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The Real World is Interdisciplinary: Exploring Students' Perspectives and Experiences with Interdisciplinary Mathematics Education

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Abstract

Learning mathematics in a silo presents it as a complex discipline that is detached from the real world and therefore difficult to understand. As such, there is now a growing interest in interdisciplinary mathematics education (IdME). Yet, first-hand accounts of students' perspectives and experiences about IdME are lacking. Thus, this study explored Grade 8 students' perspectives on, and experiences with an IdME project in their mathematics course. An exploratory case study methodology was used to collect qualitative data in the form of student self-reflections and interviews. Findings suggest that students' experiences with IdME provided them with new perspectives about mathematics, improvement in understanding of complex mathematics concepts, and recognition that an interdisciplinary team of teachers further transformed their mathematics learning experiences. Despite the mostly positive feedback, some students found IdME challenging as it contradicted their preconceived notions of mathematics only existing in a silo and previous traditional forms of mathematics learning. Future research is needed to further examine the ways that IdME can be used to transform mathematics instruction, leading to better performance and achievement in mathematics.

Introduction

Mathematics plays a crucial role in students' daily lives and their preparation for the future. Mathematical knowledge enables students to gain a greater understanding of the abstract world and solve problems relevant to their everyday lives (Devlin, 2018; Gainsburg, 2008). Furthermore, mathematical processes help students develop critical thinking, problem-solving, and communication skills (Asigigan & Samur, 2021; Puspa et al., 2019; Su et al., 2015). These skills are essential for students to tackle complex problems in their future careers and everyday lives (Rios et al., 2020). Given the value of mathematics, it has long been taught as a core subject in schools worldwide.

Despite acknowledging the importance of mathematics in their lives, many students perceive mathematics as a dull and abstract discipline which is often detached from reality and therefore difficult to understand (Mosvold,

2008). This perception is particularly true for secondary school students whose motivational and competence beliefs severely impact their mathematics achievement (Frenzel et al., 2010; Watt, 2004). One promising approach is to link mathematical knowledge and concepts to real-world contexts so that students are better able to understand complex mathematical processes. As real-world contexts and problems are interdisciplinary, an approach to teaching and learning that sees mathematics as connected to other disciplines may be advantageous (Chi, 2021; Kristensen et al., 2024). As such, interdisciplinary mathematics education (IdME) has received considerable attention in recent years (e.g., Chao-Fernández et al., 2019; Chi, 2021), with school curricula internationally explicitly calling for this approach to teaching and learning (e.g., Australian Curriculum, Assessment and Reporting Authority, 2013; Kim & Lee, 2022; Ontario Ministry of Education, 2020). In our context of Québec, Canada, the provincially mandated curriculum explicitly encourages and emphasizes the importance of interdisciplinarity and cross-curricular competencies for meaningful and engaging mathematics learning (Québec Ministry of Education, 2007b, 2007c). Specifically, the curriculum indicates that, "teachers should encourage students to discover the connections that may be made with other subjects…through interdisciplinary activities in the classroom or the school" (p. 14) as it helps students improve their mathematical understanding (Québec Ministry of Education, 2007b).

Researchers (e.g., Lovemore et al., 2021; Ozturk & Erden, 2011) have primarily examined teachers' perspectives of IdME, such as their views about the positive effects this approach has on students' learning as well as barriers to its implementation. Teachers appreciate the use of IdME as they believe that presenting mathematics in an interdisciplinary format can allow students to acquire strong conceptual understanding in an engaging way (Brand & Triplett, 2012; Saleh & Shaker, 2021). Understanding teachers' perspectives of IdME is important; however research indicates that students' perspectives are equally, or more important to consider (Zhan et al., 2017). Yet, first-hand accounts of students' perspectives and experiences of interdisciplinary learning are less known, with close to no studies focusing explicitly on IdME. Given that students are important as the ultimate recipients of IdME, it is pertinent to take their perspectives into account (Zhan et al., 2017). In response to this gap, the main objective of our work is to centre students with the aim of understanding their perspectives and experiences of IdME. Specifically, using the case of a Grade 8 mathematics course, the following research question guides our study: *What are students' perspectives of, and experiences with IdME?*

Conceptual Framework

IdME is an interdisciplinary approach to teaching and learning that places mathematics as a core subject and may involve its integration with science, arts, music and/or languages in a project or problem-solving approach (Lovemore et al., 2021; Narode, 2011; Serrano Corkin et al., 2020). As with all interdisciplinary approaches, IdME allows students to learn concepts and skills from multiple disciplines to examine a central theme, issue, or problem (Costley, 2015; Helmane & Briška, 2017). IdME positively impacts the perspectives and attitudes of students toward mathematics and mathematics learning. Specifically, IdME enables students to identify the value and relevance of mathematics, particularly valuable given the prevalent view that mathematics is detached from other disciplines (Ray, 2013). Indeed, IdME develops students' understanding and sense of how mathematics relates to, and builds on the other subjects (Kokko et al., 2015). When students discover these connections between

mathematics and other disciplines, their beliefs towards mathematics are positively transformed (An et al., 2008; Kokko et al., 2015). The integration of mathematics with other disciplines sparks students' interest in mathematics education (Chao-Fernández et al., 2019; Lovemore et al., 2021), while reducing their fear and anxiety about complex mathematics lessons (Landsberg et al., 2016). Learners participate actively and are highly motivated in IdME lessons, even those who are normally reluctant to participate in traditional mathematics classrooms (Lovemore et al., 2021). Through interdisciplinary connections, the IdME approach exposes students to mathematics as an exciting discipline to learn.

Apart from developing positive perspectives toward mathematics and mathematics learning, IdME also develops students' knowledge and understanding of mathematics. IdME helps present mathematics in a wider context (Chi, 2021) beyond other disciplines, allowing students to become critically aware of the usefulness, connection and applicability of mathematics concepts in the real world (Chao-Fernández et al., 2019). When students perform complex (and often abstract) mathematics tasks in real-world contexts through concrete examples, their understanding of mathematics improves. Providing students with a more authentic environment than what they experience in traditional mathematics classrooms motivates them to both learn and combine their theoretical and practical knowledge and skills (Kokko et al., 2015). Real-life examples also help teachers and students themselves identify the gaps in students' mathematical understanding (Narode, 2011), thus making the IdME approach particularly useful to promote the understanding of difficult mathematical concepts.

Teachers play an important role in enabling IdME in the classroom. IdME requires teachers to adapt the topics covered in their lessons by incorporating real-life scenarios from multiple disciplines (Yalcin, 2021). Furthermore, teachers must make explicit the connection between these disciplines and the real-world contexts that these disciplines are part of (Ferri & Mousoulides, 2018). This approach thus benefits from teachers who have knowledge across disciplines and the commitment to teach in an interdisciplinary way (Williams et al., 2016).

Despite the benefits of IdME, this approach is not without challenges. First, students need to invest significant time and effort into developing the level of interdisciplinary thinking required to effectively participate in such IdME projects (Spelt et al., 2009). Without sufficient time and effort, students may find it difficult to master the interdisciplinary content, leading to a loss in confidence and motivation (Fung, 2016). Second, some students prefer traditional approaches (i.e., teacher-centered with rote learning) in the mathematics classroom, despite acknowledging the positive potential of IdME (Kokko et al., 2015). Indeed, it can be challenging for students to learn mathematics through IdME, especially for those who are more familiar and proficient in learning the subject through a traditional approach (Lehtinen et al., 2017). Finally, subject-specialist teachers may not have sufficient subject content knowledge of other disciplines to meaningfully facilitate an interdisciplinary approach (Firdaus et al., 2020; Johnston et al., 2020).

The benefits and challenges of IdME mentioned above are usually expressed from the researchers' point of view, especially when referring to those of the students. With the exception of a few studies highlighting students' comprehensive and holistic views and experiences with IdME (e.g., Kokko et al., 2015), there appears to be less focus and attention on exploring and presenting students' in-depth perspectives and experiences with this

approach. As a result, more studies are needed for deeper investigation into students' perspectives and experiences of IdME. Therefore, throughout this paper, we emphasize the students' perspectives as they discuss their experiences with the IdME approach.

Research Context and Background

This study took place within the context of a long-term research-practice partnership between two universities and an independent girls' secondary school in the province of Québec, Canada. Specifically, this paper focuses on a teacher's implementation of IdME into her Grade 8 mathematics course. In collaboration with the second author and teachers from other subject areas (science, English language arts [ELA], and visual arts), the Lifestyles Project was developed with the broader goal of engaging students in mathematics learning by discovering its connections with other disciplines and everyday knowledge (An et al., 2016; Chi, 2021). The project was aligned with Québec's Grade 8 Mathematics curriculum (Québec Ministry of Education, 2007c) and aimed to help students develop the skills aligned with Québec's Broad Areas of Learning (Québec Ministry of Education, 2007a) and Cross-Curricular Competencies (Québec Ministry of Education, 2007b).

The Lifestyles Project was comprised of three assignments: Hobbies, Careers, and Bedroom Design. In the Hobbies assignment, students chose a hobby of personal interest and explored science and mathematics concepts associated with the hobby. In the Careers assignment, students selected a future career, found a job in this career, and calculated the salary that they would receive while taking into account required tax deductions. Finally, in the Bedroom Design assignment, students designed a 3D scaled model of the bedroom of their dream apartment considering mathematical (size and surface area) and artistic (low-relief technique) constraints. Each assignment of the project incorporated mathematics and one other subject area (science, ELA, and visual arts, respectively) with teachers from the different subjects collaborating to develop and deliver the project and ensure curricular integration. These collaborations took on many different forms including co-planning, co-teaching, and co-grading of the assignments. For example, the Hobbies assignment was graded using rubrics developed collaboratively by both the science and mathematics teachers. Further details of the Lifestyles Project are discussed elsewhere (Kiyani et al., 2024).

Methodology and Methods

Case study methodology (Denzin & Lincoln, 2011; Stake, 2006) was used to explore students' perspectives of, and experiences with the Lifestyles Project. Given the limited research on students' perspectives about IdME, the use of case study methodology was helpful as it allows in-depth investigation and analysis of a particular case (Yin, 2009). Specifically, we chose the exploratory case study method (Yin, 2009) as it offers the opportunity to gain deeper and more nuanced understandings of participants' perspectives and experiences when there is a lack of pre-existing hypotheses and/or pre-determined conclusions. We define our case as the group of students (N=16) in the Grade 8 mathematics course where the Lifestyles Project took place.

Data Collection and Analysis

The data used in this case study came from multiple sources to allow for triangulation. Data sources included student self-reflections and interviews. Students completed written self-reflections after most classes during the project to capture their experiences during, and perspectives of, the Lifestyles Project. Students were provided with prompts to reflect on various aspects of the project (e.g., What was something that surprised you either with the assignment instructions and/or while working on the assignment?). Aligning with the exploratory nature of the study, semi-structured interviews (Gubrium & Holstein, 2002) were conducted at the end of the year to elicit detailed feedback from the students about the Lifestyles Project and IdME more generally.

Semi-structured interviews, rather than closed or open-ended, were chosen because they allow for: 1) flexibility in questioning, while staying within the scope of the study's main objectives; and 2) keeping the conversation dialogic by using probes and asking follow-up questions (Denscombe, 2014; Merriam & Tisdell, 2016). During these interviews, students were asked to provide feedback about the individual assignments as well as the overall project. Interviews were audio-recorded and transcribed verbatim using the data transcription software Otter.ai. Transcripts were then assigned to multiple members of the research team to verify their accuracy. Next, interview transcripts and self-reflections were coded in a series of coding cycles using the constant comparison method and inductive thematic analysis approach (Guest et al., 2011; Kolb, 2012). Each member of the research team independently performed an initial cycle of coding using a word processor where selected datasets were coded using features such as text highlighting and comments.

The research team met regularly to compare their codes, noting similarities and differences, and discussing discrepancies to revise the codes, if needed. A collective codebook developed through this process was then used to complete a second cycle of coding. This cycle of coding was done through assistance of qualitative data analysis software NVivo, which allowed greater flexibility in adding new or refining existing codes, leading to a more emergent coding approach. Given the particular focus of this paper, we pulled the codes relevant to students' perspectives and experiences of engaging with the Lifestyles Project and identified three major themes, which will be discussed in the next section.

Findings

In this section, we present Grade 8 students' perspectives and experiences with the Lifestyles Project. First, we share the impact of the project on students' views of mathematics. Then, we discuss the impact of the project on students' mathematics learning and understanding. Finally, we present students' impressions of having teachers from different subjects co-teaching during the project. All names are pseudonyms.

Impact on Students' Views of Mathematics

The Lifestyles Project had an impact on students' views of mathematics. Specifically, through the project, students found mathematics to be enjoyable and relevant to other disciplines and the real world.

Making Mathematics Enjoyable

Based on their experiences, students concluded that mathematics could be an enjoyable discipline and attributed this to the interdisciplinary nature of the Lifestyles Project. For example, Carla shared, "I really like the arts. And I like mathematics. So, they are a lot of fun together". For students who previously did not enjoy mathematics, the interdisciplinary nature of the project was especially beneficial. As Kobu said, "Not a lot of people enjoy math. I talked to other people in my class. The people who didn't like [math] were able to find something that they enjoyed about math by putting in subjects that they enjoy." Indeed, the Lifestyles Project was enjoyable to students because it allowed them to engage with mathematics alongside at least one subject area that they appreciated (mathematics or otherwise).

Students also shared that mathematics was enjoyable because the interdisciplinary approach of the Lifestyles Project was different from their typical learning experiences in mathematics class. This change of approach to learning was novel and appreciated. Specifically, they noted mathematics classes usually consisted of a common set of activities and tasks. For example, Raza said,

> You have your quizzes, you have your tests, and then you have homework, which is doing word problems, then you have [work] in class, the teacher explains the math equation things that you're doing, and then you have some time to work on them. And it's just kind of the same thing, every math class.

The Lifestyles Project was, as Gemini recounted, "a nice little break from what we normally do." Even beyond the mathematics class, students shared that interdisciplinary learning was not something that they experienced regularly in school. Indeed, Raza reflected that the project was "out of the ordinary of what usual school is", thus for the students who felt that their school experiences were repetitive and consistent, the interdisciplinary nature of the Lifestyles Project was a welcome change and contributed to their enjoyment of the subject.

Seeing the Importance of Mathematics

In addition to making mathematics more enjoyable, the Lifestyles Project allowed students to realize that mathematics is important, as it is applicable to other disciplines and real-world situations. Students indicated that the project enabled them to view mathematics as inherent to other disciplines. For example, Raza shared, "Everything has math in it, even the arts have math in it, and there's a lot of math in science". To further reinforce the notion that mathematics is present in all disciplines, students spoke of the importance of having mathematics knowledge regardless of their choice for future academic studies. As Karshi explained, "In reality, if you're going to go into sciences, you need math. It was really important to see that even if I go into the arts, I'm probably going to need to know a little bit of math."

Students further explained that mathematics is not only necessary for all academic pathways, but also applicable to, and important in real-world situations. Specifically, the students spoke about the three assignments and how each required them to engage with mathematics through activities that they would probably encounter at some point in their lives. For example, Gemini shared her learning from the Careers assignment, "We got to see more mathematics behind everyday things like jobs and finding the salary." Or, of the Bedroom Design assignment,

Raza said,

> I learned that interior designing has math in it, because interior designers need to know how much the total surface area is of something. And they can't just pick up like, go buy a couch or something, and hope it fits. They really need to measure it so it fits.

Here, Raza highlighted the importance of taking accurate measurements in this real-world context of interior design. Another student, Carla, also spoke to the Bedroom Design assignment and the impact it had on her views of mathematics. She recounted,

> I didn't know that you actually had to measure out each piece of cardboard that you put in [the 3D model]. I just kind of cut out whenever I thought and placed it in. I learned that measurements really are important and proportions because I found myself making a table that was shorter than the bed and then I was like, "Oh my God, that doesn't make any sense."

Indeed, when speaking about the assignments in the Lifestyles Project, the students shared multiple examples to emphasize the importance of mathematics, and more specifically, (correctly) applying mathematics concepts to accomplish everyday tasks successfully and efficiently.

Impact on Mathematics Learning and Understanding

While the Lifestyles Project had an impact on students' views of mathematics, the project also had an impact on the students' mathematics learning and understanding. First, students acknowledged that they were using mathematics throughout the project and this exposure gave them an opportunity to practice and enhance their learning and understanding. As Gemini expressed, "We were [doing] mathematics throughout it all, it was fun as we got to develop our math skills." Students reported that the contexts of the assignments helped them to develop a stronger understanding of mathematics concepts. For example, of the Bedroom Design assignment, Chandi reflected, "I got better at the surface area, which is something that I had originally trouble with." Junan echoed the positive impact of this assignment saying,

> I was okay at [surface area] before, but especially now when I was looking at the actual shape, I was like: On a paper, I don't count the backside [of furniture]…we can't see it. But, like actually seeing it [in 3D] because now if I were to look at my closet or something, I could say like, oh, I wouldn't count this because I can't see it is touching the wall.

As indicated here, calculating the surface area of shapes in the 3D models of furnished bedrooms, rather than making similar calculations based on 2D drawings as experienced in their previous learning, allowed Junan to improve her mathematics understanding. Students also described the value of other assignments on their mathematics learning and understanding. Referring to the Careers assignment, Rose shared, "Our whole class learned a lot about taxes and payrolls and careers… I don't think any of us really knew about this stuff before", which, as Raza highlighted, taught them "how to deal with money and have a better understanding of money." Indeed, the interdisciplinary and real-world contexts used in the assignments of the Lifestyles Project allowed students to improve their understanding in mathematics.

While most students described the Lifestyles Project as positively contributing to their mathematics learning, others found the project to be a hinderance. As Rose indicated, "I wouldn't want [class] always to be these projects,

because I would want to learn some math and stuff. I would prefer the majority of the year to be math." As evidenced in this quote, some students saw the Lifestyles Project to be unrelated to mathematics and mathematics learning, and questioned incorporating such projects into a *mathematics* class. For these students, experiencing and engaging in mathematics through the Lifestyles Project denied them the opportunity to learn mathematics concepts, which otherwise would have been possible if no project work was involved. Other students who struggled in learning mathematics through this project commented on its interdisciplinary nature. For example, Raza said,

> Sometimes, it was a bit confusing. What exactly do we need to do for the math and what for the other [subject's] part? So, maybe, have it like, first, we are going to do the English and then focus on the math. Make it clear.

For some students, it seemed that learning in an interdisciplinary way was challenging and having a clearer integration of mathematics with other disciplines might ultimately further their mathematics learning. These students seemed to prefer to take on each subject one at a time. As Carla shared,

> I prefer to keep [subjects] separate because it's so much easier. When you have two, my brain just won't process it. It's so confusing. Do we focus on the science, or math, or just focus on the writing part [for ELA]?

Students who struggled with the interdisciplinary nature of the project felt that a more compartmentalized approach to (mathematics) learning would lead to better (mathematics) understanding.

Affordances of an Interdisciplinary Team of Teachers

As described earlier, while the Lifestyles Project was developed primarily by the mathematics teacher, she developed this interdisciplinary project in collaboration with colleagues from other subject areas. Students mentioned this interdisciplinary teacher collaboration and many commented that this was a positive aspect of the project. For example, Cymbi said, "It's really interesting. It was cool to get graded by two different teachers at the same time on two different subjects. I really liked it. I would like that again." Students indicated that the involvement of multiple teachers brought different viewpoints to the classroom. In some cases, students found this to be beneficial for their learning. As Chandi shared, "I feel like [having multiple teachers] brings in a lot of different perspectives. If you have a question, you might get a different answer from each teacher. Maybe it's easier to understand things." Some students added that involvement of teachers from different subject areas made it less intimidating to ask questions. Of this, Karshi said, "I found it easier asking the science teacher about the math because they weren't going to be the one grading it and so I thought it was just like, good to have both of them there." As indicated in this quote, when needing support in a specific subject area, some students felt more comfortable approaching the non-subject specialist teacher who was not the one grading their work.

Despite most students appreciating the presence of teachers from different subject areas, this sentiment was not shared by all. Some students felt that the teachers had limited content knowledge beyond their area of specialization. Students expressed that, as a result, the teachers were not able to provide broad support during this interdisciplinary project. For example, Aura shared, "One teacher wouldn't know the answer to the question because this wasn't their area of expertise." Specifically, students shared that they could only get subject-specific

support from the teacher with that area of specialization (i.e., support about the mathematics component from the mathematics teacher). In other cases, students reported feeling confused because teachers had contrasting expectations of students' work. In reflecting on her experiences with the Bedroom Design assignment, Karshi said,

> We would ask [the art teacher] a question, she would say something. We would ask [the mathematics teacher] the same question, she says something completely different. It was just trying to figure out whose thing you run with...that was the most difficult part.

Lassa also highlighted a similar challenge when recounting her experiences with the Careers assignment. She shared,

> Sometimes I wouldn't know who I should actually listen to...like, the ELA teacher would say put it in three-point font or whatever, [then the] math teacher would just say, do whatever you want. I wouldn't really know who to go to.

Indeed, some students felt that having multiple teachers involved in the project resulted in a lack of clear guidelines and support. As Junan said, "A lot of the time, the teachers weren't on the same page. It was kind of confusing."

Discussion

Given the scarcity of first-hand student accounts of IdME, this study presents Grade 8 students' perspectives of and experiences with an interdisciplinary mathematics project. This IdME initiative was well-received by most students. Specifically, findings suggest that IdME can positively impact students' perspectives of mathematics. In our study, engaging in IdME allowed students to transform their perspectives towards mathematics and mathematics understanding by identifying and recognizing the connections between mathematics, other disciplines, and everyday knowledge (Kokko et al., 2015). First, these interconnections presented mathematics as an enjoyable discipline (An et al., 2016; Chao-Fernández et al., 2019; Lovemore et al., 2021), particularly impactful for students who did not previously see mathematics in this light. The positive shift in students' perspectives was partly due to the unique mathematics learning environment afforded through the IdME initiative. Specifically, the interdisciplinary and real-world contexts embedded in the project were a much-appreciated change from the ordinary and consistent work experiences in mathematics classrooms (Kokko et al., 2015). Second, the interconnections also underscored the importance of mathematics as a discipline that is inherently correlated, and essential to succeed in other disciplines and solve real-world problems (Chi, 2021; Ray, 2013).

Findings also suggest that IdME had a positive impact on students' understanding of mathematics. Through the use of IdME, students developed a stronger understanding of mathematics. Specifically, findings suggest that students gained a deeper understanding of concepts that are generally perceived as complex and abstract in mathematics, such as geometry (Cesaria & Herman, 2019). By learning and implementing such concepts within the real-life contexts of the assignments in the Lifestyles Project, students were better able to understand mathematics concepts they would typically struggle to understand. These findings are closely aligned with other studies (e.g., Brante & Brunosson, 2014; Kokko et al., 2015; Narode, 2011) where the use of interdisciplinary tasks in real-world contexts improved students' understanding of complex mathematics concepts like surface area and fractions.

A unique feature of the IdME initiative in this study was the interdisciplinary collaboration of teachers to plan and deliver the project. Findings suggest that students appreciated this aspect of the project because it allowed them to: 1) access different perspectives toward a particular topic or issue; and 2) ask questions from the non-grading and/or non-specialist teacher without being intimidated. At the secondary level, teachers are often traditionally trained to teach subject-specific knowledge within their disciplinary silos (Wang et al., 2020). Thus, interdisciplinary teacher collaboration can offer a promising solution to better implement IdME by supporting teachers to move away from siloed teaching practices and integrate subjects effectively (Margot & Kettler, 2019).

While most students in our study attested to the value of IdME for their mathematics engagement and understanding, some students were more hesitant of this interdisciplinary approach. Specifically, IdME challenged students' preconceived notions of mathematics only existing in a silo. Thus, the concerns raised by some of our participants are in line with existing research (e.g., Kokko et al., 2015) indicating that students often prefer ordinary, traditional or didactic forms of mathematics learning. Since school mathematics is often 'drill-and-practice' based (Lehtinen et al., 2017) and taught in a silo (Firdaus et al., 2020), it is reasonable that students experiencing disciplinary interconnections for the first time through IdME (as in our study) would not be used to this approach and find the adjustment challenging. For students already struggling with mathematics or learning through a new approach, the presence of an interdisciplinary team of teachers may further exacerbate the lack of clear guidelines and support required to implement IdME. For example, some students in our study reported being frustrated and overwhelmed when teachers had contrasting expectations of their work or when all teachers could not provide the broad support they required. It is reasonable to expect that teachers implementing IdME are not experts in all of the integrated subjects and may also have developed and are accustomed to their own pedagogical style that may or may not align with a potential collaborator from another subject (Firdaus et al., 2020; Johnston et al., 2020). While this highlights a potential challenge to the implementation of IdME, it equally provides an opportunity for exploring ways in which teachers from the different subjects may collaborate, or be supported to collaborate, in order to improve students' IdME experiences (Rennie et al., 2012).

Significance and Implications

Our study provides a detailed account of students' perspectives of, and experiences with IdME, and an interdisciplinary approach to teaching and learning more broadly. Thus, our study is a valuable contribution given that existing research tends to focus on teachers' perspectives towards IdME (e.g., Ozturk & Erden, 2011; Saleh & Shaker, 2021). While we acknowledge that some conclusions of our study may be specific to the design and implementation of the Lifestyles Project, the importance of first-hand accounts by students in educational research cannot be underestimated. Indeed, students' perspectives can inform teachers' practices (Cook-Sather, 2006). For example, recognizing students' interests in interdisciplinary tasks can help teachers consider the approaches they use in their teaching, including transforming lesson goals and activities to maximize mathematics learning and improve students' achievement (Brante & Brunosson, 2014).

We see our study as providing a worthy contribution on IdME and interdisciplinary teaching and learning. Yet, there is a need for further research on IdME across diverse educational contexts and ways to implement new

interdisciplinary experiences of mathematics with other areas of knowledge. Interdisciplinary teacher collaboration, as seen in our study, may be one way to support the implementation of IdME. To fully reap its benefits, we encourage school administrators to consider ways to support collaborative efforts including providing common times for teaching teams to meet or providing opportunities for teacher professional development. This practical commitment to teacher development coupled with ongoing research on IdME to expand the knowledge base will provide the necessary foundation to transform mathematics instruction and allow all students to thrive in our contemporary society.

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