Exploring the Student Experience in Low-cost Intrinsic Motivation Course Conversions

Kathryn F. Trenshaw[1], Renata A. Revelo Alonso[2], Katherine Earl[3], Geoffrey L. Herman[2]
[1]Chemical & Biomolecular Engineering, [2]Electrical and Computer Engineering, [3]Counseling Psychology
University of Illinois at Urbana-Champaign
Urbana, Illinois

***Abstract*—The low-cost intrinsic motivation (IM) course conversion project aims to promote the adoption of education innovations, lowering the costs of these innovations by promoting students' intrinsic motivation to learn and to invest in their own education. We have piloted and scaled the IM course conversion of a large enrollment, sophomore-level engineering course. As part of a broader evaluation, we interviewed 31 students to better understand how the IM course conversion affected students' motivations to learn. During these interviews, students described their experiences in the course as a story from the beginning to the end of the semester. Interviews were transcribed and analyzed with an open coding scheme focused on motivational and affective statements. Preliminary analysis indicates that strategic choices, positive team dynamics, and productive failures in the learning process all contribute to promoting students' intrinsic motivation to learn in both pilot and full scale IM course conversions.**

Keywords—intrinsic motivation, low cost, Self-Determination Theory, undergraduate, large enrollment, student interviews, course conversion

I. INTRODUCTION

The low-cost intrinsic motivation (IM) course conversion project aims to redesign core engineering courses so that they primarily focus on promoting students' intrinsic motivation to learn. These converted courses would require low investments of time and money for instructors to teach. Because the traditional design of engineering courses focused on teaching the "right things" or perhaps even the "right way," previous reform efforts focused on getting students to learn the course content better by changing instructors' approaches to teaching. Although a focus on instructors' teaching methods can be beneficial, we believe that it may fail to prepare students to be life-long learners who are passionate and excited to become engineers. In contrast, the IM course conversion project focuses reform on methods to promote students' IM to learn with the belief that motivated, excited learners will ultimately learn more and persist longer in their learning.

In this paper, we report on the qualitative evaluation of the pilot and full scale versions of the IM course conversion. We interviewed 31 students who had experienced the IM course conversion to understand how the course affected their motivation to learn and their interest in the course content. We are using a grounded-theory-based analysis method informed by motivation theories with the goal of developing a finer-grained theory for describing what happens inside or outside the classroom to promote students' intrinsic motivation to learn, and how different course structures change students' motivational orientations.

II. METHODS

A. IM Course Conversion

Using Self-Determination Theory (SDT) as the foundational decision-making framework, we make all IM course conversion decisions to promote students' sense of *purpose*, *autonomy*, *relatedness*, and *competence* for learning the material [1][2]. We ask instructors to identify a narrow strategic core for their course content so that their courses have a stronger sense of purpose and to give students a degree of autonomy to direct their own learning. With these guiding principles, in Fall 2011 and Spring 2012, we piloted IM course conversions with a subset of students (fewer than 50 students) from a large enrollment (more than 200 students) sophomore-level core computer engineering course. In Fall 2012, we scaled this IM course conversion to engage all students in the same course. In this IM converted course, all students crafted three learning agreements in which they could choose how they would practice the course content and demonstrate their mastery of the course content. They could even choose elective topics to study. Our previous quantitative research found that students in the IM courses achieved learning gains that were comparable to students who were in collaborative problem solving courses, but IM students expressed a greater sense of ownership and support for their learning [3].

B. Interviews

After completion of the course, we asked students to share their individual experiences by participating in interviews. A total of 14 students who had experienced the pilot conversions and 17 students who had experienced the full scale conversion volunteered for interviews. We used a semi-structured interview protocol and asked students to walk us through a timeline of their experiences in the course. We analyzed the interview transcripts without an a priori coding scheme, because we found no prior studies that indicated what we might expect to find. Our open coding process focused on students' motivational and affective statements. We created, reduced, and synthesized codes with a four step process: 1) individual open coding, 2) collaborative code reduction, 3) individual re-coding based on the reduced code set, and 4) theme development. So far, we have completed the analysis of the eight interviews from the first pilot IM course conversion.

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III. Preliminary Results

Thematic analysis resulted in four main themes which mapped to four of the motivational orientations described in SDT [4]: 1) no motivation or disengagement, which mapped to *amotivation* (AM); 2) motivation by grades or requirements, which mapped to *external regulation* (ER); 3) motivation by career or bettering oneself, which mapped to *identified regulation* (IR); and 4) motivation by learning, excitement, interest, or fun, which mapped to *intrinsic motivation* (IM). We found that strategic choices, positive team dynamics, and productive failures in the learning process commonly marked movement from AM, ER, or IR to IM throughout the students' experiences. The following quotations are from the first pilot IM course conversion only and are annotated with the motivational orientations assigned to individual phrases in braces (e.g., {IM}).

Students were identified as IM oriented when they made statements about interest in learning or enjoyment of the experience. A representative IM quotation is shown below.

> Please don't take up spots in the [pilot] by saying you want an easy A. And **those who in the past have wanted to learn more than what's in the class, who want to learn what's real life, then definitely, definitely do this {IM}**. I wish all classes were like this. (emphasis added)

Students became more intrinsically motivated to learn when working within a positive team dynamic, when given opportunities to make strategic choices about their learning, and when failures early in the course led to productive decisions later on. Selected quotations from students who started out AM, ER, or IR oriented and moved toward IM oriented are discussed below.

Positive team dynamics (*relatedness*) resulted in mutual support, greater perseverance, and increased excitement for the course. Students who described positive experiences with other team members made more IM oriented statements about the course than those who reported either neutral or negative experiences.

> We had a good group…. We split up work evenly, everyone got their work done and then we all got together and put our parts together {ER}. The only problem was when you're transferring ... files to one computer ... we all sat there and we're trying to figure out what was going on, so I think that was a good team building thing even though it kind of stunk {IR/IM}.

> Being with other people and working with other people who were also really excited about it makes me more excited {IM}.

Students were given the opportunity to choose how they would demonstrate their mastery of the course content (*autonomy*). When students based their initial choices on "getting an easy A," the final products were low quality and received negative feedback from instructors. These early failures "woke students up" and caused them to rethink their choices (*purpose*). The students' later choices centered on learning gains rather than grades and received positive feedback from instructors (*competence*).

> [At] the end of the first learning contract, we got stuck because we got very low grades {ER} ... We were very upset and we were thinking 'should we drop out of this section or not? {AM}' But then we kind of came out of that. **We shouldn't just give up {IM}** ... (emphasis added)

> Right after that exam it sorta just tanked {ER} and then just realized, "Okay. You know what? Time for the second learning contract. The second exam is something we can do, we can actually make an impact on." {IR/IM}

> But after the first one when we were designing the questions, we decided to do a design thing more, to **get more out of the course {IM}** ...The project aspect, trying to design something that really works well. To design things that work efficiently as much as a [sophomore] could probably do {IM}. (emphasis added)

We hope to elucidate these aspects of students' experiences with future analysis of the other 23 interviews.

IV. Future Directions

We are currently analyzing the second pilot and the full scale IM course conversion interviews. Future work will include qualitative results from all 31 interviews as well as classroom and team meeting observations. We will triangulate these qualitative results with quantitative surveys of both autonomy support and achieved learning gains for both the pilot and full scale conversions. We will also compare the pilot and full scale conversions.

We are studying the outcomes of IM course conversions in one large enrollment course in computer engineering for sophomores. We hope to expand the study to include conversions of courses at different levels and within different engineering disciplines in future semesters. Collaborations with chemical engineering and bioengineering are currently underway. Interest in IM course conversions has spread beyond engineering as well, with education and psychology instructors taking notice and adapting the method to their own classrooms.

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