The Impact of Virtual or Blended Learning on Sense of Belonging in First-Year Undergraduate Health Sciences Students Enrolled in an Inquiry-Based Course

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Abstract

Literature suggests post-secondary students feel disengaged and socially isolated while learning virtually, especially during the COVID-19 pandemic. Here we explored whether a sense of belonging is differentially achieved in an inquiry-based course between two different delivery formats: virtual and blended (combination of virtual and in-person). Our primary measurement instrument was a modified version of the 26-item Sense of Belonging-Revised Scale, which we distributed to all first-year Bachelor of Health Sciences (BHSc) (Honours) Program students enrolled in an Inquiry course at McMaster University during the 2021-2022 school year. Data analyses revealed no statistically significant difference between the two groups across the four subscales of the Sense of Belonging-Revised Scale: perceived peer support, perceived classroom comfort, perceived isolation, and perceived faculty support. As promoting community is a core skill in our Inquiry course, this may have reduced the perceived difference between the two groups. Future directions include exploring facilitators' perceptions and experiences across course delivery formats.

La littérature suggère que les étudiants du postsecondaire se sentent désengagés et socialement isolés tout en apprenant virtuellement, en particulier pendant la pandémie de COVID-19. Ici, nous avons exploré si un sentiment d'appartenance est obtenu de manière différentielle dans un cours basé sur l'enquête entre deux formats de prestation différents: virtuel et mixte (combinaison de virtuel et en personne). Notre principal instrument de mesure était une version modifiée de l'échelle révisée sentiment d'appartenance révisé de 26 points, que nous avons distribuée à tous les étudiants du programme de première année du baccalauréat en sciences de la santé inscrits à un cours d'enquête à l'Université McMaster au cours de l'année scolaire 2021-2022. Les analyses de données n'ont révélé aucune différence statistiquement significative entre les deux groupes sur les quatre sous-échelles de l'échelle révisée du sens de l'appartenance: le soutien perçu par les pairs, le confort perçu en classe, l'isolement perçu et le soutien perçu du corps professoral. Comme la promotion de la communauté est une compétence de base de notre cours d'enquête, cela a peut-être réduit la différence perçue entre les deux groupes. Les orientations futures comprennent l'exploration des perceptions et des expériences des animatrices à travers les formats de prestation de cours.

Due to the COVID-19 pandemic, many educational institutions were forced to transition from in-person models of teaching to virtual and blended (virtual and in-person classes) learning delivery formats (Daniel, 2020; Dziuban et al., 2018; Lemay et al., 2021). Virtual learning can be defined as learning experiences delivered through virtual environments via electronic devices (e.g., computers, phones, tablets), whereas blended learning involves a combination of virtual learning and face-to-face interaction (Dhawan, 2020; Kintu et al., 2017; Means et al., 2013; Swerdloff, 2016). The shift to virtual learning has led to reports of lack of social connection and sense of belonging among post-secondary students (Hehir et al., 2021; Tang et al., 2022).

Thus, this study sought to investigate if the lack of social connection and sense of belonging in a virtual and blended learning environment also presents in an inquiry-based course in which students share a co-created educational space. Results of this exploratory research will provide insights for educators and learning institutions as they navigate curriculum development in a post-pandemic world in which virtual and blended learning may become increasingly accepted, and expected, as learning options.

Literature Review

Sense of Belonging

Students' sense of belonging can be defined as feelings of being respected, valued, included, and accepted as part of a community derived from a foundation of shared experiences, beliefs, and contributions to achievement of common goals (Mahar et al., 2013; Pedler et al., 2022; Stoytcheva, 2021). In the context of higher education, a sense of belonging has been associated with improved student transition into post-secondary school, and higher student retention rates, levels of academic engagement, motivation, and achievement (Korpershoek et al., 2020; Meehan & Howells, 2019; O'Keeffe, 2013; Pedler et al., 2022).

Students have reported challenges with regard to community building and fostering a sense of belonging during online learning; these challenges have been associated with disengagement and feelings of social isolation (Arasaratnam-Smith & Northcote, 2017; Lischer et al., 2021; Ziegler, 2017). It has also been found that when online learners are compared to face-to-face learners, online learners have higher attrition rates due, in part, to a lack of social connection and diminished sense of belonging (Lee & Choi, 2011). This finding aligns with the notion that a sense of

belonging is typically developed through consistent face-to-face interaction among students and educators (Peacock et al., 2020; Riley & White, 2016; Yorke, 2014).

Inquiry-Based Pedagogy

Unlike traditional didactic instructor-centred pedagogy, where information is primarily delivered by an instructor, inquiry-based approaches are embedded in social constructivist frameworks in which students are drivers of their own learning (Saunders-Stewart et al., 2012). As such, inquiry creates a shared and co-constructed educational space that may be conducive to promoting students' sense of belonging because student voices, interests, and perspectives are heard, valued, and integrated into the classroom. Given the literature on reduced social connection and belonging in online settings (see Arasaratnam-Smith & Northcote, 2017; Lischer et al., 2021; Ziegler, 2017), we wondered whether a sense of belonging is differentially experienced in an inquiry-based course between students who were enrolled in either a virtual or blended learning classroom.

Study Context

Like many educational institutions during the COVID-19 pandemic, McMaster University delivered both virtual and blended courses during the Fall 2021 semester. Inquiry is a required first-year course for students in the Bachelor of Health Sciences (BHSc) (Honours) Program at McMaster University. The course is divided into multiple sections of approximately 16-18 first-year students each with a facilitator (instructor) and three to four fourth-year peer tutors who assist in facilitating the class. Students meet for three hours once a week during both the fall (September-December) and winter semesters (January-April), both of which contain 12 weeks of classes. Given the small class size, frequency of meetings, and class discussions, many students liken Inquiry to their "homeroom."

The course fosters the development of a seven-pronged skillset through community building and reflective practice. The skills are personal awareness, problem identification, problem solving, professional communication, peer collaboration, personal and peer evaluation, and promoting and creating community. The course is discussion-based, student-directed, and takes an inquiry and problem-based approach with an emphasis on group work (McKinnell et al., 2005).

Since 2000, Inquiry has only been offered in-person until the COVID-19 pandemic forced the course to be delivered completely virtually during the 2020-2021 academic year. As COVID-19 cases decreased in Ontario, Inquiry was offered in both virtual (six sections) and blended (eight sections) formats during the fall semester of the 2021-2022 academic year. Virtual sections were delivered completely remotely, while blended sections were delivered remotely for the first few weeks of the semester before

transitioning to in-person delivery for the duration of the term. Our study thus aimed to investigate whether a sense of belonging was differentially achieved in students between these two course delivery formats.

Method

Sample and Procedure

The survey sample for the study comprised all first-year undergraduate health sciences students in the BHSc Program (M_{age}: 17.74 +/- 0.47 SD, range: 17-19) enrolled in Inquiry during the 2021-2022 academic year. A link to the survey – developed in the online survey platform, LimeSurvey – was emailed to this convenience sample (N=228), first on January 18th, 2022, and again with a reminder email on January 27th, 2022. To reduce student pressure to participate in the study, the survey was sent by a staff member of the BHSc Program, who was not directly involved in teaching the Inquiry course. Participation in the survey was entirely voluntary and anonymous. After providing informed consent by clicking "next" in the survey, participants indicated: (1) whether they were enrolled in a virtual or blended class and (2) what their learning format preference (virtual or blended) was during the course registration process. Participants then completed a modified 26-item Sense of Belonging-Revised Scale (Morrow et al., n.d.).

The original Sense of Belonging Scale was developed by Hoffman et al. (2002). Variations of the survey have since been utilized across diverse student groups (e.g., see Holloway-Friesen, 2018; Tovar & Simon, 2010). Each item of this survey is scored on a scale of one (completely true) to five (completely untrue). The original survey consisted of five subscales: perceived peer support, perceived classroom comfort, perceived isolation, perceived faculty support/comfort, and empathetic faculty understanding. We modified the survey to combine faculty understanding and support/comfort to obtain an overall measure of perceived faculty support. Also, minor changes to the wording of some questions were made to better suit our role and course structure within Inquiry; for example, we replaced "teacher" and "faculty," with "facilitator." Cronbach's alpha calculations revealed our modified scales had excellent reliability: peer support, $\alpha = 0.916$; classroom comfort, $\alpha = 0.924$; perceived isolation, $\alpha = 0.868$; and faculty support, $\alpha = 0.916$. This study was approved by the Hamilton Integrated Research Ethics Board.

Data Analysis

A total of 96 surveys were returned during the six-week data collection period. Thirty-two participants did not complete any of the subscales, and their responses were subsequently discarded. Thus, statistical analyses were performed on the responses from 64 participants (40 blended; 24 virtual) who completed subscales for perceived

classroom comfort, perceived peer support, and perceived isolation. Of these 64 participants, 15 did not fully complete the perceived faculty support subscale; therefore, we performed statistical analysis for perceived faculty support on the responses from 45 participants (27 blended; 18 virtual).

The data from the four subscales were analyzed using independent samples t-tests to discern whether perceived differences exist between (1) students in a blended classroom and students in a virtual classroom; and (2) students whose classroom format matched their preference at the time of registration ($n=47$), and students whose classroom format did not match their preference ($n=17$).

Results

All independent samples t-tests revealed no statistically significant difference across all subscales between students in a blended classroom and students in a virtual classroom. There was additionally no statistically significant difference across all subscales between students whose classroom format matched their preference and those whose classroom format did not (see Figure 1; Table 1).

Figure 1

Mean Scores of Students in a Blended (White Bars) and Virtual (Blue Bars) Inquiry Classroom Across the Four Subscales of our Modified Sense of Belonging Scale-Revised. ± 1 SEM
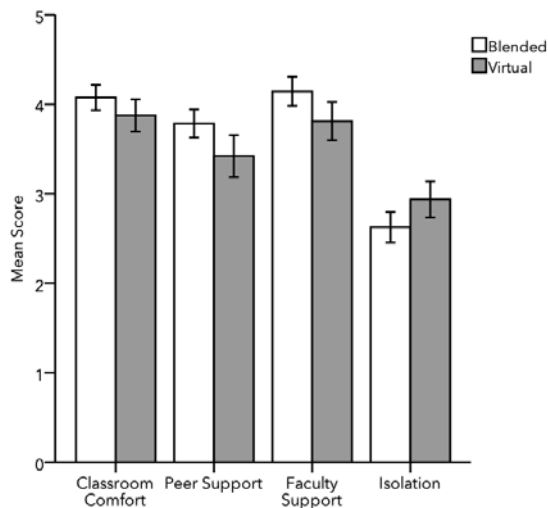
Table 1

Descriptive Statistics Across the Four Subscales of the Modified Sense of Belonging Scale

Dimension	Number		M		SD		SEM	
	Blended	Virtual	Blended	Virtual	Blended	Virtual	Blended	Virtual
Peer Support	40	24	3.78	3.42	0.99	1.15	0.16	0.24
Class Comfort	40	24	4.08	3.88	0.90	0.88	0.14	0.18
Isolation	40	24	2.63	2.94	1.07	0.99	0.17	0.20
Faculty Support	27	18	4.14	3.81	0.85	0.90	0.16	0.21

Discussion

Data revealed that students' sense of belonging, measured across four different subscales – perceived peer support, perceived classroom comfort, perceived isolation, and perceived faculty support – did not differ between students in a blended classroom and students in a virtual classroom. Our results contrast previous reports that online learners experience reduced social connection, interaction, and sense of belonging compared to face-to-face learners (Tang et al., 2022; Tratnik et al., 2019). Moreover, online learners had previously commented a sense of belonging is arguably more important when learning occurs remotely rather than in-person, as online learners are separated from the physical space and not afforded as many opportunities to socialize (Peacock et al., 2020).

One possible explanation for the lack of statistically significant difference between the two student groups is our focus both on community building as a core skill and creating a shared space with our students. In our specific Inquiry course, and in inquiry-based learning in general, the aim is to shift the traditional power dynamics of a classroom from the instructor to a more collaborative learning environment with students. For example, although the course is based on the development of a set of professional skills, students have the autonomy and flexibility to demonstrate their growth in a personalized manner through the creation and development of a learning portfolio. Additionally, although students are responsible for directing where the course goes, we encourage both reflection on the required skillset and accountability to themselves and each other (for more details of the course, see McKinnell et al., 2005). It is possible this shared and co-created space was conducive to promoting a sense of belonging, regardless of classroom format, because students' interests, beliefs, perspectives, and voices were valued, heard, and integrated into the class.

Indeed, there is some suggestion that implementing inquiry-based approaches into a course can lead to increased social presence even among online learners (Akyol et

al., 2009; Bowers & Kumar, 2015; Garrison et al., 1999). For example, many elements of the Community of Inquiry framework, particularly social presence (e.g., emotional expression, group cohesion, open communication), are found in our Inquiry course; therefore, it is possible these elements contributed to the increased sense of belonging among both student groups in our study (Garrison et al., 1999; The Community of Inquiry, n.d.). If this is the case, implementing inquiry-based approaches into courses, especially ones that are delivered virtually, seems important, as sense of belonging has been associated with better learning outcomes and increased retention rates (Banks & Dohy, 2019; Meehan & Howells, 2019; Tang et al., 2022).

Limitations

Although inquiry-based pedagogy may explain the absence of a difference among students' perceived sense of belonging (as measured across four subscales) between the two study groups, we recognize that other factors might have also affected our results. The results, for example, represent the responses of only 64 out of 228 students or 28.1% of the cohort of first-year students in the 2021-2022 academic year (and 45 out of 228 or 19.7% for the perceived faculty support subscale). Thus, our data may not be representative of the entire cohort. Moreover, we did not have discreet virtual and in-person classes. While the virtual sections remained fully online in the fall semester, the blended sections had varying degrees of online and in-person classes. Among the eight blended sections, for example, an average of 7.4 (*SD*: 1.5) or 61.7% of the 12 classes were held in person. The differences in the number of in-person classes between blended sections were a result of various factors, including facilitator and student comfort, illness, or suspected exposure of a student and/or a member of the instructional team to COVID-19. As a result, there was both variability in when blended sections began in-person delivery and a need for some blended classes to return to online delivery during some weeks.

In the blended sections, there were also instances where some students were online while the majority of the class was in-person. This mixing of delivery models within the blended classes might have affected the degree of students' perceived sense of belonging. Perhaps we would have seen larger differences between the two student groups if a higher number of our classes in the blended sections were delivered in person (or if our blended sections were delivered completely in person). In line with this possibility, it is interesting to note that although not statistically significant, students in the blended sections perceived on average more comfort and support and less isolation than students in a virtual classroom (see Figure 1).

Conclusion

Our results suggest that a sense of belonging as measured across four different subscales – perceived peer support, perceived classroom comfort, perceived isolation,

and perceived faculty support – does not differ between students in a blended classroom and students in a virtual classroom, presumably due to inquiry-based approaches or our course's focus on community building. The student-directed and collaborative nature of our course may create a space where students feel they belong because they collectively decide on the trajectory and goals of the classroom and their learning. We further facilitate this process by encouraging students to reflect on who they are, how their behaviours impact others, and how they might create a space that is inclusive of the different perspectives in the room.

Future studies should investigate whether larger differences in sense of belonging would be observed in completely in-person courses or in more traditional classes and programs where building community is less of a focus. It would also be worthwhile to explore facilitators' perceptions and experiences across different course delivery formats.

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