WIP: Pilot of Block Model Delivery of First-Year Engineering

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Abstract

York University's Lassonde School of Engineering, in collaboration with the Faculty of Science, piloted a transformative block model for delivering first-year engineering curricula. Students who opted-in experienced a modular structure, blended course delivery, and active learning strategies. In Fall 2023, the block model pilot was offered in parallel with traditional program delivery, allowing for analysis of the block model's effectiveness. Initial data show that the block model increased program success by student success rates improving with more students earning a C or higher, and failure rates lowering compared to traditional delivery model. Student focus groups and faculty reflections offered positive feedback along with opportunities for improvement.

Introduction

York University is the third-largest university in Canada, located in suburban Toronto with a large commuter student population. The Lassonde School of Engineering at York University currently offers six undergraduate engineering programs with a shared common first-year. In 2020, the school launched a process to transform the common first-year learning experience using a principles-based design approach. The persona developed through this approach highlighted the flaws in the existing first-year structure that did not sufficiently support the student demographics including first-generation learners, students balancing education and part-time employment and those with lengthy commutes [1]. Attributes of the existing learning experience included heavy workload, overlapping deadlines, and significant commuting times.

In an effort to better address students' needs, in 2023 a block model pilot was launched for the first semester of first year with a cohort of 65 students. Faculty members from different disciplines collaborated with peers, received hands-on support from the educational developer, attended interdisciplinary workshops and individual consultations to redesign their courses for the three-week intensive format. They restructured course content, created asynchronous materials, balanced student workload, and aligned with other block model courses without prior experience. Faculty also tackled logistical issues such as assessment timing, material pacing, lab space availability, and TA coordination to ensure timely grading and feedback, adjusting strategies based on student feedback and performance [2].

The block model included a modular structure, blended course delivery, and active learning strategies. The modular structure, illustrated in Figure 1, featured one course spanning the entire term and four courses taught sequentially in intense 3.5-week blocks. This approach enabled students to focus on two subjects at a time, easing cognitive load and deadline management challenges. This structure also mitigates the stress of overlapping midterms and end-of-term assignment surges. The blended course delivery allowed for a student timetable that required only three days per week on campus, thus accommodating students' work and family commitments while reducing time spent commuting.
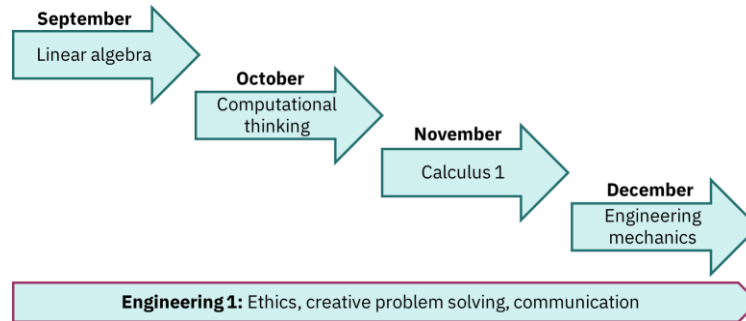
Figure 1. Modular design of the first-semester block model pilot

Block model learning has been used for decades at Colorado College[3], and was also championed by the former Quest University. Recently, the model has been adopted across the University of Suffolk in England[4] and at Victoria University, a large university in Melbourne Australia. At Victoria University, the block teaching model was initially implemented across all first-year courses with a positive impact on student retention [5], and later scaled across the institution. Samarawickrema and Cleary [6] investigated student success at Victoria University using the block model. They discovered significantly higher pass rates, particularly among marginalized groups such as students from lower-income households, non-English speaking backgrounds, and first-generation university attendees. Ambler et al. found the key feature of the block model was "its ability to foster relationships (human and non-human) that promoted a personal investment with the learning journey." [7]

Program Evaluation

This paper examines the efficacy of the block model pilot implemented at York University's Lassonde School of Engineering in Fall 2023. The pilot's effectiveness was initially evaluated by comparing the final grades of students in the block model to those taking the same courses in a traditional 12-week term. Two specific metrics were considered: the failure rate (i.e. the proportion of students receiving a failing course grade) and the success rate (defined as the proportion of students receiving a grade of C or higher). As defined by institutional rules, a good academic standing is measured by an overall average of C which is required to advance to sophomore year.

Additionally, we facilitated end of term student focus groups to understand the student experience. While some preliminary themes are presented in this work-in-progress paper, a full analysis will follow using Tinto's institutional conditions for student retention [8] as a framework.

Preliminary Results and Discussion

A high-level overview of student performance in first-semester courses is shown in Table 1. The table compared four first-year courses (linear algebra, computational thinking, calculus 1, engineering mechanics) that were taught to the block model cohort in parallel with students enrolled in the traditional model. In each course, the block teaching model proved a higher success rate and lower failure rate. These differences were most substantial for the two courses on mathematics.

Table 1. Comparison of student performance in first-semester courses in the block and traditional delivery models

	Lin. Alg. Block	Lin. Alg. Traditional	Comp. Block	Comp. Traditional	Calc. 1 Block	Calc. 1 Traditional	Eng. Mech. Block	Eng. Mech. Traditional
Failure rate	5%	13%	3%	6%	8%	13%	7%	9%
C or higher	82%	64%	90%	88%	82%	65%	92%	85%

Data from student focus groups reflect the students' varied experiences and perceptions of the block model's impact on their education. The main themes in the student focus groups were the block model structure, students' perceptions of learning experiences, and sense of community.

Block Model Structure: The block model structure allows students to focus on one subject at a time, instead of multiple simultaneously. Allowing for concentrated study and deep immersion in subjects, students found the model to be beneficial for understanding complex engineering concepts. One student remarked, "For me, I'm usually a person who leaves stuff to the last minute, but block model made me like, actually want to and try to study every single day."

Perceptions of learning: The block model had varying impacts on students' perception of their learning. Some students felt that the intensive, focused nature of the block model enhanced their problem-solving and critical thinking skills. One student said, "I feel like having the ability to put so much focus into one subject at a time… it'll impact and help us succeed later in winter term." However, others were concerned about the long-term retention of skills due to the fast pace of the block model, "I feel like for a lot of concepts, it takes a little bit of time for it to soak in."

Sense of Community: The block model fostered a strong sense of community among students as they shared the experience of navigating an intensive learning structure. As noted by students, the shared experienced led to the development of a close-knit community that facilitated connections between peers and professors, "I feel like the block model creates like a social environment between you and the professors, and they feel their students."

Next Steps

Further analysis is planned, including analyzing the impact of the block model for specific groups such as first-generation learners. More detailed focus group analysis is planned, including a follow-up focus group 4-months after the block model pilot. This pilot will continue into the 2024-2025 academic year, allowing for additional data collection.

Acknowledgment

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