Course-based Program Assessment

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Department of Mathematical Sciences
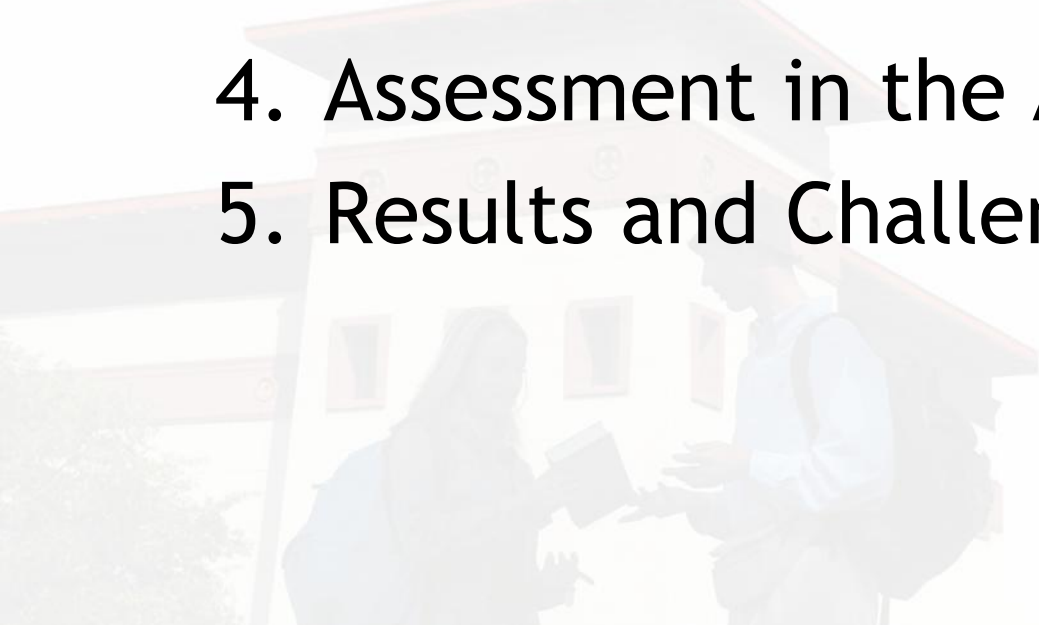
The University of Texas at El Paso

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Overview

1. UTEP and its Math Department
2. Vision, Mission, Competencies
3. Assessment Plan
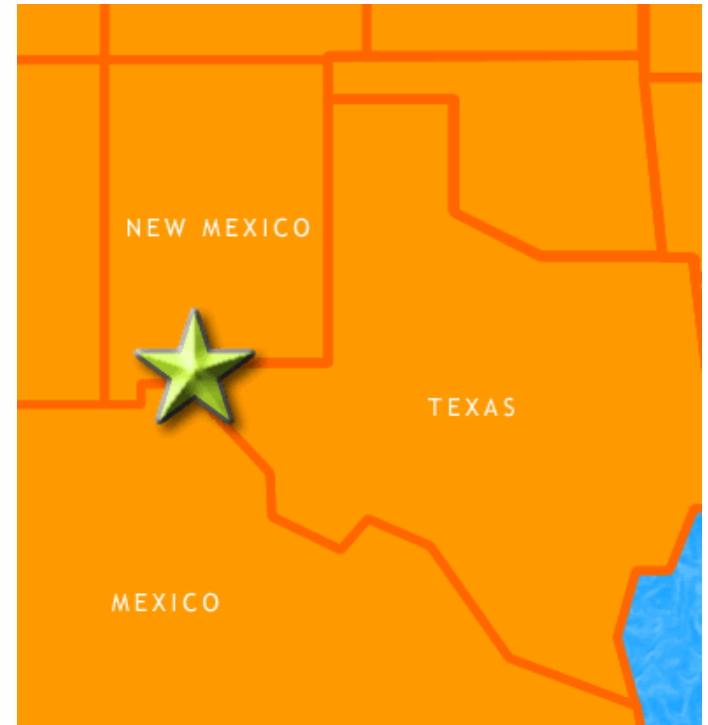4. Assessment in the Analysis course
5. Results and Challenges

UTEP Student Profile

About 22,000 students
(17,000 UG and 5,000 GR)

- 24 years of age (undergraduate average)
- 74% Hispanic
- 55% female
- 81% from El Paso County commuting daily
- 84% employed
- 50% first generation university students

The Mathematics Department

~200 UG Math majors:

- BS Mathematics (with concentrations in Secondary Education (by far the most popular choice), Statistics, Applied Math, etc.)

Graduate Programs:

- MS Mathematics, MS Statistics, MAT Mathematics

- MS Bioinformatics*, PhD Computational Sciences*

* interdisciplinary

Getting Started

Process driven by Accreditation Requirements (SACS)

Creation of a Strategic Planning Committee

Consisting of five department members

- "High profile": Department chair as committee chair
- "Departmental opinion leaders"
- Representing all sub-disciplines within the department
- Varying experience from Assistant Professor to Full Professor

Working on a Vision and Mission Statement

- Lots of "talking"
- Slowly coming to an understanding about the future path of the department
- Very slow but steady progress
- Surprise: All committee members envision quite similar student outcomes!

Spring & Fall 2004

Basic Student Competencies

Department agrees on the following student learning outcomes:

1. Given initial information and data from various domains, students will be able to identify problems, and using appropriate mathematical tools, formulate and solve them.
2. Students will be able to understand, create and analyze mathematical proofs.
3. Students will be able to communicate mathematics clearly in oral and written form.

Early 2005

Assessment in Seven Courses (I)

1. **Discrete Mathematics**
2. **Introduction to Higher Mathematics**
   - Sophomore courses; students take one of these two courses. "Intro to Higher Math" is "Math as a Laboratory Science". Discrete Math is also taken by Computer Science majors.
3. **Principles of Mathematics**
   - Junior level proof course; taken by (almost) all math majors.
4. **Introduction to Analysis**
   - Junior level course; "Analysis on the Real Line".
5. **Fundamental Mathematics from an Advanced Standpoint**
   - Senior level capstone course for future secondary education teachers; topic is high school algebra.

Assessment in Seven Courses (II)

6. Statistics
    - Senior level course; has probability course as a prerequisite. Not a requirement for Math majors.

7. Numerical Analysis
    - Senior level introductory numerical methods course; also taken by Computer Science majors.

Faculty groups design the assessment details for each course.

Example- Analysis (I)

| #	Course Goal	Linked to Outcome
1	Student will become familiar with the fundamental results of "Analysis on the Real Line" (highlights of the course include the Intermediate Value Theorem, the Mean Value Theorem and possibly the Fundamental Theorem of Calculus)	2
2	Students will thoroughly understand the definitions of the basic concepts of Analysis such as convergence, continuity, differentiation and integration	2
3	Students will be able to apply definitions and theorems in Analysis	2
4	Students will continue to develop their ability to use the method of proof to establish the fundamental results in Analysis	2
5	Students will employ effective strategies to decide the truth or falsity of mathematical propositions	2
6	Students will be able to write down proofs in a clear, concise manner using correct English and mathematical grammar.	3
7	Students will be able to present and defend a proof to a group of their peers.	3

Example- Analysis (II)

COURSE OBJECTIVES (Corresponding course goals)	MEASUREMENT METHOD	BENCHMARK
1. State important definitions (2)	Embedded final examination questions	80% (4 of 5 correct)
2. State major theorems (1)	Embedded final examination questions	66% (2 of 3 correct)
3. Use the definitions to compute a limit and a derivative (2,3)	Embedded final examination questions	50% (1 of 2 essentially correct)
4. Show facility with the following techniques: ε-δ proof, counterexample, subsequence construction (2,3,4,5,6)	Embedded final examination questions	66% (2 of 3 essentially correct)
5. Construct and present a proof to the class (7)	During class time, using notes, present at the board and defend a solution to an exercise that requires proof.	80% on a rubric score (Only minor errors in notation or presentation. No errors in logic.)

Assessment Schedule

- We are assessing 3-4 courses per semester.

- Instructor(s) write assessment report at the end of the semester.

- Reports are reviewed by the assessment committee and presented to the faculty.
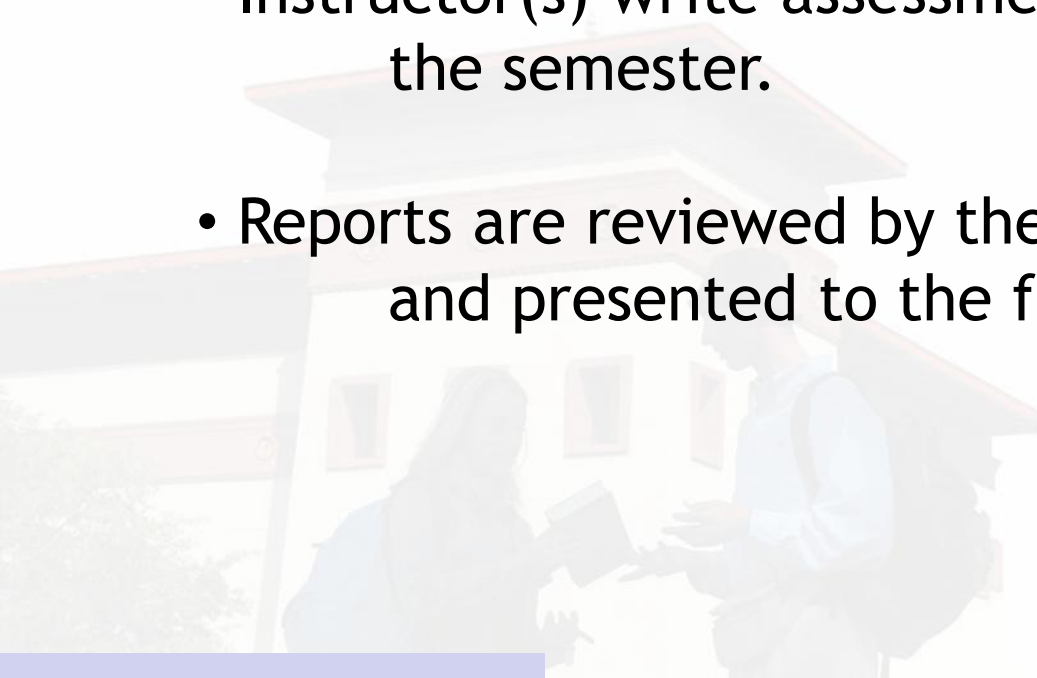
Since Spring 2009

Results

- Fine-tuning of the assessment plans is needed

- Assessment has raised awareness of the faculty involved (learning outcomes, curricular dependence, etc.)

- Discovery of "weak spots" in students' learning of some course material (e.g. relations)

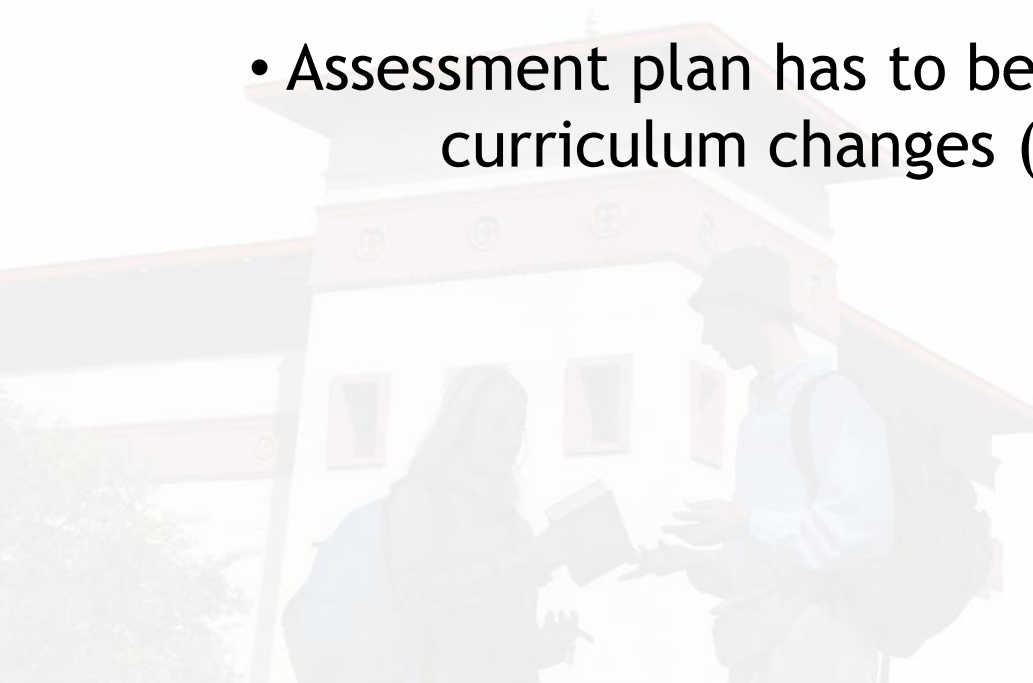- Discovery of "holes" in the curriculum (e.g. complex numbers)
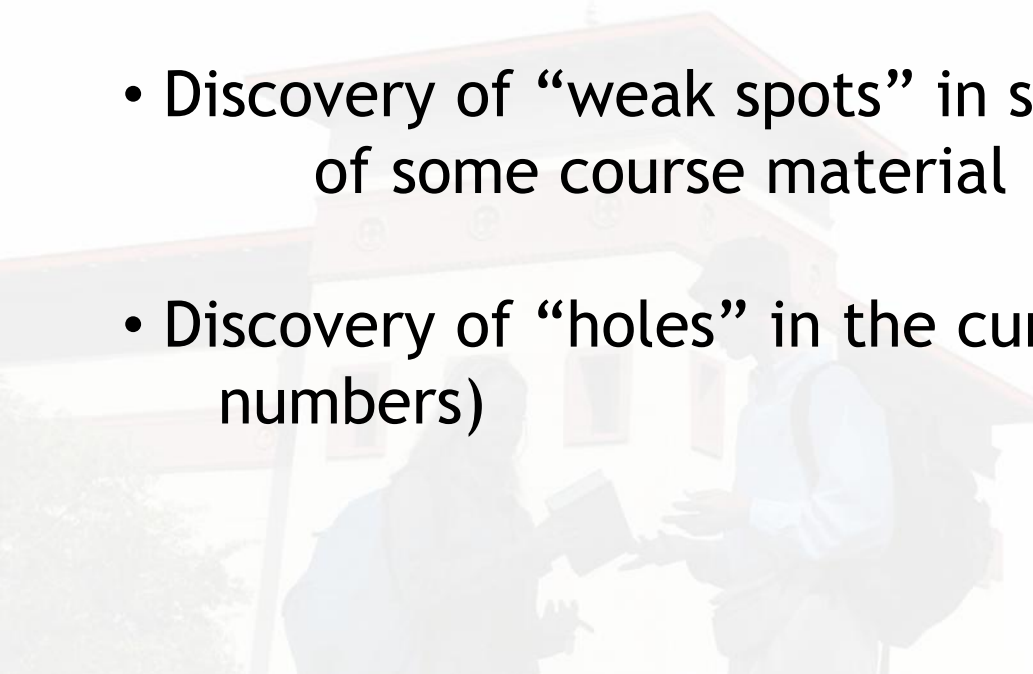
Challenges

- Lack of buy-in by some faculty

- Assessment plan has to be changed when the curriculum changes (new Statistics course)

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