Student Oriented Learning Centers: The Learning Enhancement Across Disciplines (LEAD) Program at the University of Missouri-Rolla (UMR)

www.campus.umr.edu/lead

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- Abstract

- We describe a straight-forward method of implementing the Seven Principles of Good Practice in Undergraduate Education and empowering students through the formation of faculty-based learning centers for their courses by having office-hours in an open-environment. In effect, these form informal student learning communities designed to increase understanding of content, improve skills, and validate mastery. Over fifty faculty in twelve departments at the University of Missouri-Rolla, the state’s premier technological research university, offer collaborative learning centers for twenty-eight courses from Spanish and Engineering Physics to Thermodynamics and Chemical Engineering Fluid Flow (see www.campus.umr.edu/lead/assist). Data indicates that typically 35-45 percent of the students in courses with learning centers attend the learning centers regularly for about 3 hours per week per course and that these students do significantly better in courses.
The Seven Principles are promoted by a symbiotic relationship between the divisions of:

- **Provost:** Learning Enhancement Across Disciplines (LEAD) Program
  - [http://campus.umr.edu/lead](http://campus.umr.edu/lead)
  - Course-based Learning Centers in academic departments
  - Free scheduled tutoring in Student Learning Center
  - Faculty development and dialog on engaged student learning

- **Student Affairs:** Academic Support Programs (ASP)
  - [http://campus.umr.edu/learn](http://campus.umr.edu/learn)
  - Academic and Learning Resources
  - Disability support services
  - Testing center
  - Residential Learning Centers (course review materials)
Seven Principles for Good Practice in Undergraduate Education – at UM-Rolla

www.campus.umr.edu/lead/7principles/SevenPrinciplesUMR.htm

» Encourage student-faculty contact
» Encourage cooperation among students
» Encourage active learning
» Give prompt, frequent, informative feedback
» Emphasize time on task
» Communicate high expectations
» Respect & encompass diverse talents & learning styles
Learning Enhancement Across Disciplines (LEAD) Program

LEAD provides learning assistance to students for their success & retention

- LEAD employs 30-35 accomplished undergraduate Peer Learning Assistants (PLAs) who undergo extensive training

- Over 50 UMR faculty participate regularly each week in LEAD Learning Centers

- Implements the “Seven Principles of Good Practice in Undergraduate Education”

- Stresses student-centered learning, mastery of material, student responsibility and teamwork
LEAD Program Components

1. **LEAD Tutoring**
   - provided in 25 foundational courses
   - done by trained undergrad PLAs
   - ~175 student clients per week

2. **LEAD Learning Centers**
   - Collaborative learning with LEAD faculty on duty using modified Socratic techniques
   - From *Spanish I* and *College Algebra* to *Fluid Mechanics* and *Intro Quantum Chem*
   - Approximately 40% of students in a course attend its learning center for ~3 hrs/wk
   - ~700 students/week vote with their feet to find success through Learning Centers
LEAD Learning Center (LC) Characteristics

- Operate during fixed hours each week

- Staffed by
  - discipline-based faculty as office hours in an open environment
  - accomplished, trained undergraduate peer instructors

- Facilitate and project learning-centered education
  - more student-oriented, less teacher-centered

- Learning Centers directly promote ALL the
  - Seven Principles for Good Practice in Undergraduate Education
The Beginnings

- The Physics Learning Center was established in 1997 for the course Engineering Physics I

(www.campus.umr.edu/lead/lc/physics)
The Physics Learning Center (PLC) – the Prototype LC
www.campus.umr.edu/lead/lc/physics

for calculus-based *Engineering Physics I & II* (650 students/sem) & algebra-based *College Physics I or II* (25 students/semester)

Typical Physics Learning Center Instructors
Unposed photos of Cooperative Learning and Social Dynamics in the intro Physics, Math, Chemistry Learning Centers
~40% of Students Voluntarily Used the Physics Learning Center (Engr Phys I) (note DIP just before tests)
Impact of Physics Learning Center on Student Performance

Engineering Physics I for Fall 1999 (242 students)**
- % Attending PLC: 40% course GPA 2.9
- % Non-attending PLC: 60% course GPA 2.3
  increase of GPA 0.6 out of 4.0

Engineering Physics II for Fall 2005 (54 students in 2 rec secs)
- % Attending PLC: 30% course GPA 3.2
- % Non-attending PLC: 70% course GPA 2.3
  increase of GPA 0.9 out of 4.0

**In Fall 1999, the students in Engr Phys I who regularly attended the Physics Learning Center had the same average performance expectation (ACT+high school rank) percentile as those who were non-attending (82 ± 1 %).

Data compiled by R. Bieniek & A. Pringle, UMR Physics
# Current LEAD Learning Centers (Fall 2006)

<table>
<thead>
<tr>
<th>General Chem I</th>
<th>Data Structures I</th>
<th>Elementary Fluid Mech</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engr Phys I</td>
<td>College Algebra</td>
<td>Linear Systems Mech Engr</td>
</tr>
<tr>
<td>Engr Phys II</td>
<td>Calculus I with Analyt Geo</td>
<td>Thermal Analysis (Mech E)</td>
</tr>
<tr>
<td>College Physics I</td>
<td>Calculus II with Analyt Geo</td>
<td>Thermodynamics (Mech E)</td>
</tr>
<tr>
<td>Chem E Materials Balances</td>
<td>Calculus I for Engineers</td>
<td>Dynamics (Mech E)</td>
</tr>
<tr>
<td>Chem E Fluid Flow</td>
<td>Calculus II for Engineers</td>
<td>Machine Dynamics (ME)</td>
</tr>
<tr>
<td>Elec Engr Circuits I</td>
<td>Engr Mechanics-Statics</td>
<td>Elementary Spanish I</td>
</tr>
<tr>
<td>Digital Systems Design</td>
<td>Mechanics of Materials</td>
<td>Spanish Reading &amp; Comp</td>
</tr>
<tr>
<td>Intro Data Struct &amp; Apps</td>
<td>Engineering Dynamics</td>
<td></td>
</tr>
</tbody>
</table>
Grades in General Chemistry for Fall 2005
(compiled by K. Woelk, UMR Chemistry)
Calculus I for Engineers:
Weekly Average LC Attendance (%)
Fall 2005

Data compiled by M. Bohner and E. Akin, UMR Math
Calculus I for Engineers:
Weekly Average LC Attendance (%)
Spring 2006

Data compiled by M. Bohner and E. Akin, UMR Math
Learning Enhancement Across Disciplines (LEAD) Program

Growth of LEAD Tutoring

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>2002-03</th>
<th>2005-06</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td># Client-hours</td>
<td>1384</td>
<td>1943</td>
<td>over 3 years</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>40 %</td>
</tr>
</tbody>
</table>

Growth of LEAD Learning Centers

<table>
<thead>
<tr>
<th></th>
<th>Fall 2001</th>
<th>Fall 2006</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td># Learning Centers</td>
<td>8</td>
<td>29</td>
<td>over 5 years</td>
</tr>
<tr>
<td># Departments</td>
<td>5</td>
<td>12</td>
<td>260 %</td>
</tr>
<tr>
<td># LEAD Faculty</td>
<td>22</td>
<td>51</td>
<td>140 %</td>
</tr>
</tbody>
</table>

Data indicates that students who regularly attend Learning Centers do better in course grades.
To have a successful Learning Center, faculty should:

- implement a course structure that provides frequent, prompt and *accurately* informative evaluations of students' level of mastery
- act as non-hovering guides who restrain themselves from becoming tutors or overly attentive adjusters
- promote and orchestrate an atmosphere of cooperative engagement and teamwork
- offer concentrated LC hours convenient for many students & stay during “duty” time – even if only a few students are there.
Establishing cooperative faculty-based Learning Centers in technical courses

- **Summary:**
  - Collaboration with individual faculty assists in the cultural change as UMR strives to move toward a learning-centered approach vs. teaching-centered approach to academic assistance.
  - Faculty generally need to be “cultivated” through personal contact to establish learning centers because quality of educational impact is too often only a small component of departmental reward structures. Those faculty can then act successful exemplars, and promote by example within departments.
  - Take advantage of the desire of individual faculty and departments to appear to be players in improving educational impact and retention.
  - Communication is critical, determining common goals and respecting differences in approach are necessary through continued dialog.
  - Pooled resources often are more effective than if those resources were to serve students as stand alone funds.
QUESTIONS??

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