



# Student Reflections on Experiences in Curriculum Design

Ethan Farrugia, Tania Machet, Timothy Boye, Roger Hadgraft and Elizabeth Tomc.

*University of Technology Sydney*

*Corresponding Author Email: [tania.machet@uts.edu.au](mailto:tania.machet@uts.edu.au)*

---

## ABSTRACT

### CONTEXT

The value of the student perspective in developing and evaluating engineering course content and curricula is increasingly being recognised (Lubicz-Nawrocka & Bovil, 2021; Bovil, Bulley & Morss, 2011). However, there is little written on students' own perspectives of the process. As a final-year engineering student, the first author became interested in working on projects that could have a direct impact on their education, so they undertook three co-design projects under the supervision of academic staff and engineering education designers.

### PURPOSE OR GOAL

This paper explores a student's experiences of their involvement in educational design and development projects in engineering education. The paper draws on the experience of three different models used in projects for eliciting student input into educational design. The perspective adds to our understanding on how to engage students in this process, the potential value to learning and how we can use the student perspective in education design.

### APPROACH OR METHODOLOGY/METHODS

The first author elected to complete three curriculum development projects: one took a design thinking approach in a team work context to redesign an engineering professional practice curriculum; the second was an honours thesis project to investigate a new undergraduate engineering offering and the third was a self-directed study elective to design a sub-major. The projects differed in terms of learning outcomes, project structure and assessment design, supervision, and my motivations for taking the projects. This paper reports on reflections of these aspects and situates the experience in the context of student contributions to educational design.

### ACTUAL OR ANTICIPATED OUTCOMES

The reflections presents the differences in experience given the different project approaches with a particular focus on the benefits and challenges between the methods used to implement the activities. The motivations for taking subjects, the degree of structure involved and the agency students have in selecting projects all influence student learning in these cases.

### CONCLUSIONS/RECOMMENDATIONS/SUMMARY

Involvement in educational design provides value to students. It offers students a context in which to develop their awareness of the application of engineering design skills. The paper suggests strategies that can be used to encourage student involvement in educational design projects such as offering these activities for credit and providing opportunity for students to define their project scope.

### KEYWORDS

Student co-design

## Introduction

Students bring valuable perspectives when developing and evaluating engineering education practice (Lubicz-Nawrocka & Bovil, 2021; Bovil, Bulley & Morss, 2011). However, there is little written on students' own perspectives of the process of contributing to the design of their learning experiences (Garcia, Noguera & Cortada-Pujol, 2018). Exploration of student experience in the development and design process of curricula could assist educators in understanding how to engage students in these processes, as well as any potential learning value for the students involved.

As a final year engineering student at the University of Technology Sydney (UTS), an urban university in Australia, the first author became interested in working on projects that could have a direct impact on the design of their education. They chose to undertake an elective subject that involved the students in curriculum co-design under the supervision of academics working in engineering education. The experience allowed the author to identify further opportunities to learn more about a field of engineering, systems engineering, of particular interest to them through the lens of educational design. They elected to do a further two curriculum design and development projects with a range of academics and engineering education designers. Each of these projects allowed the first author to bring the student voice to the design of engineering education practices and curricula in different contexts and using different approaches to the curriculum design and to student engagement.

This paper presents these three models for approaching curriculum design with students and uses the student perspective as a lens to explore the models in detail. Through examining multiple cases, with different contexts, this paper presents a comparative case study approach to investigating differences and commonalities in a student experience across the cases, examining how different contexts for design succeed or fail from the student perspective.

## Background

Student participation in the design of education is not new in the literature (c.f. Garner & Acklen, 1979) and students too have included their voice (Schwebel, 1969). Bovrill, Morss & Bulley (2009) report that student participation in curriculum goes as far back as Dewey in 1916. The practice is now growing and gaining attention. Recently, Martens et al (2019) identified that the growing participation of students in educational design is represented in the literature by a wide range of approaches (e.g. design-based research, co-design, participatory design etc.) and conceptual models which describe varying aspects of the process, such as the student's role or level of student participation in the process.

The literature reports that students' experiences of including their voice in codesign is generally positive and can have transformative effects on their learning such as taking on new attitudes and approaches to future projects, that it can facilitate student engagement with their learning and empower them (Toshalis & Nakkula, 2012; Bovil, Bulley & Morss, 2011, Maniu & Raulea, 2019; Nawrocka-Lubicz & Bovill, 2021).

However, student involvement in curriculum design is still the exception and not the norm in higher education and there is limited literature on students' own first hand perspective of the process. Lu, Nguyen & Erin (2015) were students involved in a semester long project giving input into their curriculum and they highlighted that co-creation of courses gave students a sense of shared responsibility with academics for their learning as well as giving them insight into new career paths.

For engineering and IT students in particular, engaging in codesigning their learning presents opportunities for professional development. Co-design skills are increasingly being considered vital for the human-centred engineer. Opportunities to experience and practice co-design skills need to be integrated throughout the engineering curriculum to build these skills in the next generation of engineers (Mazzurco, Daniel & Smith, 2019). Curriculum co-design offers a unique way for students to both engage with the curriculum and develop these skills (Narai, Boye & Mchet, in

print). Mazzurco, Daniel & Smith (2019) strongly advocate that engineering students should be presented with opportunities for curriculum co-design during their studies at university and that co-design opportunities are an integral component in educating the future cohort of engineers.

## Approach

Including the student voice in educational design can take a number of forms. Marstens et al (2019), reviewing the literature on student involvement in educational design, group and differentiate approaches by the level at which students are central to the design process, and by the focus of the approach on educational theory. Opportunities for students to participate in curriculum design and development are often either extra-curricular in nature, where students engage in various projects for either the passion of the project or for compensation, or are a component of a subject where students engaged in developing what they want to get out of the subject (c.f. Lu, Nguyen & Erin, 2015).

In the experience of this student, three different projects were undertaken that used different approaches to incorporating the student voice in educational experiences. Each project was taken as academic-credit as part of a combined degree of Bachelor of Engineering (Honours) and Bachelor of Business. Due to the effects of the COVID-19 disruption, studies were a mix of emergency online learning and in-person attendance.

Garcia, Noguera & Cortada-Pujol (2018) report that students “value, and want to be involved in” the design of their curricula but that there are some drawbacks to approaches often taken. One such limitation is that students often do not have the time they need to develop the trusting relationships, common language and pedagogical concepts needed for these activities to be most effective, nor to get a broad perspective when reflecting on the activity. By engaging in multiple projects over a long period of time, and developing the language and relationships with academics, the first-author has a unique perspective on the student experience in these processes. The three projects are each presented here as case studies, with the student’s own reflections of the experience. Through examining multiple cases with different contexts, this paper presents a comparative case study approach to investigating differences and commonalities in a student experience across the cases. Comparative case studies are appropriate when determining “how and why particular programmes ... work or fail to work” (Goodrich, 2014, p1) and this paper examines how different contexts for curriculum design with students work or fail from the student perspective.

## Case Studies of Students in Curriculum Development

### Case 1: Co-design of program redesign in an elective studio

**Context:** In 2022, UTS offered an elective studio subject which aimed to give engineering and IT students an authentic, non-technical context for applying engineering design skills. The studio focussed on the redesign of the Diploma in Professional Practice offered by UTS to IT students and compulsory for local engineering students. The Diploma in Professional Practice involves engineering and IT students undertaking two six-month work placements in an engineering or IT organisation and includes preparation subjects and reflection subjects for each of these internships. The Diploma aims to both ease the transition into post graduation work and develop professional competencies among students. The Diploma was undergoing a redesign, and this studio subject was an opportunity to involve students in the process (Anon).

**Subject Design:** The studio subject took a co-design approach. In the context of including teachers in the design of educational innovations, Roschelle, Penuel and Shechman (2006, p. 606) define co-design as “a highly-facilitated, team-based process in which teachers, researchers and developers work together in defined roles..., realise the design in one or more prototypes, and evaluate each prototype’s significance for addressing a concrete educational need”.

This studio was supervised by two academics whose teaching focuses on developing professional practice skills in their students and who research engineering education. The design team included the supervisors and the six students enrolled in the studio subject. Students were from both engineering and IT undergraduate degrees, and had a range of experiences with the Diploma. The academic supervisors planned all classroom activities and facilitated the project, while empowering students to seek out additional stakeholders and information.

Studio sessions ran over seven weeks with six hours of class time per week (initially on campus and then remotely due to COVID-19 restrictions). All students completed the redesign project together, working as a team to investigate the problem and to design a solution using a Design Thinking approach and to propose a prototype, which was presented to stakeholders for feedback. Students were individually assessed on a portfolio of work, which included the final report and presentation, as well as additional individual research and reflections on the experience.

**Student Reflection:** I elected to do this subject because it presented an interesting scenario that I had not previously been exposed to during my studies. The fact that the studio was 'for credit' contributing to the completion of my degree, coupled with the fact that the project itself was interesting made it a highly attractive offering.

Reflecting on the subject, the experience of completing such a project in a team context had a significant impact on my experience. During the earlier stages of the project, I had a preconceived idea of what the final outcome should be and, initially, I advocated strongly to steer the direction of the activities towards my preconceived ideas. However, while working in a team context, other team members challenged my initial ideas and allowed me to understand the broader implications and gaps in what I was proposing. I was also able to reflect on my own contribution to team dynamics and how I had tried to drive the direction of the project initially.

As this co-design project had a predefined methodology (the Design Thinking approach) with facilitated activities, I was exposed to a completely new way of thinking that I had not previously come across. I have previously had a strong preference for a waterfall or systems engineering approach to be applied to all projects. My experience is that with a systems engineering approach requirements are clearly defined before design activities whereas in the Design Thinking approach, requirements are constantly iterated as the project progresses. However, after completing this project I am in a better position to adapt to new projects in the future using alternative approaches. I believe that going forward, I will be more adaptable when working on new projects with unconventional methodologies.

## **Case 2: Honours thesis developing an engineering undergraduate degree.**

**Context:** This project was an honours thesis project for a Bachelor of Engineering (Honours) degree. At UTS, the honours thesis is structured as two subjects: one focussed on defining the research problem, reviewing the literature, and planning the research approach and the other subject on the execution of the project plan (the actual research) and final reporting on the process and results. Both subjects are completed with supervision from the same academic. Students may choose a project offered by academics or propose their own. Due to a successful experience with the co-design subject, the student approached an academic to propose an honours thesis project looking at the design of an engineering curriculum to introduce 'new' skills such as systems engineering, intellectual property, and entrepreneurship skills.

**Subject design:** As an honours thesis project, the initial work looked at defining the problem to research. Under the guidance of the supervisor, the student developed the project into one that aimed to use a systems engineering approach to redesign an undergraduate degree to develop skills that the literature identified as important for graduating engineers. While this was not a redesign currently being considered by the university, the Faculty does review and renew its offerings regularly.

Since this curriculum design project was facilitated via the compulsory honours thesis subjects of the degree, there were pre-existing deliverables established such as a problem analysis, project

plan, proposal, and final thesis paper. While the honours thesis subjects require independent and self directed work from students, the structure and supervision of academics guide their work. In this case, there were weekly virtual meetings between the supervisor and the student where the student had the opportunity to ask questions, seek guidance and have their progress reviewed regularly.

**Student Reflection:** After having a positive experience in a curriculum design studio, I was interested in further pursuing educational design for my honours thesis. Students have the flexibility to propose their own honours thesis ideas as I did. As it was my own choice of project topic, I found that I had a deeper attachment to the problem and project outcomes. Furthermore, since the honours thesis project has a year long duration (as opposed to the 7 week duration in Case 1), I found that I was able to research deeper into the topic and add significant detail to the final design. Also, as this project was an individual project, I found that I was able to receive more focused attention and feedback from my supervisor. As well as developing research skills, through this project I have developed a better understanding of the complex nature of education design and delivery, and will be more capable of applying this independently.

### **Case 3: Supervised, individual curriculum design project proposed by student**

**Context:** The third curriculum design project was an individual project under the guidance of two academics. The project was facilitated via a 'shell' subject where students or academics can create unique 'for credit' projects. Students and academics together develop a learning contract agreement that defines the deliverables and learning outcomes. In this case, the student actively sought out an opportunity to engage in a curriculum design project to create a systems engineering sub-major and subject for the university. This project aligned with an existing university strategy to embed more systems engineering into the curriculum. Through approaching academics who have an interest in this strategy and experience in educational design, the student was able to enrol in the subject.

**Subject Design:** For this self-directed study, the student researched and designed a systems engineering sub-major for the university. The negotiated deliverables were to produce a final report that communicated the background research, methodology for designing the sub-major and the output in the form of a proposed structure of a systems engineering sub-major. The student met with supervisors fortnightly giving the student opportunity to receive feedback and guidance on the work completed.

**Student Reflection:** I am an undergraduate engineering student with a passion for the systems engineering discipline and strong aspirations to pursue a career in the field of medical device systems engineering where I currently have a role. As such I see the value in offering a systems engineering sub-major and proposed this project. I found that this project was an invaluable opportunity to gain credit points in working in a field that is not currently extensively offered and where I could add value for future students. The opportunity to design a systems engineering curricula for my university was a deeply personal experience for me and I found that it was a unique pathway towards gaining competence in a niche field. Similar to the honours project, I found that, since this was an individual project, I had more opportunities to seek guidance and clarification from my supervisors. Further, since the project was my own idea, I felt a greater sense of accountability for the quality of work produced. I feel that in the future, the experience of having this amount of accountability on a project will allow me to be better equipped to strategise and develop appropriate project methodologies as a leader. This project allowed me to develop my understanding of a field within engineering which will be beneficial for my career.

As with case 2, during this project I was able to apply a methodology and practice activities drawn from my professional work experience. I had the opportunity to take skills I learned in the systems engineering workplace and apply them to other contexts and problems. This taught me that my professional skillset had practical applications beyond my employment.

# Discussion

## Encouraging student participation in curriculum design

This particular student has participated in three models of educational design giving them a unique perspective for comparison of models. Their experience was that offering curriculum design projects as 'for credit' subjects can encourage participation in these processes. While interested in curriculum design, the student selected to be involved in the projects as they contributed to the completion of their degree.

A further encouraging indication of how to engage students is to facilitate the opportunity for students to propose their own curriculum design projects. The student experienced high levels of engagement for the projects, which were self-proposed and they felt a vested interest in the process and outcome of those projects. This student already had co-design experience (from the initial studio) and therefore was aware of the potential for proposing educational design as a project. A realisable solution for those students who do not yet have this experience would be for academics interested in these projects to propose broad topics and allow students to take agency in defining the specifics of the project topic in order to encourage engagement.

## Student learning in individual and team contexts

Case 1 was facilitated in a team context while the others were individual. The students' experience was that both of these contexts contributed to their learning.

While working in a team context, the student expressed that their preconceived notions were challenged more often and that they were better able to understand the broader implications of their ideas. The student also highlighted that working on a team co-design project contributed to their understanding of their own behaviour in teamwork and how to handle contrasting perspectives within a team of members from different professional and academic backgrounds. Lastly, the student highlighted that working in a team context provided them with more opportunities to hone team leadership skills.

The student experience was that while working in an individual context, there was better feedback from supervisors. In the individual projects, the supervisors could allocate more focused attention on the work of the individual contributor. The student expressed that during the individual projects, they had a deeper understanding of the rationale behind different stages of methodology and educational design process and were presented with more opportunities to refine their work.

In each case, the learning outcomes perceived by the student in either the team work or individual projects were different. If student learning and development is one aim of academics looking at involving students in educational design, this experience suggests that the model should be selected considering the types of learning objectives for students and the time available to give detailed, individual feedback.

## Student experience on level of structure

Case 1 was a structured subject, planned and facilitated by the academic supervisors who had a focus on co-design. Case 2 was semi-structured, as an Honours thesis, with some agency for students and supervisors to define research questions and methodology used. Case 3 was the least structured being a self-directed study where a learning contract was negotiated between the supervisors and students. The student had increasing agency in the planning of methodology and activities for each case.

The student experienced a transformative learning experience during the structured project. Through being presented with a well facilitated project using a new methodology, in a novel context, they felt their professional skills had developed and they would be better able to adapt to new projects in the future. This experience focused on learning to apply the Design Thinking

approach; however it could arguably be seen as a result of the high level of facilitation that is included in co-design and which was implemented in this project.

The student expressed that during the unstructured projects, they felt a greater sense of personal accountability and a more vested interest in the projects because they were responsible for defining their approach and outcomes. The student highlighted that this increased their sense of accountability and interest. Importantly, they had the opportunity to leverage what they had experienced in their professional work experience (in this case systems engineering) and this developed their understanding of the profession and helped them understand better the link between academic study and professional work.

Having experienced three separate educational design projects, and reflected on these in writing this paper, the student has shared the factors that they feel affect their own learning and that helped engage them in the educational design process. These insights may be used to help engage students in future projects for the accepted benefits that the student voice brings to educational design and development, but also to provide learning opportunities for engineering and IT students where they are able to apply their skills and problem solving approaches to a novel context. The motivations for engaging and the structure of the projects will determine the nature of the students' learning.

The impact of motivations and project structure indicate a limitation to this research – the reporting is from a highly motivated student, self-selecting for these projects and bringing their own preferred approach to learning to the reflection. This opens up avenues for future research to investigate the perspectives of a range of students who engage in such projects in the future, and identify trends in the factors such as the cohort of students who select these projects, the perceived gain of knowledge for students and the most appropriate project design to promote student learning.

## Conclusion

This paper presents a comparative case study based on a single student's experience of undertaking three projects where they were involved in educational design and development. Reflecting on these, the student has identified that each of the projects, while differing in context and structure, have provided them with learning opportunities and have shifted their understanding of engineering practice as well as education. The significant factors in engaging and learning were: the for-credit offering of the projects; the difference between completing this as a team or individually; and the level of agency the student had in defining the problem, approach, and deliverables for the educational design, particularly the opportunity to bring skills acquired in the workplace into the curriculum. These reflections, of course, focus on the student's own learning rather than the contributions to the design of the educational experiences. They show the benefit of educational design activities to develop student skill and awareness of their education and how it relates to their future practice as engineers.

Significantly, the fact that the student had a positive first experience meant they actively sought out more opportunities, identifying that these projects were valuable to their own learning as well as in terms of a contribution to educational design. Through building relationships with academics and developing their understanding of pedagogy over a number of projects, this student has overcome the drawback identified by Garcia, Noguera & Cortada-Pujol (2018) of limited time for students to develop skills and knowledge in educational design processes.

## References

- Bovill, C., Bulley, C. J., & Morss, K. (2011). Engaging and empowering first-year students through curriculum design: perspectives from the literature. *Teaching in Higher Education*, 16(2), 197-209.
- Bovill, C., Morss, K., & Bulley, C. (2009). Should students participate in curriculum design? Discussion arising from a first year curriculum design project and a literature review. *Pedagogical Research in Maximising Education*.

- Garcia, I., Noguera, I., & Cortada-Pujol, M. (2018). Students' perspective on participation in a co-design process of learning scenarios. *The Journal of Educational Innovation, Partnership and Change*, 4(1).
- Garner, A. E., & Acklen, L. M. (1979). Involving students in curriculum planning. *The Clearing House*, 53(1), 36-39.
- Lu, C. Y., Nguyen, Q., & Ersin, O. H. (2015). Active student engagement in curriculum development. *American Journal of Pharmaceutical Education*, 79(2).
- Lubicz-Nawrocka, T., & Bovill, C. (2021). Do students experience transformation through co-creating curriculum in higher education?. *Teaching in Higher Education*, 1-17.
- Martens, S. E., Meeuwissen, S. N., Dolmans, D. H., Bovill, C., & Könings, K. D. (2019). Student participation in the design of learning and teaching: Disentangling the terminology and approaches. *Medical teacher*, 41(10), 1203-1205.
- Mazzurco, A., Daniel, S., & Smith, J. (2019). Development of Socio-Technical and Co-Design Expertise in Engineering Students. In *Research in Engineering Education Symposium; Research in Engineering Education Network*: Cape Town, South Africa.
- Narai, R., Boye, T., Machet, T. (2022), Co-designing an engineering professional practice program with students, *Frontiers in Education Annual Conference 2022*. Manuscript Under Review
- Roschelle, J., Penuel, W. R. and Schechtman, N. (2006) Co-design of Innovations with Teachers: Definition and Dynamics. Paper presented at the *International Conference of the Learning Sciences*, Bloomington, IN.
- Schwebel, R. (1968). Wakening Our Sleepy Universities: Student Involvement in Curriculum Change. *Teachers College Record*, 70(1), 1-11.
- Toshalis, E., & Nakkula, M. J. (2012). *Motivation, engagement, and student voice*. Boston, MA: Jobs for the Future.

## Copyright statement

Copyright © 2022 Ethan Farrugia, Tania Machet, Timothy Boye, Roger Hadgraft and Elizabeth Tomc: The authors assign to the Australasian Association for Engineering Education (AAEE) and educational non-profit institutions a non-exclusive licence to use this document for personal use and in courses of instruction provided that the article is used in full and this copyright statement is reproduced. The authors also grant a non-exclusive licence to AAEE to publish this document in full on the World Wide Web (prime sites and mirrors), on Memory Sticks, and in printed form within the AAEE 2022 proceedings. Any other usage is prohibited without the express permission of the authors