

Institutional Effectiveness Report

2021-22

Programs: Mathematics BS

College and Department: College of Arts & Sciences - Mathematics

Unit Contact: Michael Allen

Mission: 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.

Program Goals:

PG 1: The Mathematics program will grow and continue to recruit and retain a strong number of students.

The undergraduate degree program will average at least 15 graduates per year.

PG 2: Increase the use of technology in mathematics classes.

The number of faculty using technology and the type of technology used in the classroom will increase every year until the unit is saturated with users of technology.

PG 3: Improve initial math course placement for incoming freshmen and transfer/international students by developing a placement procedure involving a mathematics test.

PG 4: Faculty will be involved in outreach activities to spread the appreciation and understanding of mathematics.

Student Learning Outcomes:

SLO 1: 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.

SLO 2: All students graduating from the University will be "mathematically literate" and able to apply their knowledge from the mathematics courses in their curricula.

A departmentally developed curriculum map can be found in Appendix 1 that shows the connections between courses and student learning outcomes.

Assessment Methods:

PG 1: Recruit and retain a strong number of students

1. Count Mathematics graduates in the previous July 1- June 30 time period: 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: 15 graduates a year

PG 2: Increase the use of technology

1. Faculty Annual Report: As part of their annual effort report each faculty member list the type of technology used in courses.

PG 3: Improve initial math course placement

1. Math Placement: 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.

PG 4: Faculty involved in outreach activities

1. Faculty Annual Report: As part of their annual effort report each faculty member list STEM Center activities.

SLO 1: Demonstrate an understanding of mathematics

1. ETS Major Field Test: 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.

SLO 2: Mathematically literate

1. National Survey of Student Engagement: Relevant questions on the NSSE will assess students' confidence in their mathematical abilities.
2. For Secondary Math Education Majors, the National Evaluation Series (NES) test in Mathematics used is to assess the mathematical knowledge and competencies necessary for a beginning teacher of secondary school mathematics. Secondary education mathematics students must now pass the NES to get their degree.

- For non-math majors, the math faculty designed a simple assessment using three common questions on each of the finals in Math 1530 and Math 1910, respectively. Math 1530 was chosen because engineers do not normally take it while Math 1910 is mostly engineers.

Results:

PG 1: Recruit and retain a strong number of students

The table below shows the number of graduates per year. The BS in Mathematics program did not meet this goal because only 5 students graduated from the program in the 2021-2022 academic year. COVID has definitely affected everyone. The five-year moving average is 10.6. The Department did create four new concentrations: Pure Math, Applied Math, Statistics and Data Science, and Actuarial Science. The Department has a long way to go because the number of admissions into our program was 4 in Fall 2021 and 9 in Fall 2022.

Number of TTU BS in Mathematics Graduates
July 1-June 30 reporting periods

Year	Men	Women	Total Number of Graduates
2017-2018	8	5	13
2018-2019	7	5	12
2019-2020	11	3	14
2020-2021	6	3	9
2021-2022	4	1	5

PG 2: Increase the use of technology

This goal has been obtained and is to be removed. All math faculty now use or require some type of technology in their classes. Also, with the new renovation of Bruner Hall, every classroom is a distance learning classroom.

PG 3: Improve initial math course placement

The Math Department has been working with the College of Engineering to place students “just-in-time”. COE had some of their students take the ACCUPLACER exam to see what math courses they actually should be placed into. WE are currently tracking those students to see if their placement was correct.

PG 4: Faculty involved in outreach activities

This goal has been obtained and is to be removed. As part of faculty evaluations, outreach activities are part of the rubric and, hence, are routinely seen in their effort reports.

SLO 1: Demonstrate an understanding of mathematics

Three of the six students who took the ETS Major Field Test in Mathematics in 2021-22 scored at the 68th percentile or higher while two of the six scored at the 83rd percentile or higher. The learning outcome goal of having at least 50% of our students score at the 75th percentile or higher was not met this year.

The table below displays the average scores of TTU students who took the Major Field Test in Mathematics in recent academic years.

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
2016-17	156.3	12	160.3	75th
2017-18	157.3	12	172	93rd
2018-19	156.2	12	172.8	93rd
2019-20	157.4	9	177	84 th
2020-21	157.5	7	158.6	56 th
2021-2022	157.5	6	163	68 th

SLO 2: Mathematically literate

1. Data from the 2019, 2020 and 2021 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

	2019 TTU	2019 Carnegie	2020 TTU	2020 Carnegie	2021 TTU	2021 Carnegie
Freshmen	3.1	2.9	2.1	2.2	2.4	2.4
Seniors	3.3	3.2	2.3	2.2	4.0	2.5

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

2. The Praxis II Mathematics Subject Assessment data for TTU graduates is shown in the table below. The last column values are for the NES Content Knowledge Test.

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

Academic Year	2017-18	2018-19	2019-20	2020-21	2021-22 (Math)	2021-22 (Math MG)
Number of Test Takers	1	3	10	10	12	12
First Attempt Pass Rate	0/1 or 0%	0/3 or 0%	4/10 or 40%	2/10 or 20%		
Final Pass Rate for Licensure	1/1 or 100%	3/3 or 100%	4/10 or 40%	9/13 or 69%	8/12 or 67%	2/12 or 17%

The reporting scheme has changed this past year with the simple report of the number of students who passed the NES Mathematics. We also now have the number of Middle Grade teacher candidates who passed their portion of the exam. For secondary education, the numbers are low but not out of the ordinary. As for the Middle Grade candidates, there is definite room for improvement.

3. In Spring 2022, 68% of the students in Math 1530 scored 60% or better on the five common questions asked of them. In other words, 68% passed the common questions.

Modifications for Improvement

PG 1: Recruit and retain a strong number of students

The Math Department created four new concentrations and is actively recruiting. Emphasis is being placed on communication and all preview events on campus.

PG4: Improve initial math course placement

The Math Department will continue work with the College of Engineering on proper placement of their students, which make up over 80% of the Math Departments' student population.

SLO 1: Demonstrate an understanding of mathematics

Again, the scores are a little low. This will be discussed in the next faculty meeting.

SLO 2: Mathematically literate

The NSSE numbers were not as good as previous years but TTU seniors still scored better than the norm with 2.3 versus 2.2.

The NES test results still indicate that Secondary Education Mathematics students are struggling to pass the math content. The second score for Middle Grade candidates is more telling and emphasizes the need for a discussion about our Math Education courses.

Appendices

1. Math BS Curriculum Map

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