Math Placement and Developmental Course Acceleration at Worcester State University

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S T A T E
UNIVERSITY

Overview

Worcester State University

- Worcester State University is a public university located in Worcester, Massachusetts with 5380 undergraduate students and 837 graduate students. WSU has 28 undergraduate majors, 31 minors, and 29 graduate programs. (Fall 2018)
- The average age of a WSU student is 22.4 years and the average SAT score is 1104. Only 5% of WSU students are out of state or international and 37% live on campus. (Fall 2018)

Background
Math Placement
Developmental Course Acceleration

History
WSU Placement Exam
Data Results

History

- All incoming freshmen are required to take a mathematics placement exam during summer orientation, which will give them a Code 1-7.

- Based upon their placement exam results and their intended major, they are placed into a math course for their freshmen year.

- WSU has four math pathways: education, statistics, liberal arts, and STEM.

- All WSU students are required to take 2 quantitative reasoning (QR) courses, with at least one being a Mathematics (MA) designation.

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History

Code	Courses
1	MA 98: Developmental Math: Arithmetic
2	MA 99: Developmental Math: Elementary Algebra
3	MA 105: Survey of Math
4	MA 150: Statistics I
5	MA 130: Numbers and Operations for Teachers or MA 180: Introduction to Functions
6	MA 190: Precalculus or MA 202: Business Calculus
7	MA 200: Calculus

Background   History
Math Placement   WSU Placement Exam
Developmental Course Acceleration   Data Results

WSU Placement Exam

- Prior to 2018, WSU had been administering the College Board's Accuplacer exam. The exam comprised of 3 sections: Arithmetic, Elementary Algebra, and College Level Math and was an adaptive, computerized exam. Every student took the Arithmetic and Elementary Algebra exam, however only students who scored high enough took the College Level Math portion.

- In 2017, College Board announced that they were creating a new version of Accuplacer called "NextGen Accuplacer" and that beginning in January of 2019, schools must begin using this new exam. After careful analysis of the new exam, the math department at WSU decided this new exam did not align with our pathways and requested we be allowed to create our own WSU Placement Exam.

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WSU Placement Exam

- In early 2018, we began work on creating our own College Level Math portion of the exam. This was piloted on paper to the Fall 2018 incoming freshmen.

- In fall of 2018, we began to search for a platform to computerize the exam and began creating the Arithmetic and Elementary Algebra portions.

- In January of 2019, we had completed all 3 portions of the exam, piloted it among the math department faculty, and now just needed to work with the university on the implementation process. The full WSU Placement Exam was set to be given starting on April 1, 2019.

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WSU Placement Exam

- In mid-March of 2019, just two weeks before the switch to the full WSU Placement exam, the Massachusetts Board of Higher Education approved their 2019 Common Assessment Policy along with a statement:

"We understand several institutions have developed their own exams and we look forward to learning more from those efforts. At this time, given the potential move to a system-level assessment, we believe it would be prudent to suspend any pending campus-level development of homegrown exams until further discussions are had at the statewide level. The Department will begin to explore this option between now and the end of the summer, with recommendations on how to proceed in the Fall."

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WSU Placement Exam

- The NextGen Accuplacer was administered beginning on April 1, 2019 and in the first ten days, 54 students took the exam and these were the results:

Code	Number of Students	Percentage
1	19	35.19%
2	3	5.56%
3	13	24.07%
4	5	9.26%
5	5	9.26%
6	7	12.96%
7	2	3.70%

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Data Results from College Level Math (CLM)

Number of incoming freshmen who on their first attempt received a code 5, 6, or 7 on CLM in proportion to the total number of incoming freshmen receiving a 5, 6, or 7 on CLM on their first attempt:

	Code 5	Code 6	Code 7
Fall 2017 Incoming Freshmen Accuplacer CLM	$\frac{285}{406}$ (70%)	$\frac{111}{406}$ (27%)	$\frac{9}{406}$ (2%)
Fall 2018 Incoming Freshmen WSU CLM	$\frac{279}{393}$ (71%)	$\frac{82}{393}$ (21%)	$\frac{31}{393}$ (8%)

- Out of the 31 code 7's for Fall 2018, of those who took Calculus, there were 5 A's, 1 A-, 1 B+, and 1 D. Several took Business Calculus or Statistics and they all earned A's as well.

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Data Results from Arithmetic and Elementary Algebra

Spring 2019 (WSU Arithmetic and WSU Elementary Algebra)

- In MA98: Developmental Arithmetic
  14/16 (88%) passed on the first attempt
  (Code 1 to a Code 2)

- In MA99: Developmental Elementary Algebra
  37/44 (84%) passed on the first attempt
  (27 earned a Code 5, 3 earned a Code 4, and 7 earned a Code 3)

Massachusetts Board of Higher Education

2019 Common Assessment Policy:

- "At state universities and University of Massachusetts campuses, 75% of entering first-year degree-seeking students will successfully complete a college-level English and mathematics course appropriate for their major and a college-level Composition course within the first year of initial enrollment/before earning 24 credits unless specified differently in their course of study by AY 2020-2021."

- "Students who require remediation should have the opportunity to complete their college-level mathematics course within one year of enrollment, preferably within a co-requisite model."

MA 130: Numbers and Operations for Teachers

- Taken by all Elementary Education majors

- The first in a 3-course sequence

- Topics include: mental math techniques, bar diagrams, standard algorithms, primes, fractions, ratios

MA 130: Numbers and Operations for Teachers

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Suppose that b is a positive whole number. Write down a positive fraction smaller than $\frac{1}{b}$ and write a sentence explaining why your fraction is smaller. Your answer will involve b.

Jess had a number written on the whiteboard but the digit in the ten thousands place got smudged. She remembers that the number is divisible by 11. Use the divisibility test to help her find the missing digit.

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MA 130: Numbers and Operations for Teachers

Marshall is 6 kg heavier than Ted. Ted weighs twice as much as Lily. If the combined weight of the three people is 146 kg, how much does Ted weigh?

MA 130: Numbers and Operations for Teachers

Marshall is 6 kg heavier than Ted. Ted weighs twice as much as Lily. If the combined weight of the three people is 146 kg, how much does Ted weigh?

5 units + 6kg = 146 kg
5 units = 140 kg
1 unit = 28 kg
2 units = 56 kg
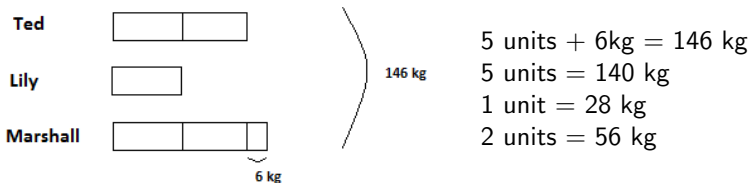
MA 130: Numbers and Operations for Teachers

Students need minimum grade of a C to count the course toward their Education major.

- It is typical that 40% of the students do not meet this grade each semester and must re-take the course.

- Students are often behind in their major because of the MA 130 sequence

MA 130 Coreq: Round 1 Fall 2017

- 18 students enrolled, 14 took final exam

- Format: MA 098 and MA 130 alternated approximately every two weeks, M-Th 8-9:15

- Registrar would not let students withdraw from MA 130 and stay in MA 098 so none withdrew

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- Registrar would not let students withdraw from MA 130 and stay in MA 098 so none withdrew

- Students were given permission to take course Pass/Fail by chair of Education Department. If they passed they would have to retake for ELE/ECH major, but would count for QR if they switched majors. 14 students chose this option, and they all completely gave up on the course and earned F's.

- Grade breakdown: 4 C's, 14 F's, 28% success rate

MA 130 Coreq: Round 2 Fall 2018

- 18 students enrolled, 17 took final exam

- Format: MA 098 on MW and MA 130 on TR, 8-9:15

- Students were required to spend a minimum of 30 minutes in the tutoring center each week; the center was reserved for them on Fridays

Students read sections of the book before class and answered Reading Guide questions in their notes. Class time was spent in small groups on problems or activities.

How did it go?

All students passed MA 098, though some needed to re-take the final exam

47% of the students earned a C or above and were finished with MA 130

- All were placed into the same First Year Seminar for Spring 2019
- Those needing to retake MA 130 were not allowed to do so right away

How did it go?

HW Not Handed In	HW Incomplete	Percent NHI	Percent INC	Missed Reading Guides	Classes Missed	Office Hour Visits	Math Center Visits	Course Grade
2	3	20	30	7	6	1	7 of 11	F
1	3	10	30	4	5	0	8 of 11	F
0	3	0	30	1.5	2	0	11 of 11	C+
4	1	40	10	13	11	0	1 of 11	F
0	1	0	10	1	1	1	8 of 11	D-
0	5	0	50	2	0	1	6 of 11	C
0	3	0	30	1	0	0	10 of 11	C
0	2	0	20	1	1	0	3 of 11	D+
0	3	0	30	2	1	0	8 of 11	C
2	2	20	20	1.5	3	0	8 of 11	B
0	0	0	0	2.5	1	0	6 of 11	C
0	5	0	50	4	4	0	5 of 11	F
0	0	0	0	0	0	0	12 of 11	B
2	1	20	10	9	7	0	5 of 11	F
0	2	0	20	0	1	1	6 of 11	F
0	3	0	30	0.5	0	0	11 of 11	B
1	2	10	20	0	0	3	9 of 11	F

Thoughts Going Forward

- Minimum Math Placement score needed (scores inside each code)

- MA 098/099 corequisites broken down by majors

- First Year Seminar with emphasis on succeeding in college

The big takeaway: this population of students is just not ready for the workload required in this course in their first semester.

Thank You!

Questions?