

Department/Program: Mathematics and Actuarial Science	Chair/Director: Axel Schulze-Halberg	Assessment cycle/year:
	Email address: axgeschu@iu.edu	2020-2021

Mission/Purpose

TEACHING

It is the highest goal of the Department of Mathematics and Actuarial Science at Indiana University Northwest (IUN) to provide excellent quality education and training in mathematics and actuarial science while also providing the required mathematics courses for education, physical, and life sciences students. It is also our goal to provide quality general education mathematics courses for all IUN students, regardless of their program of study.

SCHOLARSHIP

The faculty in the Department of Mathematics and Actuarial Science demonstrates a high level of commitment to continued scholarship in a variety of focus areas, including pure and applied mathematics, actuarial science, and the scholarship of teaching. The faculty remains dedicated to ongoing professional development for all members of the department.

SERVICE

Faculty members in the Department of Mathematics and Actuarial Science actively seek to engage in the educational needs of the communities surrounding Indiana University Northwest. It is our goal to work cooperatively and collaboratively with other departments at IUN, and the governments and educational systems throughout the region we serve, to improve the quality of life for the citizens of Northwest Indiana. The activities of the Department of Mathematics and Actuarial Science directly fulfill IUN’s mission, vision, and strategic plans. Our curriculum is designed to provide excellent education in mathematics and actuarial sciences and support curriculum of other departments in the College of Arts and the Sciences and in other divisions of IUN.

The Department of Mathematics and Actuarial Science is academically central to the mission and strategic vision of IUN because of our service role in providing general education courses. Our graduates consistently find jobs in Northwest Indiana and the greater Chicagoland area. Existence of our actuarial degree significantly contributes to IUN excellence in business and economics.

Student learning outcomes (Goals):

Goal 1. Use mathematical models such as formulas, graphs, and tables to draw inferences.

Goal 2. Represent mathematical information symbolically, visually, numerically, and verbally.

Goal 3. Use arithmetic, algebraic, geometric, logical, and / or statistical methods to model and solve real world problems.

Which Student learning outcomes (Goals) did you assess this year?

All of the goals were assessed.

Assessment Summary

Outcomes/Objectives	Measure(s)	Findings	Action Plans
1. Represent mathematical information in writing	Students will create and revise a mathematical article either as part of their senior thesis (MATH-M493 in our Mathematics BSc/BA programs) or within a Mathematics course that involves intensive writing (MATH-M320 in our Actuarial Science BS program). In addition, their work will be presented at one or several undergraduate conferences.		
2. Redesign of our Mathematics Placement Test (MPT)	The MPT was programmed as a web application. Furthermore, remote proctoring (Examity) was implemented to eliminate student cheating. The department took administration of the MPT over from the Retention Office.	The redesigned MPT is in use since the beginning of the fall semester 2020.	We are tracking placement data. Furthermore, we will track grades of the students who took the MPT in order to ensure accurate placement. Results for the fall semester 2020 are shown and discussed below.
3. Prevent retention problems after new state requirements to send students to Ivy Tech in case they fail the MPT	The MPT scores students obtain.	A considerable portion of newly admitted IUN students per calendar year need an affordable and convenient refresher class.	We provide a free seminar (STEP) for students to help them prepare for the MPT. Also, using internal support from Academic Affairs, we created a free college preparatory course MATH-M15. We keep offering four sections per semester.
4. Creation of online classes	The online classes are performing well and we plan to expand our online offerings. In addition to MATH-M 118 Finite Mathematics and MATH-M 100 Basic Mathematics, we are now teaching several upper level online classes. Furthermore, we designed an online version of MATH-M 117, as well as the Calculus series (MATH-M215/6, MATH-M311). Course design of MATH-M301 is scheduled for the spring semester of 2022.		
5. We have common mid-term and common final exams in M118 and M100 general education courses. As needed, we look at students' achievements. Math faculty group selects specific problems from these exams that address the three goals (1)-(3). The faculty group will develop a rubric that is based on three outcomes, randomly select a group of students that received a grade of C or better in a course, and analyze work of these students as excellent, satisfactory, or needs improvement. If less than 75% of students score satisfactory on a particular outcome, we will review and revise where necessary the content and coverage of the outcome in our courses for further improvement. We perform this task sporadically, every several years, as needed.			
6. Participation in collaborative cross-campus online programs	The department is participating in several collaborative online programs. In 2020, we joined the new collaborative online program in Actuarial Science.	Data is currently being generated.	We participate in designing the new collaborative online program in Actuarial Science. As a byproduct, this will require to design several new online courses, such as the Calculus series (see above). These new online courses will be offered independent of the collaborative program (for example in the summer sessions).

7. Reducing DFW rates by studying the effect of collaborative learning in our classes MATH-M 100 and MATH-M 117	Effect of collaborative learning on student grades and retention within the “Pedagogical Innovation Group” (PIG) initiative	Ongoing project. Initial report was submitted two years ago.	Dr. Vesna Kilibarda, and Dr. Xiaofeng Wang are conducting this study.
8. Reducing DFW rates by using online environments for homework assignments (WebWork and MyLab)	Several instructors are using MyLab. Dr. Daniele Rosso implemented the use of WebWork.	We are studying the effects on student retention. Detailed data will be available in 2022, see below for overall DFW rates.	We continue to generate data in 2021 and 2022.

Analysis Questions

Based on your findings and action plans, what primary changes will you make for student learning? Program outcomes? Changes to the assessment process?

1. This is already implemented. Our MATH-M 493 thesis class and our MATH-M 320 class serve as intensive writing courses.

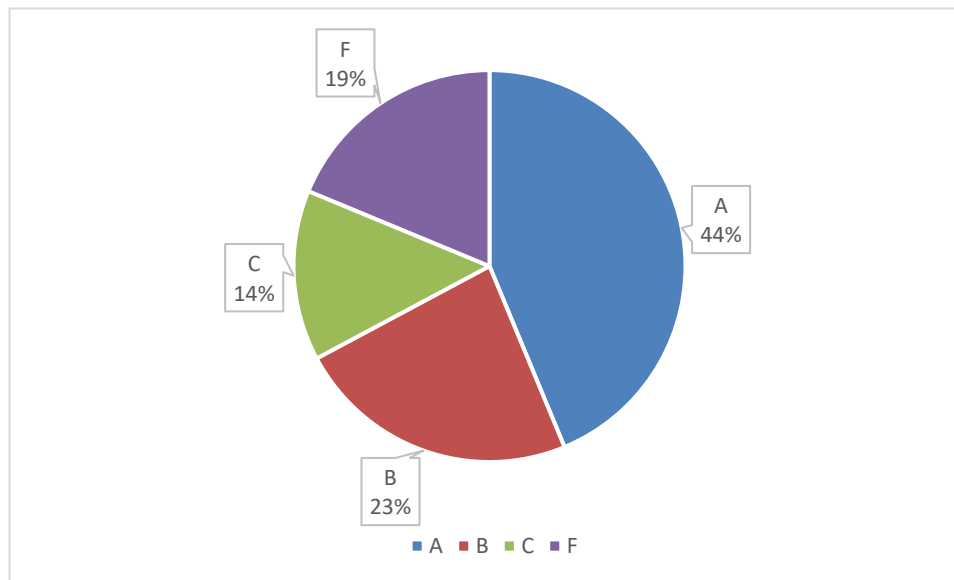
2. We are generating placement data for each student who takes the redesigned MPT. In addition, we track each student’s academic performance in the Mathematics class he was placed into by our MPT. We use this data to continuously improve our MPT in order to enhance placement accuracy.

3. We continue to offer four free sections of our class MATH-M 15 per semester. This class gives the students an opportunity to raise their skills in mathematics to college level while attending their other classes. This measure greatly improves the retention rate as many of these students would probably leave from our University, discouraged and possibly abandoning higher education goals entirely. In addition, we offer students to take the online workshop “STEP” that improves readiness for taking our MPT. The data pertaining to our redesigned MPT is continuously being recorded, and first results for the fall semester of 2020 are shown in the table below. Several remarks are in order here.

1. In the table we compare new data from the fall semester of 2020 with historical data from the years 2017 and before. The reason for skipping the years 2018 and 2019 is that the MPT data for those years may not yield reliable conclusions due to likely excessive cheating by students, as frequent disagreements between MPT results and other information (SAT/ACT test scores, High School grades etc.) suggest. Such cheating was possible because during the two aforementioned years the MPT was administered without proctoring. In contrast to this, the present version of our MPT employs remote proctoring by Examity, which is expected to remove the bulk of cheating attempts.
2. While the total number of students taking the MPT has decreased since 2014 (likely due to falling enrollment), it is in magnitude still of the same order as in 2017 and prior, such that a comparison of data is acceptable. The principal tendency that can be observed by inspection of our table is a shift from higher placement levels towards the lower ones. More precisely, we observe that the percentage of students placing in the lowest level is significantly higher than in previous years. In order to find a placement level distribution similar to 2020, we must go back until 2010 (for this reason we included data from this year in our table). At this point we do not have sufficient data to make a reliable conclusion regarding this phenomenon, but we hope to do so in the fall of 2022.

Placed in level	Class to take	Fall 2010	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2020
MA101	M015 Arithmetic	126(42%)	42(29.4%)	32(23.2%)	35(30.2%)	21(26.9%)	41 (40.6%)
MA102	A100/Algebra1	102(35%)	37(25.9%)	33(23.9%)	18(15.5%)	21(26.9%)	31 (30.7%)
MA103	M117/Alg2 or M100 Gened	62(21%)	56(39.2%)	58(42.0%)	47(40.5%)	28(35.9%)	21 (20.8%)
MA104	M127 Pre-Calc & Trig or GenEd M118 Finite Math	6(2%)	8(5.6%)	14(10.1%)	14(12.1%)	7(9.0%)	7 (6.9%)
MA105	M215 Calculus1	1(0.3%)	0(0%)	1(0.7%)	2(1.7%)	1(1.3%)	1 (1%)
total number of students who took the MPT		297	297	138	116	78	101

3. In order to assess effectiveness of our new MPT version, we track grades of students who were placed by it. The pie diagram below shows data pertaining to students who took the MPT in the fall semester of 2020 and enrolled in the resulting class in the spring semester of 2021. More precisely, the pie diagram visualizes the grade distribution attained by students after completing classes in the spring semester of 2021. Inspection of our pie diagram reveals two main pieces of information: first, 81% of students pass the course that they are placed in (note that the F-portion of our pie includes withdrawals), which is an acceptable percentage. Second, 44% of students pass the course they are placed in with a grade of A (tendencies A- and A+ included). This percentage seems fairly high and suggests slight adjustments of the the MPT's difficulty. However, before making such adjustments, we plan to gather more data in order to obtain conclusions regarding consistency.



4. In 2020 we have started offering an online version of our class MATH-M 117. We will incorporate this class into the assessment mentioned under point 7. We are planning to design online versions of more upper-level classes, including the Calculus series (MATH-M 215, MATH-M 216, MATH-M 311). These online classes can be used within new collaborative online degree programs, see point 6.

5. Continuous improvement.

6. The department currently participates in several ongoing collaborative online programs. These programs include Informatics and the Graduate Certificate in Mathematics, as well as the graduate program Master of Arts for Teachers (Mathematics). We are in the process of designing a collaborative online MSc degree in Actuarial Science. The participation of our department will take place e.g. through online versions of Calculus courses.

7. We are in the process of generating data for this item. Action will be taken once the data becomes available. In case the data suggests that collaborative learning has a measurable effect on the performance of our students, we plan to extend the approach to more of our classes. Due to the pandemic and the unprecedented switch to online teaching modalities in the spring of 2020 has impacted this point. Even though collaborative work among students is possible in an online environment, the results may not be comparable to the in-person scenario. Starting in the fall semester of 2021, we will continue to generate data for the latter scenario.

8. Data for this item is currently being produced.

For items 7 and 8 we keep track of the time evolution of our DFW rates that are shown in the diagrams below for recent years. As can be seen from these diagrams, on average we were able to lower our DFW rates considerably, in particular for introductory-level classes. This is especially visible when comparing

with DFW rates from 2017 and before (this data is not shown here for the sake of brevity). At this point we do not have sufficient information to pinpoint the reason for the decrease of our DFW rates. It is likely that several factors impact at the same time here, such as the newly introduced block-scheduling of freshman courses, and our collaborative approach (see above), among others. Furthermore, note that the COVID-19 pandemic might affect the DFW rates, as our instructors were encouraged to give students more leeway in order to dampen the effects of the pandemic.

