



Short Communication

Inquiring about Perinatal and Reproductive Health in Undergraduate Education

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Abstract

This paper discusses a novel course for undergraduate health sciences students. This course, *HTH SCI 3NN3: Inquiry in Perinatal and Reproductive Health*, is rooted in an inquiry-based learning approach (using the IREC framework). The course started in the Winter 2021 term in an online classroom due to COVID-19, with its second cohort in Winter 2022. The primary objective of *HTH SCI: 3NN3* is to introduce students to a diversity of perinatal health topics ranging from midwifery, obstetrics, lactation, social/cultural dimensions of health, healthcare access, and global health — through different educational methods. These methods include discussions, guest lectures, and a semester-long inquiry group project. For many of our students, *HTH SCI: 3NN3* is their first formal education in perinatal health despite personal interest in these topics. Students appreciate the variety of perinatal health research topics presented in the class as well as the opportunity to work in a group, study a relevant topic of their choice, and to create and refine a project over the semester. Although the course has been well received, students also face challenges with the technical writing required by the course as well the pressures associated with academic grades — difficulties experienced by many learners. The positive reception and enthusiasm in *HTH SCI: 3NN3* speak to the importance of including perinatal and reproductive health in undergraduate education and aligning curriculum with students' interests to help ensure their academic success.

Keywords: Perinatal and reproductive health; Perinatal health education; Reproductive health education; Inquiry-based learning; Health sciences education; Undergraduate science education

Introduction

Global strategies and commitments have recently been made to improve women's healthcare, such as making sustainable changes to facilitate access to perinatal care services and enhancing antenatal health education [1–3]. Despite these commitments, perinatal and reproductive health are often excluded from education, including at the undergraduate level. University students remain misinformed with respect to reproductive health, sexually transmitted infections, pregnancy, miscarriages, and reproductive care options. A straightforward solution would be to include these topics in undergraduate curricula [4–7]. Perinatal and reproductive health in post-secondary education has improved students' evidence-based knowledge on these topics, which then assists them in their other studies and future careers. Additionally and importantly, increased knowledge in reproductive health also enables students in making more informed personal health decisions [6,8]. In light of these benefits, it seems clear that increased efforts need to be made

to actively include perinatal and reproductive health topics into university curricula. Introduction to such topics can ensure health sciences students have a well-rounded understanding with respect to this component of healthcare as well as exposure to perspectives of different patient populations.

McMaster University's Bachelor of Health Sciences Honours (BHSc) Program is uniquely multidisciplinary, encouraging students to learn about current health issues through various lenses in order to holistically understand them [9]. At its core, the BHSc Program is an inquiry-based pedagogy, emphasizing skills development across the span of the degree [10]. In spite of the interdisciplinary nature of BHSc, before our course there was no content explicitly focusing on perinatal and reproductive health within the Program. It was important to fill this curriculum gap due to the aforementioned significance of these fields locally and globally. Approximately 65% of BHSc students attend medical school after graduation [11]. Thus, it is even more important for these students to understand reproductive health and the issues relevant to the childbearing and neonatal populations. To help fill this need, we developed, *HTH SCI 3NN3: Inquiry in Perinatal and Reproductive Health*, a course for third- and fourth-year students centred around the IREC

inquiry education model [12]. Briefly, IREC incorporates four phases where learners:

- 1) **Inquire:** ask and refine research questions.
- 2) **Research and Reflect:** to gather the relevant information for their questions.
- 3) **Evaluate:** appraise their collected research and discuss its relevance to their questions.
- 4) **Construct:** synthesize and review their work to share with others.

Course Purpose and Structure

The purpose of *HTH SCI 3NN3* is for students to understand facets of the preconception, prenatal, and postpartum periods by studying the current research. Students can choose to examine perinatal issues through the perspectives of medicine, humanities, social/cultural

dimensions of health, healthcare access, global health, midwifery, and nursing over a four-month semester.

For students to appreciate the myriad of topics and issues related to perinatal and reproductive health, experts are brought in to share their current work via lectures and group discussions. To prepare for the arrival of the invited speakers, students are required to read and share their thoughts on relevant research articles as well as prepare questions for each guest expert. These “Response Notes” ensure that students are prepared to thoughtfully engage with the presented topics.

The major assessment piece of *HTH SCI 3NN3* is a semester-long inquiry group project based in the IREC model [12]. Students are divided into groups of four or five to develop a research question based on a perinatal topic of interest. Over the term, students advance their projects based on four assignments (Table 1). As instructors, we review each assignment to provide ample feedback concerning how they can refine their ideas to further develop their inquiry, critical thinking, and scientific writing skills.

Assignment Name [12]:	Description
INQUIRE	Introduction of the group’s topic of choice, preliminary ideas, research questions with respective rationales, and next steps.
RESEARCH AND EVALUATE: PART ONE	Sharing of the refined research questions and the resources key to the project. Students are to reflect on the gathered information and whether it has exposed gaps in the proposed questions.
RESEARCH AND EVALUATE: PART TWO	An expansion of RESEARCH AND EVALUATE: PART ONE, students elaborate on their selected topic by deeply reflecting on the available literature; commenting on broader connections and proposing potential solutions. This assignment is the students’ last opportunity to submit work for instructor feedback prior to their final submission.
SYNTHESIS	Presentation: Students showcase their project for the class in an interactive 30-minute presentation. Final Paper: Students critically appraise their topic of interest and provide their final analyses of their refined research questions. This paper encourages students to share their new expertise, any alternative perspectives, solutions, and research gaps to inform future work.

Table 1: *HTH SCI 3NN3* inquiry group project components.

Learnings from COVID-19 course adjustments:

In Fall 2020, it was announced that the Winter 2021 term was to be conducted virtually in response to the ongoing COVID-19 pandemic. Therefore, all classes were held in an online classroom for the safety of students, instructors, and guests. A benefit of teaching online was that guest speakers from outside of the Hamilton area were more easily able to be a part of our class because they did not have to travel to campus; rather, they could attend class remotely. In response to the transition from virtual to in-person classes in the Winter of 2022, we continue to invite guest lecturers to participate remotely. This approach has allowed guests to join us from around the globe. We encourage other instructors to continue to consider the utility of technology and virtual options post-pandemic. Virtual options facilitate the presence of guests and ensure that a wealth of relevant topics and a variety of perspectives are discussed.

Course Experiences

Overall, *HTH SCI 3NN3* is a pleasure to teach, and many of our students have shared how thoroughly they enjoyed the course. Coming in to 3NN3, most BHSc students have no perinatal health knowledge apart from what they

learned about pregnancy and the reproductive tract in their single year-long Anatomy & Physiology course. As students had continued interest in the subject area, and perceived a gap in their learning, they were excited for this course. Students’ positive responses to *HTH SCI 3NN3* illustrate the need for a continuous evaluation of curricula to ensure a large array of course topics are available that target learners’ diverse interests during their undergraduate education [13–15]. We continue to be impressed with our students’ effort, interest, and engagement in the course topics. We look forward to teaching *HTH SCI 3NN3* in the coming years and further refining the course.

Student engagement:

A major indicator of the success of our course is how students positively respond via their in-class participation. Throughout the entire term, our students remain engaged in the material and share their interests in perinatal health. Two major reasons for consistent student participation in *HTH SCI 3NN3* have been: students’ personal interest in the subject matter, and the small class size, something common in inquiry-based teachings. Despite the difficulties imposed by the pandemic, every class has been filled with lively discussion pertaining to the week’s topic. While the distance associated with an online learning environment can create a

disconnect between students and instructors, the active engagement of our learners and the small class size help create a lively and effective class dynamic.

Many of our students express a desire to pursue future careers in perinatal health, and all of them have the desire to learn. Thus, they come prepared for each class and remain mentally focused. A few of our past students also came with research experience or jobs that connected to antenatal care, enriching the experience for all learners. The literature showcases how students' personal interest in a course provides motivation throughout their studies, helping to ensure their academic successes [16,17]. When reflecting upon course design, it is important for faculty to consider aligning their curriculum with student interest, so they are encouraged to excel academically.

Our past and present students have also shared how they enjoy the small size of the course as this facilitates comfort with the group. Outside of class, students share articles, useful resources, and assignment feedback in an online platform – to continue participating in the course asynchronously. That students spend additional out-of-class time dedicated to *HTH SCI 3NN3* speaks to both their engagement with the learning material and their feelings of safety in receiving constructive feedback from one another. Additionally, the small class size facilitates comfort and participation in class discussions, as well as provides ample opportunity to ask further questions of their peers and instructors to improve their knowledge and skills.

Academic support:

Another major benefit of a small class has been the amount of time we, as instructors, can take to get to know each learner to provide specific and personalized feedback regarding improvement of their assignments. This includes aspects such as written communication skills or approaching the research literature — benefits that translate to other classes, as well as students' skills as lifelong learners. Often, departments face difficulties with the organization, feasibility, and costs associated with small class sizes. However, for undergraduate learners, an inverse relationship has been reported between high academic achievement and large class sizes [18,19]. That our students can remain focused and engaged, even when online, speaks volumes to the benefits of small-group learning. Therefore, it is recommended that universities, departments, and faculty consider the advantages of small classes with respect to the ability to offer increased student support. We are hopeful that more programs in the future can incorporate smaller class sizes and the IREC model their curricula.

Inquiry research project

Our students appreciate how their semester projects were rooted in the IREC model. The iterative nature of this approach allows them to continuously engage with the inquiry process and problem-solving in their assignments and scaffolds their progress. Students are assigned to their groups to ensure an even blend of third- and fourth-year students; balancing students' levels of experience and allowing opportunities for support and mentorship. Working in groups

also allows students to improve transferrable skills such as interpersonal communication and conflict resolution, lessons they can use in future collaborations. Each group works together to select the topic of research for their project. Past topics have ranged from exploring Kangaroo Care (skin to skin contact between caregiver and baby) to the effects of chlamydia in pregnancy. Since each project group researched very different subjects, having groups share their work throughout the semester augmented the course content by introducing students to additional perinatal health topics that were not necessarily addressed by the in-class speakers or discussions.

The inquiry project is designed to be open-ended. Once students choose the topic they wish to explore, the continuous and iterative nature of the work throughout the term allows them to engage deeply with their questions and the scientific process. Our students display initiative by completing their assignments with significant attention to detail and well thought out, thoroughly researched ideas. We also give ample feedback and speak with each group individually regarding their strengths and areas of improvement to help refine their ideas for the final paper and presentation. Operationally, the major drawback of a semester long research project is the amount of time instructors require to engage with students' projects. We carefully review each group's work because of the vast differences between projects; our goal is to provide students with as much feedback and guidance as possible to help ensure their academic success. Therefore, a small class size is required to feasibly include a large inquiry project in a course. It has been remarkable to see the progress and enjoyment our students had with their projects. We encourage other educators to consider incorporating something similar in their courses where feasible.

Overall, the flexibility of inquiry group projects allows learners to explore a topic that interests them, as well as helps individuals refine their independent research, collaboration, and project management skills. Flexibility is something to be woven into undergraduate curricula, as the independence students receive from this educational method encourages reflection and critical thinking with respect to acquiring their new knowledge [20]. An adaptable curriculum design also inherently encourages innovation and creativity to learners, traits which are frequently overlooked in undergraduate education. While educational activities rooted in creativity remain underrepresented in undergraduate science curricula, some educators have emphasized innovation by having students use their imaginations in research question development or problem-solving, such as creating examples for scientific concepts, and drawings [21,22]. The IREC inquiry model encourages active learner engagement, which serves as motivation for students to creatively incorporate their personal interests into their studies, something that should continue to be emphasized in academia [12].

Student Struggles with *HTH SCI 3NN3*

Although many of our students have shared how much they enjoyed the course and past students received high scores, not surprisingly, our students have experienced some struggles. Principal student challenges associated with HTH

SCI 3NN3 were the scientific writing required by this course and the common student stresses associated with grades.

Writing:

In reading students' assignments and in our feedback sessions, our students shared that throughout their undergraduate education, they had limited opportunity to engage with and refine their scientific writing skills. While some of our students mentioned that they had taken a writing class, they felt they needed more exposure to scientific writing to further refine these skills. We felt to best support our learners, we needed to provide more discussion and resources surrounding scientific writing during the term to help students to express their thoughts within their inquiry projects. Emphasis on providing writing resources, such as David Lindsay's Scientific Writing = Thinking in Words [23], is something we will continue to offer to future cohorts. Other undergraduate science students and faculty have shared the benefits of including scientific writing exercises, such as forming a cohesive argument, into courses to improve students' written communication skills. However, writing remains largely absent in undergraduate science programs [24,25]. Typically, due to the large class sizes in undergraduate studies, learning assessments are derived from knowledge-based tests, such as multiple-choice exams. Thus, students have minimal opportunity to practice writing. In accordance with Miller's four level assessment pyramid, multiple choice tests only cover the first level of knowledge – recall – as opposed to allowing students to demonstrate their expertise [26]. Writing activities encompass level two of Miller's pyramid because in writing responses, learners have to reflect, interpret, and apply their new knowledge as opposed to simply recalling course content [26]. Therefore, it is important for instructors to develop assessments that have students not only demonstrate their knowledge, but to the ability apply it via the written word.

Grades:

Our students are extremely hard working determined individuals with high academic standards. These traits can unfortunately and paradoxically, impede learning. Oftentimes students' major focus, like many ambitious students, is not what they are learning per se, but the final grade on their transcripts. Undergraduate students face continuous pressures to receive the highest grade-point-average possible to have a competitive edge for scholarship opportunities, jobs, and future education such as professional or graduate school. Given the significant weight of grades in society, it is no surprise that our students focus on the quantitative outcomes of the course, rather than the learning process and their personal growth. Particularly given the self-directed nature of inquiry, students can feel a lack of control towards their grades, which brings them anxiety [27]. For example, some students have worried about missing project expectations – looking for opportunities to receive a better grade – the result being they fail to recognize the importance of defining expectations for themselves. Faculty need to speak openly about the competitive nature students have towards grades and try to get learners to prioritize learning as well [27]. While

grades are likely to remain an ever-present quantitative measure and communication tool in education, it is important for educators to facilitate students' realization that learning is often disconnected from the grades they receive. To aid our students' awareness of their learning process and growth in *HTH SCI 3NN3*, we had them complete personal learning reflections at mid-term, and at the end of the semester. In their responses, some thought beyond their grades by commenting on what they found interesting in the course as well as what they learned from their peers and group dynamics resulting from the inquiry projects. We advise other educators to consider, and we are going to continue, including reflections into curricula in hopes of having students think beyond their grades.

Implications and Next Steps for HTH SCI 3NN3

Together, engaged students and a small class size create a friendly and supportive dynamic that encourages learners to academically challenge themselves by asking deep questions and critically appraise literature relevant to *HTH SCI 3NN3*. As students had very minimal perinatal health knowledge, it has been important to introduce them to lesser-known topics. For example, midwifery-based obstetrical care is foreign to the majority of Canadian students; introducing this topic facilitates a wider understanding of perinatal care services and models of care. It is great to see how our students learn about a previously unknown health profession. Several students are now interested in pursuing a midwifery career because it aligned more with their clinical interests than other professions.

Given how influential undergraduate courses can be for students, it is important to offer a diversity of introductory topics and opportunities for students to expand their new knowledge in 'more specialized courses.' In a single term, we are only able to scratch the surface of perinatal and reproductive health; therefore, in the future, it would be great to offer courses that expand on *HTH SCI 3NN3*. Creating a subsequent antenatal health course, such as one focused on nutrition in pregnancy or different models of maternity care, would give students more exposure to these fields to accommodate their academic interests. Giving students more exposure to perinatal health will help them make more informed decisions on the fields in which they potentially want to focus their future education or careers.

Closing Remarks

Overall, *HTH SCI 3NN3* filled a content gap concerning perinatal and reproductive health that existed in the BHSc Program but is also common elsewhere. The small class environment provides a space for the students to discuss, ask questions, and receive ample feedback from instructors. The IREC inquiry model provides iterative opportunities for students to actively think about their learning goals, research skills, and their personal interests in perinatal health. As our students have had minimal prior exposure to the field, they appreciate learning about a range of topics presented by community providers, faculty, and peers. Such sharing allows students to translate their new learning to real-world applications.

The students' challenges with scientific writing illustrate another common gap in undergraduate education that can be addressed in additional classes or assessment re-design. Our experiences also speak to another major stressor students face with the pressures of achieving high academic grades. Undergraduate education needs to place more emphasis on students' process and facilitate a space for students to value the learning progression—rather than simply final marks. As instructors, we are gratified to see how much our students enjoy the course. Their continued participation and enthusiasm propel each class forward. Without these high levels of engagement, this class would not be as successful and enjoyable. We hope by sharing our experiences that other curriculum designers will see the benefits of inquiry learning and perinatal and reproductive health teachings in undergraduate education.

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