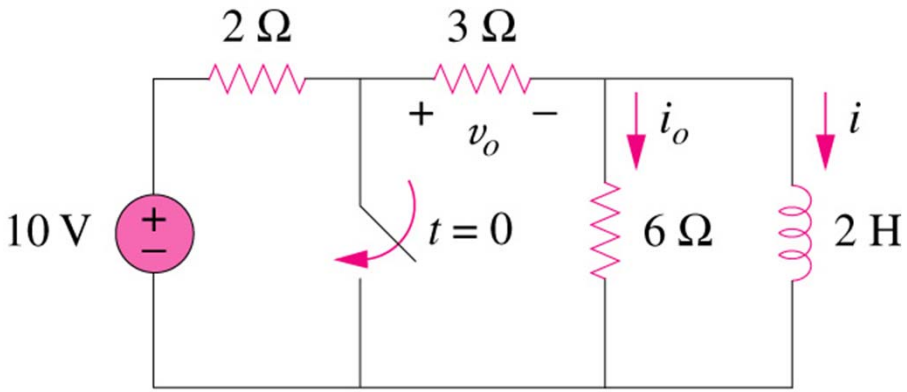
A Comparison of Learning Styles in an Introductory Electrical Systems Course

Dr. Carlotta A. Berry
Dr. Deborah J. Walter

March 31, 2007

Hypothesis

Because of the visual nature of circuit analysis, there may be a relationship between students' learning style and course performance in introductory electrical systems.



Goals and Objectives

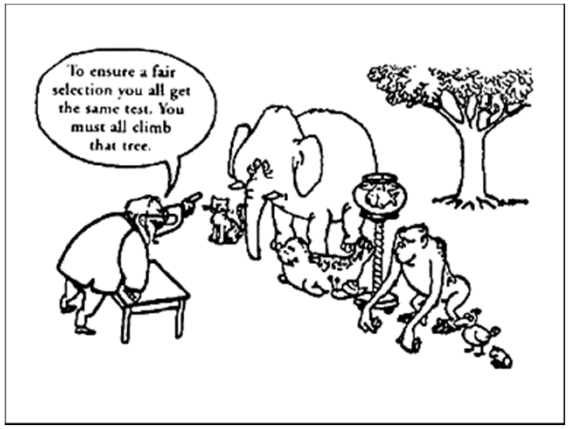
- To design the electrical systems course and its associated laboratory exercises to be optimally geared toward student learning styles
- To improve student success in this course by teaching the redesigned course

Methods

- The Felder, Solomon, Silverman Index of Learning Styles (ILS) was given to all students during their freshman year
- Data was collected from the 7 sections of the electrical systems course
- Relationships between the students' ILS and course grades were examined
- Other factors examined were
  - Gender
  - GPA
  - Major

Index of Learning Styles and Engineering

- most engineering students are *visual, active, sensing* and possibly *global*
- effective in academic advisement and to aid a student in effective test and study skills
- typically *teaching style* is not well matched to students' *learning style*



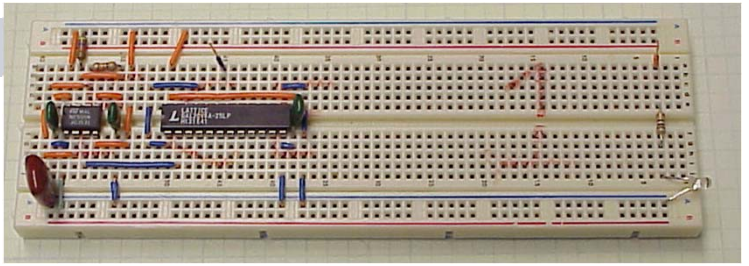
Index of Learning Styles and Women

- Female students are more *reflective*, *verbal, sensing, sequential*
- However, the *reflective* result was contradicted in a subsequent study
- Therefore, more studies are required before these conclusions can be generalized for women

Motivation

- In order for an engineer to be successful in any career they must develop skills characteristic of a *diversity* of learning styles
- Thus, course content must be delivered over a range of styles
- Additionally, students must learn to adapt to the delivery of content in a variety of forms

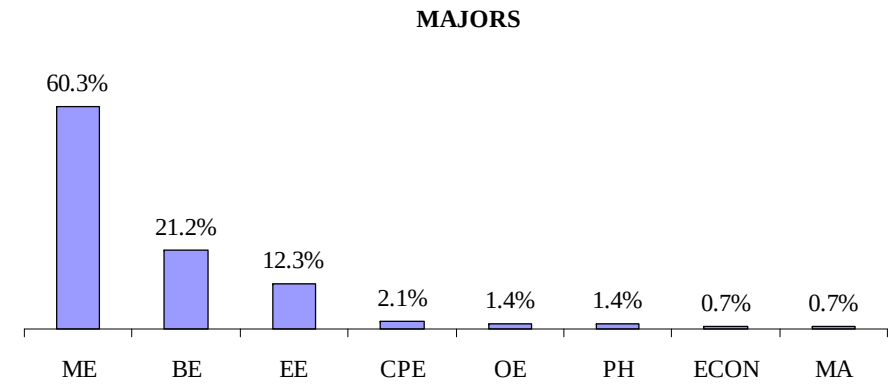
Course Description

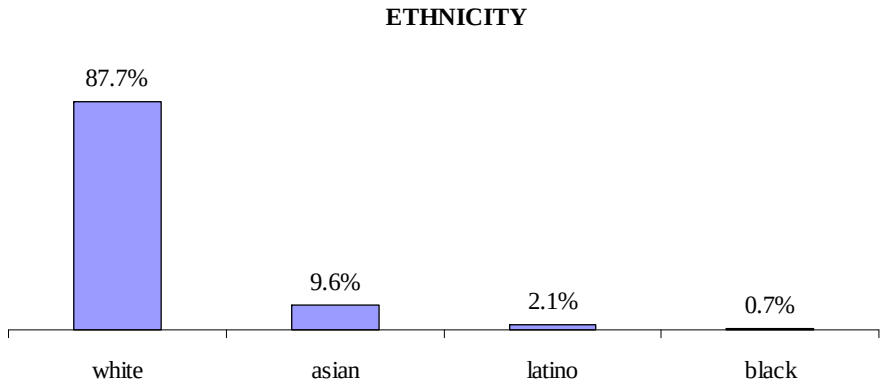


- Sophomore-level electrical systems course
- 8 sections (7 instructors), common exams, homework, labs
- Student population is majority white male
- Extends basic DC circuits concepts taught in Physics
- Covers KVL, KCL, Thevenin's theorem, AC power, and operational amplifiers
- Multi-disciplinary course (ME, BE, EE, CpE, OE)
- 3 hours of lecture and 3 hours of lab per week
- 1 lab practical, 2 midterms, 1 final, 10 labs, 10 homework assignments

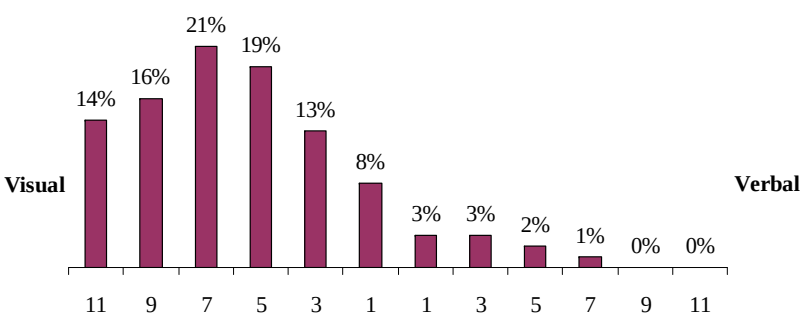
Cohort Description

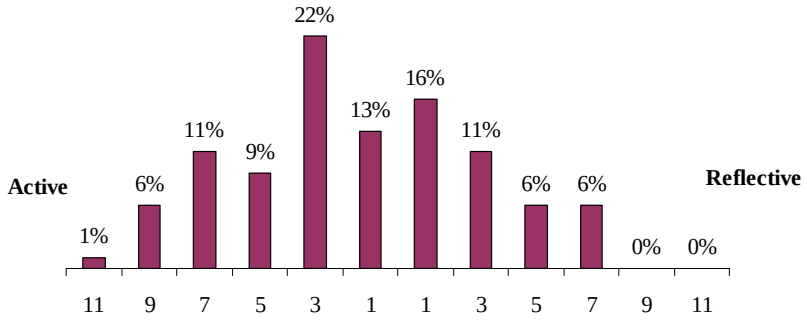
- 187 students enrolled in course
- *146 (78%)* students consented to participate
- *128 (88%)* sophomores, 18 (12%) juniors
- *119 (82%)* men, *27 (18%)* women

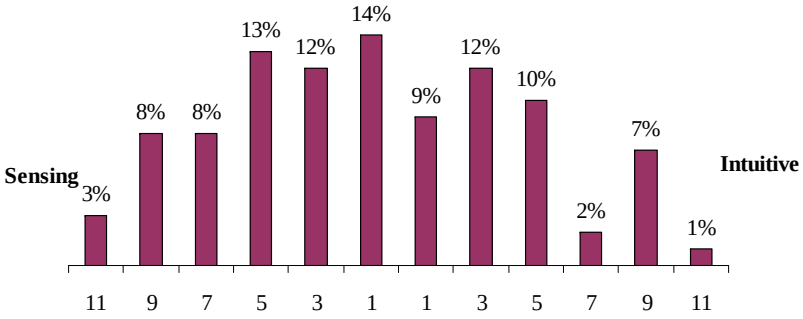


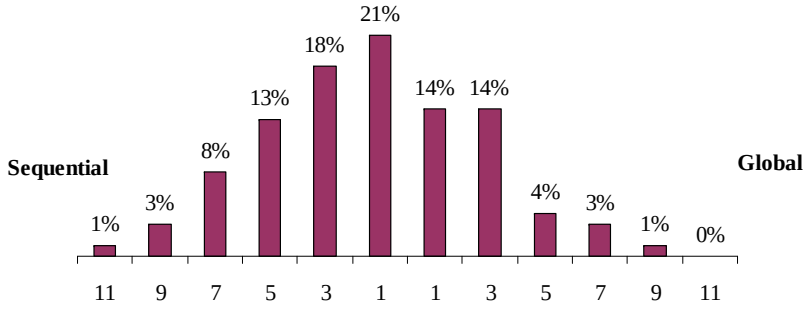


Cohort Description (*ILS*)









Results:
ILS and Student Performance

- Surprisingly, the only significant difference at level of 5% was for *reflective learners*
- Reflective learners performed better on the
  - Homework *(p = .028)*
  - Labs *(p = .003)*
  - Exams *(p = .003)*
  - Overall course grade *(p = .002)*

Results:
Gender differences

- Women and men performed equally as well on all grades except for the *lab practical*
- Men performed an average of *10 points (p = .002)* higher then their female counterparts on the practical. This gender difference was not noted in the overall laboratory grade
- It should be noted that lab experiments are performed in self-selected teams of 2 but the lab practical is performed individually

Conclusions

- The result of this study indicated that there ***is*** a relationship between a student's preferred learning style and course performance
- Surprisingly, there was no evidence that *visual learners* would perform better in this course

Conclusions

- However, two interesting results merit more study:
  - *Reflective learners* master the material and use the contextual knowledge to excel in all course measures. One possible explanation is that that the passive presentation of material may suit their learning style. Felder concluded that although labs are inherently sensory, they may be mechanical in nature and not *actually encourage* active learning

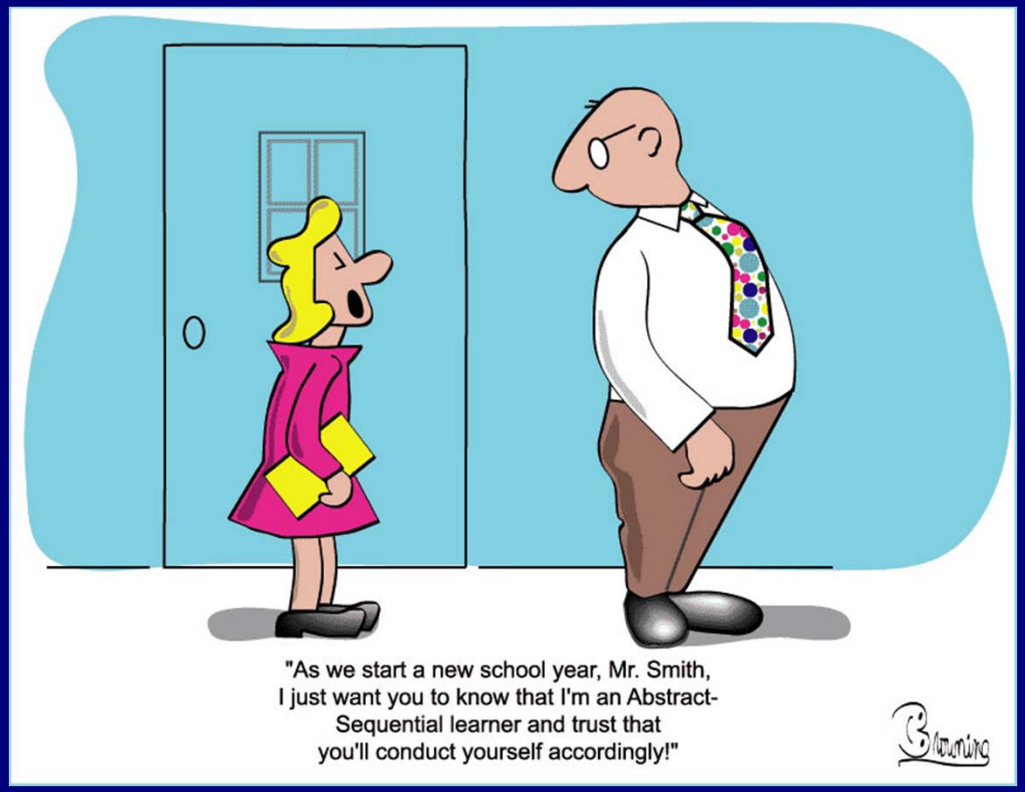
Conclusions

- There is a difference in how *female students* perform in the lab that is only evident when they are evaluated individually. Although studies indicate that it may not be ideal, cross gender teams are likely because of the small number enrolled in the course. However, this performance phenomena may be attributed to a *lack of confidence, intimidation* or less than equitable *role assignments* associated with cross gender teams

Future Work

- *Reflective Learners*
  - Evaluate the current course content and categorize the activities in the course or lab based upon the dimensions of the ILS
  - This will determine how many activities are actually geared toward each style
- *Female Students*
  - The sample size for women was small (27) so additional studies would have to be performed to see if these are replicated
  - Cross-gender versus same-gender teams would also be evaluated
  - Perform interviews or surveys to identify any self-efficacy factors such as self-confidence or intimidation with respect to laboratory exercises

QUESTIONS


"As we start a new school year, Mr. Smith,
I just want you to know that I'm an Abstract-
Sequential learner and trust that
you'll conduct yourself accordingly!"