WESTERN MICHIGAN UNIVERSITY

Student and Faculty Learning Communities to Increase STEM Student Retention

www.wmich.edu/step

Award #0336581

Goals

- Improve Student Success
- Improve Teaching and Learning for 1st year STEM Courses

Challenges

- No common first-year curriculum among 16 undergraduate programs (other than technical writing, calculus, and general chemistry)
- Low historical Retention Rates (average over 2000—04)
  - -2nd Year Retention Rates = 60.0% to CEAS; 74.3% to WMU
  - -3rd Year Retention Rates = 40.6% to CEAS; 61.1% to WMU
- Diverse academic background of entering 1st-time, 1st year CEAS students as demonstrated by 1st semester Math Placement

Calculus II and higher	Calculus I	Pre-Calculus	Algebra II	Algebra I or lower	No Math Data
7%	22.2%	23.7%	30.3%	16.7%	4.2%

Strategies

- Learning Communities: place ~20 students in the same 3-to-5 courses together to promote connection and study group
- Learning Communities based on majors (CCE, ECE, Chemical/Paper, Undecided) or math placement (calculus, pre-calculus, algebra)
- Mentored by faculty – preferably in an anchor class
- Content tutoring on evenings and weekends that supplement tutoring provided by math, chemistry, and physics
- Faculty Learning Community meeting once a month to discuss reading, coordinate co-curricular activities, share and discuss mentoring strategies
- Created parent program in 2007-08 to engage the helicopter parents
- Revision of 1st Year STEM Courses
  - -Chemistry I: move one chapter to Chemistry II; added seminar on study skills and math skills for chemistry
  - -Technical Communication: added career development as a theme for writing assignments
  - -Math/Chemistry collaboration to develop a set of 40 problems based on Chemistry I concepts for Algebra II

Implementation

- Placed 256 students into learning communities in 2005-06, 294 students in 2006-07, and 328 students in 2007-08
- Examples of Learning Community Course Clusters
  - CCE: Tech. Communication, Engr. Graphics, Intro to Design, Geoscience, Math (Calculus, Pre-Calculus, Algebra II)
  - Chemical Engr: Tech. Communication, Chemistry I, Intro. to Chemical Engr., Math (Calculus, Pre-Calculus)
  - ECE: Tech. Communication, Digital Logic, Chemistry I, Math (Calculus, Pre-Calculus)
  - Undecided: Tech. Communication, Intro to Design, Math (Calculus, Pre-Calculus, Algebra II), and Chemistry (Calc/Pre-Calc)
  - Math: Tech. Communication, Engr. Graphics, Math (Calculus, Pre-Calculus, Algebra II), and Chemistry (Calc/Pre-Calc) or Intro to Engr. Design (Algebra II)

Results

- Building Connections-% of Positive Responses to FYEE Components (Agree or Strongly Agree)

Item	2005	2006	2007
I know at least 6 other LC students	87	78	79
I have studied with other LC students	74	63	73
I know where to get tutoring for core classes	54	54	70
I have used a tutor for one or more core classes	32	44	31

- 2nd Year and 3rd Year Retention Rates

		2nd Year Retention (%)		3rd Year Retention (%)	
		FYEE	Comparison	FYEE	Comparison
Retention to CEAS	2005-06 Cohort	**68.0**	60.0	**54.3**	40.6
	2006-07 Cohort	**70.1**	60.0		
Retention to WMU	2005-06 Cohort	76.2	74.3	**69.5**	61.1
	2006-07 Cohort	77.9	74.3		

- Bold represents statistically significant at $\alpha = 0.05$
- Assessment of impact of co-curricular activities on student development based on Bloom's taxonomy (cognitive/affective)

Year	Level 1 (Knowledge)	Level 2 (Comprehension)	Level 3 (Application & Analysis)	Level 4 (Synthesis & Evaluation)
2005-06	10.1%	66.7%	22.5%	0.7%
2006-07	31.8%	47.3%	19.4%	1.5%

- Algebra II → Chemistry I

	# of Students (Algebra II)	# Successful1	# successful and continuing in Chemistry the following semester	% continuing and successful in Chemistry1	Avg. GPA in Chemistry	Avg. GPA in Algebra II (for those taking Chemistry the following semester
Pilot Fall 05	39	29	16	37.5	1.18	2.75
Fall 2006	39	28	18	88.9	3.53	3.11

- Higher Successful Completion Rates of critical 1st year STEM courses (grade =/>C) - statistically significant at $\alpha = 0.05$
  - -Calculus I (Science/Engineering) - Fall 06; Calculus I (General) - Spring 06, Fall 06;
  - -Pre-Calculus - Fall 05, Spring 06, Fall 06
  - - Algebra II - Fall 06
  - -Chemistry I - Fall 05, Fall 06
  - -Physics I - Spring 07;
  - -Technical Communication - Fall 06
  - -Engineering Graphics - Fall 05, Fall 06

Impact

Institutional Policy

- In-semester progress reports from instructors → mid-term grade reporting in 2006
- Student release form → software that allows students to grant access to registration and grade records to parents in 2007
- Increased collaboration between academics and student life → V.P. of Student Life on Advisory Board in 2007
- Created pilot engineering residence program in 2006-07 with 41 students and expanding to 118 students in 2007-08
- Created resources on student success in Podcasting format Visit at www.wmich.edu/oit/itunes
- College created task force to examine teaching and learning in Statics, Mechanics of Material, and Dynamics

Student Successes

Amanda Rossman, Paul Rossman, and Kendall Vasilnek presented their design project at the 2006 NCS-ASEE meeting.

Students, Paul Pagano, Edward Brabandt, Kendall Vasilnek, and Amanda Rossman, presented at the 2007 ASEE Annual Conference

1st Year Students, Joshua Cook, Adam Eaton, Aaron Mason, Stephen Orey, Britney Richmond, and Kimberly Warners, presented design projects at the Capitol Hill Symposium and SENCER (Science Education for New Civic Engagement and Responsibilities) Poster Session in Washington, D.C., and met with Michigan Congressional Representative, Fred Upton.

Future Work

- Improve collaboration between Academics and Student Affairs
- Build relations with departments to create customized learning communities
- Raise awareness among faculty about the Millennial students and faculty role in student success
- Address critical engineering science classes to improve 3rd year retention
- Incorporate Community College Transfer students