

# Outline • Why I chose a "hybrid" course format • The targeted course • Experimental course format • Preliminary results • Advantages and challenges • Current work • Tips for potential adopters

# Why I Chose A "Hybrid" Format

- To address two basic instructional problems:
  - the general ineffectiveness of the "large lecture" format in conveying course content
    - inherent "group paced" nature
    - sporadic attendance
  - the general ineffectiveness of "handed in" homework in helping students learn the course material
    - widespread "cheating" (students copying one another's work)
    - · difficulty with providing timely feedback
    - observations from attempts to use on-line discussion groups to promote homework collaboration

### **The Targeted Course**

- ECE 362 junior-level course on embedded microcontroller system design
- Three learning outcomes:
  - an ability to write programs for a computer in assembly language
  - an ability to interface a microprocessor to various devices
  - an ability to effectively utilize the wide variety of peripherals integrated into a contemporary microcontroller

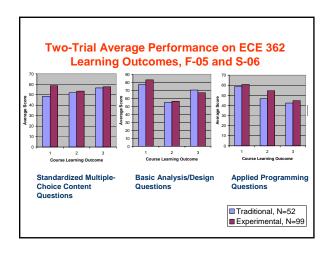
### **The Targeted Course**

- Each outcome is assessed using a comprehensive, in-lab practical exam consisting of:
  - standardized multiple-choice questions that gauge understanding of content
  - analysis/design questions that gauge basic skills
  - application programming questions that gauge more advanced (synthesis) skills
- Standardized examination questions and procedures facilitate meaningful comparisons among cohort groups

### **Experimental Course Format (DPS)**

- Lecture content delivered via video streaming
- Contact hours used for collaborative problem solving in small-group settings (multiple sections)
- Conducted in lab so that a variety of hands-on exercises could be completed (<u>DPS page</u>)
- Instructor walk-through of solution (via Net Meeting) once sufficient time given to work each problem
- Students' "homework" score based on attendance and participation in DPS sessions
- Traditional lecture division run in parallel with experimental division (students were given choice of course format)

# Preliminary Results (F-05 / S-06) • For each trial, approximately 2/3 of the students selected the experimental course format • Based on survey results, a significant majority (78% F05, 93% S06) believed that the on-line lecture and directed problem solving combination helped them learn the course material better • A majority (67% F05, 79% S06) also said they would choose the experimental format in another ECE course • An adjustment made for the S-06 trial was to schedule the DPS sessions prior to students' lab periods • The directed problem solving cohort exam average was generally higher than that of the traditional lecture cohort (most notably for higher-order problem solving skills)



### **Advantages and Challenges**

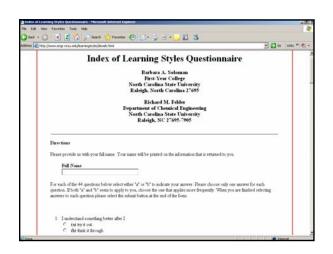
- Advantages
  - direct, immediate feedback on problem solving methodology ("bi-directional")
  - ability of students to employ "cognitive rehearsal" (talking through how to solve a problem with their partner)
  - significantly less day-to-day overhead (handling homework and giving lecture)
  - students have more control over their education (can attend "virtual lecture" when best for them)

## **Advantages and Challenges**

- Challenges
  - ensuring students "keep up" with virtual lecture
    - on-line quizzes and/or resource utilization tracking tools are often easy for students to circumvent
    - in-class quizzes to track progress take time away from problem solving ("useful work") and incur additional overhead
  - ensuring students use the collaborative problem solving sessions "wisely"
    - coming to class with their annotated notes
    - not just "sitting there" and attempting to learn by osmosis

### **Current Work**

- Third trial in ECE 362 currently underway, again with parallel divisions
- Similar model developed for sophomore-level prerequisite course (ECE 270 Introduction to Digital System Design) – first trial with parallel divisions currently underway
- Used on-line ILS Questionnaire to help students decide which course format might be best for them



### **How ILS Survey Results Utilized**

- On-line 44-item questionnaire that assesses preferences on four dimensions
  - Active / Reflective
  - Sensing / Intuitive
  - Visual / Verbal
  - Sequential / Global
- The traditional lecture division was recommended for students with some combination of reflective, verbal, and/or sequential preferences
- The directed problem solving division was recommended for students with some combination of active, visual, and/or global preferences

### **Tips for Potential Adopters**

- On-line lecture content doesn't need to be "super fancy" to be reasonably effective
- Employ some mechanism to help ensure students "keep current" with on-line content
- Give students a choice of course format if possible this will give them perhaps their first opportunity to think about (and hopefully discover) how they best learn