Integral feedback: A qualitative analysis of students' experience of an Enhanced Lab Calculus

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Abstract. The Calculus sequence has outsized importance with regards to the persistence of students in their pursuit of STEM degrees. As such, non-traditional formats have been introduced to Calculus classrooms in an attempt to improve student experience and in doing so increase persistence. This study looks at one such non-traditional format, in which a Calculus II course is paired with an applied lab component, and takes a critical perspective on analyzing the value of such a program by explicitly seeking to understand what components of the newly designed course were salient to students' experiences. Through a combination of Grounded Theory techniques, Thematic Analysis, and construction of a comparative matrix, I identify three higher-order concepts, each of which contain several sub-themes, that were impactful to students' experience of this non-traditional course and make suggestions for how such themes can provide foundations for further work in understanding student experiences of structural Calculus innovations.

Key Words: Calculus II, Student Experience, Lab Calculus, STEM

1. INTRODUCTION

Calls in support of encouraging students of all ages to pursue careers in science, technology, engineering, and mathematics (STEM) have been seemingly ubiquitous in recent years. Despite an overwhelming national need for individuals with STEM degrees [31], STEM graduates remain a relative rarity; the National Center for Education Statistics indicates that in the academic year 2015-16, only 18% of bachelor's degrees awarded were in STEM fields, with additional variation across race and gender identity [28].

Attempting to explain this gap in the supply of STEM graduates and demand for a STEM-focused workforce has led researchers to identify mathematics- the calculus sequence specifically- as an important influence on whether STEM-intending students will persist in their chosen STEM field throughout the course of their studies, or whether they will switch out of STEM, and thus out of the STEM “pipeline” [11,35]. The role of Calculus in this pipeline has proved to contribute to disparities in STEM fields, and as such is even more important to address as mathematics educators and policy makers acknowledge the importance of centering equity in the reform of mathematics education [15]. The need to ensure that the Calculus sequence is oriented toward student persistence is key in ensuring both that universities are awarding the quantity of STEM degrees required by advances in STEM industries, and that students of diverse identities are structurally enabled and encouraged to pursue fields that they are interested in. This study examines a course that was a part of a broader campus-wide initiative to increase such student persistence in STEM at Dunshire University (pseudonym).

The idea of reforming the way that mathematics is taught is not a new one; in 1986, the National Science Foundation (NSF) put out a report calling for academic institutions to increase the involvement and investment of university faculty in the mathematics education of their undergraduate students [30]. Several such investments targeting reform in the course structure and instructional strategies used in Calculus-level courses have shown promise for increasing student learning and engagement [21,27,41], and among them is the idea of having both a lecture and recitation component to a standard Calculus classroom. Anderson and Loftsgaarden (1987) conducted a study in which they asserted that students

enrolled in a Calculus I course that featured both a lecture and a recitation course had a better passing rate than that of a traditional Calculus I lecture course [1]. This was further asserted by Vestal, Brandenburger, and Furth's (2015) work, in which they assessed that having students enroll in a co-requisite Calculus I lab led to higher pass rates [39].

As educators and administrators contemplate and implement this kind of co-requisite structural reform within the Calculus sequence, it is important that they think critically about the impacts of such reform. Teaching and learning are closely intertwined, and as such, listening to and understanding student feedback is key in successful program adaptation. This work highlights student feedback on one such reform. By analyzing collected data from students enrolled in Dunshire University's Enhanced Lab Calculus (ELC), I will explore the following research questions:

- How did enrolled students experience the newly-implemented Enhanced Lab Calculus?
- What attributes of the newly structured course did these students attend to as being positively or negatively impactful to their experiences?

2. THEORETICAL FRAMING

This work draws on several established theories existent within education research, including constructivism and Critical Theory. In addition, by pursuing the above-stated research questions through the course of this work, I seek to elevate the student perspective of such reform and, in doing so, broaden the scope of what is being asked of these structural Calculus reforms. While studies often look at the “success” of such reforms as being quantifiable boosts in earned grade or pass rate (i.e. [1,39,41]), fostering critical analysis of these programs requires the centering of the narratives of individual student experience when assessing program effectiveness and providing direction for future adaptations. This qualitative analysis of how students experienced Enhanced Lab Calculus provides such a centering, and enables student-focused and student-informed adaptation of similar co-requisite structural reforms.

As alluded to previously, this study is based on the theoretical foundation of constructivism, which holds that “knowledge is constructed through discourse in the context of individual histories and

social interaction,” and that experiences have no meaning outside of how “conscious minds engage” with them [3]. Each participant in the focus group I will be analyzing has a uniquely constructed student experience of ELC. The commonality of their enrollment in ELC acts as a foundation, onto which each student builds their experience with impactful aspects of the course, which, metaphorically, can be attuned to building blocks to complete the full structure of their experience. In this study I identify common building blocks, which highlight the primary aspects of ELC which were impactful for these students. This results in several themes common to the construction of student experience for subsets of these eight students in ELC.

The focus group format in which data was collected additionally lends itself to a social constructivist perspective [18], as students were able to share and build off of each others’ responses to the researchers’ questions, thus situating meaning of their Enhanced Lab Calculus experience within their membership of that group and allowing them to continually construct new knowledge. Just as students’ interactions with one another’s reasoning lead to heightened conceptual growth in mathematics classrooms [32], engaging in a focus group setting allowed students space in which to engage with peers’ constructed meanings of their experience and build on their own understanding of their own experience.

Tenets of Critical Theory also come into play in this analysis [22]. Several of the students self-identified as international students and/or women and/or individuals with a dis/ability, all of which are identities that have been traditionally underrepresented in undergraduate mathematics classrooms and in STEM as a whole. As a researcher, it is important to not only acknowledge these identities, but emphasize that these identities are unequivocally impactful to the way a student experiences ELC and mathematics more broadly as a structure in which there exist dynamics of power and privilege. This is highlighted in several of the questions asked of the focus group, and is attended to in the analysis.

It is worth noting that, in analyzing the transcript of this focus group, I do not intend to make broad generalizations about how *all* Dunshire students are experiencing ELC. Many demographic groups were not represented within the focus group, and acknowledging that experiences and perceptions are individual is paramount in dispelling generalizing perspectives, such as racial essentialism [2]. Rather, the

aim of this study is to highlight the experiences of these students, and in doing so provide insight as to what qualities of the ELC program might be impactful in informing further program development.

3. RESEARCH DESIGN AND METHODOLOGY

The piece of data that I have analyzed was funded by the Progress through Calculus (PtC) initiative (NSF DUE #1430540), and was collected by a research team consisting of Drs. Jessica Ellis Hagman, Matthew Voigt, and Jessica Gehrtz, who share an interest in diversity, equity, and inclusion (DEI) work. The overall PtC project included data collected from twelve institutions during the 2017-2018 academic year, including classroom observations and analysis of course materials, individual interviews, surveys, and focus groups.

a. Research Setting and Program Background

The focus group transcript involved in this analysis was collected at Dunshire University during Hagman, Voigt, and Gehrtz's third site visit, at which point they had an established rapport with individuals at Dunshire. Dunshire is a highly selective private university located in the Southern United States with approximately 6,500 undergraduate students, of whom 41% identify as white, 21% identify as Asian, 9% identify as Black, 7% identify as Hispanic/Latinx, very few identify as Indigenous, and 10% identify as international students. It has several programs, analyzed in other parts of PtC DEI work, that are in place to academically and socially support a diverse group of students, and interest in the ELC program stemmed from investigation of the program as a further means to support student success in Calculus.

Dunshire's implementation of the ELC program was a direct result of an administrative call for departments across the university to enhance the experience of first-year students. Dunshire's mathematics department chose to invest into creating ELC, which is a unique program in several ways. As was mentioned in the introduction, ELC added a lab component to a traditional lecture section of Calculus II, creating a course structure in which students were in a lecture with their primary instructor 3 hours per week, and participated in a lab section 2 hours per week. While most lecture-lab or lecture-recitation structures rely on Graduate Teaching Assistants (TAs) to facilitate the lab or recitation

component of such a structure [26], the lab component of ELC was led by an established faculty member in the mathematics department.

Interviews with administrators and faculty confirmed that a prime motivator for the development of ELC was to encourage personal and professional connection between undergraduate students and faculty members- connections which can lead to increased student persistence through heightened social and academic integration within their department or broader institution [33,37,40]. These connections can be especially salient for individuals identifying with populations that have been traditionally underrepresented in STEM fields, such as first-generation students and students for low socioeconomic backgrounds [10].

An additional motivator for the development of ELC was to engage students with mathematical content that existed outside of a traditional Calculus II course structure. In the context of the labs, students were encouraged to learn about STEM field-relevant examples that leveraged the math that they were learning in the lecture portion of the class. In addition to enhancing students' mathematical understanding and providing reason for furthering that understanding through connection with outside STEM concepts [13,41], connecting mathematics meaning to students' lives outside of an educational setting is also important as a measure in working towards equity and engaging students critically with mathematics [9,25].

b. Recruitment and Participants

With these two motivators in mind, Dunshire launched the ELC program in Fall of 2017, with 2 sections containing a total of 57 students. It then continued into Spring 2018, in which it grew to 8 sections, serving a semester total of 206 students. The majority of students enrolled in ELC were STEM-intending (64.7%), with a class standing distribution of majority first-year and sophomore students. In order to recruit participants for this study, Hagman, Voigt, and Gehrtz enlisted the assistance of an ELC instructor to send out an email requesting participation from students. As all student participants were enrolled in ELC at the time of the focus group, they were offered compensation via extra credit points in the course.

While demographic information was not collected on these participants, each participant did self-disclose various elements of their identities and backgrounds with the researchers in the context of the focus group. To add more nuance to who these participants are, *Table 1* introduces each participant's pseudonym, juxtaposed with what they self-disclosed during the focus group. While aware this does not accurately span these participants' identities and experiences, these self-disclosures add some depth to their perspectives by way of additional human information.

<i>Pseudonym</i>	<i>Self-Disclosed Demographic Information</i>
Ana	Economics and Mathematics Major & International Student
Audrey	Female & Mathematics Major & Student with a Dis/Ability
Bella	Female & Environmental Science Major
Cassidy	Female & Economics Major
Rebecca	Female & Economics Major
Madiha	Female & Economics Major
Sarah	Female & Economics Major
Paulo	Economics Major & International Student

Table 1. A list of participant pseudonyms and self-disclosed demographic information.

c. Data Collection

The focus group itself took place on Tuesday, November 6th, 2018 at 10:30 a.m. on Dunshire's campus. Eight students in total were a part of this focus group. Hagman, Voigt, and Gehrtz had prepared several questions ahead of time pertaining to DEI and the identity-based experiences of the students, and allowed room for additional interpersonal exchange and attendance to student opinion on ELC in a semi-structured focus group format [29]. Premeditated questions centered around diversity, equity, and inclusion practices at Dunshire, as well as general questions about how students felt about the new ELC course format. The focus group itself lasted approximately an hour, with Voigt primarily facilitating conversation and Gehrtz and Hagman observing and taking notes.

Proceedings of this focus group were digitally recorded and initially transcribed by an online audio-transcription platform called Temi. In Spring of 2019, after I had joined the PtC team, I cleaned and finalized transcripts from this particular site visit, culminating in the transcript that I used within this analysis. While this piece of data has been previously utilized as part of a broader work in the development of a framework for mathematics stakeholder conversations centered on diversity, equity, and inclusion [38], analyzing it through a new lens with a focus on student experience of the ELC program specifically yields necessary perspectives for the continued usage and adaptation of ELC and similar programs.

d. Positionality

In this section, I acknowledge the identities of the research team, as well as my own background and identity, as such attributes inherently impact the lens through which data and analyses are filtered. Hagman, Voigt, and Gehrtz, in combination with myself, represent variation in gender, sexuality, first-generation status, and academic rank, and simultaneously all identify as white, neurotypical, able-bodied individuals. These identities have impact on the entire scope of this work, beginning with acknowledging that the researchers' identities may have impacted the comfort or feelings of (dis)comfort that individual participants may have felt in sharing vulnerable perspectives on their ELC experience.

I also acknowledge my own personal privilege as a researcher in ways that are relevant to my identity and to my academic experience. As a white cisgender woman, bringing my own lens into this work will undoubtedly result in unintentional mis-interpretations of student perspectives or inability to recognize meanings in the responses of students with nuanced experiences beyond my own. As a researcher who has in the past and hopes to in the future center ideologies of equity in my work, I have been very intentional in exposing myself to literature that challenges dominant perspectives and explores and elevates such nuance, and am grateful to have the continual professional guidance, mentorship, and fellowship of colleagues and academics who are well-versed in equity research and themselves represent various identities in mathematical spaces.

e. Data Analysis

Data analysis for this project was conducted in multiple stages, and blends a variety of tenets and techniques from Grounded Theory [8], Thematic Analysis [7], and cultural domain analysis [3]. I have broken up analysis into two distinct stages, the first of which involved the development and refinement of themes from the data through line-by-line coding, memo-ing, axial coding, and thematic analysis, and the second of which involved development of a comparative matrix which aligns with representation of constructed individual experiences of ELC.

i. Phase 1: Development and Refinement of Themes

Because I approached this data analysis without a pre-existing thematic framework, I chose to begin the analysis process by implementing line-by-line coding as recommended in Grounded Theory analysis on the first half-hour of interview transcription, in order to explore the data in intense detail in a way that “remain[s] open to exploring whatever theoretical possibilities [I] can discern in the data” [8]. Performing line-by-line coding prior to developing themes allows for having this initial interaction with the data go beyond personally held ideals, and supports my desire to limit (although obviously never eliminate entirely) the way in which my personal lens impacts the analysis.

In this line-by-line coding, I attempted as much as possible to code using gerunds, as recommended by Bazeley [3], to reflect the active ways in which students were constructing and discussing their experiences within ELC. Throughout my line-by-line coding, I engaged in the process of memo-writing [6], reflective on emerging themes as they related to the line-by-line codes. From these memos, three higher order concepts emerged in terms of what students were discussing in the context of the ELC focus group: *Instructor Impact on Student Experience*, *Student Feelings of Confidence in the Course and Content*, and *Accessible Exposure to a Variety of Applications*, each of which had a variety of themes contained within them.

After identifying these higher-order concepts and themes and defining them within my memos, I revisited this first data unit and categorized my line-by-line codes into these various themes to ensure that I was, as accurately as possible, capturing all I had read through this first unit of data. As all of my line-

by-line codes from the first data unit relevant to student experience fit nicely within one or multiple of these themes, I concluded that the codes were robust enough such that I could move on to an axial coding of the second data unit.

In additional reflection of Grounded Theory, I then went on to conduct axial coding [8] using a second unit of data: the second half of the focus group transcript. From this axial coding, I concluded that, while my three higher-order concepts were robust, additional nuance was needed within the concepts' themes by way of constant comparison to my initially developed themes. Through engaging with a second process of memo-writing, I emerged from the second unit of data with the ten total themes, five of which existed under *Instructor Impact on Student Experience*, three of which existed under *Student Feelings of Confidence in the Course and Content*, and two of which existed under *Accessible Exposure to a Variety of Applications*.

After identifying and clarifying definitions for each of these themes, I engaged in thematic analysis [7] with the entire focus group transcription and identified instances in which each theme was mentioned by a participant as being impactful to their experience of ELC. The themes are described in further depth within the *Findings* section of this paper.

ii. Phase 2: Constructing a Comparative Matrix

The second phase of my data analysis consisted of constructing a comparative matrix [3] to highlight which students identified which themes as impactful to their experience. This enabled me to retain student experiences as individually constructed and perceived; instead of treating my themes as generalizable, I wanted to ensure that attention was paid to who spoke about what as being impactful to their experience. I added additional nuance to this matrix by utilizing various symbols to represent certain components of the students' perspectives, allowing for a deeper discussion around who was attending to which themes as being impactful.

4. FINDINGS

In this section, I will describe each of the refined themes and provide evidence for their development. Following this, I will present the comparative matrix that was created by identifying instances in which

each theme was mentioned by a participant as being impactful to their experience. In both of these presentations of analysis, I provide the reader with an in-depth and nuanced view of how participants discussed ELC and what factors were indicated as being salient to their experience.

a. Phase 1 – Developed and Refined Themes

A total of ten themes, which exist under three higher-order concepts, arose from the data as being impactful to student experience (see *Table 2*). These themes were developed through my line-by-line coding, axial coding, and memo-ing, and were validated through both a sorting of the line-by-line coding and through continual reflection and refinement of definition to ensure that they captured the data in a robust way.

Instructor Impact on Student Experience	Student Feelings of Confidence in the Course & Content	Accessible Exposure to a Variety of Applications
Instructor Responsibility for Learning	Agency Attributed to Instructor	Content Applications
Welcoming Response to Questions		
Community of Care Leading to Inclusion	Clarity in Grading	(In)Accessibility of ELC Material
Instructor Enthusiasm		
Instructor as a Role Model	Lower-Stakes Format	

Table 2. A list of the fully developed higher-order concepts and their associated themes

i. Instructor Impact on Student Experience

This higher-order concept stemmed from ways in which students attended to how the specific ELC instructor (whether that was Tara's instruction of the ELC lecture or Hank's instruction of the ELC lab) impacted their experience of the course. This theme came through strongly; many participants began the focus group by comparing Tara and Hank's instructional styles to those of TAs they have had in past math classes, with emphasis on how having Tara or Hank instead of a TA had been impactful. Further, students narrated several anecdotes of specific interactions that they had with Tara or Hank that led either

instructor to have a profound impact on their experience. These anecdotes and comments took the shape of five subthemes: *Instructor Responsibility for Learning*, *Welcoming Response to Questions*, *Community of Care Leading to Inclusion*, *Instructor Enthusiasm*, and *Instructor as a Role Model*. These themes, as well as some of the quotes that exemplify them, are described below.

Instructor Responsibility for Learning

When describing past mathematics experiences at Dunshire, several of the students emphasized that they felt that they were responsible for their own learning. This responsibility manifested itself in different ways; Audrey felt that she had to answer her own questions instead of being able to rely on an instructor for knowledge, Bella describes that her previous course left her “teaching [herself] out of the textbook a lot that semester”, and Paulo mentions that he “wasn’t actually learning anything” during class time because the environment was unwelcoming and he was “literally just trying to get through them to make sure [he] got a good grade.”

Comparatively, students described ways in which Tara specifically took responsibility for student learning, both through her words and actions. Audrey articulates this shift in responsibility with the quote below:

So it’s definitely a lot more teaching yourself in some other classes, which can be okay, but it’s much easier when the teacher will let you know what they’re thinking... I think that is a huge thing [in ELC], not having to worry so much...and just being able to rely on your teacher.

This reliance on Tara to convey needed information to the students and be responsible for their learning is reflective of the trust students have in Tara to be fair in her expectations. Cassidy describes an experience in which her ELC section did poorly on an exam, and Tara responded by taking responsibility and telling the class that perhaps the exam was a difficult due to how she wrote it, and not necessarily due to the students’ lack of knowledge, which further emphasizes that Tara trusts in her students as they trust in her.

Another way in which Tara took responsibility for students’ learning in an impactful way was by prioritizing students’ learning above simplistic assurance of content coverage. Madiha mentions how Tara

“[is] definitely much better in making sure that you actually learned rather than just checking the topic off,” and Paulo emphasizes how she is “willing to really help you learn.” Ana builds off of this statement by expressing that Tara “actually takes the time to teach us something.” Several students acknowledged that timing, and the consequent ‘cramming’ of course material into the class period, was problematic for them in prior classes, so the ways in which Tara attends to their learning and makes their learning a priority, even so far as “stopping everything” to ensure student understanding, as Rebecca mentions, illustrates that Tara sees student learning as one of her primary responsibilities as an instructor and conveys that to the students in her behavior, thus impacting their experience of ELC.

Welcoming Response to Questions

Audrey and Paulo both attended in several ways to how Tara’s positive responses to student questions impacted their experience. Paulo specifically attended to Tara’s smile in response to questions as making a difference in his time in ELC, as shown by his quote below:

[Tara] is always willing to take any questions. She’s always taking it with a smile, and she’s ready to help you out...I think that a smile goes a long way. Just being available outside of class or being willing to answer questions without a frown on their face.

The welcoming attitude conveyed by Tara’s smile in response to questions was something that Paulo valued and contrasted to past experiences of instructors being disappointed or responding negatively to questions during and outside of class time.

Audrey highlights Tara’s positive verbal response to questions as being important as well, saying that “with being able to ask questions and everything, even if it might be a simpler question, she’s like ‘oh, that’s such a good question.’” By providing this kind of verbal affirmation, Tara helped Audrey feel welcome in asking her questions. Later in the focus group, Audrey builds on this statement by discussing how this kind of welcoming response explicitly helped her understanding and reduced social anxiety in the class:

With Tara, people ask all kinds of questions. Some of them are weird, some of them are difficult, some of them might not make sense. Some of them are like, ‘what is the

derivative of $\ln$ again?’ And instead of being confused and not being able to follow the whole thing because you forgot one simple thing, now you don’t have to be scared of [an instructor]...making you feel stupid, and you can just continue on with the class.

For a course at the Calculus II level, asking something like ‘what is the derivative of $\ln$?’ would be a valid example of a question students are expected, in a traditional curriculum structure, to have internalized prior to Calculus II, and Audrey’s usage of it as an example highlights the ways in which Tara welcomes questions indiscriminately. Audrey also provided an example on the other end of the Calculus II knowledge spectrum, in which she asked Tara about topics that went outside the scope of ELC’s content, and Tara responded by doing her best to explain the topics at a Calculus II level and suggesting further resources to learn more.

Madiha goes a step beyond Tara, to say that if ELC has been instructed by someone who wasn’t Tara but “who answered the questions also” in a similar way, then “it would definitely have some sort of a similar experience,” implying that welcoming responses to questions were so impactful that they would shape how Madiha experienced ELC whether the instructor was Tara or someone else.

Community of Care Leading to Inclusion

“Community of care” is a term borrowed from DiGregorio (2018), in which faculty create an environment in which “everyone feels safe, supported, and encouraged to express her or his views and concerns” [10,20] A community of care is directly aligned with inclusion within undergraduate classrooms, and can be brought through a variety of faculty actions within the classroom (see [20] for discussion and suggestion on such faculty actions).

For the students in ELC, ways in which Tara and/or Hank created a community of care and thus an inclusive environment spanned a range of actions and traits. For Ana and Paulo, who are both international students originally from Brazil, a community of care and consequent feelings of inclusion stemmed from Tara’s openness to meet them where they were at in their coursework. Paulo explains the following below:

I think that a lot of international students are a little behind on knowing math really well when we come. A lot of my international friends started from [Calculus I] while most American engineers that I know will start straight off from [Multivariable Calculus], or even Linear Algebra. I feel like Tara being open to this... definitely helps people who come from not such a great background in math to achieve and do better.

In Paulo's comments, he acknowledges that he himself has felt behind his American peers within engineering because of his math knowledge specifically. Ana, as a mathematics major, had a similar feeling, and further elaborated on how Tara welcomed and affirmed her knowledge and encouraged her in her pursuit of mathematics:

I feel like with Tara, I don't feel the need to constantly explain [that I am behind where a math major is expected to be in mathematics coursework]. One day I just talked to her like, 'Tara, I'm worried. I'm in Calc II and I'm a sophomore and I want to major in math.' She was like, 'Ana, you have time. Let's sit down and talk about it.' So I feel like having someone just to have your back is great.

This kind of verbal affirmation from an instructor is highlighted by Johnson & Hanson (2015) as being an important component of fostering a caring and participatory classroom [19], and Tara's words were obviously very reassuring and impactful to not only Ana's ELC experience, but to her perception of her dual identities as a mathematics major and an international student. She indicates also that, regardless of Tara or Hank's presented identities, if an instructor created a welcome space in which she could bring her cultural identity, she feels her experience would have been similar in this realm. She notes:

If the [instructor] doesn't feel like you're inferior to them, it's fine. They just need to be open and if I need help because I feel like I'm being underrepresented or something, and if I'm able to talk to that person no matter if that person is like a female or a male or something, that's going to be amazing.

While Ana certainly felt this kind of comfort level in Tara's "openness", her acknowledgement that such comfort transcends instructor identity speaks to the ways in which instructors have control over creating a community of care within their classrooms.

Further, a community of care is one in which students can bring their whole selves to the classroom. For Ana, this was highlighted when Hank "was really interested" in her experiences of her home country of Brazil, citing that "he thinks that diversity is nice and he's really interested in when you'd say something about your own background. I feel like this is encouraging in a way." Hank's interest in her experiences outside of pure mathematics content show attentiveness to students' Funds of Identity [12,17] within the classroom, which permit students greater opportunities to bring a variety of components of their identities to their classrooms and in doing so reduce feelings of imposter syndrome and stereotype threat.

Several other students articulated inclusion-focused "openness" as being an important trait that Hank and Tara brought to their ELC experience. Bella notes that Hank's "trait of being open to people and what they're interested in and stuff is really good for making people feel included," identifying the connection between caring for students' whole selves and fostering an inclusive environment. Rebecca elaborates as well that Tara "cares more and it makes [her] want to work harder," and Sarah discusses how the "open environment" that Tara creates during office hours reduces intimidation. In all of these ways, Tara and Hank work toward creating a community of care within ELC, and thus enable a more inclusive environment which impacts ways in which individual students feel welcome and included within ELC.

Instructor Enthusiasm

With Tara specifically, Madiha, Cassidy, and Ana all mentioned how Tara's enthusiasm for both the content and for student learning was positively impactful to their experience. Cassidy explains her experience of the first day in ELC as follows:

Tara is just so excited. I remember on the first day...I came in and she was like ‘I just really want everyone to do well. Hopefully we can have some fun in this class.’ And she just keeps that attitude through it all. She’s so positive.

Ana built directly off of Cassidy’s statement by saying that “because we see her actual excitement with math, we feel more excited...so maybe [Calculus II] is actually fun,” exemplifying how Tara’s enthusiasm shaped in some ways Ana’s own affect toward the class and the content. Madiha also highlights that Tara “was super eager about it, like she was actually enjoying math,” and that this translated to greater enjoyment for the students. Tara’s enthusiasm impacted student experience by influencing the enthusiasm that students themselves felt for the course and for the material.

Instructor as a Role Model

This final subtheme of *Instructor as a Role Model* pertained particularly to Tara as well, and how she functioned within participants’ minds as a female role model in a STEM field. Madiha generalizes this component of her ELC experience to encompass both her experience and that of her female friends in ELC in the statement below:

You can just see a whole different dynamic...my girl friends in the class, like a lot of girls were inspired by the fact that she is so good and she’s like in the STEM field and she’s female... you could definitely feel it from your friends or anyone in the class. You can definitely feel it around people and it’s inspiring to see the people around you also get inspired by that.

Other participants discussed how seeing Tara as a role model impacted their experience individually by way of mathematical affect or desire to pursue STEM. Rebecca mentions that she “[doesn’t] see a lot of people who look like me sitting in my big lecture halls. So I think seeing a female [teach ELC], it’s really inspiring.” Ana potently states that, in relation to Tara’s role in ELC, that “we need female professors so we can feel inspired,” and Audrey recognizes that “having a female professor... has helped me consider a math major whereas I previously wasn’t.” Bella also highlights this STEM-focused impact by noting that “having a female mentor...that experience is very helpful for going into STEM and to be able to see a

female in STEM who's successful at what she does and is able to explain things well and everything, it's really cool to see. It gives you a little bit of hope about it." In these comments, Tara's status as a role model extends beyond just impacting experience within the ELC classroom, but serves to shape how these student participants see themselves as women in their respective fields.

Further, both Audrey and Cassidy make comparisons to other courses in which their instructors have been men, and highlight the importance of having Tara as a role model outside of those experiences. Cassidy clarifies this comparison in the statement below:

Just seeing someone who looks like you doing something that you want to do is a lot more inspiring than my sixty-year-old male econ professor [who is a] white man... but seeing someone who's a really cool, strong female....that's cool. And you're like, 'oh, I could see myself doing this.'

Audrey provides an additional comparison to Hank; while qualifying that Hank has "lovely personality traits," having a female role model by way of taking the lecture portion of ELC with Tara has "made [her] feel more confident," noting that until this point she has "had a very limited amount" of role models.

While this particular component of student experience of ELC is not necessarily something under the instructor's explicit control, it arose in the data frequently enough that it warranted mentioning as impactful to student experience. The argument that an instructor's presented identity (as well as invisible identity) and how those identities are shared with students can have impacts on how students experience mathematics classrooms very clearly played a role into how focus group participants experienced ELC.

ii. Student Feelings of Confidence in the Course and Content

In this higher-order concept were ways in which students expressed feeling secure about the structure of the class and about their own competency in the material. A predicament that several expressed having felt previously in Dunshire's math courses was a feeling of uncertainty about grade, and feeling ill-prepared for assessments. In contrast, many expressed how having a clear outline for the structure and grading system of ELC, the way in which assessments and assignments were lower-stakes, and the mathematical knowledge gained from Tara's lectures were impactful to their experience. The

subthemes observed within this higher order concept were *Agency Attributed to Instructor*, *Clarity in Grading*, and *Lower-Stakes Format*.

Agency Attributed to Instructor

The subtheme of *Agency Attributed to Instructor* encompassed ways in which the perceived agency of Tara and/or Hank in determining grades, assignments, and content impacted their experiences of the course. This was often presented in comparison to previous classes that the participants had experienced which had been taught by TAs; several cited the lack of control that TAs had over the grading structure and over the amount of content they needed to cover was problematic for their experience of the course. Audrey makes this comparison below:

I don't know what sort of requirement that [the TAs] have, but I definitely think that- I could tell that they were strained, basically. And that they weren't helping us because they felt like they couldn't answer a question. So it's just that everyone's confused.

In this statement, Audrey highlights how TAs feel strained and like they were being “forced by their boss to present as much information as possible,” which led to a lack of responsiveness and student understanding. She compares this directly to the style of ELC, where “it's like very open forum. We can ask questions.” Implicitly, she is indicating that the “boss” figure that strained the TAs presentation of content has been shifted; within ELC, Tara and Hank are their own “boss” and thus have the agency to make decisions on prioritization and timing of material, leading to students feeling more comfortable and prioritized when asking questions. Bella elaborates on this, noting that the content coverage expectations that TAs are subject to “forces some teachers to not teach all of the material,” while Tara is able to “take the time to get through all of the material” in a way that still allows for a positive environment.

For Cassidy, the agency that Tara has as a lecturer in ELC is impactful because it allows for more directed homework and a more subsequently positive testing experience. She notes that she appreciates that homework “is [Tara's] problems, because they're a lot closer to what the test is than a textbook.” She is comparing this experience directly with one she had in her previous mathematics course, in which the TA assigned homework problems from the textbook but openly acknowledged that those problems would

not look like those that students would see on an exam. Because Tara has agency in writing her own homework questions, Cassidy felt as though she knew what to expect from the exams within ELC.

Ana notes further than Tara's agency over determining exam grades allowed her to trust more that her grades would accurately take into account the difficulty of a given assessment. She states:

Tara's the only one who teaches two sections... if the test is harder, [Tara's] going to make the curve lower so that an A is going to be different in a hard test than an easy test.

Because Tara is the "only one" who instructs the two courses of ELC of which she is in charge, she was given full agency over how assessment grades are determined. Audrey mentions that, at Dunshire, coordinated courses are subject to "competition between the sections," in which students all students at a given level of mathematics are compared and graded on a curve that goes across sections (and consequently across instructors). Because of ELC's novelty, Tara has the agency to determine grades outside of other Calculus II sections, and it is this agency that impacted student experience in the above ways.

Clarity in Grading

Students felt further confidence in the course that stemmed from an enhanced knowledge and clarity regarding how their overall course grades and exam grades were determined. Ana, Audrey, and Madiha all noted this as significant to their experience within ELC. For Madiha, she notes that the grading is not "complicated" nor "hard to explain," as it was for previous mathematics courses, but that ELC is "very much different" in that students understand throughout the semester their approximate grades.

Ana also highlighted how this clarity in grading policy, specifically when it comes to assessments, allowed her to understand better where she stood quantitatively in the class and to feel that the grades she was earning were more fair. She elaborates in her statement below:

The grading policy [in ELC] has also changed a lot [in comparison to past mathematics classes] and I'm not saying only the quizzes, the homework and stuff. It makes so much more sense, the grading policy... so now it's easier to understand, like in terms of 'oh,

my test grade says because of this and this and that.’ [Tara] is super fair in terms of grading.

Audrey further notes how the clarity of ELC’s grading policy impacted her experience by way of allowing her to better prioritize the time she spent on coursework. She specifically discusses the lab component of ELC, which is worth less than a quarter of the students’ overall grade. She says that she responds by telling herself, “okay, cool. I can invest a little bit of time into this because it is part of my grade,” without having to feel that she needs to invest more because it is unclear how much the lab component will impact her grade, making this clarity in policy impactful to both her experience within ELC and to her overall time-management in the broader context of her education.

Lower-Stakes Format

A majority of the focus group participants made comments relevant to how the various ways in which ELC presented them with a lower-stakes grade environment made for a more positive experience by way of reduced stress and anxiety related to the course and content. Paulo began the discussion relating to the lower-stakes format of ELC early on in the focus group with the following statement:

I liked how we have the weekly homework with problem sets instead of quizzes. In [a prior mathematics course] they expected us to go through four problems in that session in 10 minutes. And it was just not realistic...you would get destroyed by the quiz. And now you can actually sit down and look over your notes and see if you can do the problem and if you can’t, you can speak to a friend, or go to Tara’s office hours. It’s a better format.

Paulo’s comparison of these experiences, and his positive association with problem sets as opposed to timed quizzes, is aligned with mathematics education literature in which using untimed assignments in which students are allowed resources reduces mathematical anxiety and leads to a more positive student experience [24,34]. Audrey also immediately followed Paulo’s comparison by noting that she too felt that the problem set format was “so much less stress.”

Ana and Madiha also noted that removing high-pressure quizzes from the Calculus lab format reduced anxiety around the labs themselves. Madiha describes the Thursday lab sessions as “grade

boosters,” while still acknowledging that, while the material wasn’t easier, she is “actually doing much more work but because...of the whole less stressful environment.” Ana also remarks that, in previous mathematics courses, she “would always be terrified of the labs,” but with the lower-stakes environment of ELC’s labs, she notes that “[the Thursday ELC lab]’s not super horrible. It’s more fun.” Ana further indicates that the lower-stakes format of the lab portion “makes you understand that your GPA isn’t going to be as low,” which she compares to feelings in previous math courses in which she saw those courses as agents of lowering her GPA. Both of these quotes exemplify how Ana’s and Madiha’s experiences were impacted by the lower-stakes structure of ELC, and hints at ways in which it may have also impacted their mathematical affect.

Audrey takes a broader look at how the lower-stakes format impacts how she and other students view Calculus II at Dunshire. She makes the following statement summarizing ELC may impact campus-wide reputation of Calculus II:

This class has a reputation for being very difficult and scary as from what I have gathered from the general student population. People don’t want to take it. They make their, you know, their class decisions around this class because it’s difficult, time consuming, annoying, whatever. I think that having this Thursday [lab] section could possibly help the reputation for [Calculus I] and [Calculus II], because it seems to me that we’re learning the same amount of Calc II material.

Implicitly, Audrey is signifying that the ELC format is less “difficult, time consuming, annoying” in ways that are substantial and impactful to members of Dunshire’s student population, including herself.

Cassidy adds on that the changes in the grading policy and class structure to reflecting a lower-stakes format helped her “feel more confident in [her] knowledge of the class,” and notes that this is something that “does help women especially to be like, ‘oh, this is something I could pursue.’” This particular attention to how having increased confidence due to a lower-stress environment may speak especially to women is reflective of the relationship between confidence in mathematics and persistence in STEM suggested by prior literature [11]. Ultimately, students built off Paulo’s original comment by

highlighting the ways in which ELC provided a lower-stakes structure that were impactful to their own experiences.

iii. Accessible Exposure to a Variety of Applications

Showcasing material that opens students' eyes to a variety of applications for Calculus II was a primary motivator for the development of ELC, as mentioned earlier in this paper. Aspects of constructed student experience that fit into this higher-order concept were ways in which students expressed either a positive or negative impact stemming from the variety of topics covered in ELC or from the way in which instructors attempted to make those applications accessible to students who were in the process of learning Calculus II. Thus, the two themes within this higher-order concept are *Content Applications* and *Accessibility of Material*.

Of particular interest within this higher-order concept is the fact that both positive and negative responses emerged regarding both *Content Applications* and *Accessibility of Material*. While all previous higher-order concepts and subthemes were expressed to have positive impacts on the focus group participants' experiences, the following subthemes garnered push-back from one student, Bella, in particular, who felt that they had impacted her ELC experience in a negative way. This will be further elaborated upon as these themes are discussed below.

Content Applications

One target of the ELC lab component was to expose students to a wide variety of applications for the material that they were learning in their lectures, and comment that reflected impact by this attribute of ELC reflecting ways in which this variety was perceived and interpreted by students. While a majority of students appreciated and enjoyed the variety brought for by ELC, Bella noted that she felt that the content applications presented were irrelevant and had a negative impact on her experience. She indicates her dissatisfaction with the content presented in the following way:

I'm thinking of studying environmental science, and I'm almost 100% positive that [Hank]'s probably not going to go over stuff with environmental science... While I think that [other applications are] cool, I know I'm not interested in it and I would rather see an

application to what I'm interested in... I don't think it makes a whole lot of sense to me.

While I was very against [the previous structure of Calculus II] because I thought they were very stressful and we weren't learning that much and everything, I don't necessarily think this is the right replacement.

Bella's dissatisfaction, as expressed in this statement, seems to stem from her feelings that her interest (environmental science) was disregarded amongst the other applications being highlighted in the ELC lab. However, she was immediately countered by several students who saw that ELC's extension beyond their areas of interest actually had a positive impact on their experience. Audrey remarks that, by encouraging individuals to think outside of their "their path at [Dunshire]", the ELC lab session is "giving people a wider view." She mentions that ELC "gives [her] a good idea of different things that I could do, where I might not have known about them or been exposed to them before."

Madiha sees the variety of information outside of her own areas of interest as "very nice information for just general knowledge." She notes that "it's great that [Hank] covers something I'm not as much interested in, just for general knowledge." For Cassidy, this is something that she sees as having a more philosophical educational value:

I think it's also good that I know I'm never going to use any physics. I'm never going to have to know what a black hole is. But I know that's something I'll never study at [Dunshire]. So it's kind of cool to just have a little bit of exposure to it... I have so many other courses where I can learn about Econ and what to invest... so it's cool to have something that not like exactly what I'm studying and it's not the same as everything else I'm doing.

Cassidy's remarks present succinctly the dual side to Bella's remarks; while Bella felt that the ELC lab was an unfulfilled opportunity for more specific application to her area of interest, Cassidy felt that the ELC lab's lack of specific application to her area of interest lent it a degree of intellectual intrigue and value. Paulo also indicates that, while he's "not super into learning about black holes," he "gained a little bit of value" from his exposure to these topics that he may otherwise not have seen. The contrast of

Bella's perspective with that of the other focus group participants exemplifies how incorporating a variety of content application impacted students' experiences in different ways.

Accessibility of ELC Material

In addition to introducing students to the variety of applications that exist for Calculus II material, ELC's design was intentional about connecting Calculus II material to those applications in ways that were accessible to students. Rebecca notes that the videos, posted by Hank to be watched prior to the ELC lab, were particularly helpful in allowing students time to "get into those topic and...understand them with the videos." Both she and Sarah also noted that Hank made the content applications more accessible by breaking that material down, as Sarah describes below:

[Hank] breaks [ELC content applications] down so it's very simple so people can understand. We have weekly videos that we would watch before we go into class. So I think it's been interesting to see big topics like general relativity and things like that that you would think you don't have the math to apply to it and he'll break it down and make sense. I think that's been something that's been nice about the course.

In particular, Sarah's statement about initially thinking that she and her classmates would not "have the math to apply" to these broader content areas is particularly important as it relates to ELC's goal of illustrating to students how Calculus II can be applied, and can be another way in which ELC may have contributed to a shift in mathematical affect by way of showing students how they can begin with what they know as Calculus II students and build on that knowledge to conquer intimidating content areas. Cassidy remarks that she "feels like [she's] actually learned a lot" in the labs, further evidence of the accessibility of the ELC lab material being made accessible.

Bella, however, did not experience this accessibility in the context of the ELC labs; she makes the statement below in regards to how she felt about the accessibility of the concepts being discussed in the lab context:

I think that this is a Calc II course, I should be learning about applications for Calc II, not for general relativity because I don't have the math background to understand general relativity. So why am I trying to?

Bella makes very clear that she does not see the connection between Calculus II and the content applications that are highlighted in ELC lab, emphasizing that the content applications presented were beyond the scope of her math background, implying that instead they were inaccessible. In this way, the (in)accessibility of the ELC material was seen as a negative impact to Bella, while other students noted that the accessibility of the ELC material had a positive impact on their course experience.

b. Phase 2 - Comparative Matrix

As mentioned previously, I then juxtaposed these themes with the identification of which individual student participants attended to them in the form of a comparative matrix, as borrowed from ethnographic cultural domain analysis practices [3]. To add additional nuance to the matrix, I have utilized several symbols within it. See *Table 3* below for a description of these symbols.

Symbol	Meaning in Comparative Matrix
+	This theme was a positive component of this student's experience in ELC.
-	This theme was a negative component of this student's experience in ELC.
T	Tara was specifically mentioned as contributing to this positive component of this student's ELC experience.
H	Hank was specifically mentioned as contributing to this positive component of this student's ELC experience.

Table 3. A key of the symbols used in the comparative matrix.

I acknowledge that, even with the added nuance brought in by the various symbols within the matrix, such a comparative matrix has the capacity to reduce participant perspectives by not allowing for the richness of comments and anecdotes to be seen within the matrix itself. I would encourage that the comparative matrix be viewed in close conjunction with the descriptions of the various themes above so as to gain a fuller picture of both the richness of these students' responses, as well as the insight into who spoke about which themes, as provided by the comparative matrix below (*Figure 1*).

Higher Order Concepts	Instructor Impact on Student Experience					Student Feelings of Confidence in the Course & Content			Accessible Exposure to a Variety of Applications	
Sub-Themes	Instructor Responsibility for Learning	Welcoming Response to Questions	Community of Care Leading to Inclusion	Instructor Enthusiasm	Instructor as a Role Model	Agency Attributed to Instructor	Clarity in Grading	Lower-Stakes Format	Content Applications	(In)Accessibility of ELC Material
Ana	T		H/T	T	T	+	+	+	+	+
Audrey	+	T			T	+	+	+	+	
Bella	T		H		T	+			-	-
Cassidy	T			T	T	+		+	+	+
Madiha	T	+		T	T		+	+	+	
Rebecca	T		T		T			+		+
Sarah			T		T					+
Paulo	+	T	T					+	+	

Figure 1. A comparative matrix showing which student participants attended to which themes when describing their experience in ELC.

From even a cursory glance of this comparative matrix, one can see several trends revealing themselves. Notably, the only themes that were cited as having a negative impact on student experience were *Content Applications* and *(In)Accessibility of ELC Material*, both from Bella's perspective. The ways in which students predominantly attended to positive aspects of their ELC experience was both encouraging, in that it implicates that they had many positive things to say about the course and their experience, while also revealing a potential bias towards highlighting what they enjoyed about the course, potentially because of the authority attributed to the researchers and the perception of the researchers being in some way affiliated with ELC themselves. While I cannot definitively speak to the origin of this bias, the overwhelmingly positive ways in which students discussed these themes of their experience lead me to acknowledge that such positivity, while being authentic, might also be indicative of a hesitancy to share more critical feedback in the context of the focus group.

Further, the comparative matrix allows the highlighting of those themes which were most common across student experience; among these eight students, those themes were *Instructor Responsibility for Learning* and *Instructor as a Role Model*. Notably, both of these themes were predominantly attributed to Tara. The *Lower-Stakes Format* of ELC was also cited by many of the students as being impactful to their experience. Additional trends, specifically the abundance of Tara's presence in these themes, as well as the existence and impact of *Student Feelings of Confidence in the Course and Content*, will be discussed below.

5. DISCUSSION

This analysis has resulted in an in-depth description of how eight students of various identities experienced the addition of a lab component to a Calculus II course, and highlights ten components of ELC that were positively or negatively impactful to their experience of ELC: *Instructor Responsibility for Learning*, *Welcoming Response to Questions*, *Community of Care Leading to Inclusion*, *Instructor Enthusiasm*, *Instructor as a Role Model*, *Agency Attributed to Instructor*, *Clarity in Grading*, *Lower-Stakes Format*, *Content Applications*, and *(In)Accessibility of ELC Material*. From these components, each student constructed their own perceptions of their experience, and built off of one another's perspectives in the focus group setting.

This work's identification of these robust themes that act as components for students' construction of their experiences in a Calculus II lab course provide indication of what may be important to student experiences in other non-traditional mathematics course formats. As the need to innovate to ensure mathematics courses are relevant and reflective of best practices is tried and tested, it becomes increasingly important that student's perceptions of their own experiences are elevated and used as valuable tools of assessment for such innovations. The themes identified by these eight students as salient to their experience can be regarded as a starting point for future discussions centering around how students are experiencing non-traditional Calculus structures, in particular those that incorporate a lab component as ELC did.

Both the emergent themes and the comparative matrix illustrate many unintentional consequences of ELC's development. The two original goals of ELC were to enable students to connect with a tenured professor in mathematics and to expose students to a variety of applications for the Calculus II content they were learning. While student attention to *Content Applications* and *Accessibility of ELC Material* align with the latter of the goals, the former did not prove to be consciously impactful to students' constructions of their experiences. While students did discuss Hank's "openness" and ability to teach complicated material effectively, there was no mention that they felt that their experience was at all impacted by his specific position within the department, but by his personality and teaching style. To the contrary, Hank himself was not mentioned exceptionally often in the focus group, as can be seen by the minimal "H"'s in the comparative matrix.

Instead, it was Tara who emerged as being exceptionally impactful to students' constructed experiences of ELC. Tara was mentioned specifically as contributing to all components created under the higher-order concept of Instructor Impact on Student Experience; she featured prominently in student's discussions of *Instructor Responsibility for Learning*, *Instructor Enthusiasm*, and *Instructor as a Role Model*. Her prominence in *Instructor as a Role Model* is particularly salient because of *who* was contributing to this discussion; every focus group participant who presented as female noted that Tara functioned in some way as a role model for them within their STEM fields, with several citing ways in which Tara's presented femininity had helped them see themselves in fields that they previously hadn't. The experience of the women in this focus group of ELC was universally positively impacted by Tara's presented identity. This speaks to previous work on the importance of representation and the role of shared-identity role models in faculty members within higher education [5,36], particularly for women in STEM fields [14,16] While much literature supports the idea of women having women role models as being positively impactful to student experience, there has been some work acknowledging a discrepancy that, in some cases, having a stereotypically feminine role model in a STEM field can be demotivating to female students [4] and that often it is not enough to simply have a role model with a shared identity- a role model must be at a level of attainment to those they inspire in order to encourage self-enhancement

[23]. The findings presented in this paper certainly at first glance appear to support the idea that female role models within STEM have a positive impact on the experiences of female students, and set the stage, in the particular context of experimentally structured mathematics courses, for additionally inquiry into how having an instructor with a shared female identity affects female students' experience in the course, and potentially their mathematical affect as well.

It is further worth noting that the higher-order concept *Student Feelings of Confidence in the Course and Content* and its associated themes arose as another seemingly unintentional component of student experience. While ELC was not necessarily designed to reduce student feelings of uncertainty surrounding their grades, the course structure, or their own content knowledge, this does appear to have been a significant factor in how they experience ELC. Because ELC was a new, largely experimental course, it was very intentionally crafted in terms of structure. Consequently, grading and coursework policies were perhaps more clearly defined than they might be in other course contexts. Clear definitions, in place from the beginning of the course, may have allowed for ease in communicating these definitions around grading and coursework to students, resulting in positive responses from students in regard to *Clarity of Grading* and *Lower-Stakes Format*. In addition, ELC's new and experimental status did provide Hank and Tara with a lot of agency over how the course was developed, as they were not necessarily subject to pre-existing expectations for course structure or additional coordination from other sources, as may have been the case for other mathematics classes at Dunshire. While this is purely speculation on the reasoning behind why the themes within *Student Feelings of Confidence in the Course and Content* were so prominent, it does undoubtedly speak to the ways in which the intentionality with which a course is developed can have unintentional positive impacts.

The duality between Bella's responses to the themes within *Content Applications* and *(In)Accessibility of ELC Material* and those of her participant peers also calls for pause; this speaks to a struggle faced by many application-focused math courses in that there exists a balance between the amount of time in which one must cover several applications and the need to create content that applies to all students. To Bella, the content chosen for the ELC lab was not relevant enough to her area of interest,

but to other students, this irrelevance to their area of interest was what made the content valuable. It is arguable that this is something ELC does not have control over; however, it may be indicative of a preference toward some content areas over others, and more work may need to be done in terms of how to best balance broadness of content with accessibility and interest to students.

This paper has sought to elevate such student perspectives, while simultaneously acknowledging that these themes provide but an introduction into the kinds of student-centered topics that ought to be considered when designing, implementing, or assessing an alternative-format course. More work is necessary- and, in particular, work aggregated to emphasize the experiences of traditionally marginalized populations- to affirm these themes as relevant to student experience of mathematics courses with lab components outside of Dunshire and outside of ELC, and to build upon them and enhance knowledge about what students attend to as important to their experience of such courses.

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