Create Learning Communities to Enhance Success for Students with Diverse Academic Preparation

Background

Edmund Tsang               Cynthia Halderson
Western Michigan University

College of Engineering & Applied Sciences

SAMPI

2008 Frontiers In Education Conference, Saratoga Springs, NY
Overview

• The Challenges
• Strategies in Creating Learning Communities
• Some Preliminary Results
• Impact on Institutional Policies
The Challenge

- Diverse academic preparation of 1st-time, 1st-year CEAS students

First-Semester Math Placement

<table>
<thead>
<tr>
<th>Year</th>
<th>Calc. II/Higher</th>
<th>Calc. I</th>
<th>Pre-Calculus</th>
<th>Algebra II</th>
<th>Algebra I/Lower</th>
<th>No MATH</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>9.7</td>
<td>31.5</td>
<td>24.9</td>
<td>23.4</td>
<td>7.0</td>
<td>3.5</td>
</tr>
<tr>
<td>2006</td>
<td>5.4</td>
<td>35.3</td>
<td>31.0</td>
<td>17.7</td>
<td>10.3</td>
<td>0.3</td>
</tr>
<tr>
<td>2007</td>
<td>5.1</td>
<td>42.7</td>
<td>31.1</td>
<td>13.7</td>
<td>7.2</td>
<td>0.3</td>
</tr>
<tr>
<td>2008</td>
<td>5.1</td>
<td>39.2</td>
<td>29.8</td>
<td>18.9</td>
<td>5.9</td>
<td>1.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>First in Family to Attend College (%)</td>
<td>28</td>
<td>32</td>
<td>26</td>
</tr>
<tr>
<td>Work Part-Time (%)</td>
<td>35</td>
<td>30</td>
<td>29</td>
</tr>
</tbody>
</table>
The Challenge

• No common first-year curriculum among 15 undergraduate programs (other than technical communication, 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
Components of FYEE -LC

• Learning Communities: place ~20 students in the same 3-to-5 courses together to promote connection and study groups
• 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
• Influenced by UTEP’s Circles of Learning for Entering Students (CircLES) program
Factors in Creating LC

• Section size for Technical Communication, Engineering Graphics, Chemistry I Lab – 24; Math section size -- 40
• Select seats from multiple sections spread across meeting times
• Good communication between CEAS, Math, Chemistry, and Physics
• For Fall Semester → request seats in early February
• For Spring Semester → request seats in early October
Factors in Placing Students in LC

- Fall Semester – pre-register students during Summer Orientation
- Spring Semester – students meet with academic advisor in late October to review recommended Spring Semester schedule; advising staff overrides registration restriction to enroll students in mid-November
## Examples of LC Course Clusters

<table>
<thead>
<tr>
<th>Learning Community</th>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
</table>
| **Civil & Construction Engineering** | • Technical Comm.  
• Engineering Graphics  
• Geoscience  
• Intro. to Engr. Design  
• Math (Calculus I, Pre-Calculus, Algebra) | • Chemistry I & Lab  
• Intro. to Engr. Analysis  
• Calculus II + Physics + Programming, or  
• Calculus I + Programming, or + General Education  
• Pre-Calculus + 2 General Education |
| **Chemical Engineering**    | • Technical Comm.  
• Chemistry I & Lab  
• Intro. to Chem. Engr.  
• Math (Calculus I, Pre-Calculus)  
• General Education | • Chemistry II & Lab  
• Intro. to Chem. Engr. Computation  
• Calculus II + Physics I, or  
• Calculus I + General Ed |
## Examples of LC Course Clusters

<table>
<thead>
<tr>
<th>Learning Community</th>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
</table>
| Electrical & Computer Engineering| • Technical Comm.  
• Digital Logic  
• Chemistry I & Lab  
• Math (Calculus I, Pre-Calculus, Algebra)  
• General Education              | • Computer Science I  
• Calculus II + Physics + General Education, or  
• Calculus I + 2 General Education  
• Engr Graphics (EE only)          |
| Computer Science                  | • Technical Comm.  
• Computer Science I  
• Math (Calculus I, Pre-Calculus)  
• General Education              | • Computer Science II  
• Digital Logic  
• Calculus II + General Education, or  
• Calculus I + General Ed          |
| Aeronautical Engineering          | • Technical Comm.  
• Chemistry I & Lab  
• Math (Calculus I/Pre-Calc)  
• Computer Programming  
• General Education              | • Intro. to Aero. Engr.  
• Calculus II + Physics I + General Education, or  
• Calculus I + 2 General Education |

*GROUNDED IN MICHIGAN REACHING FOR THE FUTURE*
# Examples of LC Course Clusters

<table>
<thead>
<tr>
<th>Learning Community</th>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculus I (mostly ME and Engineering</td>
<td>- Technical Comm.</td>
<td>Mechanical Engineering</td>
</tr>
<tr>
<td>Technology students)</td>
<td>- Chemistry I &amp; Lab</td>
<td>- Calculus II</td>
</tr>
<tr>
<td></td>
<td>- Calculus I</td>
<td>- Physics I (Calculus)</td>
</tr>
<tr>
<td></td>
<td>- Engineering Graphics</td>
<td>- Materials Science</td>
</tr>
<tr>
<td></td>
<td>- General Education</td>
<td>- Computer Programming</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- General Education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engr. Technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Intro. to Manufacturing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Physics I (Algebra)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Automotive in Society</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Computer Programming</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- General Education</td>
</tr>
</tbody>
</table>
## Examples of LC Course Clusters

<table>
<thead>
<tr>
<th>Learning Community</th>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
</table>
| Pre-Calculus (mostly ME and Engineering Technology students) | • Technical Comm.  
• Chemistry I & Lab  
• Pre-Calculus  
• Engineering Graphics  
• General Education | **Mechanical Engineering**  
• Calculus I  
• Process & Materials in Manufacturing  
• Computer Programming  
• General Education |
|                                                          |                                                                              | **Engr. Technology**  
• Intro. to Manufacturing  
• Physics I (Algebra)  
• Automotive in Society  
• Computer Programming  
• General Education |
# Examples of LC Course Clusters

<table>
<thead>
<tr>
<th>Learning Community</th>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
</table>
| Algebra II         | • Technical Comm.  
                     • Algebra II  
                     • Intro. to Engr. Design  
                     • Engineering Graphics if AE, ME, EE, ET  
                     • General Education | • Pre-Calculus  
                     • Chemistry I & Lab  
                     **Mechanical Engineering**  
                     • Process & Materials in Manufacturing  
                     • General Education  
                     **Engr. Technology**  
                     • Intro. to Manufacturing  
                     • Physics I (Algebra)  
                     • Automotive in Society  
                     • General Education  
                     **Electrical Engineering**  
                     • Digital Logic  
                     • General Education |
Other Components of FYEE-LC

- 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, 2007-08, 2008-09
- Revision of 1st Year STEM Courses (Chemistry I, Technical Communication, Algebra II)
Other Components of FYEE-LC

- 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; 118 students in 2007-08; 178 students in 2008-09
- [http://www.wmich.edu/step](http://www.wmich.edu/step)
Some Preliminary Results

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

<table>
<thead>
<tr>
<th>Item</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>I know at least 6 other LC students</td>
<td>87</td>
<td>78</td>
<td>79</td>
</tr>
<tr>
<td>I have studies with other LC students</td>
<td>74</td>
<td>63</td>
<td>73</td>
</tr>
<tr>
<td>I check my WMU email account daily</td>
<td>79</td>
<td>77</td>
<td>79</td>
</tr>
<tr>
<td>I know where to get tutoring for core classes</td>
<td>54</td>
<td>54</td>
<td>70</td>
</tr>
<tr>
<td>I have used a tutor for one or more core classes</td>
<td>32</td>
<td>44</td>
<td>31</td>
</tr>
</tbody>
</table>
Some Preliminary Results

- 2\textsuperscript{nd}, 3\textsuperscript{rd}, and 4\textsuperscript{th} Year Retention Rates

<table>
<thead>
<tr>
<th>Retention to CEAS</th>
<th>2\textsuperscript{nd} Year (%)</th>
<th>3\textsuperscript{rd} Year (%)\textsuperscript{1}</th>
<th>4\textsuperscript{th} Year (%)\textsuperscript{2}</th>
</tr>
</thead>
<tbody>
<tr>
<td>FYEE</td>
<td>Comparison</td>
<td>FYEE</td>
<td>Comparison</td>
</tr>
<tr>
<td>2005</td>
<td>68.0</td>
<td>60.0</td>
<td>54.3</td>
</tr>
<tr>
<td>2006</td>
<td>70.1</td>
<td>60.0</td>
<td>53.0</td>
</tr>
<tr>
<td>2007</td>
<td>66.3</td>
<td>60.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Retention to WMU</th>
<th>2\textsuperscript{nd} Year (%)</th>
<th>3\textsuperscript{rd} Year (%)\textsuperscript{1}</th>
<th>4\textsuperscript{th} Year (%)\textsuperscript{2}</th>
</tr>
</thead>
<tbody>
<tr>
<td>FYEE</td>
<td>Comparison</td>
<td>FYEE</td>
<td>Comparison</td>
</tr>
<tr>
<td>2005</td>
<td>76.2</td>
<td>74.3</td>
<td>69.5</td>
</tr>
<tr>
<td>2006</td>
<td>77.9</td>
<td>74.3</td>
<td>66.2</td>
</tr>
<tr>
<td>2007</td>
<td>75.2</td>
<td>74.3</td>
<td></td>
</tr>
</tbody>
</table>

Bold: Significant at the $\alpha=0.05$ level

\textsuperscript{1}The comparison is CEAS 5-year average (2000-2004) retention rate
\textsuperscript{2}The comparison is CSRDE-WMU STEM Survey (2000-2003)
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

• Have built relations with departments to create customized learning communities
• Have built relations with Residence Life to create protocol to intervene when students missed classes
• Raised 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
Acknowledgment

• Faculty Mentors: Ikhlas Abdel-Qader, Betsy Aller, Osama Abudayyeh, Sandra Blanchard, Steve Butt, Jerrie Fiala, Tycho Fredericks, Tarun Gupta, Andrew Kline, Tracey Moon, Peter Parker, Troy Place, Thomas Swartz, Slobodan Urdarevik, Sharon Van Dyken, Kimberly DeVries, and Sherif Yehia

• National Science Foundation STEP - #0336581