

Department/Program:	Chair/Director: Iztok Hozo	Assessment cycle/year:
Mathematics and Actuarial Science	Email address: ihozo@iun.edu	2015-16

Mission/Purpose

TEACHING
It is the highest goal of the Department of Mathematics and Actuarial Science at Indiana University Northwest 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 IU Northwest 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 the IUN 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 Indiana University Northwest because of our service role in providing general education courses. Our graduates consistently find jobs in Northwest Indiana and the greater Chicago land area. Indiana University Northwest is also the **only** public university in the seven county region offering a BS degree in Actuarial Science. Existence of our actuarial degree significantly contributes to IU Northwest 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?

1., 2. And 3.

Assessment Summary

Outcomes/Objectives	Measure(s)	Findings	Action Plans
1. Represent mathematical information in writing	Students will revise their senior thesis several times and present in COAS students conference or some other venue.		
2. Improve math placement exam readiness	Math placement exam scores	In the past, more than 35% of students were placing below Algebra 1. We are currently helping our students (using Math-M 15 and STEP) and keeping the number below 20%.	Provide free seminars (STEP) for students to help them prepare. Math Department obtained an internal grant in 2013 in order to address this problem. In 2015, we moved the funding of this project to a line item in our budget!
3. Prevent retention problems after new state requirements to send students to Ivy Tech in case they fail the placement exam!	Math placement exam scores.	About 120 admitted IUN students per calendar year need affordable and convenient refresher class. The snapshot of anecdotal data is enclosed.	Using internal support from Academic Affairs, we created a FREE college preparatory course program: Math-M 15. We increased the offerings to four sections per semester.
4. Create On-Line 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: Math-M 405 Number Theory online and the first Actuarial Science course Math-M 320 Theory of Interest in online format.		
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. Increase the number of Mathematics majors	Compare the number of mathematics majors and engage in recruiting more qualified students	We are increasing!	Growth in Actuarial Science. We heavily promoted internships and scholarships in Actuarial Science. Our Faculty member Michelle Guan has obtained grant to fund our students, and organized several very interesting talks by Actuarial Scientists from Chicago.
7. Math-M 100 and Math-M 117 Study	Investigate whether collaborative Learning in our mathematics courses can improve performance and retention.	The report is enclosed	Dr. Vesna Kilibarda, Dr. Michelle Guan, and Dr. Alex Wang are conducting this study.

8. WebWork	One of our faculty: Dr. Daniele Rosso implemented the use of online homework delivery system: WebWork.	We plan to study the effects.	Continue and generate data in 2018!
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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. Already implemented. Our Math-M 493 Thesis class serves as intensive writing as well as capstone class!

2. After we started the free seminars, the percentage of students failing our placement exam dropped to less than 20%. We will continue monitoring and administering free seminars as long as the results are evident. We have the free seminars (STEP program) converted to line item in our budget. We plan to continue to collect statistics with success rates in successive classes keep tracking the size of each session and the passing rate.

3. We continue with our offerings of FREE sections of Math-M 15 to three to four per semester to give the students in this program a chance to raise their math skills to college level while attending their other classes. This greatly improves the retention rate as many of these students would probably be gone from our University, discouraged and possibly abandoning higher education goals entirely. Our Introductory Mathematics Coordinator Ms. Pudar-Hozo randomly picked a math-M 15 class from Spring 2016 and decided to check where are they today. Did it help them that we have M015 class? How did they do in other IUN classes? Did they leave IUN or keep taking classes? Attached are the results.

Last 3 digits student ID	grade M015 Spr16	: GPA, units taken, grade in math A100 (next math class) and grade in M100 (should be AFTER Math-A 100)
084	A+	IUN GPA 2.98, Units Taken Toward GPA 62, A100 C
158	A+	IUN GPA 2.6, Units Taken Toward GPA 45, A100 B, M100 C
761	A+	IUN GPA 1.7 , Units Taken Toward GPA 45,A100 B
359	A	IUN GPA 3.5 , Units Taken Toward GPA 56,A100 A,M117 B+
833	B	IUN GPA 1.9, Units Taken Toward GPA 96, A100 C+, M100 C+
295	B	IUN GPA 2.0 , Units Taken Toward GPA 27,M100 W (not supposed to take it-she should pass A100 first)
112	B	IUN GPA 2.1, Units Taken Toward GPA 25, A100 B, M118 W (not supposed to take it-he should pass M117 first)

Analysis Questions

202	B	IUN GPA 2.2, Units Taken Toward GPA 52, A100 F
158	B-	IUN GPA 2.2 , Units Taken Toward GPA 27,no other math taken
058	C+	IUN GPA 2.358 , Units Taken Toward GPA 52,A100 C, M100 C
105	C+	IUN GPA 2.4 , Units Taken Toward GPA 34,A100 C+
484	C	IUN GPA 2.9 , Units Taken Toward GPA 50,A100 W
301	C	IUN GPA 1.8 , Units Taken Toward GPA 15,A100 F
264	C	IUN GPA 3.1, Units Taken Toward GPA 121, A100 F, A100 B, M100 C
417	C	IUN GPA 2.06, Units Taken Toward GPA 54, M118 F (not supposed to take it-she should first pass A100 and M117)
166	C	IUN GPA 2.1, Units Taken Toward GPA 63, M100 W and again M100 W (not supposed to take it-first pass A100)
627	F	IUN GPA 2.6, Units Taken Toward GPA 103, finished Math for Humanities IU East M111 C (any prerequisites, like passing arithmetic M015 or Algebra 1 A100???)
657	F	IUN GPA 1.3, Units Taken Toward GPA 44, no other math taken
788	F	IUN GPA 1.5, Units Taken Toward GPA 40, no other math taken
705	F	IUN GPA 3.1 , Units Taken Toward GPA 72,no other math taken
610	F	IUN GPA 0.75, Units Taken Toward GPA 16,no other math taken
804	F	IUN GPA 0.99, Units Taken Toward GPA 31, A100 F (not supposed to take- should pass M015 first)
409	F	IUN GPA 0.1, Units Taken Toward GPA 25, no other math taken
574	W	IUN GPA 2.4, Units Taken Toward GPA 63, no other math taken
036	W	IUN GPA 2.6, Units Taken Toward GPA 40, again M015 F

CONCLUSION:

Analysis Questions

1. Students who passed M015 became solid IUN students
2. Five out of 25 students managed to somehow skip a math level (either with the help of their advisor or a computer bug). They all failed this higher level math class that they got into , some of them multiple times

Therefore, after looking at this table, we believe that M015 should stay as it is. It saves quite a few good students.
HOWEVER, we identified another problem: skipping a math prerequisite results in failing 100% of times (according to this anecdotal evidence).

4. We keep monitoring the success of our online classes and if there are any reasons to compare them with traditional classes, we will conduct a study.

5. Continuous improvement.

6. Number of majors analysis. We are tracking the number of mathematics majors and their demographic data trying to determine the optimal strategy for recruitment. Our numbers seem to be increasing.

Based on all math grades in calendar year 2016:

Majors		
Actuarial Science BS	28	49.1%
Mathematics Education	16	28.1%
Mathematics BA/BS	13	22.8%
	57	

IUN cummulative GPA for math majors		
3.001-4.000	31	17actu+7mathBS+7edu
2.001-3.000	20	9actu+5mathBS/BA+6edu
1.001-2.000	5	2act+1mathBS+2edu
0.000-1.000	1	1edu

Math Majors		
male	32	56.1%
female	25	43.9%

White	40	70.2%
Black	6	10.5%
Hispanic	8	14.0%
Asian	2	3.5%
not declared	1	1.8%
	57	

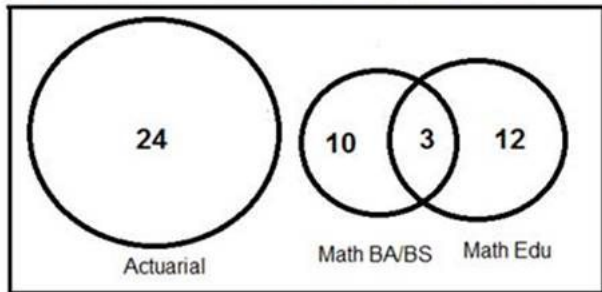
Average SAT Math Majors	
Actuarial Sci	561
Math BS/AS	546
Math Edu	488
Indiana	500
USA	541

Lake Central High School	10
Crown Point High School	6
Hobart High School	5
Munster High School	5
Bishop Noll Institute	3
Hanover Central High School	3
Boone Grove High School	2
Griffith High School	2
Merrillville High School	2
West Side Leadership Academy	2
Wheeler High School	2

Analysis Questions

Based on all math grades in calendar year 2015:

December 22 2015 IUN Math Total 49



Students who took at least one math class during calendar year 2015 while their primary major was math.

Analysis Questions

GENDER

Male	24	49.0%
Female	25	51.0%
TOTAL	49	

ETHNICITY

White	36	73.5%
Hispanic	4	8.2%
Black	6	12.2%
Asian	1	2.0%
NA-Alien	2	4.1%
TOTAL	49	

SAT MATH

IUN Actuarial	527
IUN Math BA/BS	529
IUN Math Edu	475
Indiana (2014)	500
National (2015)	511

SCHOOL NUMBER OF IUN MATH MAJORS

Hobart HS	5
Crown Point HS	4
Lake Central HS. St. John	4
Portage HS	3
Valparaiso HS	3
Chesterton HS	2
Lowell HS	2
Merrillville HS	2
Munster HS	2
West Side HS, Gary	2

7. Collaborative Learning in Developmental and General Education Mathematics Courses

MATH PIGs

Indiana University Northwest

In fall 2016, we implemented interventions in the following mathematics courses:

- M100** Basic Mathematics:
11 sections, 3 sections with intervention (Interventions are implemented before midterm exam)
- M117** Intermediate Algebra:
5 sections, 2 sections with intervention (Interventions are implemented before midterm exam and before final exam)

Motivation

Improve students' performance in math classes

Drop DFW rates in general education math courses

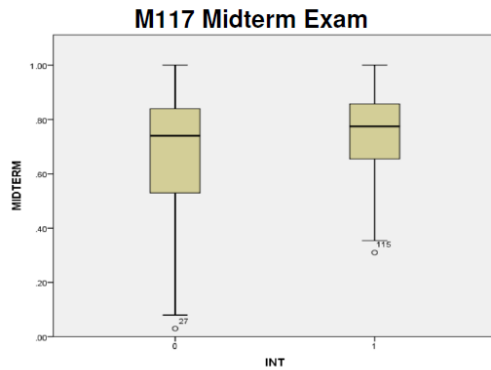
Analysis Questions

Improve retention and graduation rates

Introduce Group Activities to Lectures

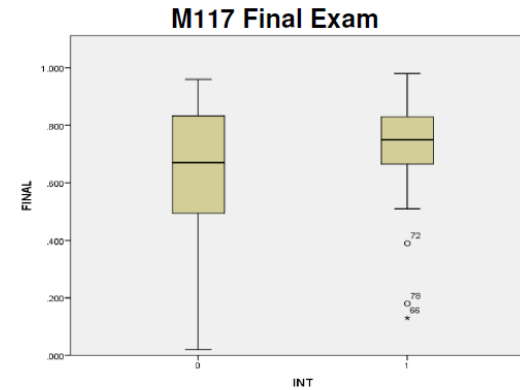
For each intervention section, we ask the instructor (volunteered) to introduce a couple of group activities to their lectures. Each group activity covers one topic/concept in the course is designed as a simple application problem, takes about 15 - 20 minutes, and is completed by a small group of students (3 - 4)

Intervention Results: M117



INT	N	Mean	Std. Dev
0	77	0.67	0.24
1	48	0.74	0.17

t-test for mean $p = 0.065$ (2 tailed)

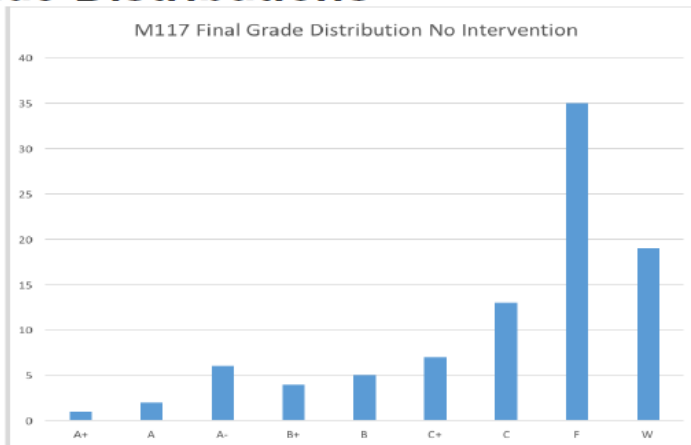
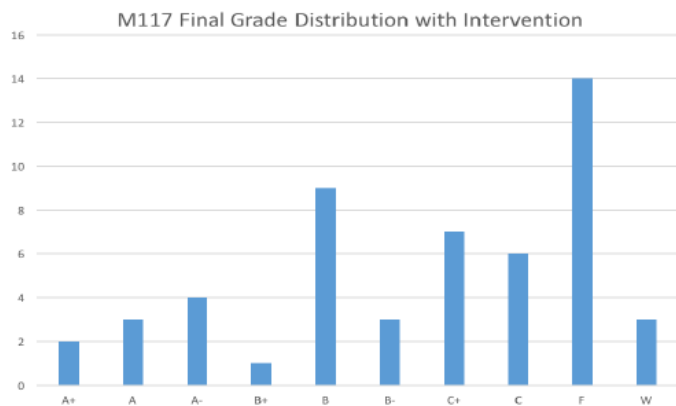


INT	N	Mean	Std. Dev
0	59	0.63	0.22
1	44	0.73	0.18

t-test for mean $p = 0.026$ (2 tailed)

Analysis Questions

M 117 Final Grade Distributions



DFW Rates

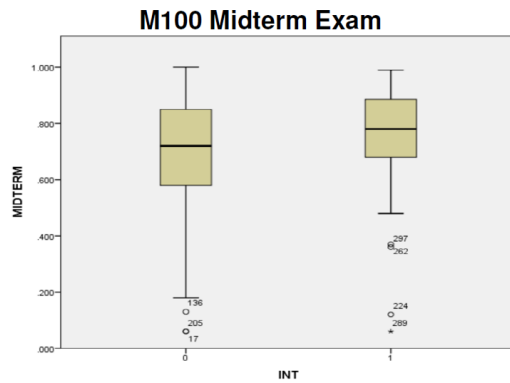
Intervention Sections 0.327 Non Intervention Sections 0.591

M117 Midterm: Proportions with complete correct answers

INT	Mean	2	9	12A	12B
0	67%	81%	35%	91%	75%
1	74%	79%	38%	94%	81%

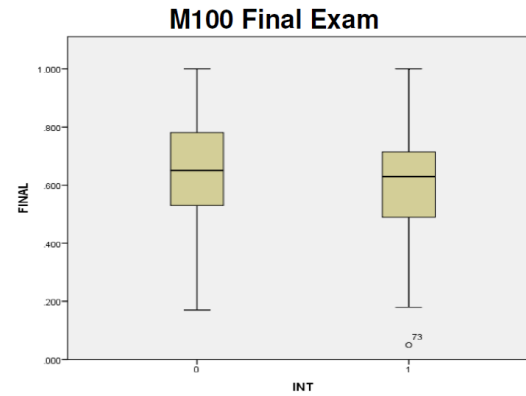
Analysis Questions

Intervention Results: M100



INT	N	Mean	Std. Dev
0	219	0.70	0.19
1	84	0.76	0.18

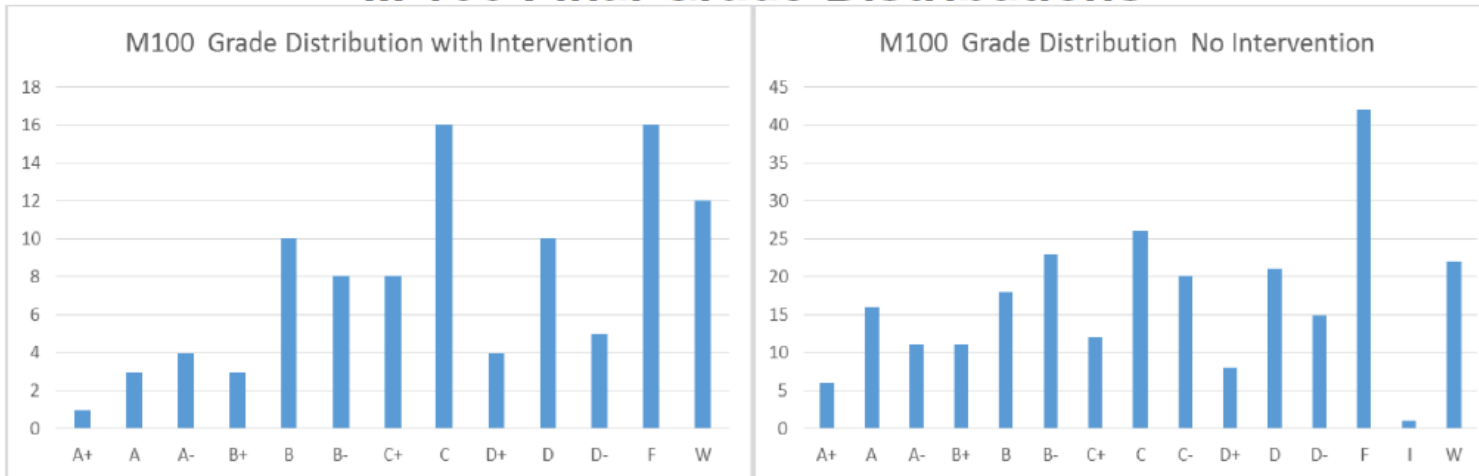
t-test for mean $p = 0.021$ (2 tailed)



INT	N	Mean	Std. Dev
0	188	0.64	0.17
1	83	0.61	0.19

t-test for mean $p = 0.181$ (2 tailed)

M 100 Final Grade Distributions



DFW Rates

Intervention Sections 0.470 Non Intervention Sections 0.433