UNIT REPORT

Mathematics BS - Institutional Effectiveness Final Annual Report 2019

Generated: 11/5/19, 1:03 PM

Mathematics BS

Mission Statement of Math Department

Reporting Year:

Providing Department: Mathematics BS

Department/Unit Contact: Allan Mills

Mission/Vision/Goal Statement:

All undergraduate degree programs at Tennessee Tech require at least one course in mathematics and many require several courses. The Department of Mathematics provides a variety of general education courses, introductory and advanced undergraduate courses in support of STEM majors, and graduate-level courses for the MS in mathematics and other graduate programs.

As a central part of a STEM-infused comprehensive institution, the Department of Mathematics strives to create successful learners of the subject of mathematics in the university community and in the community where we live. Learning opportunities are provided to students of all disciplines to advance their understanding of mathematical concepts and their effective use of analytic practices and critical thinking as useful in their studies and everyday life. The departmental faculty conduct research in mathematics and as part of interdisciplinary teams and provide service to the department, college, University, and mathematical community.

The mission of the TTU Department of Mathematics is to promote the learning of mathematics through effective teaching,

research, and public service. Such learning opportunities are provided to students of all disciplines in support of the mission of the University.

New Academic Curriculum Map Item

Curriculum Mapping :

The table below is a curriculum map showing how the required mathematics courses relate to learning goals for mathematics majors. The mathematics majors take at least 3 additional courses that reinforce these goals.

Provide Students with Conceptual Understanding and Computational, Reasoning and Communication Skills to Begin a Career or Pursue Graduate Education.

	Required Courses											
	1910	**1920**	**2010**	**2110**	**2120**	**3400**	**3430, 4310, or 4410**	**3810**	**4010**	**4110**	**4470**	**4530**
I. Conceptual Foundation												
a) Students will understand conceptual foundations of calculus, differential equations, and matrix algebra	X	X	X	X	X							
b) Students will understand major concepts in geometry, probability & statistics, abstract algebra, linear algebra, and real & complex analysis							X	X	X	X	X	X

II. Computational Skill													
a) Students will demonstrate algebraic, computational, & algorithmic skills to determine solutions to mathematical problems and interpret the results	X	X	X	X	X			X			X	X	
b) Students will utilize technology to solve problems and interpret results													
III. Reasoning & Communication Skills													
a) Students will write sound mathematical proofs						X	X		X	X		X	
b) Students will explain orally or in writing the methodology used to solve math or statistical problems						X	X		X	X	X	X	

Goal 1 - Average at least 10 graduates per year

Define Goal:

The undergraduate degree program will average at least 10 graduates per year.

Intended Outcomes / Objectives:

Goal 2 - Increase use of technology in mathematics classes

Define Goal:

Increase the use of technology in mathematics classes.

Intended Outcomes / Objectives:

Goal 3 - Improve placement of incoming students

Define Goal:

Improve initial math course placement for incoming freshmen and transfer/international students by developing a placement procedure involving a mathematics test.

Intended Outcomes / Objectives:

Goal 4 - Contribute to STEM Center mission

Define Goal:

Contribute to the mission of the Center for Teaching and Learning in Science, Technology, Engineering, and Mathematics (STEM) by having faculty members involved in its activities.

Intended Outcomes / Objectives:

Learning Outcome 1- Math major knowledge

Define Goal:

Students graduating in mathematics will demonstrate an understanding of mathematics by having 50% of graduates score at or above the 75th percentile on the ETS Major Field Test in Mathematics.

Intended Outcomes / Objectives:

Learning Outcome 2 - Other majors able to use math appropriately

Define Goal:

All students graduating from the University will be "mathematically literate" and able to apply their knowledge from the mathematics courses in their curricula.

Intended Outcomes / Objectives:

Assessment: Count Mathematics graduates in the previous July 1- June 30 time period

Goal/ Outcome/ Objective: Program Goal 1

Type of Tool: Graduation Rate

Frequency of Assessment: Annually

Rationale:

Each May the number of graduates earning the BS in Mathematics in the previous year is determined and trends are tracked using a 5-year average of the number of graduates.

Threshold of Acceptability: 10 graduates a year

Assessment: ETS Major Field Test

Goal/ Outcome/ Objective: Student Learning Outcome 1

Type of Tool: Exit Exam

Frequency of Assessment: each fall and spring semester

Rationale:

The ETS Major Field Test in Mathematics is designed to measure student performance so that meaningful comparisons between similar schools throughout the country can be made. All graduating mathematics majors are expected to take the Major Field Test during their final semester at TTU.

Threshold of Acceptability: 50% of TTU graduates score at the 60th percentile or higher

Assessment: Faculty Annual Report

Goal/ Outcome/ Objective: Program Goals 2 and 4

Type of Tool: Survey

Frequency of Assessment: Annually

Rationale:

As part of their annual effort report each faculty member lists the type of technology used and STEM Center activities

Assessment: Goal 3- Improving Math Placement

Goal/ Outcome/ Objective: Goal 3

Type of Tool: Other

Frequency of Assessment: yearly

Rationale:

Each year the department chair determines if a placement procedure is in place and whether it needs to be adjusted.

Threshold of Acceptability: The instances of poor placement should be decreasing.

Assessment: National Survey of Student Engagement

Goal/ Outcome/ Objective: Student Learning Outcome 2

Type of Tool: Survey

Frequency of Assessment: Every 2 to 3 years

Rationale:

Relevant questions on the NSSE will assess students' confidence in their mathematical abilities

Assessment: Praxis II Math Content Knowledge

Goal/ Outcome/ Objective: Student Learning Outcome 2

Type of Tool: Certification Exam

Frequency of Assessment: every semester

Rationale:

The Praxis Content Knowledge test in Mathematics is designed to assess the mathematical knowledge and competencies necessary for a beginning teacher of secondary school mathematics.

Threshold of Acceptability: 100% of Secondary Education-Mathematics graduates must pass PRAXIS content knowledge exam.

Results - Goal 3- Improving Placement of Incoming Students

Goal/Objective/Outcome Number: Goal 3

Results:

We continue to use the ACT Math subscore as a placement tool for students having an ACT score. Students without an ACT score or those who wish to challenge a placement have taken the COMPASS test. However, the COMPASS test has been discontinued by the Educational Testing Service. ACCUPLACER is now being used.

Very few instances of poor placement recommendations were noticed. However, there were a few cases of students having an ACT Math subscore granting them entry into Math 1910 without having learned a sufficient amount of trigonometry.

Attachments:

Results - Learning Outcome 1 - ETS Major Field Test scores

Goal/Objective/Outcome Number: Learning Outcome 1

Results:

Six of the twelve students who took the ETS Major Field Test in Mathematics in 2018-19 scored at the 75th percentile or higher. Thus this learning outcome goal of having at least 50% of our students score at the 75th percentile or higher was met.

The table below displays the average scores of TTU students who took the Major Field Test in Mathematics in recent academic years and the percentile of TTU's average score to the average score of other institutions using the test.

Average Scores on ETS Major Field Test in Mathematics

	National Average	Number of TTU Math Students Taking the Test	TTU Average	Percentile of TTU Average
2007-08	155.5	4	165	85th
2008-09	155.9	6	166.5	90th
2009-10	156	5	163.6	80th
2010-11	156	9	169	94th
2011-12	156	8	171.6	96th
2012-13	156	11	160.7	74th
2013-14	156.4	19	161.2	67th
2014-15	155.1	18	164.9	80th
2015-16	155.0	10	174.5	97th
2016-17	156.3	12	160.3	75th
2017-18	157.3	12	172	93rd
2018-19	156.2	12	172.8	93rd

Attachments:

Results - Learning Outcome 2- Praxis II Math Subject Assessment Data

Goal/Objective/Outcome Number: Learning Outcome 2

Results:

The Praxis II Mathematics Subject Assessment data for TTU graduates is shown in the table below. All students who earned the degree in secondary education mathematics passed the exam because passing the exam is a degree requirement. However, in recent year some students required multiple test attempts to pass the exam.

Pass Rate of TTU Students on Praxis II Math Content Knowledge Test

Academic Year	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Number of Test Takers	5	8	5	5	2	1	3
First Attempt Pass Rate	4/5 or 80%	7/8 or 87%	2/5 or 40%	2/5 or 40%	1/2 or 50%	0/1 or 0%	0/3 or 0%
Final Pass Rate for Licensure	5/5 or 100%	8/8 or 100%	5/5 or 100%	5/5 or 100%	2/2 or 100%	1/1 or 100%	3/3 or 100%

Attachments:

Results for Learning Outcome 2: NSSE

Goal/Objective/Outcome Number: Learning Outcome 2

Results:

Data from the 2011, 2014, and 2017 National Study of Student Engagement (NSSE) comparing the TTU average to the averages of all Tennessee public universities and our Carnegie peers on a question related to the learning outcome is shown in the table below. Freshman and senior students were asked to what extent their experience at college had contributed to their ability to analyze quantitative data.

TTU Student Response Averages on NSSE Questions Related to Ability to handle Quantitative Data

	2011 TTU	2011 THEC	2011 Carnegie	2014 TTU	2014 THEC	2014 Carnegie	2017 TTU	2017 THEC	2017 Carnegie
Freshmen	2.99	2.97	2.98	2.4	2.4	2.3	2.7	2.7	2.6
Seniors	3.18	3.12	3.10	2.0	2.4	2.3	2.9	2.8	2.8

Scale: 1= Very Little; 2= Some; 3= Quite a Bit; 4= Very Much

Attachments:

Results- Goal 1 - Number of BS in Math Graduates

Goal/Objective/Outcome Number: Goal 1

Results:

The BS in Mathematics program achieved this goal by graduating 12 students in the 2018-2019 academic year. The table below shows the number of graduates per year.

Number of TTU BS in Mathematics Graduates

July 1-June 30 reporting periods

Year	Men	Women	Total Number of Graduates
2006-2007	4	1	5
2007-2008	4	2	6
2008-2009	8	1	9

2009-2010	6	2	8
2010-2011	8	3	11
2011-2012	6	2	8
2012-2013	9	3	12
2013-2014	12	8	20
2014-2015	15	4	19
2015-2016	9	4	13
2016-2017	13	3	16
2017-2018	8	5	13
2018-2019	7	5	12

Attachments:

Results- Goal 2- Increase Use of Technology in Math Classes

Goal/Objective/Outcome Number: Goal 2

Results:

The table below shows the number of sections taught by full-time mathematics faculty members in which instructional technology is used. Since many adjuncts, graduate assistants, and Learning Support mathematics faculty members incorporate instructional technology in their courses, the counts underreport the overall use of instructional technology in mathematics classes at TTU.

The data shows a steady increase in the use of instructional technology.

Number of Sections Using Technology in Instruction

	2012	2013	2014	2015	2016	2017	2018
Class Instruction							
iLearn	44	25	60	70	80	85	89
Automated Homework	17	20	29	40	52	52	46
Table to project lectures	35	25	45	52	55	73	75
Archive lectures	10	13	9	35	40	46	49
Software Use							

Maple/Maxima/ Mathematica	7	0	3	2	2	0	0
Matlab	3	0	1	3	3	0	1
R	5	12	8	13	18	5	14
SAS	3	3	5	3	3	2	2
Excel	15	7	3	7	13	5	8
DPGraph, Geogebra, Desmos	2	0	4	5	1	1	11

Attachments:

Results: Goal 4- Participate in STEM Center Activities

Goal/Objective/Outcome Number: Goal 4

Results:

Several faculty members reported participating in outreach activities, but only one of them worked through the STEM Center.

Attachments:

Modification for Goal 1: Average at least 10 graduates per year

Goal/Objective/Outcome Number: Goal 1. Average at least 10 graduates per year

Program Changes and Actions due to Results:

Although this goal was met, the number of BS in Math graduates is trending downward. In addition, the department's move from Bruner Hall to temporary quarters in Foundation Hall may affect its ability to attract and retain mathematics majors. We plan to update some of our recruitment materials and to create an undergraduate student lounge near our faculty offices in Foundation Hall.

Link to Assessment:

Link to 'Tech Tomorrow' Strategic Plan: Efficiency and Effectiveness

Modification for Goal 2: Increase use of technology in teaching

Goal/Objective/Outcome Number:

Program Changes and Actions due to Results:

Faculty are satisfied with their use of technology in teaching. The department will support continued faculty efforts to take part in professional development to stay up to date with teaching and learning technologies.

Link to Assessment:

Link to 'Tech Tomorrow' Strategic Plan: Technology Infused Programs
Efficiency and Effectiveness

Modification for Goal 3: Improve Placement of incoming students

Goal/Objective/Outcome Number: Goal 3

Program Changes and Actions due to Results:

The current placement system (ACT Math scores or ACCUPLACER test) seems to be effective at placing students in an appropriate mathematics class in a timely manner. Moreover, since students without an ACT Math score are placed by the ACCUPLACER tool, the department has no need to create its own placement tests.

Faculty noticed a few instances of students with weak backgrounds in trigonometry placing into Math 1910-Calculus I

(because of an ACT Math score of at least 27). Faculty will be encouraged to carefully go over the course prerequisites and the fact that a significant amount of trigonometry knowledge is required on the first day of Math 1910 classes.

At a meeting to discuss data related to departmental goals and assessment the faculty decided to delete this goal because it is no longer relevant.

Link to Assessment:

Link to 'Tech Tomorrow' Strategic Plan: Efficiency and Effectiveness

Modification for Learning Outcome 1

Goal/Objective/Outcome Number: Learning Outcome 1

Program Changes and Actions due to Results:

The mathematics faculty are satisfied with the scores of our students on the ETS Major Field Test. The BS in mathematics curriculum is preparing students well. The faculty will continue to monitor course content and its alignment with the topics on the ETS Major Field Test.

Link to Assessment:

When reviewing the data for this goal the faculty decided to revise statement of the goal slightly. As currently stated the goal focuses on analyzing how our higher test scorers fare against the scores of students at other institutions. By revising the goal to compare the average of TTU test takers with the average scores of other institutions, we will be considering all of our test scores.

Link to 'Tech Tomorrow' Strategic Plan: Technology Infused Programs
Programs, Certificates, and Training

Modification for Learning Outcome 2

Goal/Objective/Outcome Number: Learning Outcome 2

Program Changes and Actions due to Results:

The PRAXIS II test results indicate that Secondary Education Mathematics students are struggling to pass the math content

test on their initial attempt.

In spring 2019 the department offered a Special Topics course based on a curriculum for future high school mathematics teachers developed by the Mathematics Teacher Education Partnership. We plan to create a new upper-division mathematics course for SEMA majors. The course will utilize portions of the curriculum developed by the partnership and materials developed by departmental faculty.

At a meeting to discuss data about departmental goals and outcomes, the faculty expressed dissatisfaction with the NSSE assessment. It is a measure of student confidence in their skills, but not a good measure of student learning. The faculty plan to developing two assessments for general education mathematics (one in Math 1530-Intro to Statistics; one in Math 1910-Calculus I) during the fall 2019 semester. These assessments should give a more direct measure of student learning in some selected general education mathematics classes.

Link to Assessment:

Link to 'Tech Tomorrow' Strategic Plan: General Education Curriculum
Programs, Certificates, and Training

Modification to Goal 4: Participate in STEM Center Activities

Goal/Objective/Outcome Number:

Program Changes and Actions due to Results:

A few faculty members participate in STEM Center activities. Some faculty members are involved in outreach activities that do not involve the STEM Center.

The faculty discussed this goal and decided to broaden it to include all types of outreach and professional development activities rather than restricting it to those affiliated with the STEM Center. The revised goal will be used in upcoming years.

Link to Assessment:

Link to 'Tech Tomorrow' Strategic Plan: Alumni/Friend Engagement
Research, Scholar, Intellect, and Creativity