

Assessment and Curriculum Development

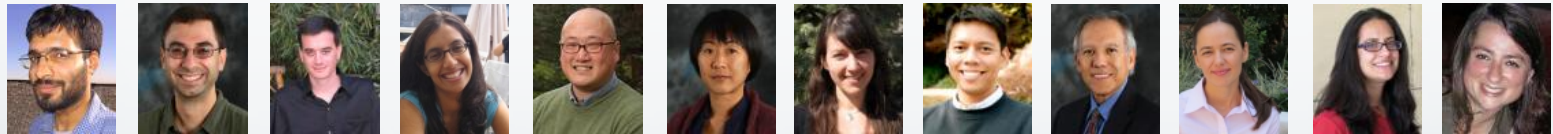
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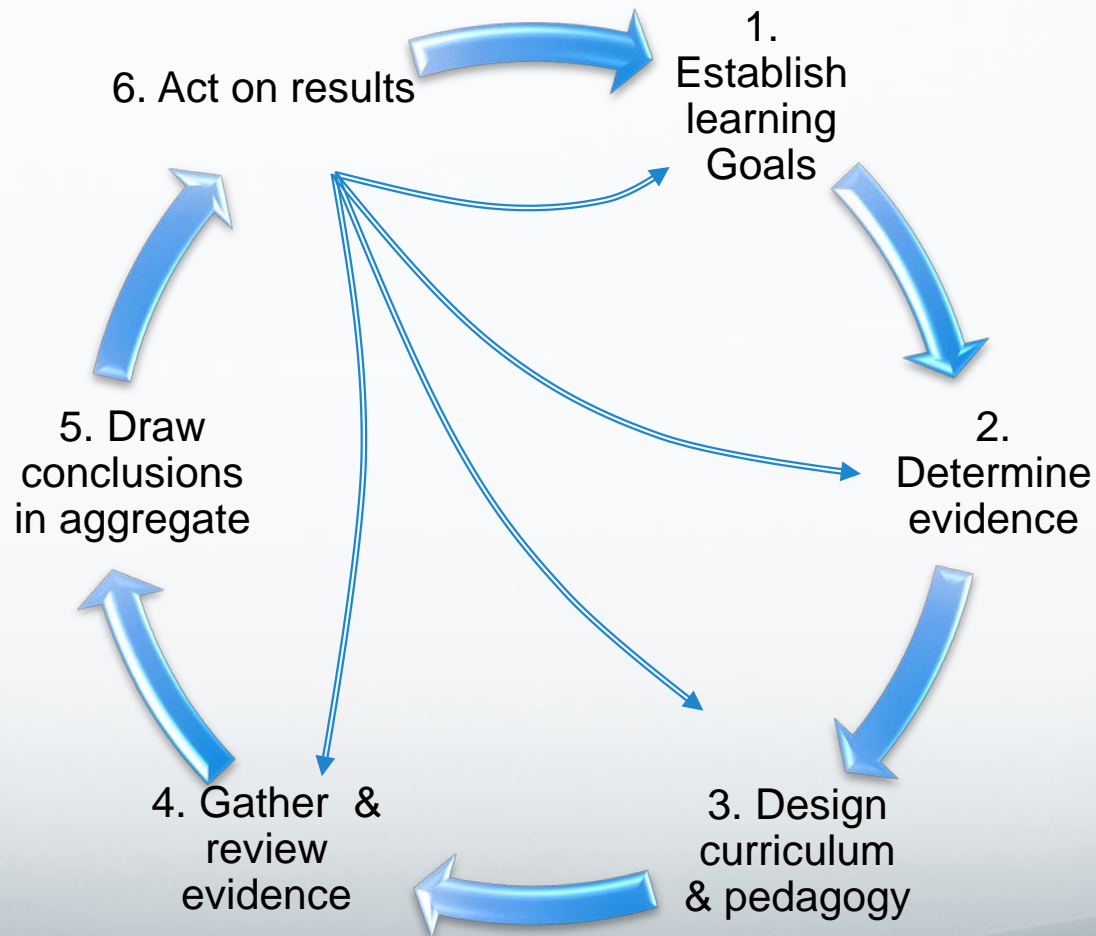
- Programs
 - Undergraduate since 2005
 - Majors: 51 graduated by 2013, 86 current students
 - Minors.
 - Graduate since 2006
 - 13 MS, 6 PhD
 - 23 current students

- Faculty
 - 12 fulltime senate faculty members



- 2 visiting assistant professors
- 10 Unit-18 lecturers

Assessment Cycle



Program Learning Outcomes

1. **Analytical Methods:** solve mathematical problems using analytical methods
2. **Computational Methods:** solve mathematical problems using computational methods
3. **Connections:** recognize the relationships between different areas of mathematics and the connections between mathematics and other disciplines
4. **Communications:** give clear and organized written and verbal explanations to a variety of audiences
5. **Modeling:** model real-world problems mathematically and analyze their models using their mastery of the core concept

Assessment History

Course Title	Program Learning Outcomes				
	1	2	3	4	5
	Analytical Methods	Computational Methods	Connections	Communication	Modeling
Calculus I & II					
Calculus III					
DE & Linear Alg					
Prob & Stats			mod.proj. 11-12		
Complex Variables					
Intermediate DE	hwk exam 09-10				
PDEs					
Numerics I & II		hwk, exam 09-10, 13-14			
Adv. Linear Alg	hwk 14-15		writing 11-12	writing 10-11	
Modeling*					grp. proj. 12-13

Indirect evidence: student survey groups (SATAL) during class period
 graduating senior surveys (2014-2015)

First Year 2009-10

PLOs	Direct Evidence	Indirect Evidence
1. Analytical Methods	Homework and final exam questions in Intermediate DE	SATAL survey group of students taking both courses
2. Computational Methods	Homework and final exam questions in Numerical Analysis I	

All 8 faculty members assessed all students work individually using common rubrics (excerpt for PLO1 below)

Poor = -1	Fair = 0	Good = 1
<p>There is an incomplete explanation. It may not be presented clearly.</p> <p>Some correct reasoning or justification for reasoning is present with trial and error, ...</p>	<p>There is a clear explanation and appropriate use of accurate mathematical representation with few errors.</p> <p>Planning or monitoring of strategy is present, ...</p>	<p>A systematic approach and/or justification of correct reasoning is present.</p> <p>Appropriate and accurate mathematical representations...</p>

First Year 2009-10

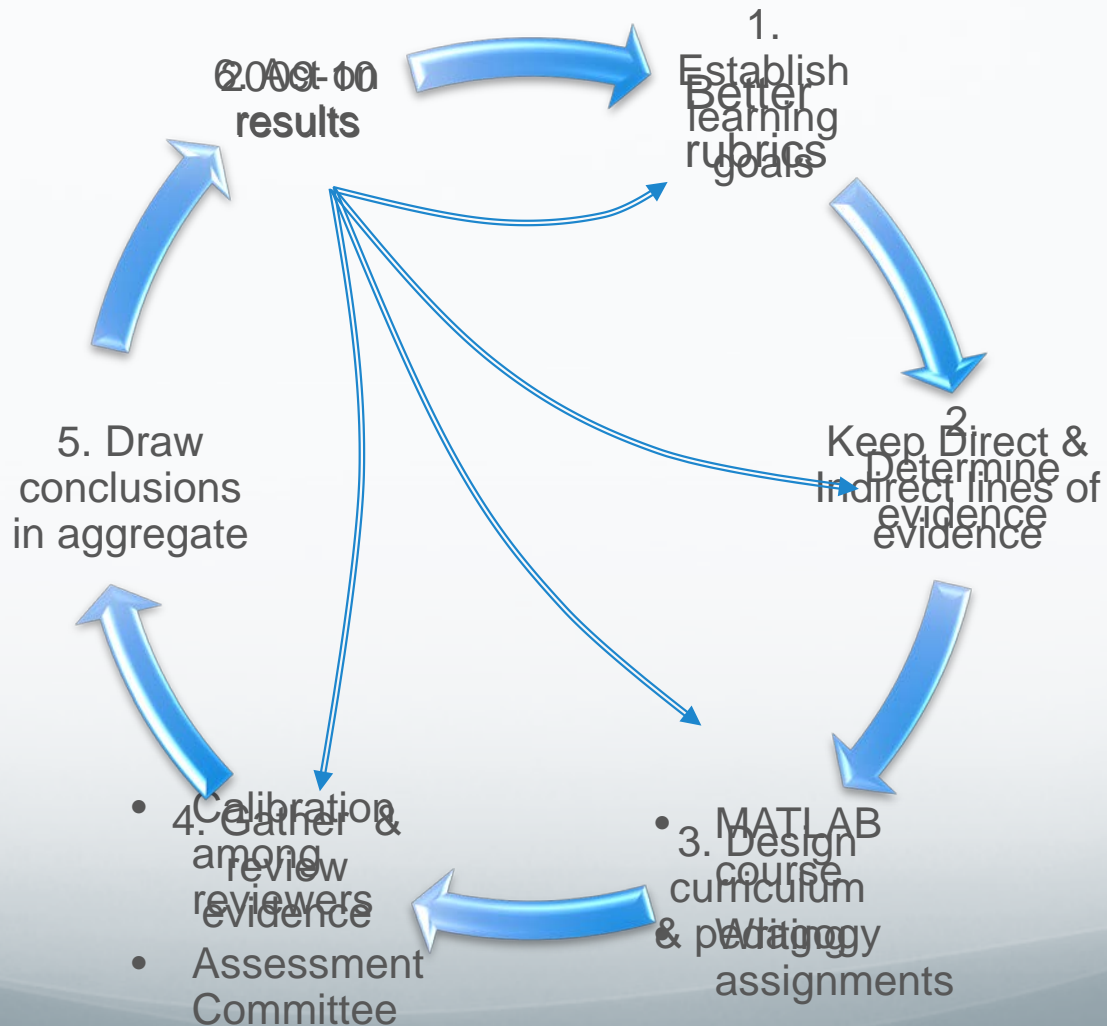
Faculty assessment of one of the embedded homework problem

	F1	F2	F3	F4	F5	F6	F7	F8
Student A	0	0	0	-1	1	0	0	-1
Student B	1	1	0	0	0	0	0	1
Student C	-1	1	1	0	0	0	0	1
Student D	-1	1	1	0	0	0	0	1
Student E	1	1	0	1	1	0	0	1
Student F	1	1	-1	0	1	0	0	-1
Student G	0	0	-1	0	0	1	0	0

SATAL student survey group results

- More early programming experience
- A writing class that aligned more closely to the writing done in mathematics

Assessment Cycle



Year 2012-13: Modeling

Rubric Excerpt

	5 pts	4 pts	3 pts	2 pts	1 pt
Math model	...				
Analysis of model	The behavior of the model is compared directly to the original problem.	The behavior of the model is related to the original problem.	The behavior of the model is discussed.	Minimal discussion of the results is given.	No meaningful discussion of the results is given.
Clarity of presentation	...				

Committee member assessment of the written reports

	Student A			Student B			Student C			Student D		
F1	4	3	3	5	4	5	5	4	5	3	3	2
F2	3	3	3	4	5	4	4	4	4	3	2	4
F3	3	3	3	3	4	5	4	5	4	3	2	3

Year 2012-13: Modeling

Report Excerpt

Overall, the committee felt that students performed fairly well when it came to modeling a real world problem, with an average rating of 3.69. The general quality of the analysis of the results was deemed to be slightly lower, with an average rating of 3.5. The ratings on all three aspects assessed were overall very close to each other, and showed a noticeable correlation within each report, showing that good projects were deemed satisfactory in all respects, and poorer projects were deficient in several aspects.

Curriculum Development Supported by Assessment

- Math 50 Beginning MATLAB (spring 2012)
- Math 150 Mathematical Modeling (spring 2012)
- Writing assignments, group projects, and presentations in upper-division courses
- New courses in computational methods leading to a new emphasis track: Computational and Data-Enabled Science
- Possible changes in Numerical Analysis courses to address the different needs of Applied Math and other programs

Improvement in the Assessment Cycle

- An assessment committee since fall 2010
 - Review evidence and develop rubric
 - Summarize findings in a report
 - Share and discuss findings with all faculty and all faculty decide on a course of action together
- Faculty Assessment Organizer (FAO)
 - Organize assessment activities, especially data collection
 - Coordinate with supporting services
- Better-developed descriptive rubrics and calibration among assessment committee members, shared with students as pedagogical tools

Future Work

- Continued improvement of rubrics
 - Precise and meaningful articulation of what we expect our graduating students to be able to do
 - Shared among all instructors as well as students
- Library of suitable assessment problems
- More systematic collection and storage of evidence
 - From spring semester courses
 - More frequent