject matter knowledge

Target:
70% of students will achieve 70% or higher on multi-variable calculus problems embedded in the final exam of Calculus III.

Finding (2012-2013) - Target: Met
Fall 2012: MA227-007, 009 are taught by Drs. Geng and P. Wang. 89 students took the MA227 final from the two randomly selected sections, and 79.8% (or 71) made 70% or higher on the embedded multi-variable calculus problems.

Spring 2013: MA227-002, 003, 004, 009 are taught by Drs. Sidje, Helpem, P. Wang, and Neggers. 169 students took the MA227 final from the four randomly selected sections, and 86.4% (or 146) made 70% or higher on the embedded multi-variable calculus problems.

SLO 3: Ability to Write Maths Proofs
Undergraduate students will demonstrate the ability to write mathematical proofs. Student Learning Outcome #3 Improvement Action(s) to be advanced (copied from 2010-11 report). We will review and discuss MA237’s syllabus before the fall semester starts, and find ways to make mathematical proofs and abstractions easier to understand and to apply, especially for first-time students.

Connected Documents
Curriculum Maps II-Maths B.S.
Curriculum Maps I-Maths B.S.
Rubrics of Topics-Maths B.S.

Relevant Associations:
The assessment results show that our students in general have the ability to write mathematical proofs. The result for MA237 reflects the challenge for students writing proofs the first time. MA301 is a course where proofs are systematically studied and applied. The result shows that we have done a good job toward student learning. We will continue the effort to make mathematical proofs easier to understand and to apply in MA237.
Standard Associations
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations
8 Mathematics - SLO is related to the essential characteristics and basic processes of inquiry and analysis in the discipline, encourages the development of critical thinking and requires students to analyze, synthesize and evaluate knowledge.

Strategic Plan Associations
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures

M 6: Exam of Matrix Theory
70% of students will achieve 70% or higher on embedded proof questions in the final exam of the Matrix Theory course.

Source of Evidence: Standardized test of subject matter knowledge

Target:
70% of students will achieve 70% or higher on embedded proof questions in the final exam of the Matrix Theory course.

Finding (2012-2013) - Target: Partially Met
Fall 2012: MA237-001, 002, 004 are taught by Drs. Trace and Halpern. 105 students took the final and 52.4% (or 55) made 70% or higher on the embedded questions designed to test the ability to write mathematical proofs.

Spring 2012: MA237-001, 002, 004 are taught by Drs. Liem, Trent and Evans. 105 students took the final and 69.5% (or 73) made 70% or higher on the embedded questions designed to test the ability to write mathematical proofs.

Related Action Plans (by Established cycle, then alpha):
For full information, see the Details of Action Plans section of this report.

Mathematical proofs
Established in Cycle: 2011-2012
We will continue our effort to improve students' ability on mathematical proofs. A committee will be formed in the fall to discu...

M 7: Exam of Discrete Mathematics
75% of students will achieve 70% or higher on embedded proof questions in the final exam of the Discrete Mathematics course.

Source of Evidence: Standardized test of subject matter knowledge

Target:
75% of students will achieve 70% or higher on embedded proof questions in the final exam of the Discrete Mathematics course.

Finding (2012-2013) - Target: Met
Fall 2012 and Spring 2013: MA301-001, 001, 003, 004, 005 are taught by Drs. Trace, Lee and Moore. 185 students took the final and 76.8% (or 142) made 70% or higher on the embedded questions designed to test the ability to write mathematical proofs.

M 8: Improved student learning of MA237
Faculty who teaches MA237 will be asked to evaluate whether the student learning improves under the revised syllabus.

Source of Evidence: Academic indirect indicator of learning - other

Target:
75% of faculty who taught MA237 agree that the student learning improves under the revised syllabus.

Finding (2012-2013) - Target: Met
83.3% of faculty (or 5 our of 6) who taught MA237 agree that the student learning improves under the revised syllabus.

SLO 4: Apply Maths Knowledge
Undergraduate students will demonstrate the ability to apply mathematical knowledge.

Connected Documents
Curriculum Maps II-Maths B.S.
Curriculum Maps I-Maths B.S.
Rubrics of Topics-Maths B.S.

Relevant Associations:
The assessment results show that our students have the ability to apply mathematical knowledge. The results show a much better than expected learning outcome! Being able to apply the mathematical knowledge is one of the most important goals of our program. We are very satisfied with this outcome.

Standard Associations
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations
8 Mathematics - SLO is related to the essential characteristics and basic processes of inquiry and analysis in the discipline, encourages the development of critical thinking and requires students to analyze, synthesize and
evaluate knowledge

Strategic Plan Associations
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures

M 9: Tests of the Differential Equations
75% of students will achieve 70% or higher on embedded questions in the tests of the Differential Equations course.
Source of Evidence: Standardized test of subject matter knowledge

Target:
75% of students will achieve 70% or higher on embedded questions in the tests of the Differential Equations course.

Finding (2012-2013) - Target: Met
Fall 2012 and Spring 2013: MA238-007, 001, 002, 003, 004, 005 are taught by Drs. Sidje, Roberts, Liem and Lee. With 244 students took the final, 80.3% (or 196) made 70% or higher on the embedded questions designed to test the ability to apply mathematical knowledge.

M 10: Tests of the Matrix Theory
75% of students will achieve 70% or higher on embedded questions in the tests of the Matrix Theory course.
Source of Evidence: Standardized test of subject matter knowledge

Target:
75% of students will achieve 70% or higher on embedded questions in the tests of the Matrix Theory course.

Finding (2012-2013) - Target: Met
Fall 2013: MA237-001,002,004 are taught by Drs. Trace and Hulpem. With 105 students took the final, 89.5% (or 94) made 70% or higher on the embedded questions designed to test the ability to apply mathematical knowledge.

Spring 2013: MA237-001,002,004 are taught by Drs. Liem, Trent and Kwon. With 98 students took the final, 86.70% (or 85) made 70% or higher on the embedded questions designed to test the ability to apply mathematical knowledge.

Other Outcomes, with Any Associations and Related Measures, Targets, Findings, and Action Plans

OthOtcm 5: Program Outcome: Improve the program and sustain the quality
The program will improve and sustain a high level of recognized quality.

Connected Documents
Maths Major Survey-Maths B.S.
Rubrics of Topics-Maths B.S.

Relevant Associations:
The survey results show that our program is in general highly valued by our students. We are able to offer all required courses at least once a year. We are starting a Research Experience Program, which will certainly add values to our program.

Related Measures

M 11: Offer courses at least once a year
All required math courses for majors will be offered at least once a year.
Source of Evidence: Academic indirect indicator of learning - other

Target:
All required courses will be offered at least once a year.

Finding (2012-2013) - Target: Met
All required courses are offered at least once a year. However, couple graduate level courses did not run due to the low enrollment.

M 12: Math Major Survey
An average of 4 points from the Math Major Survey conducted during the advising periods is a good indicator for a high level of recognized quality.
Source of Evidence: Student course evaluations on learning gains made

Target:
An average of 4 points from the Math Major Survey

Finding (2012-2013) - Target: Met
Our of 130 math major students, 60 responded to the Math Major Survey. The averages are: My rating of the Math B.S. Program: 4.02 The Math B.S. Program is highly valued to me: 4.24

Related Action Plans (by Established cycle, then alpha):

Major survey
Established in Cycle: 2011-2012
We plan to conduct the major survey at least once a semester. If necessary, we will organize several focus group discussion.

For full information, see the Details of Action Plans section of this report.

OthOtcm 6: Program Outcome: Optimal enrollments and degree completions
The program will build and sustain an optimal level of annual program enrollments and degree completions.

Connected Documents
Relevant Associations:
We have achieved both goals of increasing enrollment by 10% and double the graduation rate set by ACHE. We will continue our effort.

Related Measures

**M 13: Increase the total maths majors**
Increase the total maths majors by 10%. Currently we have 100 maths majors.
Source of Evidence: Academic indirect indicator of learning - other
Target:
110 maths majors.
Finding (2012-2013) - Target: Met
The data provided by A&S indicated that we have 130 maths majors at the end of Spring 2013, which is an 18% increase.

**M 14: Double the degree completion requirement**
Double the degree completion requirement set by ACHE: 7.5 graduates/year.
Source of Evidence: Academic indirect indicator of learning - other
Target:
To have at least 15 B.S. degree completion for the academic year of 2011-12.
Finding (2012-2013) - Target: Met
We have produced 38 Baccalaureates during the academic year (30 last academic year).

**OthOtcm 7: Program Outcome: Valued by graduates and others**
The program will be highly valued by its program graduates and other key constituencies it serves.

Connected Documents
Maths Major Survey-Maths B.S.
Rubrics of Topics-Maths B.S.

Relevant Associations:
The survey shows that the Math B.S. Program is highly valued by our students and the quality of our undergraduate program is also evidenced by the fact that 100% of math majors accepted by UA graduate program among those applied.

Related Measures

**M 15: Math Major Survey**
An average of 4 points from the Math Major Survey conducted during the advising periods is a good indicator for the program being highly valued.
Source of Evidence: Student course evaluations on learning gains made
Target:
At least a 4 point average on the survey question "Math B.S. Program is highly valued to me"
Finding (2012-2013) - Target: Met
The average for the question of "Math B.S. Program is highly valued to me" is 4.24

**M 16: Acceptance rate of maths majors**
Percentage of math majors accepted by UA graduate programs among those applied.
Source of Evidence: Graduate/professional school acceptance rate
Target:
We will accept 100 percent of those applicants met the requirements.
Finding (2012-2013) - Target: Met
All math majors applied to our graduate program have been accepted. The feedback info also suggest that all math majors are accepted by UA graduate programs if they applied.

Details of Action Plans for This Cycle (by Established cycle, then alpha)

**Major survey**
We plan to conduct the major survey at least once a semester. If necessary, we will organize several focus group discussion.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

**Relationships (Measure | Outcome/Objective):**
Measure: Math Major Survey | Outcome/Objective: Program Outcome: Improve the program and sustain the quality

**Mathematical proofs**
We will continue our effort to improve students’ ability on mathematical proofs. A committee will be formed in the fall to discuss the detail. A plan is expected at the end of the fall semester.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

**Relationships (Measure | Outcome/Objective):**
Measure: Exam of Matrix Theory | Outcome/Objective: Ability to Write Maths Proofs
Mission / Purpose

1. Provide high-quality and broad-based undergraduate and graduate education to our B.S., M.A. and PhD students in mathematics and to other students taking mathematics courses. 2. Conduct high-quality research and scholarly activities that will advance the state of knowledge in mathematics. 3. Contribute to the mathematics profession and our society through service and outreach activities.

Student Learning Outcomes, with Any Associations and Related Measures, Targets, Findings, and Action Plans

SLO 1: Understanding of Fundamental Concepts
Undergraduate students will demonstrate a basic understanding of fundamental concepts in mathematics. Student Learning Outcome #1 Improvement Action(s) to be advanced (copied from 2010-11 report). We will review and discuss MA237’s syllabus before the fall semester starts, and find ways to make mathematical proofs and abstractions easier to understand and to apply, especially for first-time students.

Connected Documents
Curriculum Maps II-Maths B.S.
Curriculum Maps I-Maths B.S.
Rubrics of Topics-Maths B.S.

Relevant Associations:
The assessment results show that both MA237 and MA238’s outcomes are above the expectation. The revised syllabus for MA237 seems working. We will continue our effort to improve students’ ability for mathematical abstractions and proofs.

Standard Associations
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations
8 Mathematics - SLO is related to the essential characteristics and basic processes of inquiry and analysis in the discipline, encourages the development of critical thinking and requires students to analyze, synthesize and evaluate knowledge

Strategic Plan Associations
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures

M 1: Exam of Matrix Theory
75% of students will achieve 70% or higher on embedded questions on the final exam of the Matrix Theory course.

Source of Evidence: Standardized test of subject matter knowledge

Target:
75% of students will achieve 70% or higher on embedded questions on the final exam of the Matrix Theory course.

Finding (2011-2012) - Target: Met
Fall 2011: MA 237-001, 002, and 003 are taught by Drs. Trace and Moore. With 113 students took the final, 85% (or 96) made 70% or higher on the embedded problems.

Spring 2012: MA 237-001, 002, 003 and 004 are taught by Drs. Zhu, Trent and Trace. With 125 students took the final, 84.8% (or 106) made 70% or higher on the embedded problems.

M 2: Exam of the Differential Equation
75% of students will achieve 70% or higher on embedded questions on the final exam of the Differential Equation course.

Source of Evidence: Standardized test of subject matter knowledge

Target:
75% of students will achieve 70% or higher on embedded questions on the final exam of the Differential Equation course.

Finding (2011-2012) - Target: Met
Fall 2011: MA 238-001 and 005 are taught by Drs. Sidje and Zhao. With 72 students took the final, 79.2% (or 57) made 70% or higher on the embedded problems.

Spring 2012: MA 238-001, 002, 004 and 008 are taught by Drs. Haji, Liem, Geng, and Moen. With 158 students took the final, 76.6% (or 121) made 70% or higher on the embedded problems.

M 3: Improved student learning of MA237
Faculty who teaches MA237 will be asked to evaluate whether the student learning improves under the revised syllabus.

Source of Evidence: Academic indirect indicator of learning - other

Target:
75% of faculty who taught MA237 agree that the student learning improves under the revised syllabus.

**Finding (2011-2012) - Target: Met**
86.7% of faculty (or 6 our of 7) who taught MA237 agree that the student learning improves under the revised syllabus.

**SLO 2: Skills of Single and Multivariable Calculus**
By the completion of Calculus III, undergraduate students will have proficient skills of single variable and multivariable calculus.

**Connected Documents**
- Curriculum Maps II-Maths B.S.
- Curriculum Maps I-Maths B.S.
- Rubrics of Topics-Maths B.S.

**Relevant Associations:**
The assessment results show that our students, in general, have a basic understanding of single variable and multivariable calculus. The results are better than those of the previous assessment. We will certainly continue our effort.

**Standard Associations**
- SACS 3.3.1
  - 3.3.1.1 Educational programs, to include student learning outcomes

**General Education/Core Curriculum Associations**
- 8 Mathematics - SLO is related to the essential characteristics and basic processes of inquiry and analysis in the discipline, encourages the development of critical thinking and requires students to analyze, synthesize and evaluate knowledge

**Strategic Plan Associations**
- University of Alabama
  - 1.1 Promote and enhance areas of academic, scholarship, and research excellence.

**Related Measures**

**M 4: Exams of Calculus I and II**
70% of students will achieve 70% or higher on one variable calculus problems embedded in the final exams of Calculus I and II.

**Source of Evidence:** Standardized test of subject matter knowledge

**Target:**
70% of students will achieve 70% or higher on one variable calculus problems embedded in the final exams of Calculus I and II.

**Finding (2011-2012) - Target: Met**
- Fall 2011: MA125-005,006; MA145-001; MA126-003, 005, 006 are taught by Drs. Hsia, Roberts, Zhu, Dixon, Evans and Sidje. 196 students took the MA125 or MA145 final from the three randomly selected sections and 76.5% (or 150) made 70% or higher on the embedded one variable calculus problems. 145 students took the MA126 final from three randomly selected sections and 74.5% (or 108) made 70% or higher on the embedded one variable calculus problems.

- Spring 2012: MA125-004, 006, 007; MA126-005, 006, 007 are taught by Drs. Allen, Hsia, Roberts, Sidje and Moore. 243 students took the MA125 final from the three randomly selected sections and 76.5% (or 168) made 70% or higher on the embedded one variable calculus problems; 207 students took the MA126 final from three randomly selected sections, and 75.8% (or 157) made 70% or higher on the embedded one variable calculus problems.

**M 5: Exam of Calculus III**
70% of students will achieve 70% or higher on multi-variable calculus problems embedded in the final exam of Calculus III.

**Source of Evidence:** Standardized test of subject matter knowledge

**Target:**
70% of students will achieve 70% or higher on multi-variable calculus problems embedded in the final exam of Calculus III.

**Finding (2011-2012) - Target: Met**
- Fall 2011: MA227-002,003, 008 are taught by Drs. P. Wang, Liem and Moen. 114 students took the MA227 final from the three randomly selected sections, and 81.6% (or 93) made 70% or higher on the embedded multi-variable calculus problems.

- Spring 2012: MA227-001,006, 007 are taught by Drs. Naggers, Belbas and Evans. 96 students took the MA227 final from the three randomly selected sections, and 76% (or 73) made 70% or higher on the embedded multi-variable calculus problems.

**SLO 3: Ability to Write Maths Proofs**
Undergraduate students will demonstrate the ability to write mathematical proofs. Student Learning Outcome #3 Improvement Action(s) to be advanced (copied from 2010-11 report). We will review and discuss MA237’s syllabus before the fall semester starts, and find ways to make mathematical proofs and abstractions easier to understand and to apply, especially for first-time students.

**Connected Documents**
- Curriculum Maps II-Maths B.S.
- Curriculum Maps I-Maths B.S.
- Rubrics of Topics-Maths B.S.

**Relevant Associations:**
The assessment results show that our students in general have the ability to write mathematical proofs. The result for MA237 reflects the challenge for students writing proofs the first time. MA201 is a course where proofs are systematically studied and applied. The result shows that we have done a good job toward student learning. We will continue the effort to make mathematical proofs easier to understand and to apply in MA237.

**Standard Associations**

SACS 3.3.1

3.3.1.1 Educational programs, to include student learning outcomes

**General Education/Core Curriculum Associations**

8 Mathematics - SLO is related to the essential characteristics and basic processes of inquiry and analysis in the discipline, encourages the development of critical thinking and requires students to analyze, synthesize and evaluate knowledge

**Strategic Plan Associations**

University of Alabama

1.1 Promote and enhance areas of academic, scholarship, and research excellence

**Related Measures**

**M 6: Exam of Matrix Theory**

70% of students will achieve 70% or higher on embedded proof questions in the final exam of the Matrix Theory course.

Source of Evidence: Standardized test of subject matter knowledge

**Target:**

70% of students will achieve 70% or higher on embedded proof questions in the final exam of the Matrix Theory course.

**Finding (2011-2012) - Target: Partially Met**

Fall 2011: MA237-001, 002, 003 are taught by Drs. Trace and Moore. 113 students took the final and 53.1% (or 60) made 70% or higher on the embedded questions designed to test the ability to write mathematical proofs.

Spring 2012: MA237-001, 002, 003 are taught by Drs. Zhu, Trent and Trace. 86 students took the final and 69.8% (or 60) made 70% or higher on the embedded questions designed to test the ability to write mathematical proofs.

**Related Action Plans (by Established cycle, then alpha):**

For full information, see the Details of Action Plans section of this report.

**Mathematical proofs**

*Established in Cycle: 2011-2012*

We will continue our effort to improve students’ ability on mathematical proofs. A committee will be formed in the fall to discu...

**M 7: Exam of Discrete Mathematics**

75% of students will achieve 70% or higher on embedded proof questions in the final exam of the Discrete Mathematics course.

Source of Evidence: Standardized test of subject matter knowledge

**Target:**

75% of students will achieve 70% or higher on embedded proof questions in the final exam of the Discrete Mathematics course.

**Finding (2011-2012) - Target: Met**

Fall 2011: MA301-001,002,003 are taught by Drs. Trace and J. Wang. 114 students took the final and 84.2% (or 96) made 70% or higher on the embedded questions designed to test the ability to write mathematical proofs.

Spring 2012: MA301-001,002,003 are taught by Drs. Trace and Moore. 112 students took the final and 73.2% (or 82) made 70% or higher on the embedded questions designed to test the ability to write mathematical proofs.

**M 8: Improved student learning of MA237**

Faculty who teaches MA237 will be asked to evaluate whether the student learning improves under the revised syllabus.

Source of Evidence: Academic indirect indicator of learning - other

**Target:**

75% of faculty who taught MA237 agree that the student learning improves under the revised syllabus.

**Finding (2011-2012) - Target: Met**

85.7% of faculty (or 6 our of 7) who taught MA237 agree that the student learning improves under the revised syllabus.

**SLO 4: Apply Maths Knowledge**

Undergraduate students will demonstrate the ability to apply mathematical knowledge.

**Connected Documents**

- Curriculum Maps II-Maths B.S.
- Curriculum Maps I-Maths B.S.
- Rubrics of Topics-Maths B.S.

**Relevant Associations:**

The assessment results show that our students have the ability to apply mathematical knowledge. The results show a much better than expected learning outcome! Being able to apply the mathematical knowledge is one of the most important goals of our program. We are very satisfied with this outcome.
Standard Associations

SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations

Mathematics - SLO is related to the essential characteristics and basic processes of inquiry and analysis in the discipline, encourages the development of critical thinking and requires students to analyze, synthesize and evaluate knowledge

Strategic Plan Associations

University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures

M 9: Tests of the Differential Equations
75% of students will achieve 70% or higher on embedded questions in the tests of the Differential Equations course.

Source of Evidence: Standardized test of subject matter knowledge

Target:
75% of students will achieve 70% or higher on embedded questions in the tests of the Differential Equations course.

Finding (2011-2012) - Target: Met
Fall 2011: MA238-001, 005 are taught by Drs. Zhao and Siddie. With 72 students took the final, 79.1% (or 57) made 70% or higher on the embedded questions designed to test the ability to apply mathematical knowledge.

Spring 2012: MA238-001, 002, 005 are taught by Drs. Hadji, Lien and Allen. With 112 students took the final, 79.5% (or 89) made 70% or higher on the embedded questions designed to test the ability to apply mathematical knowledge.

M 10: Tests of the Matrix Theory
75% of students will achieve 70% or higher on embedded questions in the tests of the Matrix Theory course.

Source of Evidence: Standardized test of subject matter knowledge

Target:
75% of students will achieve 70% or higher on embedded questions in the tests of the Matrix Theory course.

Finding (2011-2012) - Target: Met
Fall 2011: MA237-001,002,003 are taught by Drs. Trace and Moore. With 113 students took the final, 91% (or 103) made 70% or higher on the embedded questions designed to test the ability to apply mathematical knowledge.

Spring 2012: MA237-001,002,003 are taught by Drs. Zhu, Trent and Trace. With 86 students took the final, 83.7% (or 72) made 70% or higher on the embedded questions designed to test the ability to apply mathematical knowledge.

Other Outcomes, with Any Associations and Related Measures, Targets, Findings, and Action Plans

OthOtcm 5: Program Outcome: Improve the program and sustain the quality
The program will improve and sustain a high level of recognized quality.

Connected Documents
Maths Major Survey-Maths B.S.
Rubrics of Topics-Maths B.S.

Relevant Associations:
The survey results show that our program is in general highly valued by our students. We are able to offer all required courses at least once a year. We are starting a Research Experience Program, which will certainly add values to our program.

Related Measures

M 11: Offer courses at least once a year
All required math courses for majors will be offered at least once a year.

Source of Evidence: Academic indirect indicator of learning - other

Target:
All required courses will be offered at least once a year.

Finding (2011-2012) - Target: Met
All required courses are offered at least once a year. However, couple courses did not run due to the low enrollment.

M 12: Math Major Survey
An average of 4 points from the Math Major Survey conducted during the advising periods is a good indicator for a high level of recognized quality.

Source of Evidence: Student course evaluations on learning gains made

Target:
An average of 4 points from the Math Major Survey

Finding (2011-2012) - Target: Partially Met
Our of 108 math major students, 42 responded to the Math Major Survey. The averages are:

My rating of the Math B.S. Program: 3.52

The Math B.S. Program is highly valued to me: 4.12
Related Action Plans (by Established cycle, then alpha):

Major survey  
Established in Cycle: 2011-2012  
We plan to conduct the major survey at least once a semester. If necessary, we will organize several focus group discussion.

For full information, see the Details of Action Plans section of this report.

OthOtm 6: Program Outcome: Optimal enrollments and degree completions
The program will build and sustain an optimal level of annual program enrollments and degree completions.

Connected Documents  
Maths Major Survey-Maths B.S.  
Rubrics of Topics-Maths B.S.

Relevant Associations:
We have achieved both goals of increasing enrollment by 10% and double the graduation rate set by ACHE. We will continue our effort.

Related Measures

M 13: Increase the total maths majors
Increase the total math majors by 10%. Currently we have 100 math majors.
Source of Evidence: Academic indirect indicator of learning - other

Target:
110 math majors.

Finding (2011-2012) - Target: Met  
The data provided by A&S indicated that we have 110 math majors at the end of Spring 2012.

M 14: Double the degree completion requirement
Double the degree completion requirement set by ACHE: 7.5 graduates/year.
Source of Evidence: Academic indirect indicator of learning - other

Target:
To have at least 15 B.S. degree completion for the academic year of 2011-12.

Finding (2011-2012) - Target: Met  
We have produced 30 Baccalaureates during the academic year.

OthOtm 7: Program Outcome: Valued by graduates and others
The program will be highly valued by its program graduates and other key constituencies it serves.

Connected Documents  
Maths Major Survey-Maths B.S.  
Rubrics of Topics-Maths B.S.

Relevant Associations:
The survey shows that the Math B.S. Program is highly valued by our students and the quality of our undergraduate program is also evidenced by the fact that 100% of math majors accepted by UA graduate program among those applied.

Related Measures

M 15: Math Major Survey
An average of 4 points from the Math Major Survey conducted during the advising periods is a good indicator for the program being highly valued.

Source of Evidence: Student course evaluations on learning gains made

Target:
At lease a 4 point average on the survey question "Math B.S. Program is highly valued to me"

Finding (2011-2012) - Target: Met  
The average for the question of "Math B.S. Program is highly valued to me" is 4.12

M 16: Acceptance rate of maths majors
Percentage of math majors accepted by UA graduate programs among those applied.

Source of Evidence: Graduate/professional school acceptance rate

Target:
We will accept 100 percent of those applicants met the requirements.

Finding (2011-2012) - Target: Met  
All math majors applied to our graduate program have been accepted. The feedback info also suggest that all math majors are accepted by UA graduate programs if they applied.

Details of Action Plans for This Cycle (by Established cycle, then alpha)

Major survey  
We plan to conduct the major survey at least once a semester. If necessary, we will organize several focus group discussion.

Established in Cycle: 2011-2012  
Implementation Status: In-Progress  
Priority: High
<table>
<thead>
<tr>
<th>Relationships (Measure</th>
<th>Outcome/Objective):</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measure</strong>: Math Major Survey</td>
<td><strong>Outcome/Objective</strong>: Program Outcome: Improve the program and sustain the quality</td>
</tr>
</tbody>
</table>

**Mathematical proofs**
We will continue our effort to improve students’ ability on mathematical proofs. A committee will be formed in the fall to discuss the detail. A plan is expected at the end of the fall semester.

**Established in Cycle**: 2011-2012
**Implementation Status**: In-Progress
**Priority**: High

<table>
<thead>
<tr>
<th>Relationships (Measure</th>
<th>Outcome/Objective):</th>
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</thead>
<tbody>
<tr>
<td><strong>Measure</strong>: Exam of Matrix Theory</td>
<td><strong>Outcome/Objective</strong>: Ability to Write Maths Proofs</td>
</tr>
</tbody>
</table>
Curriculum Maps #1 (In which courses are Student Learning Outcomes Addressed)
Use “Introduce” when outcome is first address; “Reinforce” when outcome is reinforced; and “Master” when outcome is expected to be mastered.

<table>
<thead>
<tr>
<th>Course 1</th>
<th>Student Learning Outcome 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 125</td>
<td>Undergraduate students will demonstrate a basic understanding of fundamental concepts in mathematics</td>
</tr>
<tr>
<td>Course 2</td>
<td>Student Learning Outcome 2</td>
</tr>
<tr>
<td>MATH 126</td>
<td>By the completion of Calculus III, undergraduate students will have proficient skills of single variable and multivariable calculus</td>
</tr>
<tr>
<td>Course 3</td>
<td>Student Learning Outcome 3</td>
</tr>
<tr>
<td>MATH 227</td>
<td>Undergraduate students will demonstrate the ability to write mathematical proofs</td>
</tr>
<tr>
<td>Course 4</td>
<td>Student Learning Outcome 4</td>
</tr>
<tr>
<td>MATH 237</td>
<td>Undergraduate students will demonstrate the ability to apply mathematical knowledge</td>
</tr>
<tr>
<td>Course 5</td>
<td></td>
</tr>
<tr>
<td>MATH 238</td>
<td></td>
</tr>
<tr>
<td>Course 6</td>
<td></td>
</tr>
<tr>
<td>MATH 301</td>
<td></td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Course 1</th>
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<tbody>
<tr>
<td>MATH 125</td>
<td>Master</td>
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<td>Course 2</td>
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<tr>
<td>MATH 126</td>
<td>Master</td>
</tr>
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<td>Course 3</td>
<td>Student Learning Outcome 3</td>
</tr>
<tr>
<td>MATH 227</td>
<td>Master</td>
</tr>
<tr>
<td>Course 4</td>
<td>Student Learning Outcome 4</td>
</tr>
<tr>
<td>MATH 237</td>
<td>Reinforce</td>
</tr>
<tr>
<td>Course 5</td>
<td></td>
</tr>
<tr>
<td>MATH 238</td>
<td>Reinforce</td>
</tr>
<tr>
<td>Course 6</td>
<td></td>
</tr>
<tr>
<td>MATH 301</td>
<td>Master</td>
</tr>
</tbody>
</table>
**Curriculum Maps #2** (What assessment measures will be employed in which courses for each SLO)

Indicate which measure is being obtained in which course by typing “Measure n.n” in the appropriate cell. If you’d rather use a description of the measure, that is fine. Also, indicate the year/semester in which the measure will be obtained (e.g., Fall 2011). Student learning outcomes must be assessed at least once within a 2-year period. Note that a measure does not need to be obtained from every course in which an outcome is covered (see Map #1).

<table>
<thead>
<tr>
<th>Course</th>
<th>Student Learning Outcome 1</th>
<th>Student Learning Outcome 2</th>
<th>Student Learning Outcome 3</th>
<th>Student Learning Outcome 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course 1</td>
<td>MATH 125</td>
<td>Undergraduate students will demonstrate a basic understanding of fundamental concepts in mathematics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course 2</td>
<td>MATH 126</td>
<td>embedded questions on the final exam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course 3</td>
<td>MATH 227</td>
<td>embedded questions on the final exam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course 4</td>
<td>MATH 237</td>
<td>Embedded questions on the Final Exam</td>
<td>embedded questions on the final exam</td>
<td>embedded questions on tests</td>
</tr>
<tr>
<td>Course 5</td>
<td>MATH 238</td>
<td>Embedded questions on the Final Exam</td>
<td></td>
<td>embedded questions on tests</td>
</tr>
<tr>
<td>Course 6</td>
<td>MATH 301</td>
<td></td>
<td></td>
<td>embedded questions on the final exam</td>
</tr>
<tr>
<td>I am</td>
<td>Freshman</td>
<td>Sophomore</td>
<td>Junior</td>
<td>Senior</td>
</tr>
<tr>
<td>--------------</td>
<td>----------</td>
<td>-----------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>I will apply for graduate school</td>
<td>Yes</td>
<td>No</td>
<td>Undecided</td>
<td></td>
</tr>
<tr>
<td>My rating of the Math B.S. Program is</td>
<td>Excellent (5)</td>
<td>Above Average (4)</td>
<td>Average (3)</td>
<td>Below Average (2)</td>
</tr>
<tr>
<td>The Math B.S. Program is highly valuable to me</td>
<td>Strongly Agree (5)</td>
<td>Agree (4)</td>
<td>Undecided (3)</td>
<td>Disagree (2)</td>
</tr>
<tr>
<td>Course 1</td>
<td>MATH 125</td>
<td>Find limits</td>
<td>Compute derivatives</td>
<td>Interpret and apply derivatives</td>
</tr>
<tr>
<td>---------</td>
<td>----------</td>
<td>-------------</td>
<td>---------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Course 2</td>
<td>MATH 126</td>
<td>Geometry and algebra of vectors in the plane and 3-space</td>
<td>Use basic techniques to evaluate integrals</td>
<td>Use integration to solve applied problems</td>
</tr>
<tr>
<td>Course 3</td>
<td>MATH 227</td>
<td>Calculus of curves in 3-space</td>
<td>Find areas and volumes using multiple integration</td>
<td>Solve multivariable optimization problems</td>
</tr>
<tr>
<td>Course 4</td>
<td>MATH 237</td>
<td>Use Gaussian elimination to solve systems of equations</td>
<td>Use basic matrix algebra properties</td>
<td>Algebraic and geometric interpretations of the fundamental notions of vector spaces</td>
</tr>
<tr>
<td>Course 5</td>
<td>MATH 238</td>
<td>Solve linear ordinary differential equations</td>
<td>Classify an ordinary differential as linear or nonlinear, homogeneous or non-homogeneous and decide what techniques apply to solve it</td>
<td>Use the software MATLAB in solving initial value problems</td>
</tr>
<tr>
<td>Course 6</td>
<td>MATH 301</td>
<td>Write logical statements using symbols and quantifiers</td>
<td>Write simple mathematical proofs using standard methods</td>
<td>Become proficient in the language and notations of set theory</td>
</tr>
</tbody>
</table>