Experimental Cross-Hybrid Course Formats

Cordelia Brown & Dave Meyer
School of Electrical & Computer Engineering
Purdue University

Cross-hybrid variants explored:
- Directed Problem Solving with Virtual Lecture (DPS-VL)
- Directed Problem Solving with Lecture Summary (DPS-LS)
- Traditional Lecture with Integrated Problem Solving (TL-IPS)
- Traditional Lecture with Take-Home Work (TL-THW)

Traditional Lecture Survey Results

Challenges associated with hybrid format:
- 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
- development (and maintenance) of a standardized testing methodology to ensure reliable comparisons among experimental trials/cohorts

Course outcomes:
1. an ability to analyze static and dynamic behavior of digital circuits
2. an ability to represent Boolean functions in standard forms, to map and minimize them, and to implement them as combinational logic circuits
3. an ability to use a hardware description language to specify combinational logic circuits, including various “building blocks” such as decoders, multiplexers, encoders, and tri-state buffers
4. an ability to design and implement arithmetic logic circuits
5. an ability to analyze, design, and implement sequential circuits and use a hardware description language to specify them, including various “building blocks” such as counters and shift registers
6. an ability to design and implement a simple computer

Advantages of hybrid format:
- 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)
- students have more control over their education (can attend “virtual lecture” when best for them)
- significantly less day-to-day overhead (handling homework and giving lecture, meeting only twice/week)

DPS Survey Results

Summary and Future Work:
- Preliminary results, based on both exam performance and survey data, confirm the effectiveness of the DPS format relative to the traditional lecture format
- The results also confirm the effectiveness of incorporating collaborative problem solving exercises into traditional classroom presentations
- Future studies will focus on:
  - a comparison of the relative efficiencies of the two approaches (e.g. in terms of resource utilization)
  - an analysis of which approach is “best liked” by students (e.g. more frequent, less personal large-class meetings vs. less frequent, more personal small-class meetings)
  - development of “cross-hybrids” that might be even more effective