Mathematics BA/BS

Deliver An Upper-Level Curriculum With Appropriate Discipline Specific Knowledge

Goal Description:

The curriculum will address the discipline specific knowledge dictated by professional societies and/or professionals in the workforce for upper-level instruction in mathematics.

Providing Department: Mathematics BA/BS

RELATED ITEMS/ELEMENTS

RELATED ITEM LEVEL 1

Advanced Areas For Majors Learning Objective Description: Students preparing to graduate will demonstrate advanced mathematics knowledge and skills.

RELATED ITEM LEVEL 2

Euclidean Geometry Project (BA) - Math 3363 Indicator Description: Students will complete a project on the role of proof and technology in communicating mathematics.

Criterion Description:

At the end of the semester, 70% of the students submitting their project will receive a rating of 60 or better (out of 75) according to the attached rubric.

Attached Files

Project description and rubric

Findings Description:

The file Ch12Project.pdf describes the project on page 1 and includes the scoring rubric on page 2. These files are attached.

The total possible for this assignment was 75 points. Students could earn extra points by exceeding expectations in some categories. The overall scores for the students using this rubric are as follows:

60, 61, 71, 73, 75, 75, 75, 78, 80, 81, 82, 83, 84, 84

Of the 14 students, 14 out of 14 (100%) scored 80% or better on the project. 10 out of 14 (71%) scored 100% or better.

Attached Files

Ch12Project.pdf

RELATED ITEM LEVEL 3

Euclidean Geometry Projects (BA) - Math 3363

Action Description:

As 100% of the students met the criteria, we will at a minimum maintain this expectation. In the coming year, we will review the rubric to see if there are places to increase the rigor of the assignment. With several students scoring 100% or more, we may wish to revise the rubric. For example, we may change the rubric so that students are not able to score above 100%.

RELATED ITEM LEVEL 2

Introduction to Math Thought portfolio (BS) - Math 3300 Indicator Description:

Students will demonstrate the ability to write direct proofs, proofs by contrapositive, proofs by contradiction, proofs by induction, and proofs by cases.

Criterion Description:

At the end of the semester, students will turn in a portfolio of rewritten past work (or similar) that demonstrates their ability to write each of the five types of proofs listed above. At least 70% of students who turn in portfolios will earn a combined average of at least 75% on these five types of proof in their portfolios.

Findings Description:

In the Fall 2021 semester, 21 students turned in portfolios. The 5 types of proof mentioned in the criterion description accounted for 62.5% of the

portfolio score. The combined average on these 5 types of proof was 89.6%.

Student scores on these 5 types of proof totaled

37.5, 39.5, 44, 50, 51.5, 52, 52.5, 54.5, 58.5, 58.5, 58.5, 60.5, 62.5, 6

with 62.5 being the maximum possible. A combined average of 75% on these types of proof corresponds to a score of 46.875 on these types of proof. Therefore, 18/21 (85.71%) students earned a combined average of at least 75% on these 5 types of proof, while 3/21 (14.29%) did not.

RELATED ITEM LEVEL 3

Introduction to Math Thought portfolio (BS) - Math 3300 Action Description:

The success rate on the portfolio's in Math 3300 (85.71%) was very good. However, we will continue to try to improve on this success rate going forward.

RELATED ITEM LEVEL 2

Undergraduate Research Project (BS) - Math 4395

Indicator Description:

Undergraduate math majors will enroll in Math 4395 in which students perform a semester-long research project (along with discipline-specific professional development activities) with a faculty mentor.

Criterion Description:

At least 10% of our undergraduate math majors per year will enroll in Math 4395 and complete a research project with a faculty mentor.

Findings Description:

This course did not run during this cycle.

RELATED ITEM LEVEL 3

Undergraduate Research Project (BS) - Math 4395

Improve Communication Between Department And Its Majors

Goal Description:

Communicate to our mathematics majors more and better information pertaining to internships, research opportunities, scholarships. etc.

Providing Department: Mathematics BA/BS

RELATED ITEMS/ELEMENTS

RELATED ITEM LEVEL 1

Improve Communication Between Department And Mathematics Majors Performance Objective Description:

Communicate to our mathematics majors more and better information pertaining to internships, research opportunities, scholarships. etc.

RELATED ITEM LEVEL 2

Annual meeting with math majors and social media outreach

KPI Description:

In each late Fall semester, a meeting will be held, hosted by the department chair. All mathematics majors will be invited. This one hour meeting will include an introduction of all faculty in the department (via projected slides), a description of some of the research areas in the department (particularly those that have involved students), and a list of opportunities available to our majors.

These opportunities might involve departmental scholarships and awards, employment opportunities, and conferences available for travel. In addition, we will describe REUs (those both local and external) to the students and encourage students to apply.

The purposes of these meetings are (1.) to inform students of opportunities in the department, (2.) to recruit math majors into our stat minor program, and (3.) to foster a sense of belonging in the department of each one of our mathematics majors.

Results Description:

The Department hosted a virtual Majors & Minors Meeting in September 2021. 35 students attended. By way of comparison, 17 students attended in September 2020.

Since June 2021, we have used the Department's social media account on Twitter (@SHSU_Math_Stat) to post 42 different messages. These have included information related to registration, the Majors & Minors Meeting, giveaways, and celebrations of the accomplishments of students and faculty. The Twitter account is also used to retweet information related to campus events, deadlines, and other items of interest from other official SHSU accounts and the occasional retweet of a mathematical observation from an interim chair.

We also use the digital sign by the elevators to communicate announcements with our majors and minors.

RELATED ITEM LEVEL 3

Annual meeting with all math majors and social media outreach

Action Description:

Only 35 students attended our Fall 2021 meeting. By way of comparison, this is an improvement on Fall 2020 when only 17 students attended. We have over 100 majors, so having only one event where 1/3 of them attend is not sufficient. Because these meetings were virtual due to the pandemic, we feel that attendance will improve as we revert back to face-to-face meetings. Also, our social media is not necessarily targeted to majors and minors, but we are making efforts to improve that.

Increase student success and academic preparation in Math 1420 and Math 1430.

Goal Description:

Improve attrition rates in the calculus sequence.

Providing Department: Mathematics BA/BS

RELATED ITEMS/ELEMENTS

RELATED ITEM LEVEL 1

Foundation Areas - Differential Calculus Learning Objective Description: Students will demonstrate the following knowledge and skills: differentiation of standard mathematical functions, application of the Fundamental Theorem of Calculus to the evaluation of integrals, a broad understanding of integration techniques, using calculus techniques to solve optimization problems, and convergence properties of infinite sequences and series.

RELATED ITEM LEVEL 2

Assessment in Math 1420 and Math 1430

Indicator Description:

Create assessment portfolios that can be used in active learning sections of Calculus I and Calculus II to better align the way that we assess our students in these courses.

Criterion Description:

Active learning in Math 1420 and Math 1430 will use a wide variety of assessment strategies which may include group and individual projects, informal student presentations, exams with group and individual portions, techniques from mastery-based assessment, and more. In particular, each learning objective will correspond to multiple items in the assessment portfolio to provide a broad picture about student mastery or proficiency

Findings Description:

Math 1420 was not assessed, instead Math 2440 was assessed.

Math 1430 section I: the student portfolios have two main components: "Group HW assignments" which are written problem sets that are started in class and completed outside of class, and "Study Guides" (attached here) which are documents that the students create in advance of their assessments. For Spring 2022, 23 students were enrolled at the end of the semester, but 4 of those had not engaged in any coursework since Spring Break. Of the 19 students who submitted portfolios, 17/19 earned a grade of C or better.

Math 1430 section II: students created video portfolios for each set of Block Objectives. The main difference is that instead of the submission being a written study guide (as described above), the students had to record a video of themselves actually presenting solutions to problems to demonstrate their mastery of each objective. In Fall 2021, the expectations were trimmed down to just two video portfolios instead of four (one on techniques of integration, one on infinite series tests) and the students were evaluated well before the midterm/final exam so that the feedback could help them prepare for the exams. That class (Fall 2021) was fully online. A rubric was built in Blackboard to formalize that evaluation and specific notes were added for each student.

MATH 2440: students create a video portfolio at the end of the semester as part of their review process before the final exam. Prior performance from each block of material (Vector Functions, Partial Derivatives, Multiple Integrals) was reviewed to find where each student struggled. Each student was then provided with a list of 5 objectives customized for them, and they chose problems to illustrate how they corrected past mistakes to better understand each one.

Attached Files

<u>Math 1430 Assessment.pdf</u>

RELATED ITEM LEVEL 3

Assessment in Math 1420 and Math 1430

Action Description:

The data collected in Math 1430, section II is being used as a starting point to assemble some data about video portfolio assessment in calculus.

The data collected in Math 2440 from Spring 2021, Spring 2022, and upcoming data in Spring 2023 will be used to measure how effective this form of assessment is for multivariate calculus.

Update to Previous Cycle's Plan for Continuous Improvement Item

Previous Cycle's Plan For Continuous Improvement (Do Not Modify):

Closing Summary

The mathematics department will continue to focus on improving curriculum and communication with our majors. The current curriculum focus involves coordination among faculty engaged in active learning strategies and these faculty members will continue to investigate strategies to improve student success. Communication with our majors will be coordinated by both math department faculty and staff.

Update of Progress to the Previous Cycle's PCI:

We have included the counterpart to the BA side the learning objective "Advanced Areas For Majors" (which is Euclidean Geometry Project (BA) - Math 3363) by adding the new indicator "Introduction to Math Thought portfolio (BS) - Math 3300" to address the BS side of the learning objective "Advanced Areas For Majors". Our social media outreach has been improved as we communicate with students through not only our Facebook page, but also now our department twitter account.

All students in MATH 3363 students scored 60 or more points out of 75 on the Euclidean Geometry Project. This is well above the criterion of 70% of the students scoring at that level. We will retain this project and review (and potentially revise) the criterion and the rubric to maintain student success.

New Plan for Continuous Improvement Item

Closing Summary:

A major focus this coming academic year is to implement a writing assessment for our majors which will be

from a writing enhanced course that is required for the BA/BS Math programs,
will contain actual English sentences and paragraphs and not simply mathematical symbols,

3) will give the students an opportunity to submit a revision based on instructor feedback,4) will be collected (final draft) from our upper division undergraduate mathematics majors at least once a year.

This assessment will directly address the goal that "students preparing to graduate will demonstrate advanced mathematics knowledge and skills."

The math area plans to collect this assessment in Math 4377 (Algebraic Structures) in Spring and Fall of each year as part of a student's homework assignment portfolio.

Regarding the Euclidean Geometry Project, we will review and potentially revise the project rubric and criterion to build on the outstanding performance of students on this project during this assessment cycle.