WIP: Western Michigan University's Effort to Increase Retention of First-Time, First-Year Engineering and Applied Sciences Students

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Overview

- The Challenges
- Components of FYEE
- Some Preliminary Results
- Impact of FYEE on Institutional Policies
- Concluding Remarks

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The Challenge

- No common first-year curriculum among 16 undergraduate programs (other than technical writing, calculus, and general chemistry)
- 2nd Year Retention Rates (averaged over 2000-2004) = 60.0% to CEAS; 74.3% to WMU
- 3rd Year Retention Rates = 40.6% to CEAS; 61.1% to WMU

The Challenge

- Diverse academic background of entering 1st-time, 1st-year CEAS students

First-Semester Math Placement, 2004

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%

Components of FYEE

- 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

Components of FYEE

- 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)

Components of FYEE

- Content tutoring on evenings and weekends that supplement tutoring provided by math, chemistry, and physics
- Co-curricular activities (academic/professional and social) to explore career, CEAS, WMU, and self
- Created new learning community for students placed into Algebra I and lower in 2006-07 and 2007-08
- Placed 256 students into learning communities in 2005-06, 294 students in 2006-07, and 328 students in 2007-08

Other Components of FYEE

- 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

Other Components of FYEE

- 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
- Created resources on student success in Podcasting format
- Created pilot engineering residence program in 2006-07 with 41 students and expanding to 118 students in 2007-08

Some Preliminary Results

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

Item	2005	2006
I know at least 6 other LC students	87	78
I have studies with other LC students	74	63
I check my WMU email account daily	79	77
I know where to get tutoring for core classes	54	54
I have used a tutor for one or more core classes	32	44

Some Preliminary Results

- Assessment of impact of co-curricular activities on student development based on Bloom's taxonomy (cognitive/affective) – see Session S1A

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%

Some Preliminary Results

- Successful Completion of critical 1st-Year STEM courses (Grade=/>C)*

	% Successful Completion				% Successful Completion		
Calc. I Sci./Engr.	FYEE	Comparison	Significant (α=0.05)	Calc. I (Gen)	FYEE	Comparison	Significant (α=0.05)
Fall 05	73.7	65.5	No	Fall 05	58.3[1]	78.9	No
Sp. 06	57.8	60.4	No	Sp. 06	77.8[1]	51.7	Yes
Fall 06	76.5	44.1	Yes	Fall 06	85.7	63.6	Yes
Sp. 07	68.2	55.8	No	[1]# Students = 12 (Fall 05); 9 (Sp 06)			

*Withdraw = Not Successful

*Comparison = Other WMU students enrolled in course

Some Preliminary Results

- Successful Completion of critical 1st-Year STEM courses (Grade=/>C)*

	% Successful Completion				% Successful Completion		
Pre-Calcalus	FYEE	Comparison	Significant (α=0.05)	Algebra II	FYEE	Comparison	Significant (α=0.05)
Fall 05	78.7	70.5	Yes	Fall 05	76.3	74.0	No
Sp. 06	68.6	56.1	Yes	Sp. 06	44.4[1]	67.2	No
Fall 06	85.9	72.8	Yes	Fall 06	81.4	63.8	Yes
Sp. 07	67.3	63.3	No	[1]# of FYEE Students = 9			

Some Preliminary Results

- Successful Completion of critical 1st-Year STEM courses (Grade=/>C)*

	% Successful Completion				% Successful Completion		
Chemistry I	FYEE	Comparison	Significant (α=0.05)	Physics I	FYEE	Comparison	Significant (α=0.05)
Fall 05	54.6	43.6	Yes	Sp 06 Calculus	81.8	72.4	No
Sp. 06	52.4	46.3	No	Sp. 06 Algebra	77.8[1]	55.4	No
Fall 06	78.8	71.7	Yes	Sp 07 Calculus	94.5	81.5	Yes
Sp 07	82.2	76.4	No	Sp. 07 Algebra	85.7[1]	51.4	Yes

[1]# Students = 9(06); 7(07)

Some Preliminary Results

- Successful Completion of critical 1st-Year STEM courses (Grade=/>C)*

	% Successful Completion		
Course	FYEE	Comparison	Significant (α=0.05)
Technical Comm. – Fall 2005	82.8	76.6	No
Technical Comm. – Fall 2006	86.8	60.9	Yes
Engr. Graphics – Fall 2005	81.3	64.2	Yes
Engr. Graphics – Fall 2006	87.3	66.5	Yes

Some Preliminary Results

- Algebra II → Chemistry I

	# of Students (Algebra II)	# Successful[1]	# successful and continuing in Chemistry the following semester	% continuing and successful in Chemistry[1]	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

[1]Grade =/>C; W not successful

Some Preliminary Results

- 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: Significant at the α=0.05 level

[1]The comparison is CEAS 5-year average (2000-2004) retention rate

Some Preliminary Results

- 1st- and 2nd Year Students presenting at regional and national conferences

At 2006 NCS-ASEE

1st Year Students from 2006 Met with MI congressional representative

1st Year Students from 2005 at 2007 ASEE Annual Conference

Impact on Institutional Policies

- 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

Concluding Remarks

- Building relations with departments to create customized learning communities
- Raising awareness among faculty about the Millennial students and faculty role in student success
- “High Touch” led to student success and improved retention
- Need to address critical engineering science classes to improve 3rd year retention
- http://www.wmich.edu/step