

Syllabus Review Assessment: Technical Contract Review

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Professional skills continue to be found lacking in early career engineers despite efforts to improve suggested and implemented by faculty, administration, and ABET. Utilizing the early career engineering population as a source of information and specifically, feedback on the ability to meet the professional skills expectations, engineering faculty can include suggested recommendations for improve professional skills development within the undergraduate engineering curriculum.

Syllabus Review Assessment Using a Contract Review Framework

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Abstract

Early career engineers are expected to perform technical contract reviews; many were not exposed to this task. Yet, if engineering students recognized course syllabi as a bilateral contract between the instructor and student, early career engineers would have reviewed numerous contracts on multiple occasions during their undergraduate studies (Ulmer, 2018). Instructors often build assignments around syllabus review to ensure students understand the stipulations of the contract. According to Rubio & Llopis-Albert (2022), “students read the syllabus for the extent their expectations will be fulfilled in terms of content and to gauge whether they have the necessary resources and skills to acquire an adequate level of knowledge and competencies.” (p. 119) A novel approach to deepening this understanding and to explicitly expressing expectations while teaching the concepts of contract review incorporating the syllabus produced increased acknowledgement in aspects of the course including learning objectives and prerequisite knowledge. This increase was evidenced by a decrease in communication between students and instructor about misunderstandings surrounding the syllabus and evaluation comments directed at confusion in components of the syllabus. Further, technical contract review in this assignment guided students in detail-oriented practices including compliance benefiting further academic progress and future engineering roles. Students acquired knowledge through assessment allowing them to associate terms of the syllabus to terms of a conventional contract; these included observables, conditions, precise description, and formal representation (Farmer & Hu, 2018). The data from this study cannot be generalized in predicting success in an engineering course; however, previous studies show that students who have an increased understanding of course objectives and expectations have increased learning outcome success (Ulmer, 2018). The data from this study does indicate that utilization of a technical contract review framework for a syllabus review resulted in better understanding of the components of the course for undergraduate engineering students. The study was not intended to result in an improved syllabus; however, the syllabus review assignment may uncover lack of clarity to which the instructor could address.

Keywords: syllabus, course objectives, observables, conditions, precise description, formal representation, prerequisite knowledge,

Introduction

Early career engineers are often asked to review technical components of purchase orders, requests for proposals (RFPs), request for quotes (RFQs), and service contract agreements. Upon conclusion of this review, engineers are then asked to report on the technical aspect of a client's expectations and the organization's stipulations and ability to meet customer requirements. According to Carbonetto (2024), some describe the unfamiliarity with this task citing lack of exposure to technical contract review within the undergraduate engineering curriculum. Yet, at the start of each course, most instructors ask engineering students to review the course syllabus, a contract (often containing technical information) between the student and the instructor. According to Ulmer (2018), students who understand the course expectations along with corresponding learning outcomes of a course perform better on assessments and tests.

Syllabus review can range from an assignment where students are asked to read over the syllabus to a graded quiz where they might be asked to recall details of the syllabus. The purpose of this action research aimed at determining the effectiveness of various syllabus review methods ultimately identifying a method that resulted in students gaining a deeper understanding of course objectives and expectations. With an impactful assessment, it may be possible to increase engineering students' understanding in terms of learning objectives and expectations, potentially leading to increased academic outcomes. Additionally, these assessments as learning (AaL) where engineering students take responsibility for their own learning through asking questions, investigation, and self-reflection can be structured to teach the principles of technical contract review (Dann, 2014). When students become aware of the concept of (technical) contract review, they may understand the roles of the two parties who agree to the conditions of the contract. According to Carbonetto (2024), many early career engineers previously viewed a syllabus as a one-party contract provided by the instructor describing what students were required to do. In their professional roles, their understanding expanded to grasping the obligations for both parties.

This study was guided by the following questions: Can an assessment as learning be utilized by engineering educators to increase students' understanding of course expectations and learning outcomes further increasing the opportunity for success? Can an assessment as learning be utilized by engineering educators to demonstrate the principles of technical contract review using a syllabus as the contract further increases students' understanding?

Method

An online engineering mechanics course conducted during the 2023 summer session included an assignment where 125 students were asked to review the syllabus and complete a quiz. Questions to the quiz could be answered by reading the syllabus. For example, students were asked questions on office hours policy, alignment of assessments to topics, and prerequisite knowledge. The instructor recorded emails received from students that contained a question that could have been answered by reading the syllabus. The occurrences were tallied and totaled at the end of the 12-week 2023 session.

A revised approach to syllabus review was developed within the technical contract review framework which demands the reviewer pays attention to the details and ensures all aspects are compliant to the intent(s). The instructor incorporated aspects of this framework into an assessment assigned after students were instructed to read the syllabus (Farmer & Hu, 2018). This assessment included select-response and open-ended questions that guided the student in the practice of technical contract review. After a brief description and examples of such terms as observables, conditions, and representation was provided, questions about these terms as these related to items in the syllabus were asked. This assessment was assigned to 125 students at the start of an engineering mechanics course conducted during the 2024 summer session. The instructor recorded emails received from students that contained a question that could have been answered by reading the syllabus. The occurrences were tallied and totaled at the end of the 12-week 2024 session.

Findings

Despite all 125 students successfully completing the assignment, during the 2023 summer session, the instructor received emails (the preferred method of communication for the course) from 35 students (28%) containing questions that could be answered by reviewing the syllabus. For example, students asked make-up and grading policies, sequencing of course topics, and alignment of assessments to content. Additionally, 20% of all comments to the instructor received at the end of session alluded to confusion surrounding learning objectives and grading even though this information was contained within the syllabus. These findings pointed to the notion that the conventional syllabus quiz did not fully meet the objective of reinforcing the understanding of competencies and learning objectives as well as other aspects of the course.

For the 2024 summer session where the students completed the enhanced syllabus review assessment based on technical contract review, only five percent of the students sent emails asking the instructor questions during the session that could be answered by reviewing the syllabus. Additionally, 10% of the comments to the instructor received at the end of the session alluded to confusion surrounding learning objectives and grading. These findings indicate improvement to understanding expectations and objectives of a technical course when students were assigned a syllabus review assessment based on a contract review framework.

In this framework, for example, students previously might have been asked whether they met the prerequisite requirements for the course. They would, in this case, check a box that indicates compliance with the requirements. Students when taking the enhanced assessment were not just simply asked whether they met the prerequisite requirements but rather what was expected of them in terms of prerequisite knowledge. Questions such as how they will recognize that they are lacking or deficient in prerequisite knowledge and how will they remediate if they identify themselves as lacking are examples questions from this enhanced assessment. These types of self-reflective questions prompted an increased awareness of both expectations and objectives for the course as indicated by the decreased number of questions and comments to the instructor concerning the details of the syllabus.

To include competency in technical contract review, a framework which provides the basis for FCL, a formal language for developing written technical contracts (Farmer et al., 2018), was utilized in the syllabus review assessment. For example, terminology such as obligation, permission, prohibition, valuation, breach, and blame assignment were used in the questions for the assignment. Asking students to respond to questions like what is permitted in recording a lecture, for example, familiarized them with the terms such as permissions and prohibitions in context of contract review. Additionally, students were provided a definition of breach and then asked to identify scenarios that would breach the contract. Some scenarios would require students to focus on the academic integrity stipulations and policies for the course and university. Other scenarios would require students to pay attention to attendance policies, for example. Obligation stresses the importance of what the student is obligated to learn about while blame assignment allows students to identify when they have not met their obligation and why this might have occurred. The syllabus contract's valuation motivated the students as they could derive the value the class will give them upon successful completion. Dann (2014) found "it (the syllabus) helps students to meet the desired subject objectives and to motivate them." (p. 152) Valuation was also

aligned with relevance as students learned about course competencies and comprehended from reading the syllabus the necessity of possessing these competencies in preparing for industry.

Discussion

Students had the opportunity to reflect on the syllabus review assessment. Because the assessment utilized in the 2024 summer session emphasized the contractual aspect of the syllabus, students' perspective changed from perceiving the syllabus as just simply something that described what the course was all about to a contract to which both the instructor and student entered with certain obligations imposed on both parties. One student commented:

I always thought of the syllabus as just a list of what we were going to learn along with a schedule of events (test dates). After finishing this syllabus review, I look at the syllabus differently than before, as a contract and going through this contract, I learned the practice of contract review.

Another student stated:

When the syllabus is presented as a contract, it forced me to take the obligation more seriously. I paid more attention to the objectives of the course and thought about how I was going to meet these obligations and objectives.

Students learned about observables and conditions within the context of a syllabus contract. In technical terms, the meaning of a contract or what the agreement is depends on observables such as what actions the two parties take (Farmer & Hu, 2018). Actions, such as taking a test, led to observables, a grade, in this instance. One of the responses to the question on the role of observables and conditions of the course syllabus included the student taking on a more vested interest in the observation of their grades as opposed to the instructor. As the syllabus progresses with details on student learning outcomes (i.e. students will be able to), an observable of a poor grade should prompt a student to delve into the meaning of the contract which should not only describe which part of the contextual sequence is constraining the student from forward progress but also contain guidance and resources as to further actions to take in order to improve.

In this process of transition from the traditional syllabus to a contractual agreement, the status of (technical) competencies must be considered as these are conventionally mandated by university bulletins and ABET. A student who views the syllabus as something more than a list of competencies that need to be acquired benefits from the consideration of how these competencies further academic progress towards earning a degree. The syllabus review

assessment based on contract review asks students to identify specific and transversal competencies. According to Rubio and Llopis-Albert (2022), “specific competencies are those that are carried out in the development of the subject itself while transversal competences are skills related to personal development, which do not depend on a specific thematic or disciplinary field but appear in all domains of professional and academic performance.” (p. 122) Students gained an understanding of causal relationships within the syllabus and would be able to apply this knowledge to contract review while serving in the role of an engineer. Professional skills would be identified as transversal competency according to the above definition; students gained the understanding of the causal relationship between competent professional skills and acquiring technical knowledge. This understanding would be essential in the review of a service agreement that an engineer may review where a particular process (cause) contributes or influences the production of another process (effect).

Conclusion:

In the current engineering education environment where educators are being asked to interject additional curricula as a response to employers’ requirements for better prepared, industry-ready engineers, any instance where an assessment can serve as a dual-purpose learning tool provides an opportunity for efficient planning. In this action research, an enhanced assessment as learning was utilized to teach engineering students basic tenants of contract review while emphasizing the learning objective and student outcomes necessary for success in an engineering course. The assessment in this study included questions prefaced with basic definitions. Students acquired minimal knowledge from reading the question and then responding appropriately by utilizing the information contained in the course syllabus. With this efficient method, students were able to change their perspective on syllabi acknowledging this document as a contract containing stated conditions, observables, permissions, and other components of a typical agreement. With this updated understanding, students were more invested in deepening their understanding of course objectives and instructor expectations which this increased understanding has been demonstrated to increase success.

Future Research

The limitations of this study including the inability to correlate the increased understanding of the syllabus content as demonstrated by the decrease in questions and concerns expressed by the students following the syllabus assessment to student learning outcomes and academic performance could be further studied with an IRB approval including consent. Additionally,

modifications and improvements to a syllabus based on comments from the students may demonstrate a method for syllabus improvement and show a correlation to student success.

References:

- Carbonetto, T. (2024). *Early Career Engineers' Perspectives on Leadership Competency Development in Undergraduate Education* (Publication No. 30994836) [Doctoral dissertation, Marshall University]. ProQuest Dissertations & Theses Global.
- Dann, R. (2014). Assessment as learning: Blurring the boundaries of assessment and learning for theory, policy, and practice. *Assessment in Education: Principles, Policy & Practice*, 21(2), 149-166.
- Farmer, W., & Hu, Q. (2018). FCL: A formal language for writing contracts. *Advances in intelligent systems and computing*, 54.
- Rubio, F., & Llopis-Albert, C. (2022). Best practices in syllabus design and course planning applied to mechanical engineering subjects. *Multidisciplinary Journal for Education, Social and Technological Sciences*, 9(2), 118-124.
- Ulmer, J. M. (2018). Evolving characteristics of today's applied engineering college-level educator: 2013 to 2017. *The Journal of Technology Studies*, 44(1), 28-40.