

## Research

# Empathy for the health professional in online asynchronous graduate education: an initial design thinking approach to program improvement

Ilana Bayer<sup>1,2</sup> · Asiana Elma<sup>1,3</sup> · Muhammadhasan Nasser<sup>1</sup> · Lawrence Grierson<sup>1,3,4</sup>

Received: 9 May 2022 / Accepted: 16 June 2022

Published online: 23 June 2022

© The Author(s) 2022 **OPEN**

## Abstract

**Introduction** Health professionals engage in continuous professional development through higher education. As traditional university learning environments pose a challenge to working health professionals, distance education allows these learners to engage in higher education in alignment with their learning preferences and needs. Literature on health professional learners' experiences in online learning environments report findings at the course level and/or focus on a singular aspect of the online learning experience.

**Objectives** In this initial study, we aim to understand the health professional learner's perspective in a distance graduate education program and make normative recommendations to improve the health professional learner experience in an online environment.

**Methods** Within the context of the *Empathy* arm of Deitte and Omary's (Deitte and Omary in Acad Radiol 26:1417–1420, 2019) Design Thinking methodology, we conducted a two-part sequential explanatory qualitative study. Part 1 involved focus groups with stakeholders (n = 14) of the Health Science Education (HSED) Graduate Program at McMaster University (Hamilton, Canada). Part 2 entailed semi-structured interviews with learners (n = 11) in the HSED Program. An unconstrained approach to directed content analysis was used to analyze the data and construct themes.

**Results** An overarching theme of 'the learner experience is an autonomous-supportive online learning environment' was constructed, with two sub-themes: learner autonomy and building community.

**Conclusion** Learners valued an autonomous-supportive online learning environment wherein they could tailor their educational experiences while also fostering a sense of community in the online environment. Future research should consider how a balance between maintaining autonomy in pacing learning and building community can be achieved to enhance the health professional learner experience in an online environment.

**Keywords** Medical education · Design thinking · Distance education · Student experience · Online learning · Higher education

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s44217-022-00009-8>.

✉ Ilana Bayer, [bayer@mcmaster.ca](mailto:bayer@mcmaster.ca) | <sup>1</sup>Health Science Education Graduate Program, Faculty of Health Sciences, McMaster University, Hamilton, Canada. <sup>2</sup>Department of Pathology and Molecular Medicine, Faculty of Health Sciences, McMaster University, Hamilton, Canada. <sup>3</sup>Department of Family Medicine, Faculty of Health Sciences, McMaster University, Hamilton, Canada. <sup>4</sup>McMaster Education Research, Innovation, and Theory (MERIT), Faculty of Health Sciences, McMaster University, Hamilton, Canada.



## 1 Introduction

As part of a larger commitment to improving the quality of healthcare for patients and communities, many health professionals engage in continuous lifelong education and learning [1]. This is typically understood in terms of continuous professional development and often includes those opportunities that practitioners have to enhance their clinical knowledge, refine procedural techniques, and extend the scopes of their practices [2]. However, health professionals pursuing this professional development are increasingly selecting higher education (i.e., graduate training). Health professionals engage with graduate-level training to build increased capacity and capability to contribute to their chosen fields in ways ancillary to their core patient care responsibilities: clinical teaching, pursuing academic leadership, research, and more [3]. Although this type of learning is appealing to many practitioners—though it is typically not required to obtain or maintain licensure—the programs that offer this type of education are often delivered in traditional university learning environments, which operate on rigid schedules requiring consistent physical attendance. This can pose a problem for interested health professionals, as the high demand and pressures for productivity in their professional lives may preclude them from being able to meet in-person participation requirements [4].

The rise in online, at-a-distance approaches to higher education, spanning a range of professional disciplines [5–7], seemingly presents effective new opportunities for health professional participation [8, 9]. In particular, asynchronous online education poses a unique opportunity for working health professional learners, allowing them to complete learning activities with greater flexibility and freedom [3]. Nevertheless, asynchronous online approaches are also accompanied by a new set of unique challenges concerning engagement and satisfaction [10, 11]. For instance, Dyrbye and colleagues conducted a mixed-methods survey of the experiences of clinician-educators ( $n = 71$ ) in an online graduate health professions education program (i.e., concerned with building skills in clinical teaching). The researchers obtained a 68% response rate (48 respondents, including 45 physicians) and using qualitative analysis, reported that the lack of regular, synchronous face-to-face interactions gave way to communication difficulties and challenges in establishing relationships with instructors, peers, and staff, as well as time commitments [12]. Disconnectedness such as this can lead learners to feel isolated from the learning community and ultimately dissatisfied with their learning experiences [13, 14].

While the greater higher education literature sheds light on the learner experience in distance education in several disciplines, beyond the Dyrbye study [12], scholarly research on health professional (or any professional who is pursuing higher education while concurrently working) experiences in distance education programs remains limited, as do normative recommendations on how to improve experiences for these learners. For example, Yang and colleagues emphasize the importance of institutional and instructional support that facilitates learner connectivity [5]; but what this support might look like for health professional learners has not yet been distilled. Literature that does report on health professional learners' experience highlight evaluative outcomes at the individual course level [15–18] or focus on singular aspects of online learning (e.g., building communities of practice) [19]. Accordingly, this initial study considers holistic experiences at the program level, investigating health professional learner perspectives in an asynchronous online graduate program in a manner informed by a Design Thinking methodology [20].

## 2 Methods

Design Thinking is a human-centered process of evaluation and innovation that fosters collaboration between and among stakeholders as well as the integration of multiple perspectives to understand issues and develop solutions that are appropriate for all users [21]. This methodology has been used across various disciplines to understand and approach complex challenges, as the nature of Design Thinking is relatively open-ended [22]. However, in this study, we have employed the Deitte and Omary version of the Design Thinking framework, where the methodology is divided into five stages: (1) *empathizing*, where user experiences are considered and an understanding of their needs and preferences are understood; (2) *defining*, where the most pressing and meaningful challenges and/or opportunities are described; (3) *ideating*, which involves contemplating solutions that may be impactful in addressing the described challenges; (4) *prototyping*, where the most impactful (and feasible) ideas are developed; and (5) *testing*, during which prototypes are piloted and results are shared with all stakeholders for their input, feedback, and suggestions for improvement [23, 24]. A review by Altman and colleagues found that interventions developed using Design Thinking were more effective, easier to use, and accepted relative to traditional, expert-based solutions [25].

Accordingly, in this initial study, we operationalize the *Empathy* stage of the Design Thinking framework as described by Deitte and Omary [23]. This paper presents the results of our investigation to gain a deeper understanding of the needs, preferences, and challenges that health professional learners face in an asynchronous, online education graduate program; an understanding which is ideally positioned to support the development of novel solutions to address these challenges.

## 2.1 Study design

This two-part sequential explanatory qualitative study contemplates the *Empathy* stage of a Design Thinking project aimed at improving and enhancing the educational quality of the Health Science Education (HSED) Graduate Program at McMaster University. The first part comprised an empathy-focused mapping stage with program stakeholders; the second part involved a series of semi-structured interviews with program learners. The design was sequential insofar that the empathy mapping phase informed the development of the interview guide used in the second phase.

## 2.2 Research team

The research for this study was conducted by the authors of the paper. The initials of the authors (IB, AE, MN, LG) are included in the methods section to indicate the stages in which each team member(s) played a role.

## 2.3 Study context

This study was conducted in the context of the HSED Program, which is an online, primarily asynchronous, Master's of Science-level degree training program in the Faculty of Health Sciences at McMaster University in Hamilton, Ontario, Canada. The HSED Program is designed to provide clinicians seeking Master's-level training the theoretical and practical foundations to become more effective and innovative health professions educators. Learners in the HSED Program are typically working health professionals from a wide variety of disciplines who teach in health sciences education, research, and academic clinical care, and who hold leadership positions in healthcare and health professions education settings (see <https://hsed.mcmaster.ca/> for details about the HSED Program).

The majority of learning activities in the program are administered online and asynchronously, allowing active health professionals to pace their academic work alongside their professional roles [26]. However, learners are required to engage in two mandatory in-person events during their time in the program. Before beginning their studies in the online environment, incoming learners attend a week of mandatory, in-person sessions in the summer months preceding their first term to orient them to the HSED Program and familiarize them with their fellow learners and faculty. Likewise, learners nearing completion of their degree also engage with a week of in-person sessions surrounding their final curricular requirements in the summer months preceding their final term [26].

## 2.4 Ethics approval

This study was approved as an education quality improvement activity by the Hamilton Integrated Research Ethics Board.

# 3 Part 1—empathy mapping

## 3.1 Participants

There were 14 focus group participants, which included 8 faculty members who were involved in health professions education, 3 student representatives, an educational developer from the funding institution, 1 graduate officer for the HSED Program, and the HSED Assistant Dean. This process was mediated by a group facilitator (IB).

## 3.2 Data collection

Focus group participants were assigned to smaller “user groups” according to their respective roles: one group of learners (3 members), 2 groups of faculty who teach the HSED Program (4 members per group), and one administration group

(3 members, comprised of the developer, officer, and dean). Each user group generated “empathy maps” on physical poster charts, which were defined by four quadrants: “Think”, “Feel”, “Say”, “Do”. Using the maps, the users were asked to categorize their experiences in terms of their thoughts, observations, feelings, and actions [27]. In this context, the empathy maps illustrated what each user group did, said, thought, and felt as it related to their experience in the graduate program (Fig. 1).

### 3.3 Data analysis

Empathy maps were analyzed using thematic analysis by two researchers (IB and AE) in order to capture the important elements of the user experience [28]. Thematic analysis began with a close reading of the empathy maps to ensure familiarity with the data. The two researchers (IB and AE) then independently analyzed the maps using open and axial coding techniques to inductively generate categories regarding the learner experience in the online program [29]. Differences in coding outcomes were reconciled during research team meetings with IB, AE, and LG. The findings derived from the empathy maps informed the development of the semi-structured interview guide used in Part 2 of the study.

## 4 Part 2—semi-structured interviews

### 4.1 Participants

Part 2 of the study involved semi-structured interviews (total n = 11) with current learners (n = 8) and very recent graduates (n = 3) of the HSED Program (Table 1). We ceased recruitment with consideration for the concept of information power as described by Malterud and colleagues—essentially, recruitment of interview participants until sufficient information was collected to meet the research objective described above [30].

# Empathy Map: Student

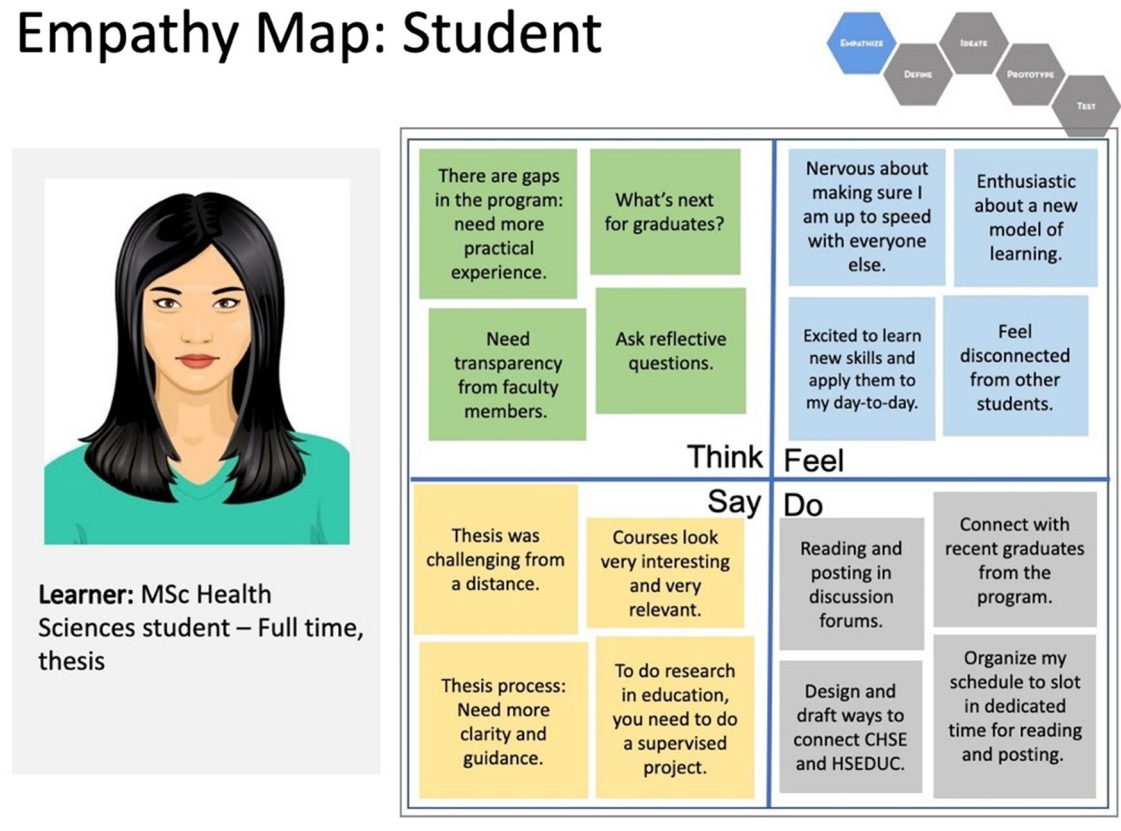


Fig. 1 An example of an empathy map created by a full-time, thesis-based learner in the MSc Health Science Education Graduate Program

**Table 1** Participant demographic data

Characteristics	Participants (n = 11)
Sex	
Male	3
Female	8
Student academic load	
Full-time	5
Part-time	6
Student program pathway	
Course-based	5
Thesis-based	6
Interview format	
In-person	4
Zoom communications	7

## 4.2 Data collection

Participants were recruited through email requests using a purposive sampling technique, to maximize diversity in learner's academic load (i.e., full-time, part-time) and program pathway (i.e., course-based, thesis-based) [31]. Interviews were conducted either in-person, by online video-conferencing platform, or by telephone, according to each participant's preference. These interviews were facilitated with the use of an interview guide that consisted of questions contemplating the structure of the program as well as its perceived strengths, weaknesses, gaps, and opportunities. See Online Resource 1 for a full interview guide. The interviews were conducted by one of two researchers (IB and AE) and lasted approximately 30 min. All interviews were recorded digitally, de-identified (IB), and transcribed verbatim prior to analysis.

## 4.3 Data analysis

The interview data were analyzed by an unconstrained approach to directed content analysis informed by the analysis performed in Part 1 of the study [32]. This again began with a close reading of interview transcripts and progressed through a process of deductive, line-by-line coding to identify resonance with the analysis completed in Part 1. The transcripts were also coded inductively to identify other experiences relating to the learner experience in an online program [29]. Independent coding of the first three transcripts was completed by two research team members (AE and MN). Upon completing the first three transcripts, these researchers met to review their codes. The full research team (AE, MN, IB, and LG) then met to reconcile coding differences and reach a consensus on the final coding framework. Once the coding framework was finalized, the remaining transcripts were coded consistently by a member of the research team (MN) on the qualitative software program, NVivo (QSR International, Doncaster, Australia). Codes with conceptual similarities and characteristics were grouped together by the full research team to form higher and broader level categories, which were then ultimately expressed as one overarching theme, with two subthemes that gave a focused explanation of the learner experience in an online program. Member checking was conducted by sharing the findings with three program stakeholders to ensure the findings resonated with the participants' sentiments and the nature of the overall program [33]. The interview transcripts were not returned to participants for commentary. Additionally, the research findings were not returned to study participants.

## 5 Results

### 5.1 Part 1—empathy mapping analysis

Analysis of the empathy maps revealed that learning challenges in the HSED Program were related to the use of technology for curricular activities, support received and provided to learners, challenges and barriers associated with communication between fellow learners as well as staff and faculty, and feelings and perceptions of connection and workload management. Interview questions were accordingly structured around the aforementioned challenges.

### 5.2 Part 2—semi-structured interviews

One overarching theme was identified as relating to the health professional learner experience in the online HSED Program. There was an overarching theme of ‘the learner experience is an autonomous-supportive online learning environment’, constructed based on responses to semi-structured interview questions, which were informed by results associated with empathy maps in Part 1 of the investigation. This overarching theme also yielded two subthemes relating to the experiences of ‘learner freedom and autonomy’ and ‘fostering and building of community within the program’. These subthemes also include considerations around the online environment and the opportunity for professional development (Table 2).

#### 5.2.1 Learner freedom and autonomy

Learner responses alluded to their ability to control and tailor their learning experiences, specifically with respect to their capacity to balance both professional and educational activities through self-management of their schedules. The online environment provided learners with the flexibility to tailor their activities to their individual circumstances and available time to engage with these activities. This level of autonomy was perceived as enhancing a positive learning experience. Particularly, participants described the online, asynchronous delivery to be appealing with respect to the ability to balance the various responsibilities associated with their full-time professional work.

*“It appealed to me because there was such a large online component because being somebody who is also clinically busy, I can’t make it to class regularly. So, that was really appealing” (P3).*

Autonomy was also reported as another valued aspect of the asynchronous aspect of the program. In addition to allowing them to maintain professional work capacity, the asynchronous and flexible nature of the program allowed learners to set their own individual pace for completing learning activities and curricular requirements based on their personal learning needs and preferences.

*“I enjoyed the flexibility that it provided. So, being able to watch the videos at my own pace and kind of keep up with the readings and work it around my schedule is very convenient” (P8).*

#### 5.2.2 Building a community

In general, participants shared an appreciation for the in-person interaction with fellow learners during the mandatory in-person orientation week. They expressed these opportunities as enriching. Specifically, learners who had previously met during the in-person program events were more equipped to form relationships and deepen their connections with peers, fostering a sense of community in the online learning environment.

*“We met in-person for Residency Week where I got to know all of my classmates. And, when we did the online courses, it was nice to be able to engage with those same people online which I just found was really nice. You start to build sort of relationships and community and that kind of thing” (P3).*

In particular, learners expressed an appreciation for the presence of in-person sessions at the beginning of their time in the program as it promoted a sense of “group identity” and enriched subsequent online interactions:

*“...having formed that bit of a sense of group identity at the beginning really did make it richer to have those discussions with colleagues that you could picture. You could feel connected to when you are totally online” (P11).*

**Table 2** Thematic analysis

Themes	Subthemes	Subtheme considerations
The learner experience is an autonomous-supportive online learning environment	Learner freedom and autonomy Building a community	Challenges with the online learning environment Opportunity for professional development

However, participants described the challenges associated with the online learning environment, particularly concerning how they hindered the construction of community. To this end, 91% of participants (n = 10) generally described negative experiences with asynchronous collaboration and discussions, which were perceived as a source of disconnectedness relative to in-person collaborative learning environments, which were seen as being more conducive to connectedness.

*"I think most people wrote their discussion post as like mini essays rather than how you would actually talk if you were talking in the class. So, I think that was where I felt the most disconnected" (P7).*

Furthermore, interviews revealed that asynchronous online settings of collaboration were perceived as inauthentic and inferior to in-person settings due to a lack of contextual cues, pauses, and body language:

*"...because in text and on the Internet, things can often be misconstrued. Or you lose the sort of nonverbal or the nonverbal cues that you might get from somebody when you are conversing with them in-person or on video. So, some of the inflections or the meanings or how they are trying to say something can be misconstrued or lost." (P5)*

That said, 82% of participants (n = 9) indicated that they enrolled in the program with the specific intention to learn how to educate trainees and colleagues in health professional roles. They thus viewed the program as an opportunity to advance their professional training and development of educational theory, development, and research. Accordingly, most participants highlighted that the curriculum and learning activities within the program had a high degree of applicability and relevancy to their personal and professional aspirations. These perceptions, however, related not to the asynchronous online delivery of curricular materials and teaching and learning activities, but rather the influence of the online environment on professional development. Specifically, online delivery was seen as facilitative to the breadth of the professional network that they were able to develop via their involvement in the program:

*"I mean that network of people that I met were extraordinary. My ability to translate some of my research into practical changes at a curricular level has been important. I have been invited to speak at other schools and within the school of medicine at my institution because of the work I have done." (P11)*

This reflects the nuanced nature of participants' perceptions around building community in a primarily asynchronous online learning environment. While in-person activities contributed to community formation, asynchronous collaboration was seen as an impediment to connection. Nevertheless, asynchronous online delivery also allowed for the creation of robust professional networks.

## 6 Discussion

This study's primary objective was to explore health professional learners' experiences in the online graduate program and identify the needs and challenges that shape their experience in the program. Though participants generally reported positive experiences about the degree of autonomy and flexibility offered by the asynchronous nature of the program, they also highlighted challenges associated with the formation and maintenance of community and connection with other users in the online learning environment and its inferiority to in-person activities.

It is clear from this analysis that the freedom to self-pace the learning experience based on personal and professional constraints was necessary for a positive learning experience. As busy, full-time working health professionals enroll in the program with the desire to equip themselves with educational leadership and scholarship skills, it can be challenging for them to balance professional obligations and pursue formal education through traditional means. With an alternative mode of delivering education, learner participants found online learning appealing as it provides them with the flexibility and autonomy to tailor their learning towards both their professional and personal needs and goals; especially given the largely asynchronous nature of the program under study. The finding is reflective of the elements of Knowles' Adult Learning Theory as adult learners tend to be goal- and relevancy-oriented when pursuing further education [34, 35]. Specifically, learners bring past professional experiences and are motivated to continue learning based on their interests, past experiences, and professional needs. With the autonomy offered through the primarily asynchronous online graduate program, learners can act as active agents in shaping their learning experiences to be individually relevant to their professional goals and experiences.

However, although Knowles's theory captures the participants' self-regulated learning style, it fails to account for the consequences of autonomous learning and the importance of dialogue and discussion as part of the learning experience. Vygotsky's Social Constructivist Theory provides us with some insight as it explains that the learner is an active



participant in creating knowledge and shaping their learning experience; however, this is understood as happening in social settings rather than independently [36]. To promote flexibility and autonomy, asynchronous communication and interaction—mainly through discussion boards—is often the preferred method of fostering learning and knowledge construction in online education [37]. The results presented here, while noting the small sample size of this study, indicate that indeed the social aspect of learning was of great importance to the participants and that the online learning environment did not necessarily facilitate the construction of a sufficient social community. In this regard, the opportunity for ancillary in-person connection seemed to be important to promoting a learning environment that fosters the co-creation of shared knowledge.

The importance of community identified in this study echoes findings from the literature on online education, as synchronous interaction and communication help to establish a social presence, or the perceived “realness” of interaction in an online learning environment, which results in deeper engagement and interactions with other learners and instructors [38–40]. Through these interactions, learners developed initial bonds and relationships with other learners, which helped to establish a stronger sense of community. Being a part of a learning community is vital for distant learners as it creates a space for them to share their thoughts and experiences, promote collaboration and learning, and reduce feelings of isolation and disconnection [41, 42].

Overall, the results of this study reflect established findings in earlier research on online learning around the dueling value of learner autonomy and community in largely asynchronous online education [12, 43]. Our work extends this tension to a particular subgroup of learners—namely, working health professionals who pursue online graduate health professions education (and by extension, engage in continuous professional development). Moreover, this tension creates challenges for quality improvement in primarily asynchronous online education programs for health professionals; for instance, how might educators balance both flexibility and autonomy while also building community and social networks? Can this occur without introducing more rigidity into program scheduling and requirements?

The value of learner autonomy and the need for social connection in the learning environment necessitates the development of unique solutions that seek to strike a balance between flexibility for individual learners and the co-construction of communities of learning that foster connection. These solutions may potentially entail increased synchronous sessions with fellow learners and faculty in the program or program-facilitated formation of learner-selected communities of learning. Nevertheless, each approach that may be developed and implemented to address this tension can have unintended and unforeseeable implications for all users in the program. Accordingly, any solution implemented requires rigorous development. As this study is situated in the first stage of a Design Thinking approach—an approach that is geared towards the development of a user-centric solution—the progression of this work naturally leads to the exploration of future Design Thinking stages. Specifically, this involves engagement from learners and other program stakeholders to further distill challenges associated with balancing user autonomy and social connection, before ideating potential innovative solutions (an exercise we briefly performed earlier), which can then be developed into prototypes for testing in the program.

Limitations to this study include a very small sample size and variance in the types of learners (e.g., full-time or part-time streams, course-based or thesis-based). The learner variance, and their respective experiences, may have impacted results. Additionally, some investigators are stakeholders that are directly involved in the program and thus may have had preconceptions based on their personal experiences with the program. Interviewers also included program stakeholders, who may have anticipated certain responses or themes from participants to validate or confirm their own perceptions. Responses were independently coded by researchers and coding was then also independently reviewed (AE, MN) in an effort to minimize personal biases. Virtual face-to-face interviews may have also resulted in participants being interviewed by investigators with whom they had pre-existing interactions, potentially constraining participants’ willingness to openly express their experiences. It is not known whether anonymous interviews or asynchronous data collection (such as typed submissions) would have impacted responses.

## 7 Conclusion

Asynchronous online learning presents a significant opportunity for continued education for health professionals; however, it is not without its own set of particular challenges for learners. This initial study leverages an early-stage Design Thinking approach, in combination with qualitative methods, to empathize with the health professional learner regarding their experiences in primarily asynchronous online education. Learners valued an autonomous-supportive learning environment in which they can experience freedom and autonomy in pacing their learning while retaining the opportunity

to build community. While these findings align with prevalent theories of learning and findings from the broader online learning literature, they also present a challenge in the context of health professions education, specifically in terms of navigating a balance between the individual preferences of a learner and the collective engagement required to foster community. For largely asynchronous online education programs, this creates a need for ways by which educators can strike a medium between learner freedom and building community. Next steps will involve further definition of these experiences and the development of innovative, data-based prototypes to address this tension encountered by health professional learners in the online learning environment.

**Acknowledgements** The authors would like to thank the stakeholders from the MSc Health Science Education Graduate Program who participated in this study.

**Author contributions** IB and LG contributed to the study conception and design. IB and AE led data collection and management. AE and MN analyzed the data. All authors including IB, AE, MN, and LG participated in interpretation and contributed to the critical revision of the manuscript. All the authors read and approved the final manuscript.

**Funding** This work was supported by the MacPherson Institute at McMaster University under the MacPherson Leadership in Teaching and Learning Fellowship Grant #11355.

**Data availability** No dataset was used for this study.

**Code availability** Not applicable.

#### Declarations

**Ethics approval and consent to participate** This study was approved as an education quality improvement activity by the Hamilton Integrated Research Ethics Board. Informed consent was obtained from all individual participants included in the study.

**Competing interests** The authors declare no competing interests.

**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

## References

1. Frank JR, Danoff D. The CanMEDS initiative: implementing an outcomes-based framework of physician competencies. *Med Teach*. 2007;29(7):642–7. <https://doi.org/10.1080/01421590701746983>.
2. Leach DC, Fletcher SW. Perspectives on continuing education in the health professions: improving health care through lifelong learning. *Chest*. 2008;134(6):1299–303. <https://doi.org/10.1378/chest.08-1022>.
3. Cervero RM, Artino ARJ, Daley BJ, Durning SJ. Health professions education graduate programs are a pathway to strengthening continuing professional development. *J Contin Educ Health Prof*. 2017;37(2):147–51. <https://doi.org/10.1097/CEH.0000000000000155>.
4. Heuberger R, Clark WA. Synchronous Delivery of Online Graduate Education in Clinical Nutrition: An Inquiry into Student Perceptions and Preferences. *J Allied Health*. 2019;48(1):61–6.
5. Yang D, Baldwin S, Snelson C. Persistence factors revealed: students' reflections on completing a fully online program. *Distance Educ*. 2017;38(1):23–36. <https://doi.org/10.1080/01587919.2017.1299561>.
6. Pilkington C. A playful approach to fostering motivation in a distance education computer programming course: behaviour change and student perceptions. *Int Rev Res Open Dis*. 2018. <https://doi.org/10.19173/irrodl.v19i3.3664>.
7. Cochran JD, Baker HM, Benson D, Rhea W. Business student perceptions of online learning: using focus groups for Richer understanding of student perspectives. *Organ Manag J*. 2016;13(3):149–66. <https://doi.org/10.1080/15416518.2016.1218195>.
8. Kumar A, Kumar P, Palvia SCJ, Verma S. Online education worldwide: current status and emerging trends. *J Inf Technol Case Appl*. 2017;19(1):3–9. <https://doi.org/10.1080/15228053.2017.1294867>.
9. Müller T. Persistence of women in online degree-completion programs. *Int Rev Res Open Dis*. 2008. <https://doi.org/10.19173/irrodl.v9i2.455>.
10. O'Shea S, Stone C, Delahunty J. "I 'feel' like I am at university even though I am online". Exploring how students narrate their engagement with higher education institutions in an online learning environment. *Distance Educ*. 2015;36(1):41–58. <https://doi.org/10.1080/01587919.2015.1019970>.

11. Martínez PJ, Aguilar FJ, Ortiz M. Transitioning from face-to-face to blended and full online learning engineering master's program. *IEEE Trans Educ.* 2020;63(1):2–9. <https://doi.org/10.1109/TE.2019.2925320>.
12. Dyrbye L, Cumyn A, Day H, Heflin M. A qualitative study of physicians' experiences with online learning in a masters degree program: benefits, challenges, and proposed solutions. *Med Teach.* 2009;31(2):e40–46. <https://doi.org/10.1080/01421590802366129>.
13. McManus D, Dryer R, Henning M. Barriers to learning online experienced by students with a mental health disability. *Distance Educ.* 2017;38(3):336–52. <https://doi.org/10.1080/01587919.2017.1369348>.
14. Jaber R, Kennedy E. 'Not the same person anymore': groupwork, identity and social learning online. *Distance Educ.* 2017;38(2):216–29. <https://doi.org/10.1080/01587919.2017.1324732>.
15. Forde C, Gallagher S. Postgraduate online teaching in healthcare: an analysis of student perspectives. *Postgrad Online Learn J.* 2020;24(1):118–39.
16. MacNeil H, Telner D, Sparaggis-Agaliotis A, Hanna E. All for one and one for all: understanding health professionals' experience in individual versus collaborative online learning. *J Contin Educ Health Prof.* 2014;34(2):102–11. <https://doi.org/10.1002/chp.21226>.
17. Pullen DL. An evaluative case study of online learning for healthcare professionals. *J Contin Educ Nurs.* 2006;37(5):225–32. <https://doi.org/10.3928/00220124-20060901-04>.
18. Reeves S, Fletcher S, McLoughlin C, Yim A, Patel KD. Interprofessional online learning for primary healthcare: findings from a scoping review. *BMJ Open.* 2017;7: e016872. <https://doi.org/10.1136/bmjopen-2017-016872>.
19. Moule P. E-learning for healthcare students: developing the communities of practice framework. *J Adv Nurs.* 2006. <https://doi.org/10.1111/j.1365-2648.2006.03813.x>.
20. Adams C, Nash JB. Exploring design thinking practices in evaluation. *J Multidiscip Eval.* 2016;12(26):12–7.
21. Razzouk R, Shute V. What is design thinking and why is it important? *Rev Educ Res.* 2012;82(3):330–48. <https://doi.org/10.3102/0034654312457429>.
22. Madson MJ. Making sense of design thinking: a primer for medical teachers. *Med Teach.* 2021;43(1):115–21. <https://doi.org/10.1080/0142159x.2021.1874327>.
23. Deitte LA, Omary RA. The power of design thinking in medical education. *Acad Radiol.* 2019;26(10):1417–20. <https://doi.org/10.1016/j.acra.2019.02.012>.
24. Henriksen D, Richardson C, Mehta R. Design thinking: a creative approach to educational problems of practice. *Think Skills Creativity.* 2017;26:140–53. <https://doi.org/10.1016/j.tsc.2017.10.001>.
25. Altman M. Design thinking in health care. *Prev Chronic Dis.* 2018. <https://doi.org/10.5888/pcd15.180128>.
26. Health Science Education MSc Program. Curriculum. <https://hsed.mcmaster.ca/current-students/curriculum>. Accessed 1 April 2022.
27. Vianna M, Vianna Y, Adler IK, Lucena B, Russo B. Design Thinking: Business Innovation. MJV Press; 2012. <http://designthinkingbook.co.uk/>. Accessed 8 May 2022.
28. Vaismoradi M, Jones J, Turunen H, Snelgrove S. Theme development in qualitative content analysis and thematic analysis. *J Nurs Educ Pract.* 2016;6(5):100. <https://doi.org/10.5430/jnep.v6n5p100>.
29. Strauss A, Corbin J. Basics of qualitative research. 2nd ed. Thousand Oaks: Sage publications; 1998.
30. Malterud K, Siersma VD, Guassora AD. Sample size in qualitative interview studies: guided by information power. *Qual Health Res.* 2016;26(13):1753–60. <https://doi.org/10.1177/1049732315617444>.
31. Creswell JW, Plano Clark VL. Designing and conducting mixed methods research. 2nd ed. Thousand Oaks: Sage Publications; 2011.
32. Hsieh H-F, Shannon SE. Three approaches to qualitative content analysis. *Qual Health Res.* 2005;15(9):1277–88. <https://doi.org/10.1177/1049732305276687>.
33. Lincoln YS, Guba EG. Naturalistic inquiry. Thousand Oaks: Sage; 1985.
34. Knowles M. The adult learner: a neglected species. 4th ed. Houston: Gulf publishing company; 1992.
35. Knowles M. The modern practice of adult education. 3rd ed. Cambridge: Cambridge University Press; 1980.
36. Schreiber LM, Valle BE. Social constructivist teaching strategies in the small group classroom. *Small Group Res.* 2013;44(4):395–411. <https://doi.org/10.1177/1046496413488422>.
37. Martono F, Salam U. Students' learning in asynchronous discussion forums: a meta-analysis. *Int J Inf Commun.* 2017;13(1):48–60. <https://doi.org/10.4018/IJICTE.2017010105>.
38. Gosmir D, Van Osdel J, Morrison M. Perceptions of synchronous chat tools in an online course. Paper presented at the National Educational Computing Conference 2009, Washington DC.
39. Richardson JC, Maeda Y, Lv J, Caskurlu S. Social presence in relation to students' satisfaction and learning in the online environment: a meta-analysis. *Comput Hum Behav.* 2017;1(71):402–17. <https://doi.org/10.1016/j.chb.2017.02.001>.
40. Tu CH, McIsaac M. The relationship of social presence and interaction in online classes. *Am J Distance Educ.* 2002;16(3):131–50. [https://doi.org/10.1207/S15389286AJDE1603\\_2](https://doi.org/10.1207/S15389286AJDE1603_2).
41. Lewis KO, McVay-Dyche J, Chen H, Seto TL. Examining sense of community among medical professionals in an online graduate program. *J Educ Online.* 2015;12(1):1–29.
42. Hawkins A, Barbour MK, Graham CR. Everybody is their own island": teacher disconnection in a virtual school. *Int Rev Res Open Dis.* 2012;13(2):124–44. <https://doi.org/10.19173/irrodl.v13i2.967>.
43. Hartnett MK. Influences that undermine learners' perceptions of autonomy, competence and relatedness in an online context. *Australas J Educ Technol.* 2015;31(1):86–99. <https://doi.org/10.14742/ajet.1526>.