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Board 174: Fostering Inclusivity and Engagement while Learning by Doing: A New Paradigm in Engineering Education Based on Student-Designed, Student-Taught Courses

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Qingyuan Cao is a 3rd year Robotics Engineering undergraduate at UC Santa Cruz. He currently serves as the president of the UCSC Rocket Team, which competes in the NASA Student Launch Competition. He has participated with the experiential learning initiative since his freshman year, first as a student, then as an instructor for the past two years. With three years of industry experience, he offers a first hand perspective on the design subjects he teaches, including 3D design and fabrication. Currently, he is a manufacturing engineer for the company Precision Swiss Products. In his free time, Qingyuan enjoys teaching his Pomeranian, Biscuit, new tricks.

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Matthew Kaltman is a senior Robotics Engineering student at the University of California, Santa Cruz. Throughout his academic career he has fallen in love with low-power agricultural sensing solutions, and is continuing this passion as an Undergraduate Research Assistant in Dr Colleen Josephson's j-Lab in Smart Sensing. Matthew has mentored students throughout the last four years, serving roles as a tutor and student-instructor, finding that the best way to truly learn a concept is by teaching to others. Matthew is expected to graduate in the summer of 2024 after completing his senior thesis in the development of a solar-powered sensor utilizing Visible Light Communication (VLC).

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Khanh Tran is a 3rd year Electrical Engineering undergraduate at the University of California, Santa Cruz. He is the vice president of the UCSC Rocket Team, serving as a technical lead, mentoring undergraduate students and designing rockets for the NASA Student Launch Initiative Competition. He also participated in both sides of the experiential learning experience, as student and student instructor. Outside of school and teaching, he is learning and designing UCSC's first ever bipropellant liquid rocket engine.

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Fostering Inclusivity and Engagement while Learning by Doing: A New Paradigm in Engineering Education based on Student-Designed, Student-Taught Courses

Introduction

What if students were the teachers? Inspired by the skill-building workshops organized by our undergraduate science and engineering clubs and our Sustainability Minor's multidisciplinary skill-building curriculum, this student-centered concept led to a series of experiential engineering courses which are fully undergraduate-designed, organized, and taught. Within this Lead By Design program, upper division student-teams propose course topics that they believe are important to have earlier in the curriculum - often topics that are absent or inaccessible to most engineering students - with the goal of giving fellow students practical engineering skills that they will retain and apply through their education and professional careers. During the minimum two-quarter long program, nascent student-teachers can enroll in a Lead By Design course where they learn about and practice active-learning pedagogy while developing their class content to be taught in a subsequent quarter. Successful teaching teams are hired to teach their quarter long class, with the option to come back and mentor others and/or teach their class again. We began piloting this students-teaching-students concept in 2020, and have since run 15 instances of quarter-long, nine learner hours/week courses in a wide range of topics: Robot Operating System, Graphical User Interfaces, Embedded Programming, Hacking, Creative Virtual Reality, among others. This proceeding is a discussion of two of the original classes taught as part of this program: Introduction to Electronic Design and Introduction to 3D Design & Fabrication (examples of student work from these classes are shown in Figure 1).

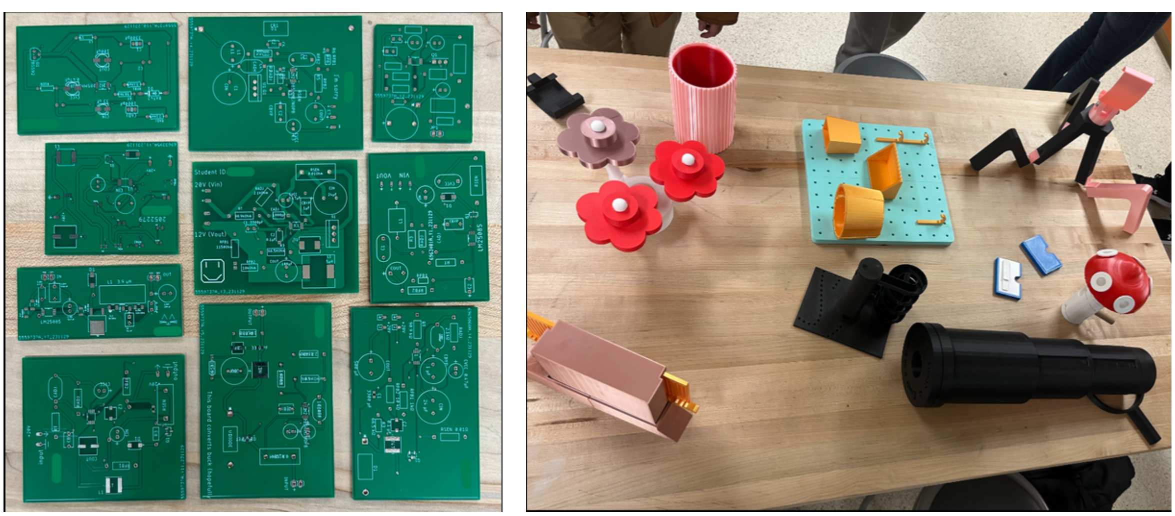

Figure 1: (Left) Ten of the power conversion PCBs designed by learners in the Electrical class. (Right) Lego flowers, adjustable peg board, telescope, marble track, hummingbird feeder (shaped as a mushroom), wallet, and an adjustable phone tripod created by learner teams in the 3D Fabrication class.

The authors of this paper are past teams of student-teachers from different engineering majors who, from firsthand experience, identified a gap in UC Santa Cruz's undergraduate engineering curricula. The de-emphasis of physical practice and active learning in the classroom, a challenge faced by many engineering schools across the country, reduces student preparedness to enter industry or applied research [3] [2] while being detrimental to student sense of belonging [5]. This is reflected locally in a university-wide survey conducted at our university, where more than 80% of students felt they needed more support from faculty and around 64% felt they needed more opportunities to participate in classes [4]. From the authors' experience, the lack of opportunity for engineering practice has a clear and notably negative effect on undergraduate clubs, impacting students' confidence and ability to materially contribute to applied projects and pursue other independent and extracurricular educational opportunities. We found that the time constraints of a third or fourth year engineering student dissuade them from joining clubs, leaving the majority of new club members as first or second year. With limited practical experience from their college courses, only the most self-actualized lower division students with plenty of extra time in their schedules are likely to be able to catch up.

As shown in the literature, active and experiential learning have the potential to engage all learners through diverse learning modalities, create peer learning communities, and close achievement gaps for underserved learners through constructivist knowledge accumulation [5][10][8][7][6]. However, these benefits do not affect all students equally without directed efforts to create an inclusive, low risk, and supportive learning environment [5]. It is often the case that many lower division courses are presented as "weeder" classes, a concept that is associated with "gatekeeping" and is correlated to higher rates of attrition among minority students [5][10]. By the time students reach classes in the upper division, where theoretical content is able to be applied to real world lab scenarios, these detractive factors and feelings of disconnectedness have impacted student confidence and dissuaded promising students from pursuing the field academically or professionally, again an outcome that affects underrepresented students disproportionately. At the same time, we see that students who do connect to the material and their peers through extracurricular projects, internships, or clubs earlier in their educational career tend to have increased confidence and a stronger sense of belonging in the engineering discipline, further cementing the importance of such experiences towards stronger teamwork and problem solving skills [5][10].

With these educational shortcomings in mind, we decided to join the effort in providing experiential learning to first and second year students and become student-teachers by designing and leading the Introduction to Electrical Circuit Design and Introduction to 3D Design & Fabrication First Year Design courses. Our motivation was to address the aforementioned issues by giving lower-division students a glimpse into professional engineering practice that we had accrued through our diverse experiences both inside and outside of academia and our preliminary results show we are successful [9]. By working to scaffold the development of an engineering identity early among these learners, within a community of practice, we can promote and support student confidence in approaching future engineering theory with the practical background we provide. We hope the class will become a hallmark of student-led instruction within our School of Engineering, leveraging the resources of a university class and the student-focused lens of student-teachers.

Motivations of a Student Teacher

Since its inception in the 2019-2020 academic year, the goal of the undergraduate student-teacher-led courses has been to provide opportunities for engineering practice in an active and encouraging environment, one that is counter to the traditional didactic lecture hall. The following all are statements from former students turned teachers, offering insight into their journey and reasons for participating in the course as well as the value that they added.

"I wanted to make electrical engineering more accessible to both STEM and non-STEM majors so that they can pursue projects of their own. The tutorial-esque nature of the class where students design and build a power supply is aimed at guiding students through a small-scale engineering design cycle, from design to prototyping to assembly and verification. In addition, some skills such as soldering and PCB design + assembly aren't taught until the upper division classes."

- Former student-teacher (Winter 2022, Electrical Engineering Graduate)

Eliot Wachtel (Robotics Engineering, 4th year) - took the class virtually as a freshman (Fall 2020) during the COVID-19 pandemic - the first year it was taught by an undergraduate teaching team. The course got him hooked on circuit design, brought him into the underwater robotics club, and gave him the confidence to pursue the opportunity of becoming electrical lead and later president of the club. He has taught the class every year since he took it.

Miguel Robles-Hernandez (Computer Engineering, 3rd year) - took the class Fall 2022 as a sophomore under Eliot. He loved the hands-on nature of the class, making it one of his favorite classes so far. Inspired, he offered to help teach it the following year with the goal of improving the curriculum and structure for better learner retention.

Matthew Kaltman (Robotics Engineering, 5th year) - got excited about engineering once it was hands-on, but didn't experience that until upper division courses and felt that the applied experience was much more conducive to learning theory by experiencing practical effects. He heard about an opportunity to help lead an experiential learning class for lower-division students and joined the effort.

Qingyuan Cao (Robotics Engineering, 3rd year) - Qingyuan has been involved in this course topic for three quarters: once as a learner and twice as a student-teacher. Having joined the university's rocketry club through direct connections from taking the course as a student, he knows firsthand what a valuable resource it is for learners interested in Computer Aided Design (CAD) & 3D printing. Since he had proficiency with what was being taught already prior to coming to college along with his professional experience in 3D modeling, he was eager to continue the legacy of the course and to push it to what it is now.

Khanh Tran (Electrical Engineering, 3rd year) - As a member of the university's rocketry team, he was introduced to and took the class under Qingyuan. He believes that the class provides a great way to learn engineering through a casual, low pressure environment. Motivated by his positive experience, he opted to teach the course to help improve learners' experience and introduce more people to the world of CAD and 3D printing.

Course Design

Between the five student-teachers writing this paper, we have 21 years of experience working in seven project-based student clubs. This experience motivated us to become teachers and enroll in the one quarter Lead By Design class, where we worked in teams to develop (and practice) course content under the guidance of faculty. This class focused on developing and solidifying our understanding of:

- Active and experiential learning alongside classroom teaching methods
- Non-violent communication and constructive assignment feedback
- Iterative and Backwards Design as part of the engineering design cycle
- Formative and Summative assessment strategies

Notably, the student-teachers were the ones dictating course content, including course learning outcomes and teaching strategies. This preparatory course gave them opportunities to design, practice, and iterate based on feedback from the instructor and other teaching teams.

High Level Course Flow

The resulting courses are designed to provide first-year learners with experience navigating the full engineering design cycle in a more supportive learning environment. They forgo some theory and proof-based rigor in favor of a more empirical first exposure to foundational topics. In so doing, our aim is to slowly shift ownership toward student-directed learning while fostering learner confidence. The courses start with heavily scaffolded labs and classroom activities to foster a strong foundation in the material. As part of the supportive "set them up" stage, student-teachers guide learners through fundamental theory to prepare them for the more complex topics to come. Student-teachers continually gauge learner understanding using formative assessment strategies, employing activities and assignments both to assess student understanding and to guide improvement in weak spots. As the learners begin to show their grasp of the foundational content, this guidance drops off in favor of more student-driven projects. Later in the quarter, learners are considered proficient in the skills and equipment taught in the class and are then "let go" to work in teams to complete a full iterative design project. Here learners successfully design, prototype, troubleshoot, and ultimately assemble a functional or creative project artifact in a team setting. Activities surrounding this culminating project support an enduring understanding of the underlying learning outcomes specific to that course topic (refer to Table 1 for example learning outcomes).

To this end, we divide each course structurally into two main phases: a series of smaller, tool-based activities and a larger, team-based design project. All the while, we continue to focus on realization of theory, application-specific technical intricacies, and proficiency in the manufacturing methods required to create real-world prototypes. This flow is outlined for the two case study classes in Figure 2 below.

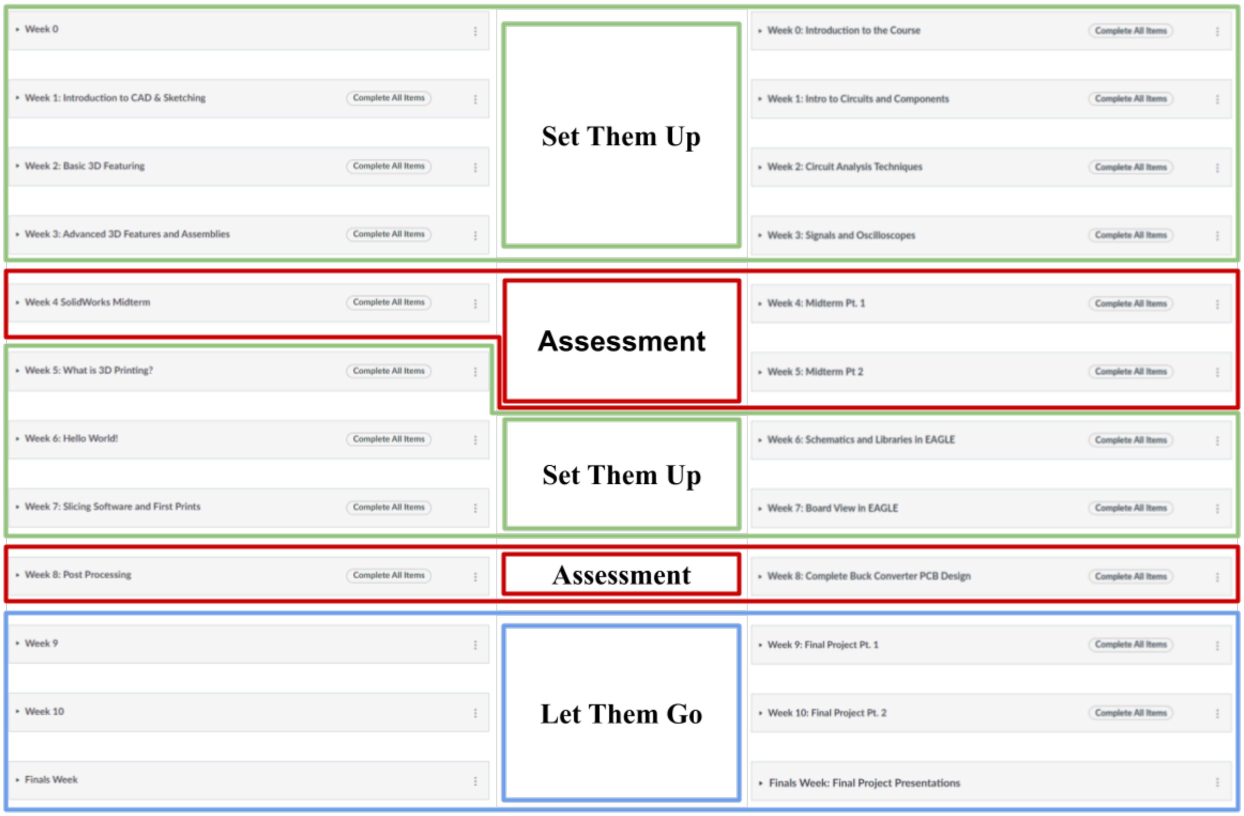

Figure 2: A visualization of the "Set Them Up" and "Let Them Go"structure as it was used in both of the case study courses, shown here via twelve Canvas modules

For the Electrical Circuit Design course, the course is divided between early learning modules of component and circuit theory with later modules focusing on the EDA toolchain, placing an emphasis on Printed Circuit Board (PCB) layout. For the first five weeks of instruction, learners develop skills in the design, construction, and testing of circuits. They begin with hand-drawn and breadboarded circuits to illustrate theory and component behavior, building up to a complete soldered design. From here, they progress by laying out more complex circuits in Autodesk EAGLE PCB design software, sourcing parts from vendors, and ordering professionally manufactured boards. With all these materials together, students assemble their fan circuits, troubleshooting and iterating as a team in this culminating project experience.

For the 3D Design & Fabrication course, the quarter is divided into 3D Computer Aided Design (CAD) in SolidWorks for the first four weeks and then 3D Fabrication via Fused Deposition Modeling (FDM) 3D printing. During the first three weeks of instruction, learners are introduced to CAD via an exploration of the tools within SolidWorks. Following this set up phase, their skills are fully utilized in week four with a midterm that simulates challenges inspired by the Certified SolidWorks' Associates Exam (CSWA) [1]. The CSWA exam is the unofficial universally recognized industry standard CAD assessment and thus is used as the benchmark for an intermediate level user of SolidWorks. After they pass the midterm, learners apply the knowledge from 3D modeling to designing their own models for manufacturing via the 3D printing process. At this point, the course completely shifts from a pure software focus to a more physical and interactive learning environment, leading to their culminating project experience, a 3D printable design of their own choosing.

Table 1: Abbreviated learning outcomes that dictated the design of the two courses, divided into technical, theoretical, and professional skill sets. These cumulatively cover key skills the student-teachers consider critical to thrive in an engineering school.
(Red = Electrical; Blue = 3D Fabrication; Purple = Both)

Technical	**Content Knowledge**	**Professional**
Circuit prototyping and assembly methods/ technique	Electronic circuit design cycle	Teamwork - working in small groups
Component selection, sourcing, and technical evaluation	Basic principles of electricity and mathematical circuit analysis	Communication - presenting to the class and engineering notebook
Circuit design, simulation, schematic capture, board layout, and manufacturing	Basic analog component properties; basic analog/integrated circuits, with focus on 555 timer & LM25085 - buck controller	Engineering mindset - breaking things down into smaller parts, defining requirements
Measuring voltage, current, and resistance using test equipment	Basic signals, focusing on PWM (Pulse Width Modulation)	Navigating failure (recovering from failure)
Electrical circuit debugging techniques	Best practices for schematic drawing and board routing	Making informed design decisions.
Identifying tools and techniques to model parts	Basics of 3D CAD, sketching, modeling.	Professional documentation practices; ability to read professional documents
Notebook drafting, CAD design, slicing, tolerancing, 3D printing	Iterative design cycle	Time management, task planning, and estimating task duration

Weekly Structure

A typical week begins by flipping the classroom; it starts with a prelab assignment that learners complete on their own time before the start of class. The prelab exposes learners to the relevant background information for that week's module topic through a mix of article readings and online videos. We decided to preload introductory content out of lecture so that everyone can start from the same foundation while reserving in-class time for more meaningful (and more fun) activities. The prelab is punctuated with a quiz, due before the start of class without exception, to ensure that all learners complete the material through a mix of multiple choice and open response questions that reinforce key outcomes. The prelab quiz also served as a form of formative assessment; the student-teachers review the quiz results before the start of class to better tailor course content for the week. An example of the weekly module structure is shown in Figure 3.

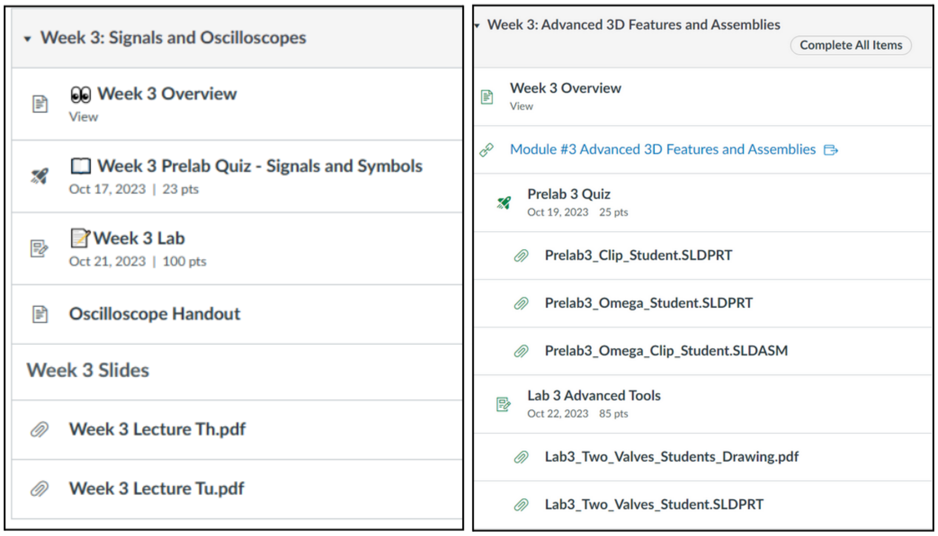

Figure 3: Example of weekly modules as depicted in Canvas, taken from both courses. The one on the left is from Electrical and right is from CAD. Each module contains all the relevant materials and assignments for the week made accessible to learners in an easy to find Canvas module.

During class time, we exemplify prelab concepts through peer activities and interactive demonstrations to facilitate social learning [11], these strategies are discussed in more detail in the Teaching Strategies section. After working through concepts with their peers and colleagues, learners are then let go during independent practical lab assignments to synthesize and cement learning, pushing them to develop their own problem solving methodology. These "let them go" ministages further reinforce learner confidence by demonstrating that they can accomplish the goals of the class through real-world labs and projects. When we let them go, we get a better gauge of how well the information was retained, highlighting key areas that may need to be reviewed and unpacked in a future lecture.

Culminating Project

For both classes, the final culminating project experience is where learners solidify and take ownership over their learning by selecting what skills they want to become "experts" in as part of a design team. Throughout this multi-week, iterative experience, learners have multiple avenues to showcase and refine their understanding through the construction, documentation, and presentation of their team artifact. For the Introduction to Electrical Circuit Design class, student-teachers designed a preconceived final project to specifically cover the major learning outcomes (Table 1) of the course, spanning most of the components and key circuits covered in the class and making use of all class equipment and software. The project asks students to design the electrical circuits necessary to run a USB-C powered desk fan, making sure they integrate together and fit into class-provided enclosures. This project is complex enough to give students a taste of how electronic products are designed with multiple stages of iterative design, but has only two major sub-circuits within it, making it achievable within the ten week timeline.

On the other hand, for the Introduction to 3D Design & Fabrication class we decided to enable our students to take ownership of their learning by allowing them to propose a design and determine the goals of their project. These students were instructed to formulate their project idea around one of the following two criteria, while constrained for complexity through weekly feedback sessions with student-teachers:

(Engineering) Prompt 1:
Using the skills you learned with SolidWorks and 3D printing, design a solution to an identified problem in your daily life.

(Artistic) Prompt 2:
Using the skills you learned with SolidWorks and 3D printing, create a piece of art that can be displayed on a table or wall.

This choice allowed learners to create many unique project artifacts that had true meaning for the students making them. It also asked teams to push the boundaries of their learning and use SolidWorks and the 3D printers in unique ways, which they would then share with other students as lessons learned. Examples of these projects can be seen in Figure 4.

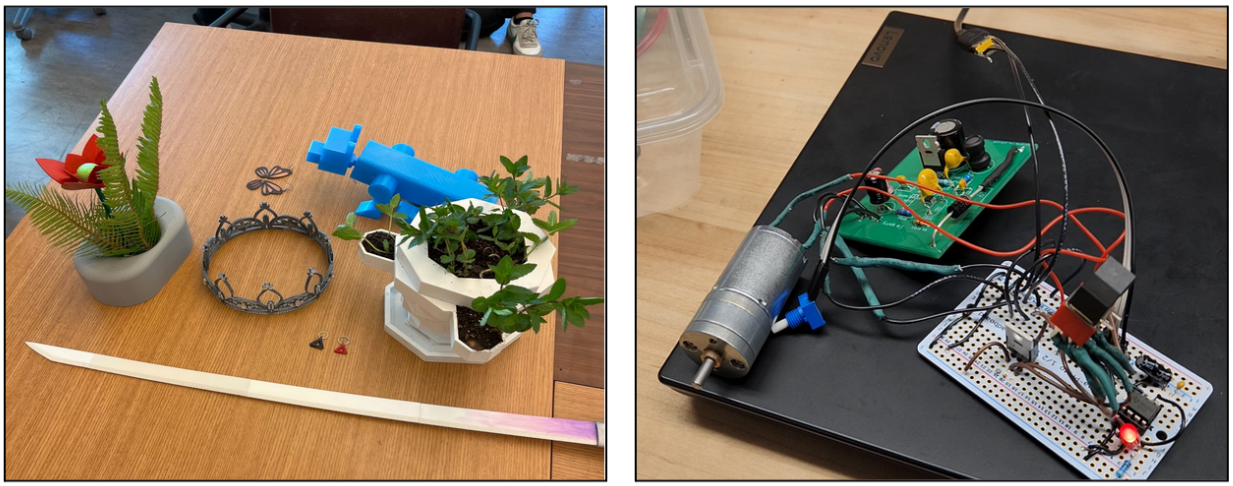

Figure 4: (Left) Final project artifacts produced by learners in Fall 2022 3D Fabrication class, which includes: a mint pot planter, butterfly earrings, katana, triangle earrings, crown, desk shrubs vase, and replica robot dog all Designed in SolidWorks and printed in PLA using the Prusa Mini. (Right) One example of the fully functional final project circuits, designed and assembled by a learner team.

"One of the drawbacks of the nature of this course is that it runs only as a single quarter course, which can make it difficult to dive very deep into every concept introduced in this lab. The final project's emphasis on self-exploration and creativity makes up for this caveat. This is because as a team, I can explore the nuances of using SolidWorks for design and understand the considerations for a successful print. In terms of the hands-on experience and collaboration, I feel like I've learned more from this class than from other classes that have more learners and are lecture-based"

- Learner A

Critical Teaching Strategies

In teaching both courses, a wide variety of teaching techniques and class activity structures were used; in the end, we found six of these to be the most effective:

1. Instructor Puppeting
2. Kahoot in Review and Lecture
3. Group Challenges
4. The Wheel
5. Conceptual Blockbusters
6. Unguided Exploration

1) The first, and most successful technique employed was that of instructor puppeting. This concept allows learners to direct the student-teacher through a task, with the student-teacher doing only what the learners explicitly request. This gave learners the opportunity to think through the process of completing a task while simultaneously leaving space for student-teachers to give hints if the class gets stuck. More importantly, it allowed the student-teachers to make corrections to unsafe practices and explain their reasoning, introducing natural stopping points for discussion and clarifying questions. A noteworthy reason that this method was so efficient in both classrooms was through the fact that first-year students feel much more comfortable in puppeting fellow students as opposed to tenured professors with dozens of years of experience in the field.

2) We also saw overwhelmingly positive reception to and reviews of the weekly assigned prelabs via Kahoot. This gave learners an opportunity to review the material in a fun and forgiving (and slightly competitive) environment, while also letting student-teachers receive real time feedback on overall learner comprehension. When answers were not unanimously correct, we took time to review the question and any potential pitfalls that learners may have encountered.

3) Group challenges were implemented by both the Electrical Design and 3D Fabrication classes after the basics of their respective software tools had been taught. Learners work inside their seated table group of approximately 4-6 students and together tackle a challenge provided by the student-teachers, such as trying to replicate the CAD model or route the board given a schematic. Within the group, each member would take turns driving the laptop through a timed rotation schedule. This activity allows learners to test their skills and to learn new things from their classmates both through watching and guiding each other.

4) One smaller, but still noteworthy method introduced in the Fall 2023 rendition of the Electrical Circuit Design course was the wheel. A tried and true method of ensuring learner participation via the imminent possibility of getting their name randomly drawn by the spinning of a wheel listing learner/team names. While at first glance this method may seem like an inappropriate choice for the college-aged learner, it seemed to work successfully in providing some friendly pressure to pay attention and participate in class discussions.

5) Conceptual blockbusters was a very well received activity that we implemented in the most recent iteration of the Intro to 3D Design and Fabrication course. Conceptual blockbusters are simple yet challenging brain teasers that force learners to think in ways they are not accustomed to. Refer to the Slow Elevator Problem for an example [12]. These blockbusters were designed as a warm-up activity and given at the beginning of lecture on the Tuesday of each week.

6) Another activity that was well received was the unguided 3D printer exploration for the mechanical class and the unguided oscilloscope exploration for the electrical class. Both consisted of a small lecture detailing equipment safety and asking learners to predict the basics of what buttons or dials can perform what function. After, student-learners were given a list of tasks they could complete or explore which they worked in small groups to accomplish, these included: loading and unloading filament onto the 3D printers, leveling the print bed, measuring the frequency of a periodic signal, calibrating pieces of equipment, among others. This activity pushed learners to take agency over their learning and provided a space to gain confidence in the material from teaching their peers. It is noteworthy that this method is most effective when learners have no previous experience as it provides an environment where learners are encouraged to learn together.

The Secret Sauce

The course's success is attributed to its well-structured design, but the primary factor lies in the effectiveness of the student-teachers. A key factor in this is the way we, as students, are better able to relate to the challenges and experiences that learners may be facing and thus are better positioned to take action, fostering a more empathetic learning environment. 89% of students stated they were comfortable or very comfortable "reaching out for help in understanding the course content" in a 5 point Likert survey item [9]. We found that learners are more inclined to participate in more vulnerable class actions, such as asking questions or showing their work, if they view their instructor as a colleague or even a friend. The student-teachers being fellow undergraduates goes a long way to make the course more friendly and welcoming – with one learner reporting,
"The combined lectures, labs, and in class challenges, allowed us to directly apply what we were learning rather than just taking a test and answering questions... It's taught by undergrads which made approaching the professors with questions less intimidating and made getting to know them easier"

- Learner B

Furthermore, as both instructors and learners are undergraduate students, many of us maintained similar schedules, allowing instructors to meet the needs of the learner by offering additional office hours and open lab hours on weekends and other times not traditionally offered by a typical professor. We found that the most non-traditional times (such as weekends or late at night) had some of the highest attendance rates out of all the offered hours. Additionally, a well-monitored Slack channel proved a more effective way to get prompt feedback from student-teachers as well as fellow learners on a familiar platform, letting them post course questions and provide suggestions in an accessible public forum.
"The teaching team was also very easy to get into contact with. The open lab hours and feedback for assignments also helped me understand the area I could improve in"

- Learner C

A less obvious, but critical factor in facilitating the non-traditional accommodations was the combined classroom and lab space dedicated to student-taught courses. This mixed-use and configurable room held class, section, and open lab hours, providing a centralized space for teachers and students who came to view the space as their own. By holding class lectures and lab work in the same space, dynamic mixes of theory and practice were easily and commonly implemented. Lab equipment stored in the classroom facilitated impromptu hand-on demonstrations and reduced preparation time for activities. Additionally, the space allowed for group style seating arrangements, placing emphasis on hands-on collaborative work instead of aligning students towards a single point to simply watch a lecture.

Lastly, student-teachers are more inclined to experiment with different teaching methods and learning strategies as they know firsthand what makes for an engaging learning environment. This flexibility facilitates a more personalized learning experience, supporting our goal to make the first steps into engineering more welcoming and friendly.
"This class is a lot different from any class I've taken at UC Santa Cruz because the student-teachers give interactive activities to help learners be involved in the class and make the layout of the class more fun instead of just lecturing the whole time. I feel good about the module structure, I feel like the pre-labs help us in terms of content for class and the labs give us a chance to practice what we've learned that week."

- Learner D

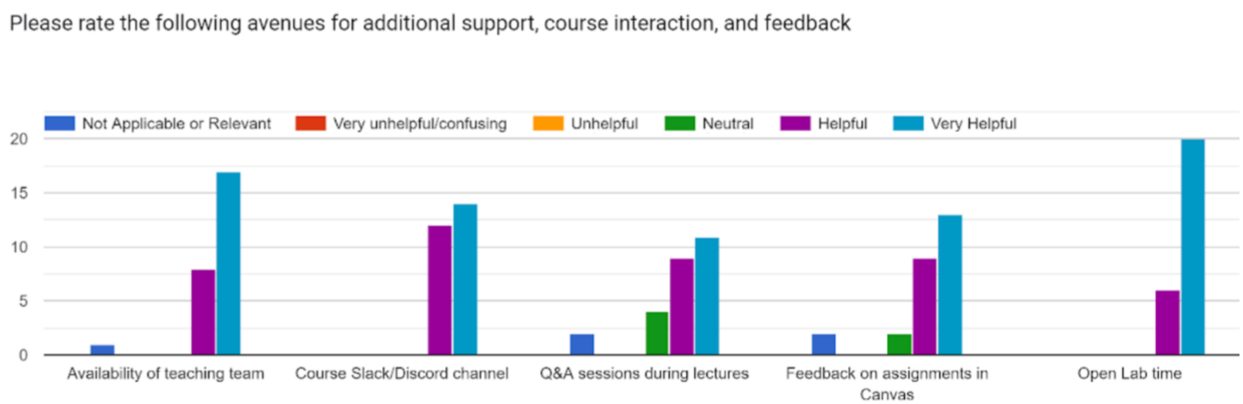

Figure 5: Some of the results of an internal survey conducted during the final week of the two courses [9]

Results

While there is room for continued iteration, these two courses mark an important step forwards in student-led instruction. Learner engagement remained high throughout the quarter with overwhelmingly positive end-of-quarter survey ratings, with 93% of students stating the class was "very engaging" on a Likert item survey question [9]; many students expressed an eagerness to design their own course in the near future, a testament to the learners' resounding support for student-led instruction. We have observed a more diverse and multidisciplinary student body, one that actively participates with questions and comments throughout lectures and activities; in some cases, being reluctant for class to end. This is in stark contrast to the atmosphere in other engineering courses taken previously by the student-teachers. Despite the 21% female-identifying population in our School of Engineering [4], our courses had a more balanced 45:55 gender ratio this year, structurally promoting a diversity of opinions and backgrounds. The advantages granted by having student-teachers also support a more inclusive learning environment with reduced stigma for wrong answers, allowing them to quickly recognize and address misunderstandings as they arise. This stems from the innate ability of student-instructors to empathize and unpack concepts with their peers. The casual and approachable learning environment has resulted in a boost in engineering identity demonstrated through the achievement of complex final projects among learner-teams.

Lessons Learned and Future Improvements

While receiving positive feedback for this supportive structure, one major area of improvement for future versions of the course is in the quantity and style of student-teacher support provided to learners. With the student-teacher goal to strive for individual learner success, we inadvertently abetted a culture of hand-holding in the early weeks of the quarter. The reduced scores towards later labs and uncompleted final projects highlight that the implemented scaffolding was perhaps too directed. Future improvements for the course would focus more on student-teachers prompting learners to find their own way through challenges earlier in instruction. Along the same vein, scheduling structured open lab hours and project reviews in the first half of the week could prioritize starting labs early and build positive habits and promote independent learning. The ideal balance and nature of student-teacher support is still in need of further experimentation and review.

Given the agency to follow our creative vision and a quarter of supported pedagogical design instruction, we were truly able to craft our ideal introductory technical courses. Our learners effectively learned applicable skills and theory, developed friendships alongside teamwork skills, and emerged with a series of tangible projects proving their ability as nascent engineers.

What kind of course would you have taught as an undergraduate student?

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