

Lessons Learned: Designing for Complexity and Ambiguity in Total Course Development from Conception to Delivery

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Faculty may experience varying degrees of curriculum and instructional design including the development of completely new courses and programs, existing course redesign, and the design of targeted instructional units or modifications. In these different curriculum design contexts, faculty developers may also be challenged with providing varying degrees of support to their faculty clients. The goal of this paper is to offer insight into ways of translating and expanding common course design considerations to inform design and instructional approaches for open-ended design and learning. Specifically, how can faculty developers engage in course development when the development process is inherently complex and ambiguous? What does it mean for course development when the ability to navigate complexity and ambiguity are explicit course learning objectives? This paper is based on the author's experience as an engineering education researcher, curriculum developer, and instructor of record, leading the development and instruction of a new course offered in an undergraduate multidisciplinary engineering program. As part of the course development, the author participated in a six-day intensive Summer Course Design Institute offered through the Center for Instructional Excellence at Purdue University. This paper will focus on three course design considerations and how each one may be expanded and translated to offer strategies for course design and instruction. Reflection and reframing of course design considerations offers faculty developers new approaches to course development.

Background of Course

The course focused on interdisciplinary collaboration and problem framing for students to generate insight about a complex problem situation. This course was designed as an opportunity for students to connect their learning across courses and prepare them for advanced study in interdisciplinary coursework and senior engineering capstone design. The primary focus was on developing students' abilities to engage with multiple perspectives from themes of professional engineering issues and utilize these perspectives to build frames as ways of seeing and understanding a situation. The course was project and discussion based with biweekly reflections and course readings. The primary pedagogical element utilized collaborative learning sessions based on a flipped-classroom model, where students would read unique articles to gain new perspectives, come prepared to in-class sessions to share their perspectives, and engage in problem framing of a complex situation. Therefore, the course centered around these interactive, discussion-based, collaborative learning sessions to promote engagement and active learning.

Course Design Considerations and Lessons Learned

The lessons learned are presented as translations of three course design considerations pertaining to 1) content and learning objectives [1], 2) constructive alignment [2] and 3) inclusive teaching [3]. Table 1 identifies the general course design considerations, the core idea behind these considerations specific to this course development context, the way the design considerations were reframed given the open-ended nature of the course, and the strategy for implementation for course design and instruction. By considering these translations, the specific

lessons learned show how components are applied from course development through instruction leading to three implementable strategies: 1) journey mapping for holistic student experience 2) integrating course content, active learning pedagogy, and assessment through collaborative learning sessions and 3) scaffolding learning moments to build up to a culminating course experience. In the following sections, each of these strategies corresponding to the course design considerations are described, as well as my instructor reflection on student feedback.

Table 1

Translation and Reframing of Course Design Considerations for Implementation in an Open-ended Course Design Context

Course Design Considerations	Core Idea and Approach	Reframed Approach to Expand Thinking	Strategy for Implementation
Content and Learning Objectives [1]	Focus on learning objectives to address “what will students be able to do by the end of the course?”	Focus on being and becoming to address “who will students be and become through their development in this course?”	Journey mapping for holistic student experience that considers course content mapping and student growth
Constructive Alignment [2]	Alignment between content, pedagogy, and assessment to ensure course elements are mutually supportive.	Development of instructional experiences as pedagogy that integrates content and assessment	Integrated collaborative learning sessions to engage with multiple perspectives
Inclusive Teaching [3]	Engagement with inclusive active learning techniques to create an environment where all students feel supported in their learning	Empower students to integrate their learning across experiences	Targeted focus on scaffolding learning moments to build up to the culminating project experience

Content and learning objectives: Journey mapping for course content and student growth. It is common for course and instructional development to begin with thinking about learning objectives and asking the question “what will students be able to do by the end of the course?” However, the nature of my course development was such that the course content was open-ended in that there was no existing outline for content, suggested topics, or required subject material to be covered in the course. As the course developer and instructor, I had full autonomy over the content and instruction of the course. To start to think about this teaching experience, I reframed thinking about course content and learning objectives to think about “who will students

be and become through their development in this course?” This new question led me to a journey mapping process to envision the kind of experience I wanted to create for my students that would support them in becoming an interdisciplinary professional. By thinking about students’ journey first, I was able to frame the content and overall learning goals, which then led to the development of course learning objectives.

Constructive alignment: Integrated collaborative learning and assessment. The course design followed constructive alignment principles [2] to consider how content, pedagogy, and assessment work together to support student learning. For my course, I leveraged constructive alignment principles to think about how I could create a unifying and integrated experience for students that would serve as a pedagogical activity and assessment while providing practice opportunities to engage with the course content. In this way, the collaborative learning sessions, which formed the major pedagogical component of the course, served as the integrating piece throughout the course and the basis to facilitate authentic and active learning in the course. As part of the collaborative learning sessions, students were required to engage in multiple perspectives through a summary reading assignment, and then work within a team during the class session to analyze a problem situation using problem framing techniques of the course. The collaborative learning session included a synthesis deliverable for students to describe their problem framing and engagement process. The collaborative learning sessions offered a way to integrate content, assessment, and pedagogy, with built in constructive alignment throughout the course.

Inclusive teaching: Scaffolding learning moments to build up to the culminating project experience. With the course design consideration of inclusive teaching, I aimed to provide students multiple opportunities for assessment and feedback, an inclusive space to engage with multiple perspectives and ideas, and autonomy and flexibility in their learning experience. Throughout course development, I used self-determination theory [5] to consider students’ motivation and learning needs as a guiding framework for creating an environment where students would have a sense of autonomy in their learning. In addition, the Summer Course Design Institute introduced a number of Learning Assessment Techniques [4] that offered different ideas for active learning pedagogies and activities. With these guiding frameworks, my course development aim was to leverage these frameworks and ideas so that students would be able to see their learning coming together through multiple opportunities for practice, and to be able to transfer their learning to new and applied contexts. The combined use of activities including the collaborative learning sessions, accompanying reading synthesis assignments, and weekly student reflections, aimed to provide students with opportunities and support to integrate their learning across multiple experiences and build up to a culminating project experience.

Instructor reflection on student feedback. At the mid-semester feedback review, students emphasized the importance of balancing student autonomy in open-ended learning with direct instruction and examples. While the nature of the course was inherently open-ended, it was important to balance open-endedness that supported learning versus open-endedness that caused confusion, anxiety, or decreased motivation. An emphasis for the remaining of the course was made to provide more explicit and targeted scaffolding for students to build up to a level of confidence that would allow them to engage in the open-ended nature of the collaborative learning sessions. This feedback reinforced the need for me to model my practice when it comes to dealing with uncertainty and open-endedness. For example, in open-ended collaborative learning, it may be helpful to engage in a training session with students to model the practice of

collaborative learning. Therefore, as a lesson learned, particular attention should be made to consider how open-ended learning experiences may be de-constructed into “learning moments” to support scaffolded learning along a progression of development.

Discussion and Conclusion

I have highlighted three course design considerations for curriculum development as a launching point to think differently about course development when the design process is complex and ambiguous. I have pointed to ways that these considerations may be expanded and translated into strategies for implementation for creating and supporting open-ended learning experiences. These lessons learned are not offered as comprehensive course design principles, or a complete illustration of how course design considerations may be conceptualized and implemented. Instead, the course design considerations are presented here as a starting point for thinking about new course design elements that may support student learning. For example, faculty developers may reframe learning objectives beyond what students should be able to do, and consider ways for eliciting how faculty think about their course as a learning experience and how this experience supports students in becoming a learner and professional through the course. It may also be worthwhile to consider ways of integrating pedagogy and learning activities through the course that reinforce learning, provide opportunities for practice, and contribute to students’ progression of abilities. Through the use of a unifying and integrated pedagogy, that of multiple collaborative learning sessions, I have offered one way that pedagogy may serve as an integrating thread through the course experience that is consistent with the need for constructive alignment and inclusive teaching. While faculty developers are faced with providing curriculum support for diverse users, settings, and learning goals, it is important for faculty developers to reflect on their process in ways that might expand the practice of faculty developers and allow for adoption and adaptation of these practices in different settings.

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