



Enhancing Students' Understanding of Electronics and Instrumentation Through Capstone Projects

Nasser M. Juma, Elizabeth Gire, N. Sanjay Rebello, Kristan L. Corwin
and Brian R. Washburn

Kansas State University

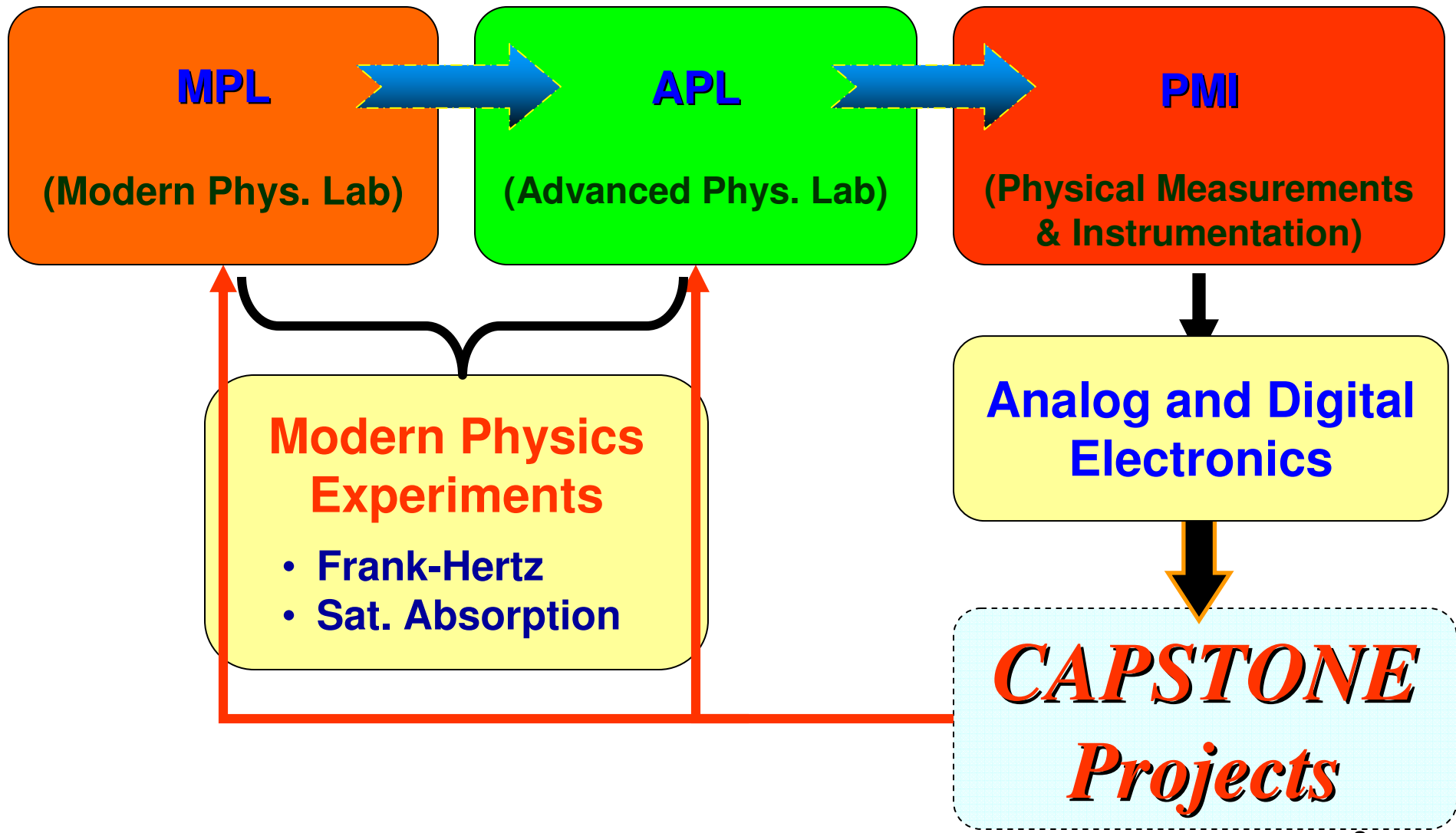


Supported by the U.S. National Science Foundation under grant DUE 0736897.

Advanced Labs at KSU

- 3 courses in the **advanced labs sequence**:
 - Modern Physics Lab (**MPL**)
 - Advanced Physics Lab (**APL**)
 - Physical Measurements & Instrumentation (**PMI**)

Advanced Labs at KSU



3

During the Capstone Project

The students,

- Redo an experiment from MPL or APL
- Generate ideas for improvements
- Implement idea

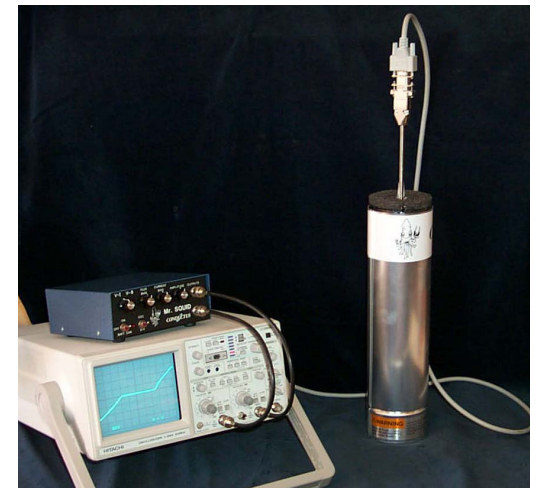
Examples of PMI Capstone Projects

- Measuring the Speed of Light
- Saturated Absorption Spectroscopy
- SQUID (Superconducting Quantum Interference Device)
- X-Ray Diffraction
- Chaotic Circuits

Example Capstone Project

SQUID (Superconducting Quantum Interference Device)

- Redo experiment from MPL or APL
 - Superconductivity, critical current, ...
- Ideas for improvements
 - Flux locked loop servo system
- Implement idea
 - Build circuit and apply to experiment



Spring 2010

- 6 students enrolled
- Students worked in pairs on a capstone project
- We collected the following data:
 - Pre-Post Conceptual Questions
 - In-Class Observations
 - Pre-Post Interviews
 - Survey (Capstone experience)

INTERVIEWS - Student Comments

What did you learn from doing the capstone project?

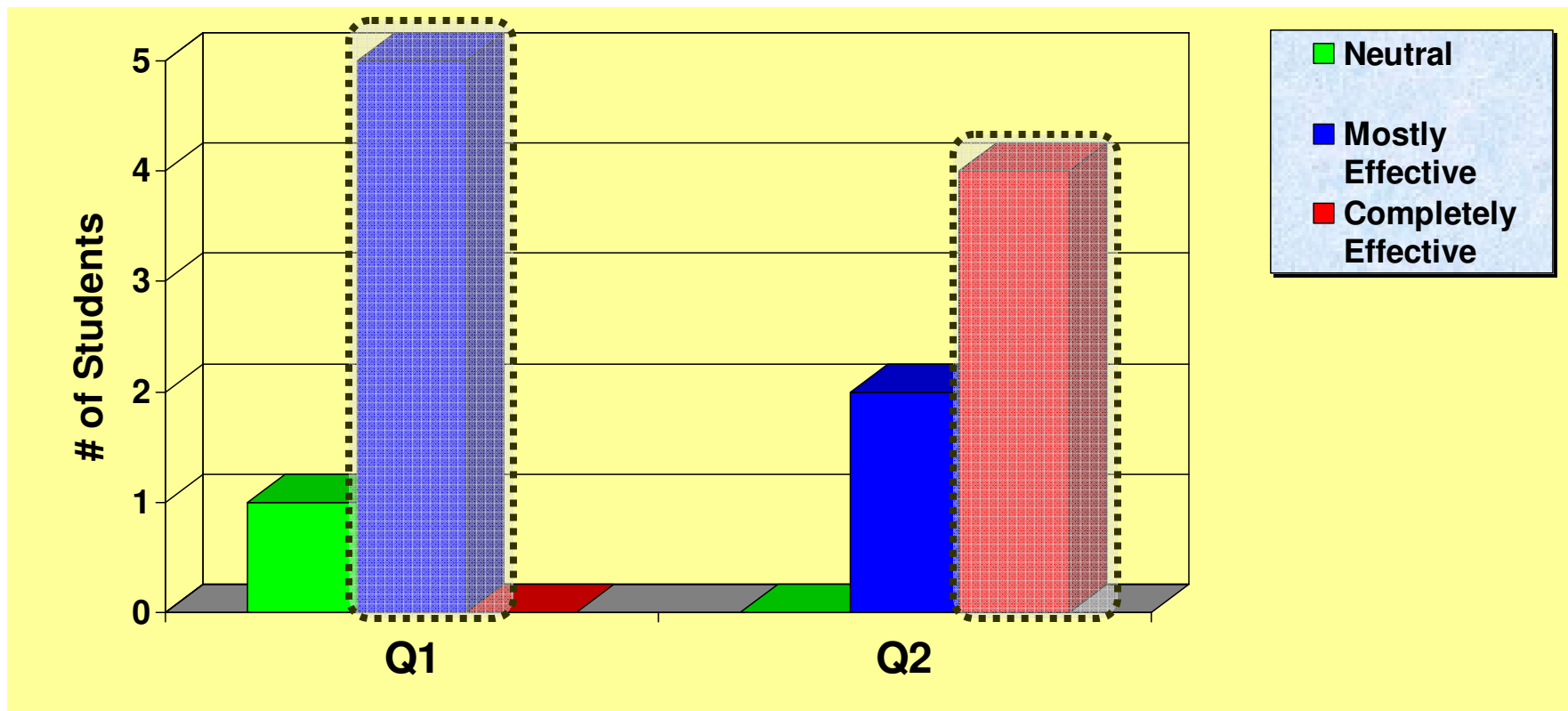
“I think it was a good thing to do, **I relearned some things that I did in the Advanced Lab** and **I kind of understand them better now that I have had other classes** ... having learned some of that, it's easier to understand how the super conducting works”

“I think it actually gives you a real situation that you **use what you previously learned in the first part of the class**. Because right now we did all the little tricks but we don't know what the tricks are used for.”

Summary of Survey Results

How effective was the capstone project experience in helping you ...

- Q1 - Learn the **physics concepts** of the experiment?
- Q2 - Improve your **skills in circuit building**?



Summary

- The capstone projects allow students to
 - Relearn and deepen understanding of concepts
 - Apply circuitry to experiments
- Next, we'll analyze the rest of the collected data to get more details about how the students solved these projects

Thank You!

Contact Information:

mhuninas@phys.ksu.edu

For more information, Please see our poster (**# D08**)

at **AAPT tomorrow night**

or at **PERC!**