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


- **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.


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# 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
  - 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
  - Academic and Learning Resources
  - Disability support services
  - Testing center
  - Residential Learning Centers (course review materials)

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# 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

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# 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

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# Learning Enhancement Across Disciplines (LEAD) Program

## 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

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# 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*

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# The Beginnings

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

(*www.campus.umr.edu/lead/lc/physics*)

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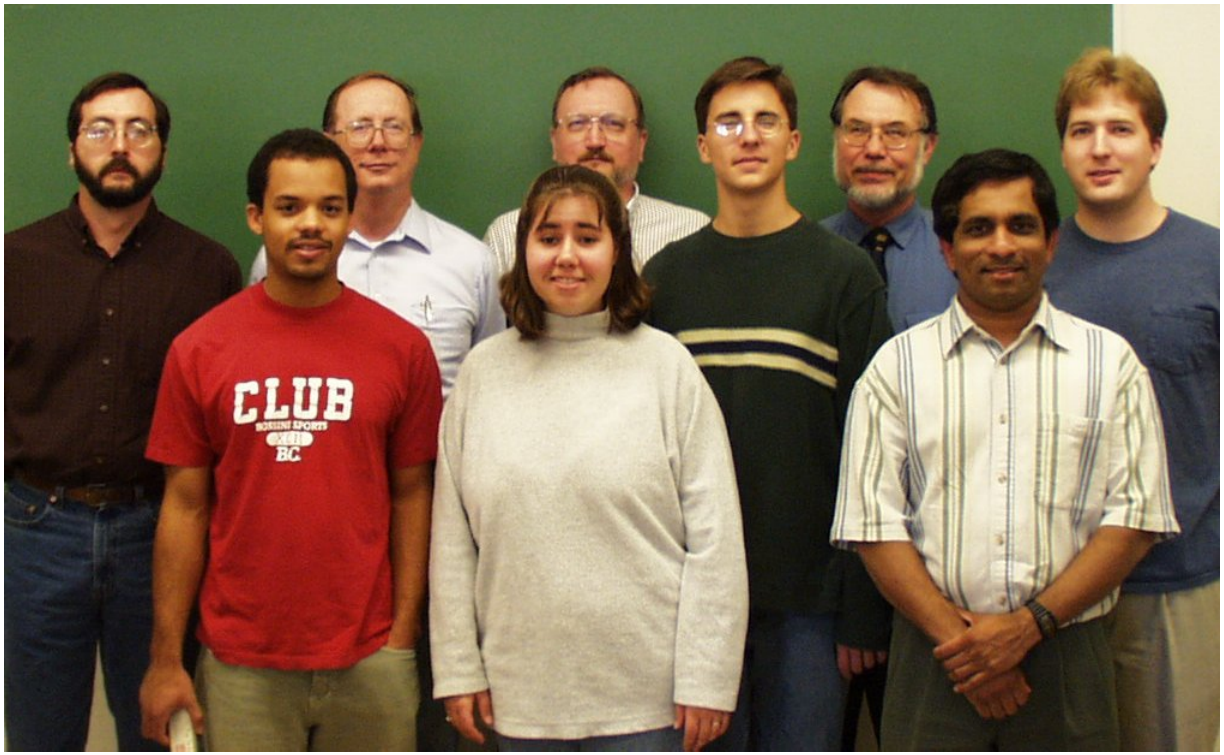
# The Physics Learning Center (PLC) – the Prototype LC

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**

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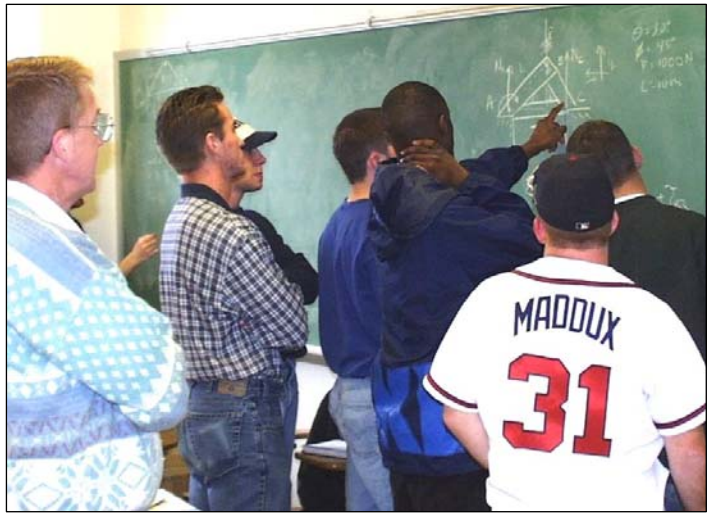
# Unposed photos of Cooperative Learning and Social Dynamics in the intro Physics, Math, Chemistry Learning Centers

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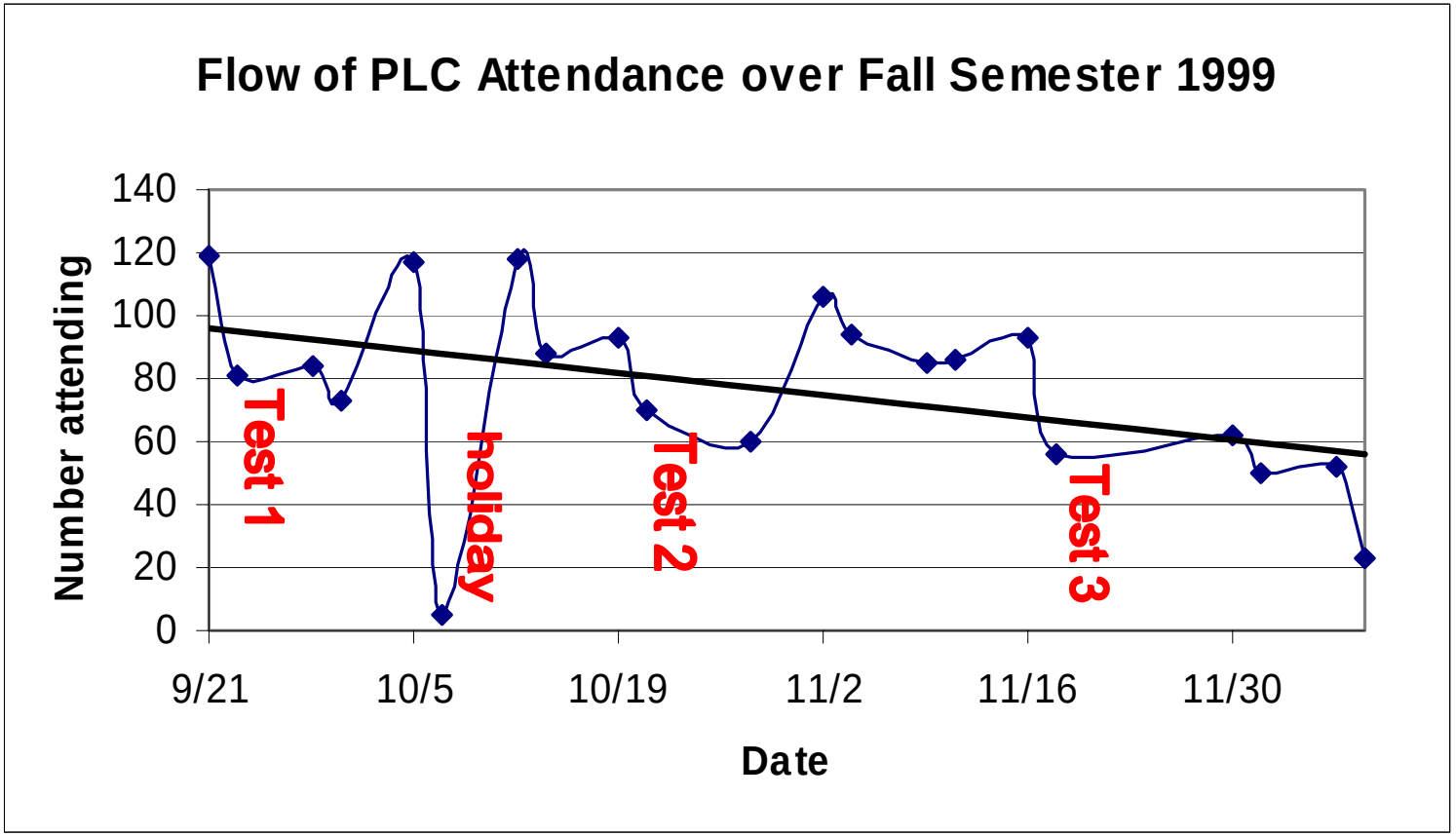
# ~40% of Students Voluntarily Used the Physics Learning Center (Engr Phys I) (note DIP just before tests)

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# 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

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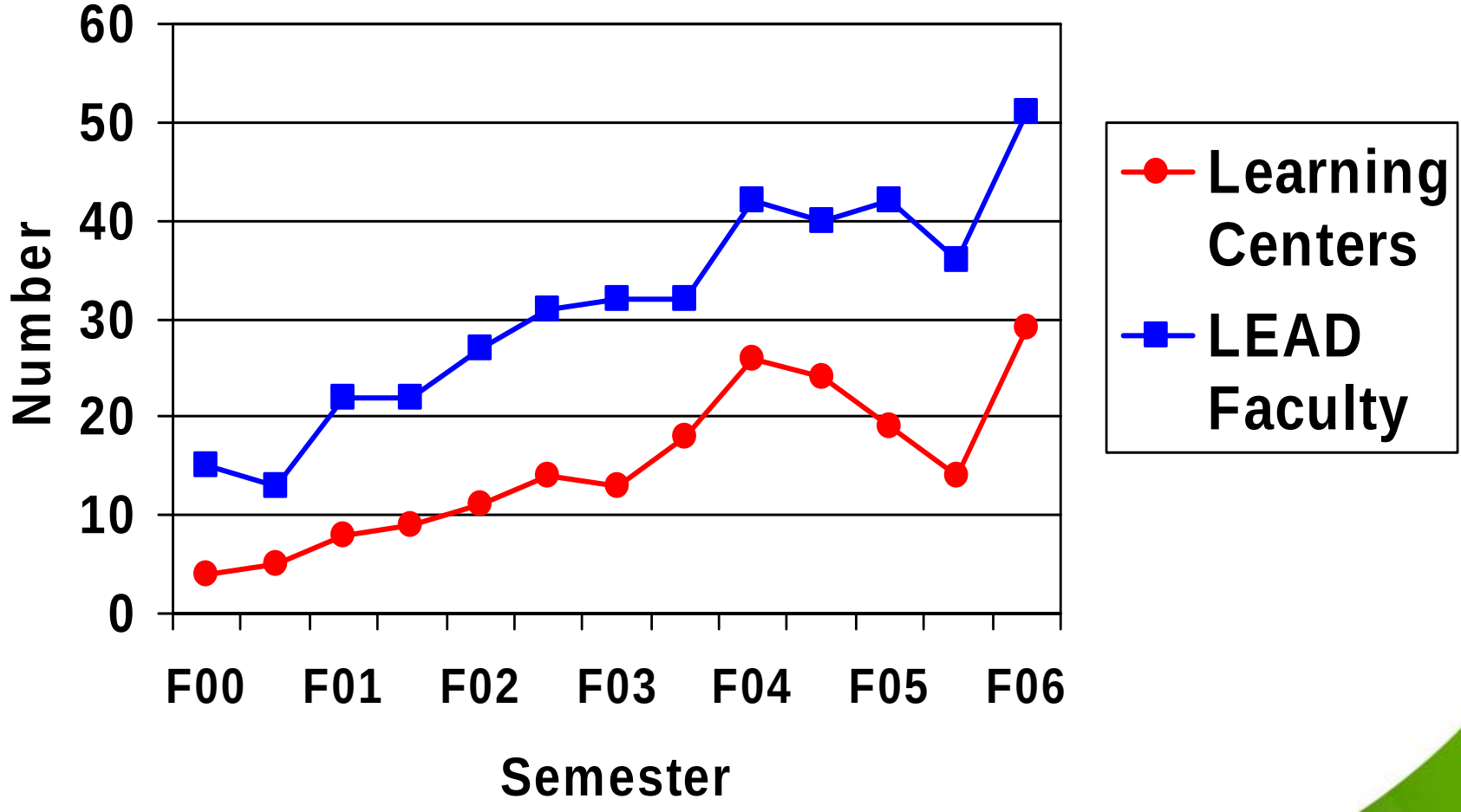
# LEAD Learning Centers and LEAD Faculty Associates

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# Current LEAD Learning Centers (Fall 2006)

| | | |
|---|---|---|
| General Chem I | Data Structures I | Elementary Fluid Mech |
| Intro Quantum Chem | Discrete Math (Comp Sci) | Water Resource Engr |
| Engr Phys I | College Algebra | Linear Systems Mech Engr |
| Engr Phys II | Calculus I with Analyt Geo | Thermal Analysis (Mech E) |
| College Physics I | Calculus II with Analyt Geo | Thermodynamics (Mech E) |
| Chem E Materials Balances | Calculus I for Engineers | Dyanmics (Mech E) |
| Chem E Fluid Flow | Calculus II for Engineers | Machine Dynamics (ME) |
| Elec Engr Circuits I | Engr Mechanics-Statics | Elementary Spanish I |
| Digital Systems Design | Mechanics of Materials | Spanish Reading & Comp |
| Intro Data Struct & Apps | Engineering Dynamics | |

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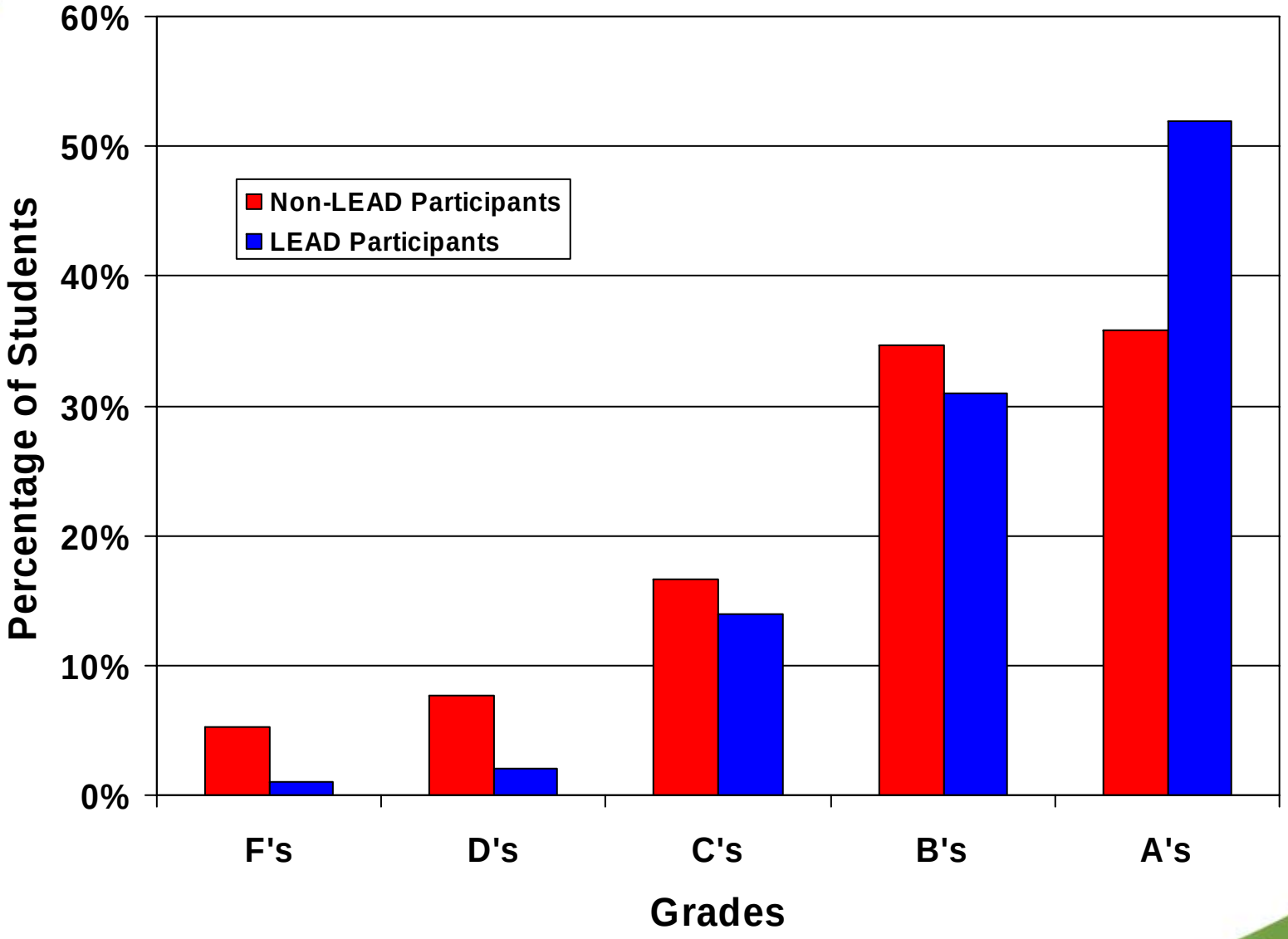
## Grades in General Chemistry for Fall 2005
## (compiled by K. Woelk, UMR Chemistry)

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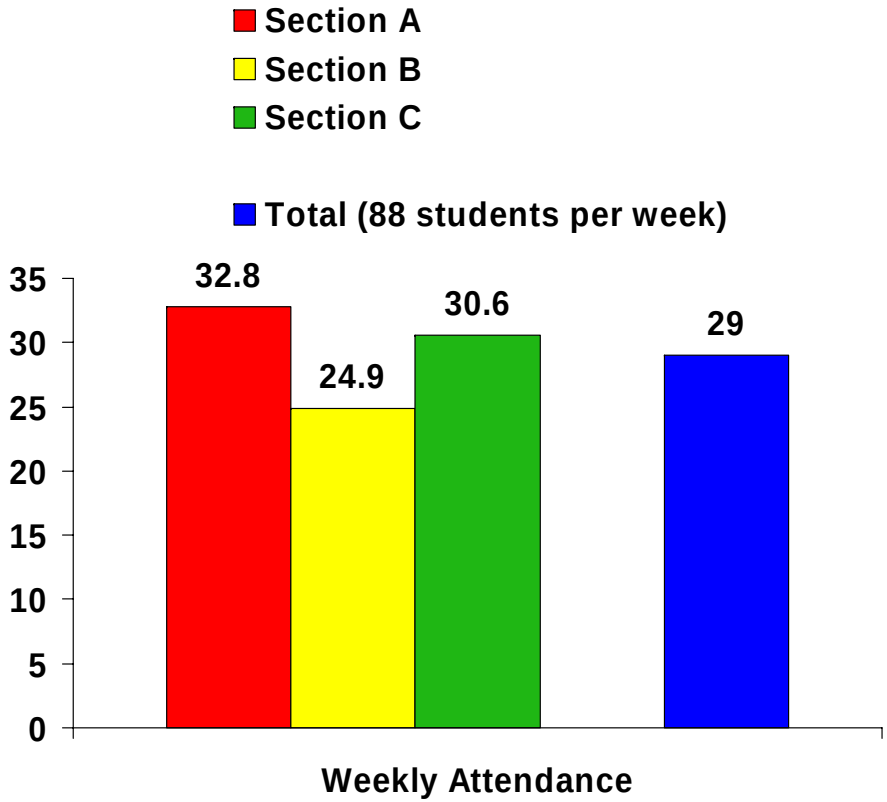
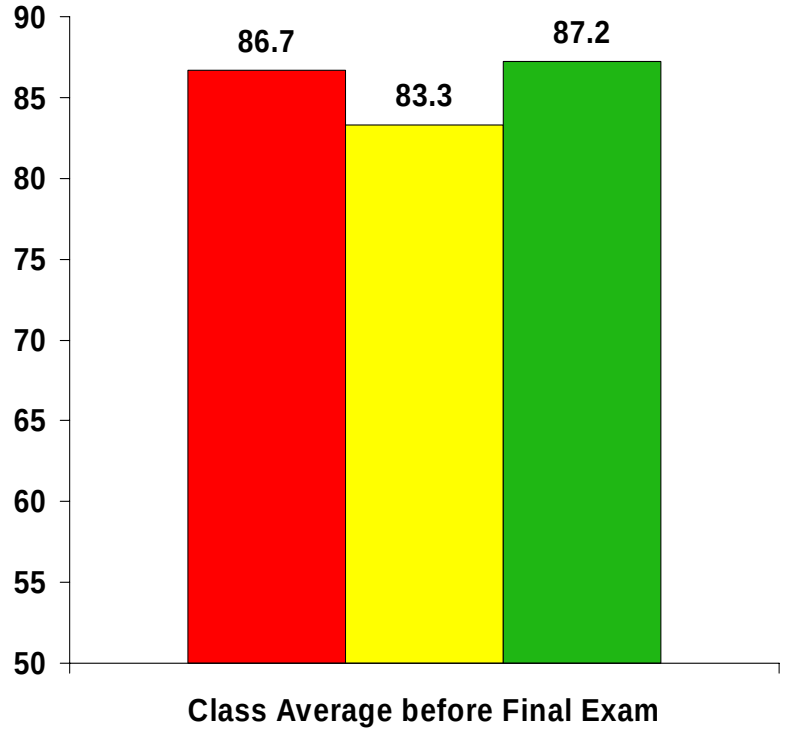
# Calculus I for Engineers:
# Weekly Average LC Attendance (%)
# Fall 2005




Data compiled by M. Bohner and E. Akin, UMR Math

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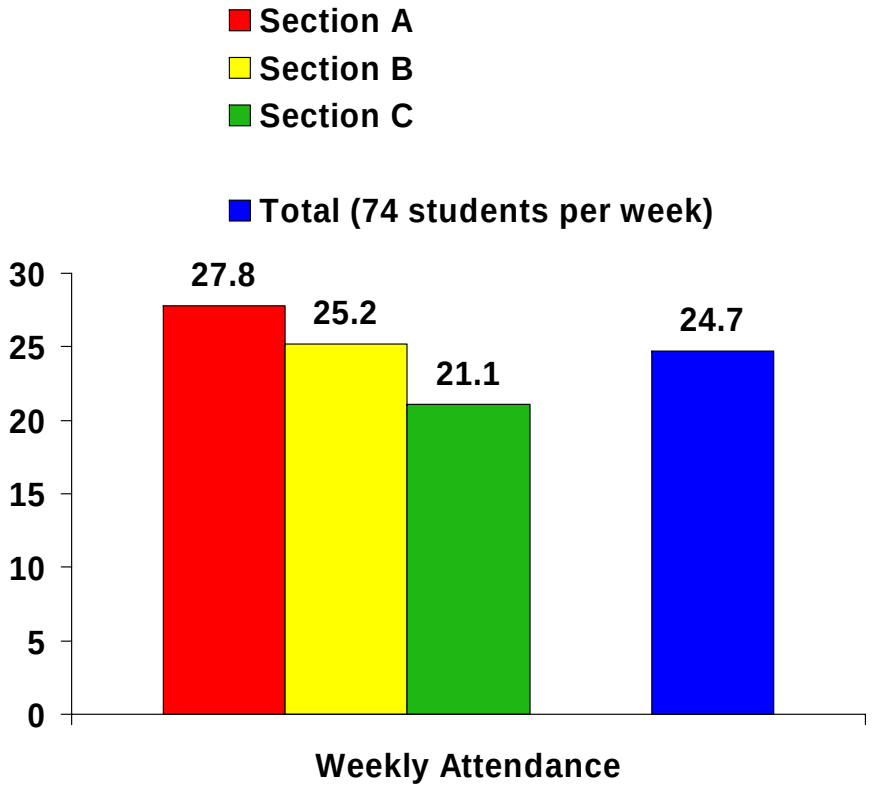
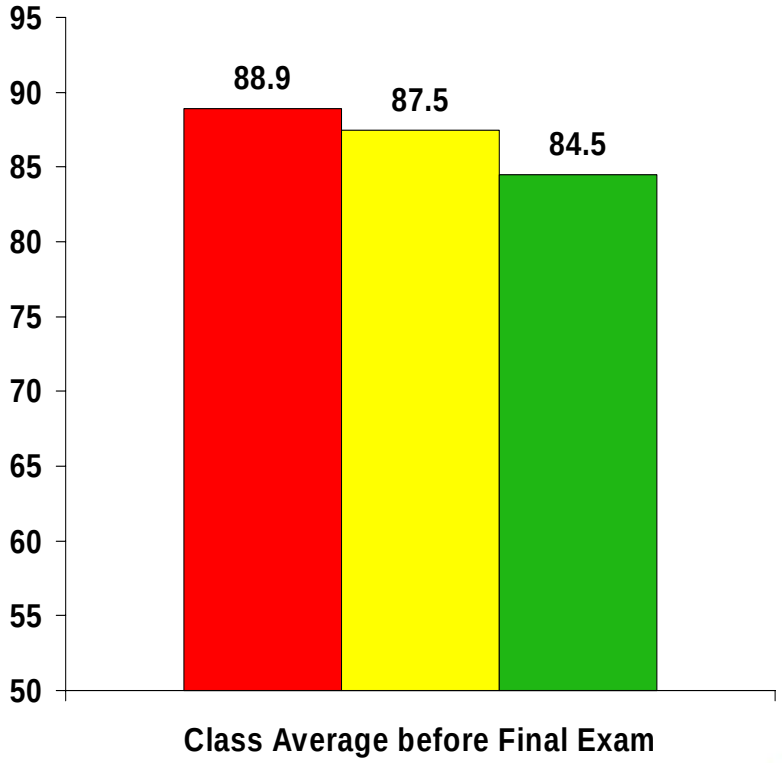
# Calculus I for Engineers: Weekly Average LC Attendance (%) Spring 2006

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# Learning Enhancement Across Disciplines (LEAD) Program

## Growth of LEAD Tutoring

| Academic Year | 2002-03 | 2005-06 | Increase over 3 years |
|---|---|---|---|
| # Client-hours | 1384 | 1943 | *40 %* |

## Growth of LEAD Learning Centers

| | Fall 2001 | Fall 2006 | over 5 years |
|---|---|---|---|
| # Learning Centers | 8 | **29** | *260 %* |
| # Departments | 5 | **12** | *140 %* |
| # LEAD Faculty | 22 | **51** | *130 %* |

***Data indicates that students who regularly attend Learning Centers do better in course grades***

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# 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.

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# 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.

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# QUESTIONS??


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*www.campus.umr.edu/lead*

and of New Faculty Programs

*www.campus.umr.edu/newfac*


This talk is now posted at:

www.campus.umr.edu/physics/depart/profs/bieniek/files/TeachTechNov2006.ppt

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