Faculty Learning Community
Project Form

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06-09-214 Circuit Theory
"Creating an environment of deeper learning in Circuit Theory laboratory"
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Problem:

1. Students are not learning the often abstract concepts in Circuit Theory.
2. Students do not know how to use the laboratory equipment.
3. Students show little initiative and do very poorly on laboratory reports.
4. Students are leaving the program and RIT at an alarming rate.

Goal:

1. Improve test grades in Circuit Theory.
2. Graduate students that I would loan my test equipment to.
3. Teach classes with engaged excited students.
4. Retain more students.

Target Students: Freshman in Electrical, Computer and Telecommunications Engineering Technology.

Hypothesis/Proposed Solution: We can move closer to our goals by creating a set of experiments that are more closely related to real engineering activities. Today's students want and expect everything, including their labs, to "do something." If you listen closely, one of the most common things I hear today is "what does it do?" Can you blame them? Phones are not just phones, watches not just watches. If you make a simple beeping sound when a student touches a bookshelf he/she will do touch it again. If you do it again, they will get interested and look more closely at the shelf, what makes it work. They probably will not say "shelves can't beep."

1. If students feel the work they are doing is relevant and does something they will spend the required time outside of class learning about it. Often, what is lacking in Circuit Theory is simply practice.
2. Students will build their own "permanent" printed circuit boards. PCBs they can take home and show off. They take more care in building them. They want to make them work. They want to learn how to use the test equipment engineers use to test and fix PCBs. They want to know how they work.
3. Students will look forward to the "exciting" hands on labs where they create something real.
4. If students are doing better and enjoying themselves, they are less likely to leave.

Progress Point:

1) Developed new experiments – Summer 054
2) Purchased equipment for PCB fabrication – Summer 054
3) Created new laboratory procedures based on real world applications – Summer 054
4) Used new laboratory experiments and observed the results – Winter 062
5) Continue with new experiments in Circuit Theory II – Spring 063
6) Have new professors teach Circuit Theory I with new experiments – Spring 063.
7) Get feedback from students and professors familiar with the old and new experiments. – Spring 063.

Successes:

1) Very similar test results – but final grades appear better. Data is presented from two instructors over 3 years.
    a. Grade of A: This year 25%, last year %, year before %.
    b. Grade of C, D or F. This year 46%, last year %, year before %.
2) All students can measure current. They say "I understand KVL – there must be a voltage drop or the light would not turn on." Students ask if they can use Ohm's Law and a voltage measurement instead of measuring current. They understand the theory that relates different measurements. This has never happened before.
3) Students have control. They call the new labs the "exciting labs" and the other old labs the "measurement labs." They ask, when will we do another exciting lab. Zull said "If we want to help people learn we must help them to see how it matters in their lives."
4) Student retention is clearly better but there are MANY factors.
    a. This year: 72% (only one year's data!)
    b. Previous years: (051, 041 & 031 classes) 51%, 62%, 41%,
    c. Tutoring programs have been implemented for "at risk students"
    d. Circuit Theory course now starts in Winter quarter with introductory course added in the fall.

Obstacles: Making PCBs can is messy.

Surprises:

My teaching assistant in Circuits this year did the old Circuits lab. His comments were "I liked the labs, they were great" and "It would definitely motivate me to create a whole bunch of them (PCBs)."

The following are from a professor who has taught Circuits the old and new way.
"I can't recall this kind of performance in a trailer group before."
"…students appear to know their away around the lab equipment better than the past."

Comparative Results:

Assessment:

1) Student survey: positive comments received by students that responded.
2) Student retention: handled above.
3) Comment from past student and faculty who have experienced both old and new labs.

Future Study: Continue developing labs that “do something.” Show students make me excited to go to work at Kodak.

Resources – Faculty/Student Advisors:

1) Steve Ciccarelli
    a. Past FTLC member
    b. Past Circuit Theory teacher
    c. Current Circuit Theory teacher using new laboratory experiments
2) James Hurny
    a. Circuit Theory Teacher
3) Lewis Pang
    a. Past Circuit Theory student
    b. Current Laboratory assistant using new laboratory experiments.

Resources – People:

Resources – Reading: Giving students control – presentation from Lillie.

Question/Requests to FLC:

Student focus group to get feedback and have students report back on what they enjoyed and how it can improve.

Quantitative required: Retention, before and after grades.