

A Multiple Measures Approach to Mathematics Placement

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Fast Facts about Penn College

- Affiliate of The Pennsylvania State University
- Both a two-year and four-year college with a technical emphasis
- Open admissions policy
- Mandatory placement process, with seven placement levels
- Over 6,500 students, with approximately 41% seeking a baccalaureate degree

The mathematics department at the Pennsylvania College of Technology, working in conjunction with other offices at the College, revised the placement process to provide for the use of multiple measures in the placement of all students, beginning in the fall of 2008.

Foundation for our changes...

AMATYC Position Statement on Initial Placement of Two-Year College Students into the Mathematics Curriculum.

- Adopted November 2002 and reaffirmed Spring 2007 by the Placement and Assessment Committee of AMATYC.

The criteria used to determine mathematics placement should be based on the goals of the mathematics program.

Mathematics Department Goals Referenced in the Design of the Placement Exams

Enable students with diverse academic, technical, and personal mathematical backgrounds to:

- Apply critical and logical thinking to problem solving;
- Apply and adapt a variety of appropriate strategies, including technology, to investigate mathematical conjectures, to solve problems, and to judge the reasonableness of the results;
- Use mathematical models to represent and understand quantitative relationships;
- Recognize and apply mathematics in contexts outside of mathematics to interpret physical and social phenomena;
- Use the language and symbols of mathematics to express mathematical ideas precisely;
- Build individual confidence in their abilities to understand and apply mathematics.

Objectives:

- Reflect the mathematics department goals
- Increase student success rates by improving the initial placement process

Actions:

- Design appropriate instruments
- Implement multiple measures approach

Crossroads in Mathematics: Standards for Introductory College Mathematics Before Calculus states that placement tests should provide a measure of students' abilities not only to show mastery of algorithmic skills but also to think critically and solve problems (AMATYC, 1995).

A Need for Appropriate Measuring Instruments

- New placement exams were designed, piloted, assessed and revised
 - Exam content more closely aligned with our course goals and student outcomes
 - Questions reflecting student understanding of basic algorithmic skills, applied problems and concepts were designed
- Student survey was designed, piloted, assessed and revised to measure:
 - Mathematics anxiety
 - Study skills
 - Attitude toward mathematics

A college placement team, led by faculty from the mathematics department, should develop policies and procedures to be used for the placement of all two-year college students entering the mathematics curriculum.

A Placement Committee was formed to:

- Assess the old placement exam and process
- Make recommendations for changes to the process
- Develop a bank of possible placement questions which led to a new placement exam
- Conduct pilot tests, assess results and make appropriate changes as needed

These procedures should be applied equitably to all students and use an analysis of multiple measures, which may include:

- ***High school and college records***
- ***Scores on college entrance examinations***
- ***Scores on placement tests***

High School and College Records Measuring Prior Knowledge

- Prior Course Work
 - High school math courses and grades
 - Self-disclosed/student's perception
 - Official high school transcripts
 - Specific courses
 - Grades
 - Time lapse since last math course
 - High school rank
 - PSSA (Pennsylvania System of School Assessment) scores, if available
 - Transfer courses transcripts

Scores on College Entrance Examinations Measuring Aptitude

- Mathematical Aptitude
 - SAT scores, if available
 - ACT scores, if available
- Reading Ability
 - Reading SAT score, if available

Scores on Placement Tests Measuring Current Prerequisite Knowledge

- Pre-Algebra, Elementary Algebra, Intermediate Algebra, and Functions & Graphs components
 - Basic Skills
 - Applications
 - Conceptual Understanding
 - Trigonometry and Basic Trigonometry
 - Functions & Graphs only
- Reading Level

In addition, student success can be impacted by less quantifiable factors such as motivation; family and work obligations; special student needs; and educational, career, and personal goals. These may also be factors to consider.

- Web-based affective characteristics survey
 - Study Skills awareness
 - Anxiety level
 - Attitude scores (confidence and motivation)

In all cases, the placement team should make the final decision regarding placement based on an analysis of multiple measures. All those involved in the testing, advising, and placement of students into the mathematics curriculum should be well versed in the elements of the program.

The Online Placement Review Committee consisting of math faculty reviews all information and determines which of seven placement levels each student will be assigned.

- Computerized process
- Independent review
- Requires two of three faculty be in agreement

Appropriate staff, facilities, and equipment are essential to the success of the program.

- Information Technology personnel provide
 - Programming assistance
 - Technical support
- Advisement Center staff oversees
 - Testing process
 - Collection of data for review and analysis
- Mathematics Faculty are responsible for
 - Development of the instruments and procedures
 - Assignment of initial placement level
- Administration provides
 - Funds
 - Oversight

It is the responsibility of the college to advise students on policies, procedures, and implications of the placement program prior to enrollment. Opportunities to prepare for the placement test should be provided by the college, and information regarding these opportunities should be disseminated to all students prior to placement testing.

- Mathematics Department web page
 - Sample placement exams available online, with a self diagnosis component

- Advisement Center
 - General information provided on web page
 - Written correspondence prior to testing
 - Advising sessions for new students to discuss placement

- Outreach for K-12 Office
 - Conducts workshops for Counselors and High School Teachers

- Fall and Spring Open House
 - Sample placement activity
 - Information table