Effective Closed Labs in CPSC 121: Lessons from Eight Terms of Action Research

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Unusual introductory course combining discrete mathematics (theoretical tools) and digital logic (hardware). Required for CPSC majors and a few other programs.

~100-200 students per term. ~6-15 TAs per term. TA background in digital logic often relatively weak. Many different faculty and TAs work on the course over time.
Methodology: Action Research

Our approach is based on action research.

• Goal: to enact social change. We used action research to identify problems in the labs, and to assess changes intended to improve them.

• Process: through empowering the stakeholders through participatory research.

• Role of the researcher: the researcher is a participant in the course; here we act simultaneously as course designers, assessors, and educators.
Methods: Regular + End-of-Term Student Feedback

CPSC 121 Lab Feedback

We are in the process of redeveloping many of the labs in this course to improve them. For one mark in lab each lab, please provide feedback on how you found the lab. Feedback is anonymous - after hitting submit, show the ensuing page to your TA for the mark.

* Required

What is the number of the lab you are reviewing?

I had enough time to work on this lab.

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The written instructions were clear and well-written.

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The lab was relevant to the lecture material.

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The lab was interesting.

CPSC 121 End of Term Lab Survey

As part of our endeavour to improve the CPSC 121 labs, we would like your feedback on how the labs were overall this term. Filling the survey is worth one bonus mark in lab 10. Your answers, as usual, are confidential.

The labs contributed to my understanding of the course material.

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The pre-labs contributed to my understanding of the course material.

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The challenge problems contributed to my understanding of the course material.
Methods: End-of-Term TA Reviews

CPSC 121 Lab TA feedback

1. Interesting for me
   - Strongly agree

2. Fun for me
   - Strongly agree

3. Rewarding for me
   - Strongly agree

4. Of an appropriate difficulty
   - Strongly agree
Additional Methods

- Continuous staff feedback (lab prep/staff meetings)
- Early focus groups (kicked off this effort, finding that students found labs unrewarding/disconnected from lecture)
- Final exam questions
- Midterm and End-of-Term Evaluations

This year: developing an assessment to measure achievement of selected learning goals, rather than affective outcomes.
Formal appointment of a TA as “lab coordinator” enables broad, regular feedback from all stakeholders, feeding to improvements in labs.
Design Process: Weekly Timeline

TA Lab Coordinator (re-)drafts lab, instructor reviews.

Staff meeting discusses lab

Lab prep meeting test-run/critical review by all lab TAs.

Lab posted to students (early adopter feedback)

Staff and lab prep meetings review lab.

Lab coordinator in lab, sends “post-mortem” to staff. Other TAs also send post-mortems as needed.
Design Process: Term-to-Term Timeline

Term n
- Informal feedback
- Student surveys
- TA surveys
- TA lab documents

Term n+1
- Informal feedback
- Student surveys
- TA surveys
- TA lab documents

Analyze data, address problems from that term...

Changes recorded (and rendered sustainable) since “retirement” of second TA lab coordinator with “lab manager guide”, “lab planner guide”, and living “labby-lab” (lab by lab design document).
Example: TkGate/Logisim Change

In our first end of term student surveys qualitative and quantitative data agreed: "tkgate sux!!!!! [sic]". (We also learnt that the crucial CPU lab was poorly received, and that the students loved the regular expressions lab.)

In the next two terms we tried improving our support of tkgate. Still no change in student feedback. "tkgate is totally not user friendly."

So we threw it out. We switched to logisim.
TkGate ⇒ Logisim

Qualitative feedback that term, and subsequent ones, didn’t have complaints about the circuit simulator. (“no news is good news”)

Quantitative feedback jumped up dramatically. (Compare to feedback on breadboarding kit, where only small term-to-term changes occurred.)
Other Examples

• Shorter lab documents
• (Ongoing) evidence-based TA redesign of instructor-designed marking scheme
• Break-up of “heavy” sequential circuitry lab
• Finally well-positioned first CPU lab
• Editing standards for labs

Acknowledgments: Head TAs (Rachel Busby, Mark Crowley, Ian Dewancker, Vanessa Kroeker), instructors (Meghan Allen, Patrice Belleville, Dave Tompkins, George Tskiknis, Kim Voll, Bob Woodham), other TAs (too many to cite!), and the many students who gave feedback! Plus Michele Ng, Anthony Winstanley, and Mark Greenstreet. Funding from CWSEI-CS and NSERC.