

FAST FACTS

All Ohio public colleges and universities will offer pathways in mathematics that help students succeed, increase the percentage of students completing degree programs and promote the effective transfer of credits for students moving from one institution to another.

FACT: Kent State develops alternative pathways and co-requisite courses, achieves positive results

Much of 21st century science and engineering is going to be built on a mathematical foundation and a large number of the century's new jobs will require strong quantitative skills. Yet, mathematics – at Kent State University and elsewhere – is a major stumbling block for so many students.

So the question is: what kind of high-quality, entry-level mathematics courses and pathways should be developed, and what can institutions do to ensure that students take the most appropriate courses to meet their academic and career needs? Here are Kent State's responses to these questions.

Response #1: Course redesign

- Kent State began by **redesigning** its gateway mathematics courses and instructional approaches. Three years ago, Intermediate Algebra was changed to remedial status. Accordingly, all students who placed into Intermediate Algebra took it as a remedial course that did not give graduation credit – but did contribute to GPA.
- In 2014, the university created co-requisite courses with an extra credit hour to allow just-in-time remediation to help students achieve the same learning outcomes as College Algebra (or another algebra-intensive course). These co-requisite courses are designed for students found **not** ready for College Algebra (or another algebra-intensive course), but who need it for their majors. Students diagnosed with the most serious algebra deficits are placed into special sections **with additional mandated tutoring**.
- The new co-requisite courses are taught in "traditional" sections of about 40 with homework assigned on MyLabsPlus. To encourage students to use the online system responsibly, homework credit is kept at a level where it motivates, but cannot substantially impact grades.
- At the same time, Kent State redesigned its basic Statistics course to be taught in a "Scale-Up" (Student Centered Active Learning Environment with Upside-down Pedagogies) format. With approximately 100 students in each section, the objective is to scale back on lecturing and to create a more active and effective learning environment. Seated at tables of nine, with one computer for every three learners, students are encouraged to work individually, then to scale up by interacting in groups of three, then to larger groups, and then to a whole class interacting in a "technologically rich" classroom. Scale-Up, with its instructional economies, has long been used successfully in the sciences and is increasingly being used in mathematics at institutions across the country.

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"Our new approach to co-requisite learning has been, for the most part, a success. Our ABC grade rates in co-requisite courses so far have been similar to those for new freshmen in traditional courses, even though the co-requisite course students start at a low level of Algebra preparation. Importantly, students who succeed in the new courses can save a semester by avoiding remediation. This will be one of our surest indicators that our changes have worked well.

"One element of our innovation is a concern. For students who previously would have placed at a lower level into Intermediate Algebra, or even into more elementary courses, but needed College Algebra or higher for their major, we created a sequence of two three-credit courses (with mandated tutoring for the lowest performing students). Both courses have substantial college-level content and together they meet the learning outcomes of College Algebra. But only a disappointing 65% of students achieved ABC grades in these courses. This is an improvement on the 60% who previously exited our Intermediate Algebra remedial sequence with ABC grades. Yet, our objective is to continue working with all students to improve their learning in all mathematics-related courses."

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An early look at student performance

- *First semester (Fall 2014) sections of Statistics averaged 90 students, and the results were encouraging (AB rate 53%; ABC rate 81%; ABCD rate 91%). Students took a common comprehensive final – again with excellent results.*
- *In terms of instructional resources, the new approach saved more than 25% compared with teaching in the traditional format. In terms of outcomes, the new, less well-prepared cohort of students performed better than the previous year's cohort.*
- *Students had positive attitudes, which is an important indicator of success.*

Building on success

- *In fall 2015, the mathematics program will have access – thanks to new investments in infrastructure – to new instructional facilities designed to improve academic outcomes while increasing efficiency.*
- *With a significant reduction in mathematics remediation rates after implementation of the state's remediation-free standards, the program's developmental Emporium, albeit successful, is grossly oversized. Therefore, the single large Emporium is being partitioned into three new spaces with capacity for just over 100 students in each. One space will continue to be used as a developmental Emporium. Beginning in fall 2015, the others will be used for freshman Algebra and Calculus sections in a hybrid Scale-Up format.*
- *The university will continue its investment in extensive instructor development to gain faculty commitment by involving them up front in the design of both space and courses. Not all instructors are yet comfortable with the new approach and the philosophy it represents. Yet, attitudes are positive and people are adjusting – getting used to working in large classes. Continuing professional development will help faculty adapt their approaches and find ways to manage their workloads.*

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Response: #2: Appropriate placement of students

- *With new gateway courses and pathways, Kent State set out to devise a process for placing students appropriately – those who expect to major in a mathematics-intensive discipline as well as those headed for the social sciences, business or other fields.*
- *Recently, the university began using a Math ACT 22 (or equivalent) cut score to exempt students from remediation in compliance with the state's remediation-free standards. Faculty members were comfortable with this cut for Statistics and Math for Liberal Arts and encouraged students in non-algebra-intensive majors to satisfy their math requirements with one of these courses.*
- *Remediation-free students who Assessment and Learning in Knowledge Spaces (ALEKS) placement finds **not** ready for College Algebra (or another algebra-intensive course), but who need it for their majors, are placed into the co-requisite courses. Students diagnosed with the most serious algebra deficits are placed into special sections with additional mandated tutoring.*
- *The university places students with Math ACT scores below 22 into College Algebra (or other algebra-intensive courses) or a co-requisite course if they are found ready by ALEKS and if they need these courses for their major.*

What has been achieved?

- *Remediation rates are significantly down and students who succeed in the new courses can reduce the number of semesters needed to complete their mathematics requirement.*
- *ALEKS placement data identify significant numbers of students with Math ACT scores below 22 who are found ready for College Algebra, AND significant numbers of students with ACT Math scores *at or above* 22 who are **not** ready for College Algebra. Also, placement based on ALEKS has been more successful than previous ACT-based placement methods. Faculty will continue ALEKS placement in a way that respects the ACT 22 cut without compromising student success.*
- *With the introduction of the new gateway courses, remedial mathematics enrollments on the Kent campus dropped from about 2,900 (including many returning students) in fall 2013 to about 1,300 in fall 2014. Further reductions are expected in fall 2015, even though Kent State's freshman classes are stable in size at around 4,200.*
- *With the new approach, the Kent campus' remediation rates are expected to stabilize at 20% to 25% of the new freshman cohort, assuming similar math preparedness of freshmen in the future. Faculty members continue to seek ways to reduce this rate even further.*

