Impact of the Bimodal Format on Teaching and Learning at the University of Ottawa

Report 1 — Student Perspective

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Office of the Vice-Provost, Academic Affairs *in collaboration with* Teaching and Learning Support Service (TLSS)

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Table of Contents

Acknowledgment i
Executive summary 2
Key findings 3
Context 6
Characteristics of participants 8
Reason for choosing a course modality 10
Students feedback on technology 12
Students feedback on the techno-pedagogical experience in a bimodal course 16
Students' overall satisfaction in a bimodal course 17
About the 9% of students who did not have a good experience 18
Qualitative analysis 19
- Flexibility 19
- Well-being 21
- Equity 24
- Sense of community 27
- Assessment 31

Students' suggestions for improving the bimodal quality outcome 34
Conclusion 36

List of Tables

Table 1. Students' top reasons for choosing each modality 11
Table 2. Students' feedback on sound quality 12
Table 3. Students' feedback on Camera 14
Table 4. Students' feedback on techno-pedagogical experience in a bimodal course 16
Table 5. Summary of themes and related sub-themes from qualitative analysis of students' comments in focus groups 32
Table 6. Students' recommendation for improving bimodal experience 34

List of Figures

Figure 1. Data Collection from February to April 2022 7
Figure 2. Participating students Demographics (1) 8
Figure 3. Participating students Demographics (2) 9
Figure 4. Reason of choosing a course modality (1) 10
Figure 5. Reason of choosing a course modality (2) 11
Figure 6. Students' feedback on technology 13
Figure 7. Students' feedback on cameras 15
Figure 8. Students' overall satisfaction (1) 17
Figure 9. Students' overall satisfaction (2) 18
Figure 10. The flexibility benefits of bimodality form student perspective 21
Figure 11. The well-being benefits of bimodality from student perspective 23
Figure 12. The well-being challenges of bimodality from student perspective 24
Figure 13. The equity benefits of bimodality from student perspective 25
Figure 14. The equity challenges of bimodality from student perspective 27
Figure 15. The sense of community benefits in a bimodal course from student perspective 29
Figure 16. The sense of community challenges in a bimodal course from student perspective 30

Executive summary

This research project – part of a larger inter-university comparative project in partnership with Carleton University, Brock University and UBC Okanagan – explores the perceptions and outcomes of bimodal/HyFlex course delivery in post-secondary education during the academic year 2021-2022 to determine pedagogical considerations and recommended practices.

In February 2022, study invitations, including surveys, were sent to all uOttawa instructors and students involved in bimodal courses during the academic year 2021-2022. Among students who received the invitation, 1,425 students completed the survey, and 70 students participated in focus groups.

Key findings

Participant characteristics

- Most participating students represented the majority population of the university students, namely: female, without accommodation needs, full time traditional students starting university after high school/college, not a first-generation student, and contributing totally or partially to financing their education.
- No statistically significant differences in results were found based on demographic characteristics of participants.

Reason for choosing the modality (Table 1)

- Flexibility, followed by being a required course, and finally schedule were the top three reasons most cited by students as a reason for choosing a bimodal course.

Feedback on Technology (Table 2 & Table 3)

- **Microphones**: While students reported overall positive feedback on sound quality (85%), half only agreed that they could hear their in-person peers well. Students frequently reported challenges of ceiling, wireless or podium microphones in some classes.
- **Cameras**: Regarding cameras, student feedback was less positive compared with sound quality evaluation. Instructor level of proficiency for adjusting cameras and having only one camera installed capturing only the instructor's podium in some classes could explain this challenge.
    - Among participants, 88% could see their instructor well and read their notes, but 66% of participants raised challenges regarding camera's installation for seeing their in-person peers and 73% could not read notes on the chalkboard/ whiteboard well.

Feedback on learning experience (Table 4)

- Students reported very positive feedback from a cognitive engagement point of view.
    - Over three-quarters of participating students strongly or somewhat agreed that it was easy to focus on course material during class and more than three-quarter strongly or somewhat agreed that it was easy to connect with their instructor.

- However, over half of students reported challenges interacting and socializing with peers such as in whole class activities, small group activities, connecting with peers, and learning with peers.
- Most students also reported rarely using instructors' office hours for consultation. 86% reported that they never or only sometimes attended office hours.

Students' overall satisfaction in a bimodal course

- Participating students reported an overall positive view of bimodal courses.
    - Among the respondents, 86% agreed that they had a good experience in a bimodal course (61% strongly agree and 24% somewhat agree).

- Nearly 63% reported that they would absolutely take another bimodal course and 20% would do so if there were some improvements in bimodal delivery.

Qualitative analysis of focus groups (Table 5)

- From the qualitative analysis of focus groups with 70 students, five main themes and their related sub-themes emerged: **flexibility** (including accessibility, accommodation, time-management, learning style, well-being, motivation and participation); **well-being** (including physical, functional, social and emotional well-being and variables such as recording and attendance policies, instructors' anxiety ward technology); **equity** (including accessibility, inclusion and diversity, living cost, assistive technology, technology setting and issues, instructor's technological proficiency, instructor's perception of online students); **sense of community** (including interaction, communication, group works with peers and instructor); and **assessment**. While both online and in-person students saw flexibility and well-being as the two strengths of the bimodal format, equity, sense of community and assessment were reported as both advantages and challenges, depending on the angle discussed, the demographics of the group or the type of modality chosen by the students.

- **Flexibility benefits**: All students appreciated the flexibility regarding the timing and location of course delivery and reported that it had an overall positive impact on their learning achievement and well-being.
- **Flexibility challenges**: No challenges were reported regarding flexibility.

- **Well-being benefits**: In-person students' responses revealed an overall enhancement of their social, functional, and emotional well-being as they could return to their academic lives and satisfy their preferred learning style. Online students also reported a very positive impact of bimodal delivery on their physical health and their emotional and functional health.
- **Well-being challenges**: Some online participants reported a negative impact of bimodal courses on their well-being due to limited choices for the in-person attendance at the time of registration.

- **Equity benefits**: Bimodal courses reduced barriers of cost and accessibility for students with limited financial means. Assistive Technologies such as recording and Zoom transcription facilitated the learning of the second language speakers, and those who reported attention disorder or shyness.
- **Equity challenges**: Technology settings and technology issues in some classes sometimes created inequities between in-person and online learning experiences. In some courses, the instructor's techno-pedagogical proficiency level was the cause of differences in learning experience for the online group. Also, some instructors expressed reluctance regarding the bimodal format of the class. This created a sense of unease among online students. Some students commented about some instructors' apparent low commitment to online student learning. They felt that some instructors cared less about online students (e.g., microphones turned off, not attentive to hands raised online) or explicitly favored in-person students.

- **Assessment benefits:** Students appreciated the change of assessment type, which often shifted from exams that tested recall to higher-order cognitive assessments such as analysis and creation.
- **Assessment challenges**: Overall, students reported an increased number of assessments in bimodal courses compared with in-person classes. They also reported that online proctoring was stressful.

- **Sense of community benefits:** Thanks to technology tools and group work, Francophone students reported an enhanced participation, including more interaction with peers, more chance to create a community, more opportunities to learn from peers, and more possibility to connect with professor.
- **Sense of community challenges**: Conversely, most Anglophone students in focus groups reported fewer interactions with peers, fewer chances to create a community and fewer opportunities to learn from peers.

Context

The COVID-19 crisis in March 2020 forced all Canadian universities to move their courses online. The availability of COVID-19 vaccines in 2021, the necessity to meet student needs, and ongoing public health guidance limiting in-person gathering to slow the spread of COVID-19 led many universities to find an alternative mode of course delivery for a gradual return to campus in Fall 2021. The bimodal (or Hyflex) format was one of the alternatives chosen by several universities, including the University of Ottawa.

At the University of Ottawa, the bimodal approach was defined as 'a combination of two real-time (synchronous) teaching spaces: one physical space, that is, a classroom on campus with a professor and a reduced number of students, and a virtual space using a video platform (Zoom or MS Teams) for students who have chosen to learn remotely'.[1]

154 classrooms were upgraded for bimodal delivery in fall 2021.[2] Training for faculty members started in the summer of 2021. Teaching and Learning Support Service (TLSS) trained 131 instructors in Summer 2021. Approximately 250 bimodal courses in fall 2021 and 500 bimodal courses in winter 2022 were offered to students. The majority of bimodal courses were offered by the Faculty of Social Sciences, the Faculty of Arts and the Faculty of Law. Based on room capacity and registration numbers, a specific number of in-person seats were offered for each course to meet the physical distancing guidelines of Public Health Ontario.

Because of the novelty of this format for most of the institution's faculty members and students, the Office of the Vice-Provost Academic Affairs at the University of Ottawa and the TLSS conducted research into the impact of the bimodal format on the teaching and learning experience of instructors and students.

This research is part of a larger inter-university comparative project in partnership with Carleton University, Brock University, and UBC Okanagan to explore the perceptions and outcomes of bimodal/HyFlex course delivery in post-secondary education and to determine pedagogical considerations and recommended practices.

The research question of the project is:

> What is the impact of a bimodal format on the teaching experience of instructors and the learning experience of students?

The methodology adopted is a mixed method with simultaneous triangulation informed by theoretical grounds to obtain distinct but complementary qualitative and quantitative data.

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1 https://www.uottawa.ca/gazette/en/news/bimodal-approach-more-flexibility-our-students.

2 10 additional classrooms will be upgraded for August 2022.

In fall 2021, a set of data collection tools was developed in collaboration with the research partners. The data collection tools included an instructor survey, instructor interview questions, a student survey, student focus group's questions, a teaching assistant (TA) survey and TA interview questions as well as a multimodal in-class and online observation tool. The reliability of the observation tool was tested for validation in three bimodal classes during fall 2021.

The data collection was launched in February 2022. The study invitations, including surveys, were sent to 350 instructors who taught at least one bimodal course in fall 2021 and/or winter 2022, as well as 15,000 students who had attended at least one bimodal course. Among instructors who received the invitation, 93 instructors responded to the survey, 30 instructors conducted 30-minute or one-hour interviews, and 14 classes were observed simultaneously by two observers, one in class and one online.

Regarding students, 1,425 students completed the survey and 70 students participated in focus groups. Also, 29 teaching assistants completed the survey and 2 completed an interview.

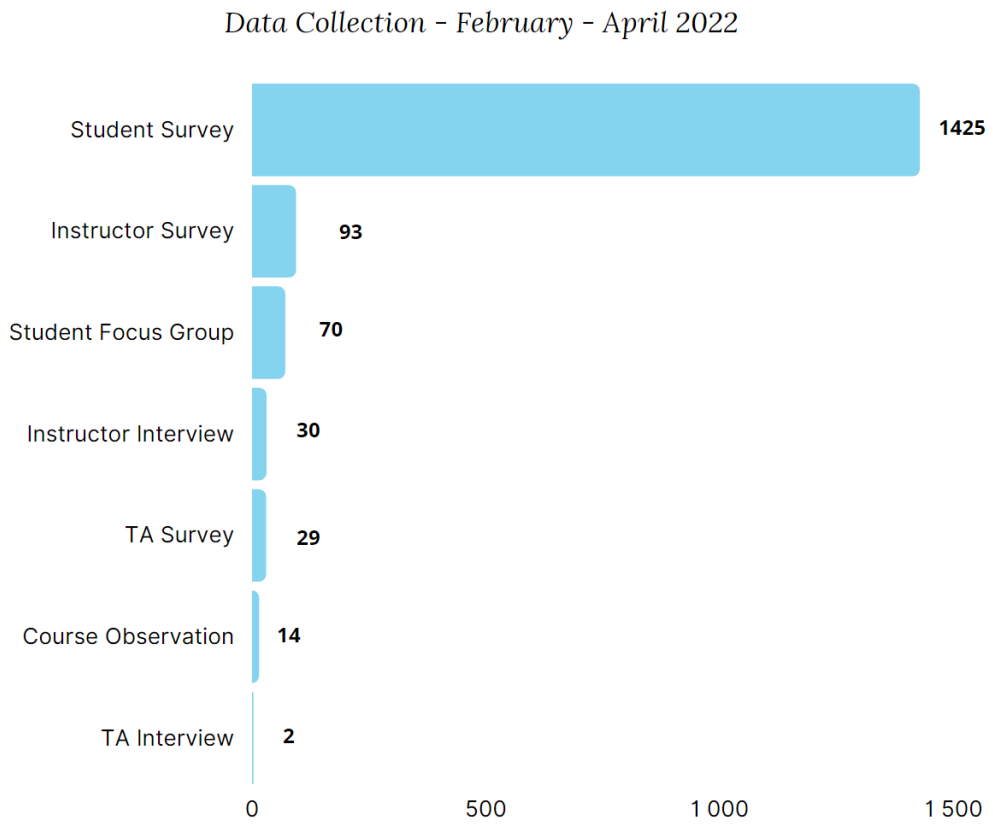


Figure 1. Data Collection from February to April 2022

Characteristics of participants

Most participants reflected the majority population of the university, namely female, with no accommodation needs, full time and traditional students starting university after high school/college, not a first-generation student, and contributing totally or partially to the financing of their education. More than half of the student participants (55%) did not identify as members of an equity-deserving group versus 40% who did and 5% who preferred not to answer. (See Appendix 3.) No statistically significant differences in results were found based on demographic characteristics of participants.

The most frequently occurring bimodal course level reported in the survey was second year undergraduate lecture-based courses offered in Winter 2022 that were managed by the instructor without the assistance of teaching assistants. Half of respondents commented on a Faculty of Social Sciences course (Appendix 6).

The detailed analysis of participants' course codes showed that social sciences (55%), arts (20%) and law (16%) were the most widely represented in the results (Appendix 4)

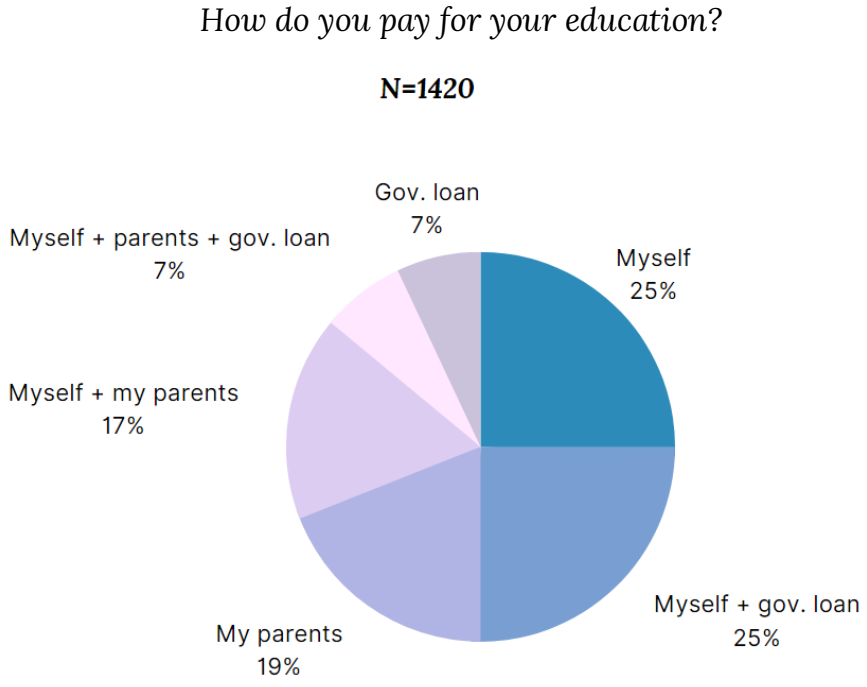


Figure 2. Participating students demographics

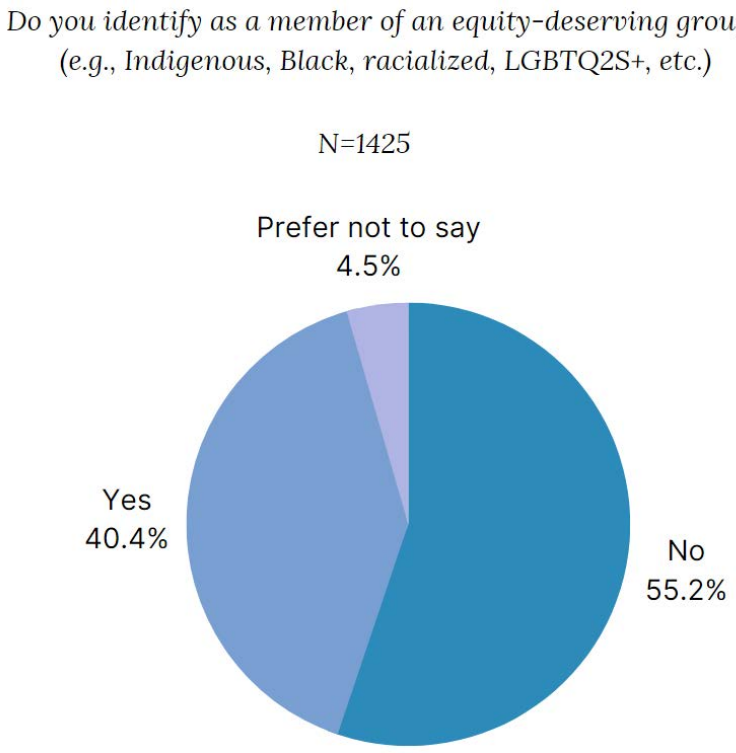


Figure 3. Participating students Demographics

Reason for choosing a course modality

Flexibility followed by a required course and schedule were the three reasons most frequently cited by students[3] for choosing to attend the course either in person or online.

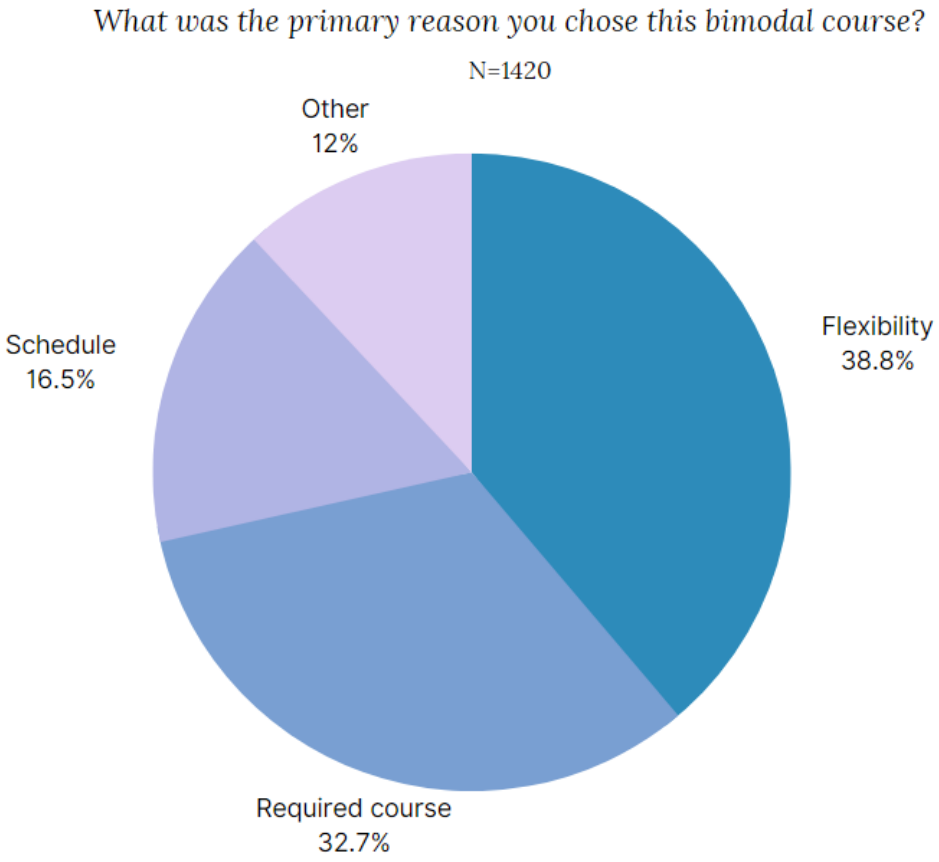


Figure 4. Reason of choosing a course modality (1)

[3] More than 39% of participating students said they chose a bimodal course because of its flexibility, 33% selected a bimodal course because it was a required course, 16% because it better fit their schedule, and 12% for another reason.

Table 1 summarizes the reason of choosing the course modality among participants

Table 1. Students' top reasons for choosing each modality[4]

In-person (11%)	**Both modalities (33%)**	**Online (56%)**
• Adaptation to learning styles and needs, • Sense of community • More responsibility and engagement	• Flexibility • Handling unanticipated events without missing a class • Time management for doing other activities	• Accessibility • Accommodation • Time management for doing other activities.

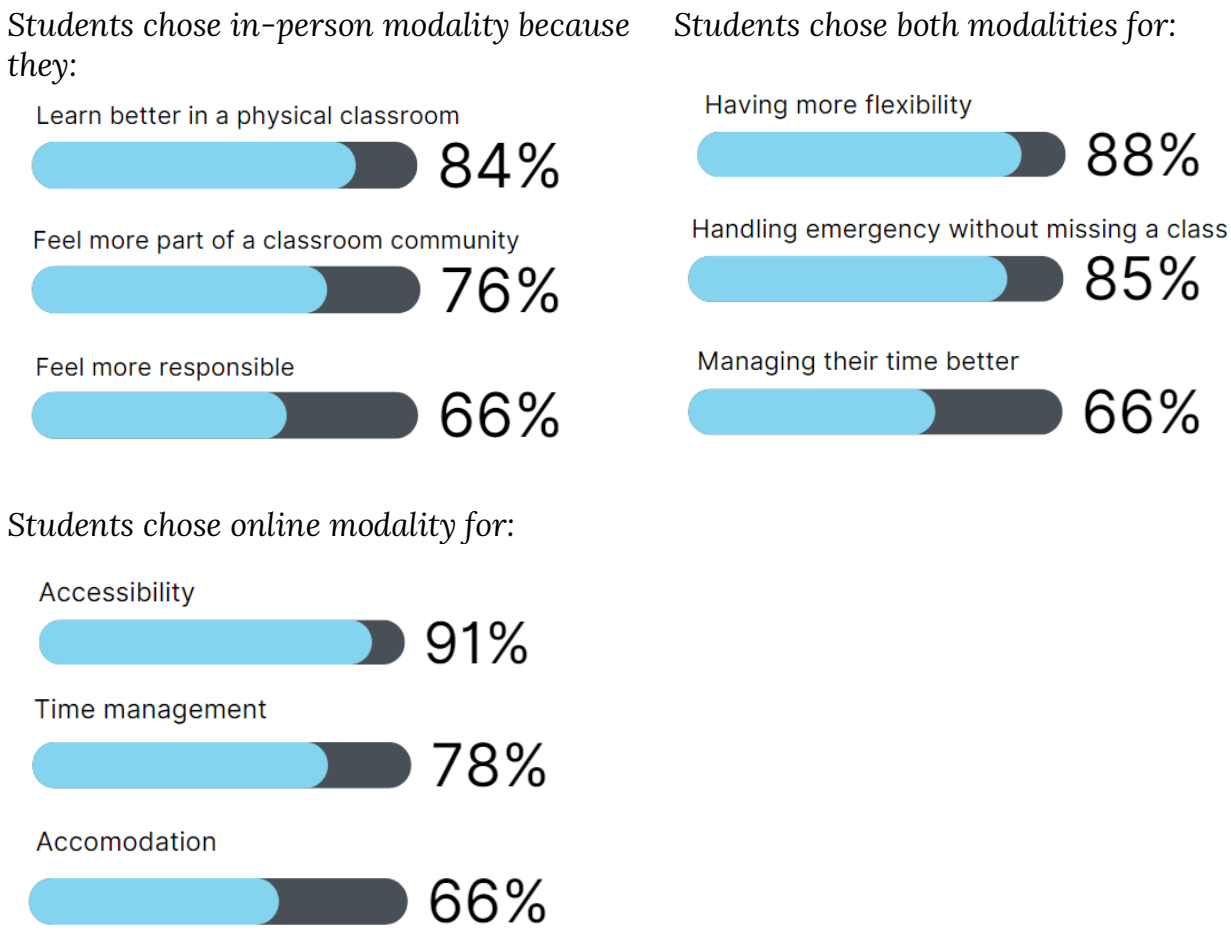


Figure 5. Reason of choosing a course modality (2)

[4] See Appendix 7 & 8 for more details.

Students feedback on technology

In a series of Likert-scale questions, students were asked about the reliability of the technology in their classrooms.

Microphones

While students reported overall positive feedback on sound quality (85%), only half of online students said that they could hear in-person students well. Table 2 summarizes students' comments on sound quality in bimodal classes.

Table 2. Students' feedback on sound quality

Challenges of hearing peers
Online students: Only half of participating students agreed that they could hear in-person students well. ● Wireless microphones: ○ Online students raised the lack of an "in-class [wireless] microphone" for in-person peers, probably in classrooms not equipped with a ceiling microphone. ○ Sometimes, when the microphone used by the students muted the instructor, the instructor forgot to reactivate their microphone again. ● High sensitivity of ceiling microphone (mentioned by fewer participants): ○ In some classrooms, the ceiling microphone picked up in-class background noises, such as keyboard typing of the in-person students and made the experience uncomfortable for online students. In-person students: ● Podium Microphone: ○ In some classrooms, probably those not equipped with a ceiling speaker, in-person students also raised the challenge of hearing online peers' questions via Zoom. Professor should repeat online students' questions to in-person peers.

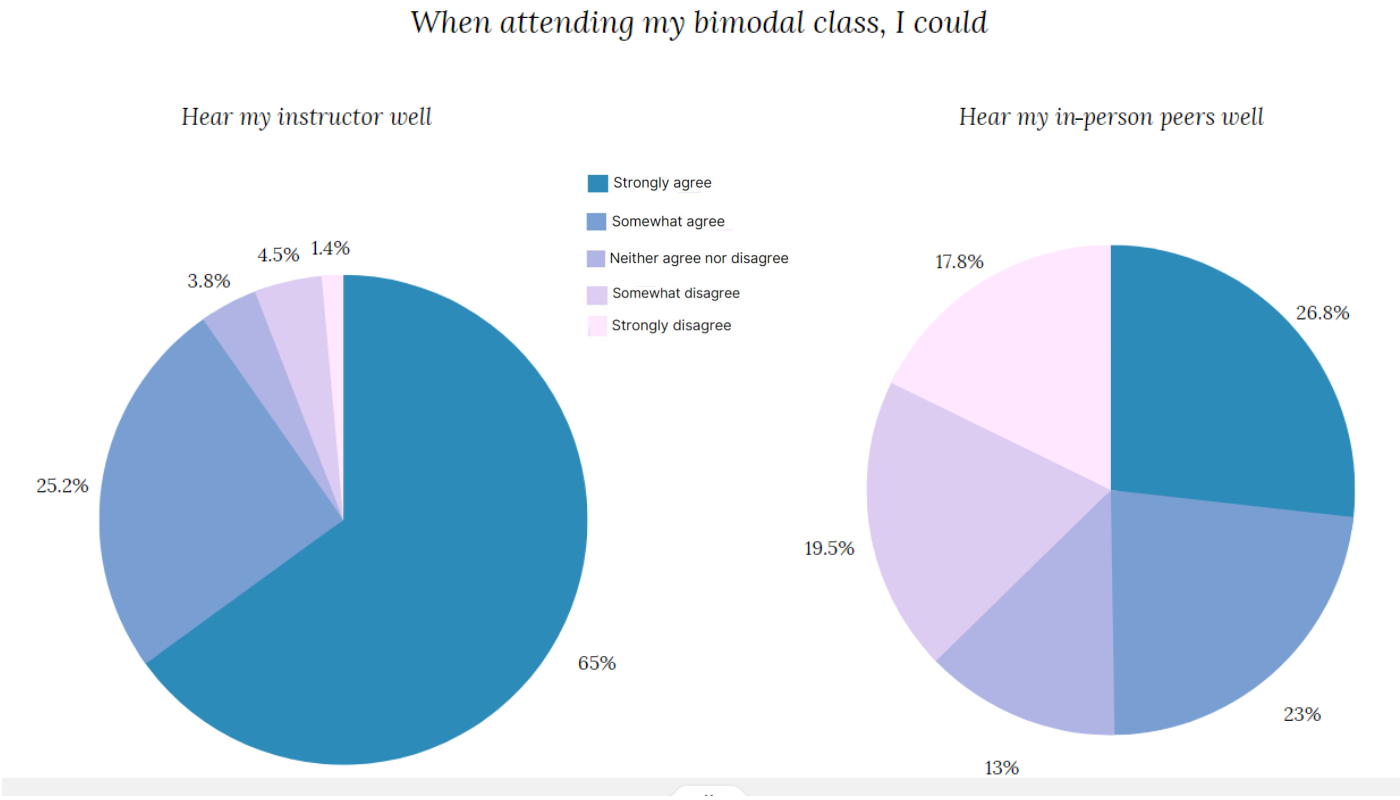


Figure 6. Students' feedback on technology

Camera

Regarding cameras, screen capture, and engagement applications, students' feedback was less positive compared with sound quality evaluation. Some online students raised challenges of seeing in-person peers and reading notes on the chalkboard or whiteboard. Some in-person students reported that they could not see their online peers well. The camera's positioning, the instructor's level of proficiency deploying cameras and sometimes only one camera installed in class which only captures the instructor podium could be reasons for this challenge.

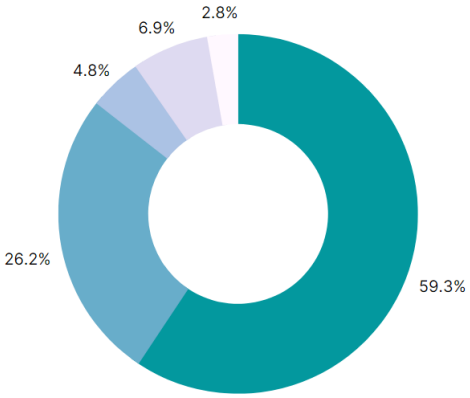
Table 3 summarizes students' comments on camera technologies in bimodal classes.

Table 3. Students' feedback on Camera

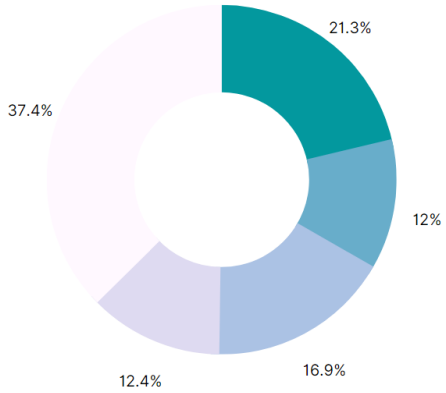
Positive feedback	Challenges
Overall positive regarding ● Reading instructors' notes ○ Most students agreed they could read instructors' notes well (88%) ● Using their own device to engage and participate in class activities ○ Most students agreed (88%) ● Seeing their instructors well ○ Most students agreed (85%)	More reservation for: ● Seeing their in-person peers well ○ Only 34% agreed that they could see their in-person peers well ● Reading notes on the chalkboard/whiteboard well ○ Only half agreed, while 28% neither agreed nor disagreed that they could read notes on the chalkboard/whiteboard well ● Seeing their online peers well ○ Just over half agreed that they could see their online peers well

When attending my bimodal class, I could:

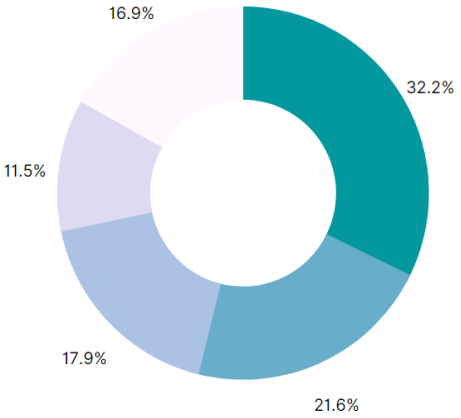
See my instructor well



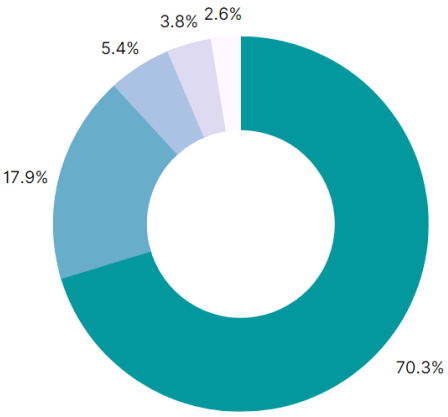
See my in-person peers well



See my online peers well



Read my instructor's notes well



Read notes on the chalkboard or whiteboard well

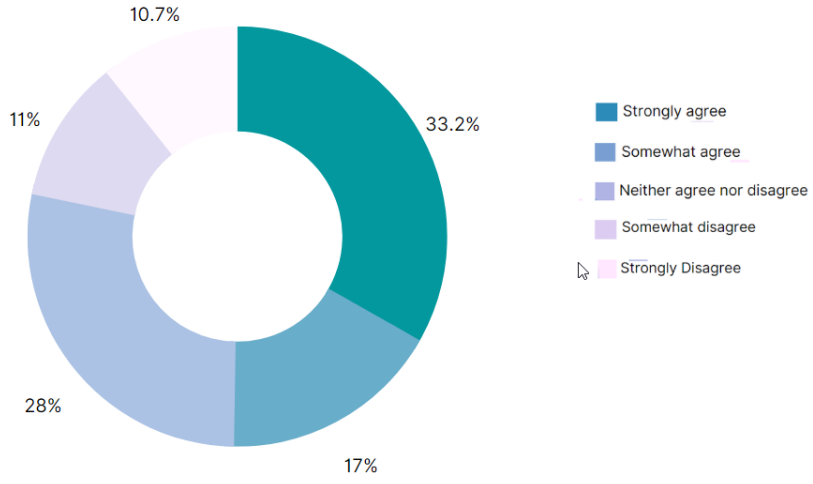


Figure 7. Students' feedback on cameras

Students feedback on the techno-pedagogical experience in a bimodal course

In two series of statements in a Likert poll, students were asked to rank first the ease of learning process and participation in class activities and then to reflect on their learning behavior inside and outside of the class. These questions aimed to understand the possible challenges for students relating to engagement and participation (behavioral engagement), learning (cognitive engagement), and socialization (emotional engagement) in their bimodal courses.

From a cognitive engagement point of view, more than three-quarters of participating students strongly or somewhat agreed that it was easy to focus on course material during class and more than three-quarters strongly or somewhat agreed that it was easy to connect with their instructor. However, students reported more challenges in terms of interaction and socialization with peers.

Table 4. Students' feedback on techno-pedagogical experience in a bimodal course

Positive feedback	Challenges
Overall positive feedback from a Cognitive engagement point of view: ● Focus on course material ○ More than three-quarters of participating students strongly or somewhat agreed that it was easy to focus on course material during class ● Connect with instructor ○ More than three-quarters strongly or somewhat agreed that it was easy to connect with their instructor	Overall challenging experience for interaction and socialization with peers and instructors: ● Whole class activities ○ Nearly half (45%) reported that it was challenging to participate in whole-class activities during the class ● Connect with peers ○ Half found it challenging to connect with their peers ● Small group discussions ○ More than half reported challenges participating in small group discussions and group work ● Distraction ○ 20% reported it was distracting for them to have students participating both online and in-person ● Learning with peers

	○ More than three-quarters reported that they never or only sometimes studied with their peers

Students' overall satisfaction in a bimodal course

Participating students showed an overall very positive view towards bimodal courses. They were asked if overall they had a good experience in the bimodal course and whether they would take another bimodal course if it was offered.
Among the respondents, 86% agreed that they had a good experience in a bimodal course (61% strongly agreed and 24% somewhat agreed).

Overall, I had a good experience in this bimodal course.
(N=1406)

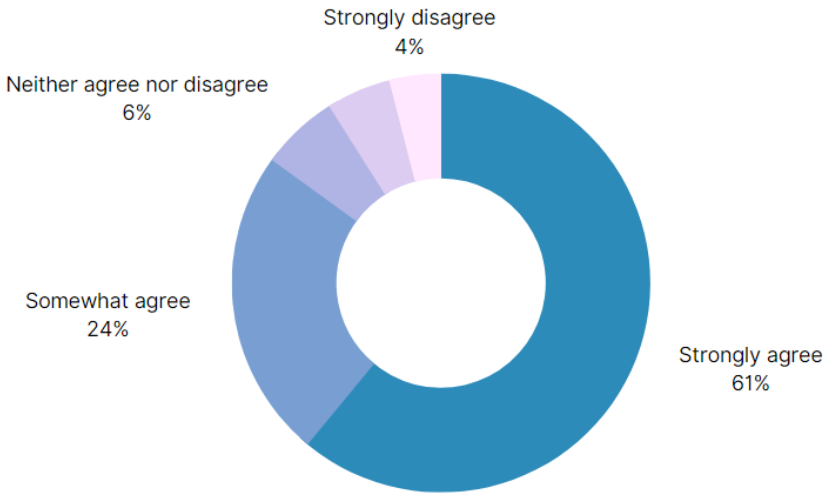


Figure 8. Students' overall satisfaction (1)

Nearly 63% indicated that they would absolutely take another bimodal course and 20% would do so if improvements were made to the bimodal delivery. No statistically significant differences were found based on demographic characteristics of participants.

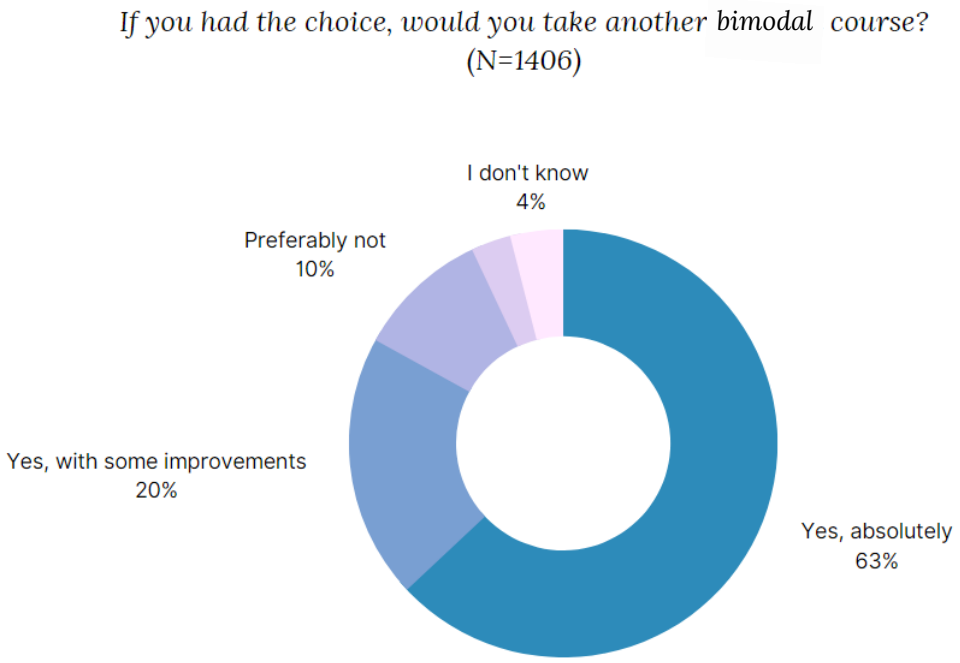


Figure 9. Students' overall satisfaction (2)

About the 9% of students who did not have a good experience in their bimodal course

Students (9%) who answered either "strongly disagree" (4%) or somewhat disagree (5%) in response to the question, "if you had the choice, would you take another Bimodal course?" were asked to give the reason for their dissatisfaction. Most students indicated that due to their instructor's attitude toward online students and the bimodal format, they would not take another bimodal course.

Students stated that the instructor "forgets about online students," "is more interested in face-to-face students," "states that he/she does not want to teach a bimodal course," "does not engage online students equally." Some in-person students reported that the instructor cancelled in-person classes at random frequency.

Another reason mentioned in student comments was the "lack of a sense of community" as "peer engagement was difficult" for students. There were "no peer meetings or discussions" and "no engagement between online and in-person students."

Technical issues in the classroom, such as not hearing and seeing in-person peers, not seeing the whiteboard or chalkboard, too many technical issues during the course, lack of timely problem solving by support staff, and instructor's low level of techno-pedagogical proficiency were reported as other reasons for dissatisfaction.

In fewer cases, wellness issues such as mental health, difficulty concentrating online, lack of motivation, and lack of course recordings were reported as reasons by students.

Qualitative analysis

To further explore students' comments in the survey, we invited them to focus groups where they were able to further explain their views on bimodal courses. The qualitative analysis of the comments of the 70 student participants in the focus groups reveals almost the same themes as their comments in the survey, but in a more nuanced way.

Flexibility

Flexible learning as a generic term "covers all those situations where learners have some say in how, where or when learning take place, whether within the context of traditional institution centered courses or in non-traditional contexts such as open learning, distance learning [...], wider access courses for continuing professional development."[5] As the main point of bimodality, it is not surprising that, like the survey results, flexibility is ranked as the top strength of bimodal courses in the qualitative analysis of student feedback.

Most students reported flexibility of delivery in terms of time and/or space had an overall positive impact on their learning achievement and well-being.

> *Et donc pour moi, bimodal me donne l'autonomie, l'autonomie de gérer mon agenda puis de gérer mes stratégies personnelles pour pouvoir réussir le cours. [...] ce que [le bimodal] me donne l'opportunité de faire, c'est d'avoir plus de temps pour étudier, pour mieux me préparer.*

Part-time students, mature students, students who work in addition to their studies, mothers, and student athletes reported that they appreciated the "accessibility to learning that bimodal courses provided for them to maintain a balance between study and their other responsibilities".

> *Je représente l'équipe GeeGee, donc je parle au nom de toutes celles qui ont adoré les cours bimodaux sauf un qui est moins favorable. Je commence par donner sa raison. Pour elle c'est difficile de se motiver [...] Puis pour les 21 autres athlètes qui ont eu la chance d'expérimenter les cours bimodaux, on est en amour, j'ai toute l'équipe, c'est*

[5] Ellington, H. (1996). Flexible Learning, your flexible friend! keynote address, in Ch. Bell, M. Bowden, A. Trott, *Implementing Flexible Learning*, *Aspects of Educational and Training Technology* XXIX (pp. 3-13). London and New York, Routledge. https://doi.org/10.4324/9781315041797-6.

> *incroyable. En 2019, on est allé en Chine pour les championnats du monde et pendant trois semaines, on a dû manquer l'école parce qu'on n'avait pas le choix.*

Also, many students with accommodation needs highlighted the accommodation which bimodal courses provided to them.

> *I found my grades went up during this period because I was able to schedule my time, and still attend classes on days my disability flared. I could see if total bimodal is unavailable, simply having recordings of the class would be amazing if a student is unable to make it into class that day.*'

> *[…] Overall, I hope the bimodal experience continues. I found my grades went up during this period because I was able to schedule my time, and still attend classes on days my disability flared.*

> *I'm quite nervous because I don't know how healthy I will be in the fall. and I really hope that there will be that option to at least get me through even the fall semester kind of as an accommodation, even if nothing else […]*

Overall, students highlighted that the bimodal courses provided them with a better balance between their personal, professional, and academic life.

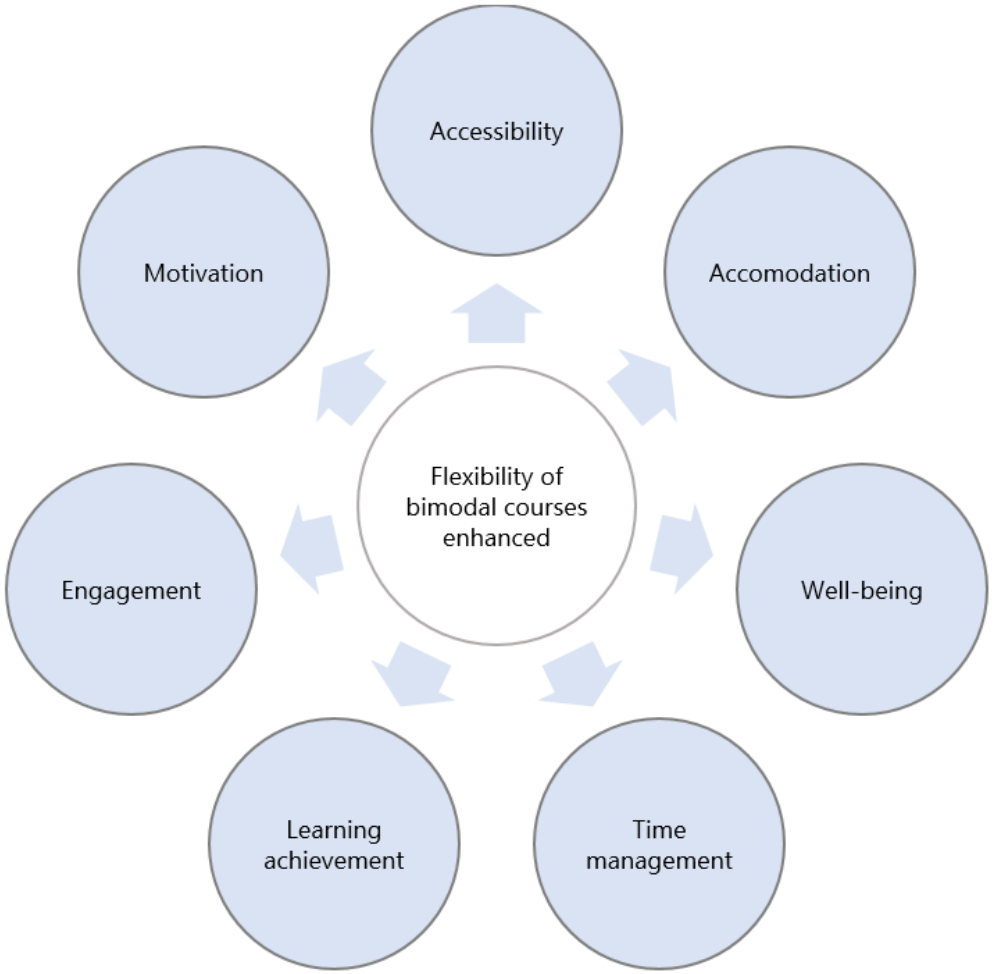


Figure 10. The flexibility benefits of bimodality form student perspective

Well-being

Well-being is a complex concept, including different aspects of health (physical, emotional, functional, and social) and rather related to people's subjective feeling and evaluation of their condition.[6] As the top reasons chosen by students in the survey show clearly, from the students' perspective, flexibility, accessibility, and accommodation that bimodality could provide during the pandemic had an overall positive impact on the well-being of both in-class and online students as well as those who chose to use both modalities for attending their courses.

[6] Simons, G., & Baldwin, D. S. (2021). A critical review of the definition of "wellbeing" for doctors and their patients in a post Covid-19 era. *International Journal of Social Psychiatry*, 67(8), 984–991. https://doi.org/10.1177/00207640211032259

Most responses revealed an overall enhancement of social, functional and emotional well-being of in-person students as they could see their friends and professors and return to their academic lives and their preferred learning style and needs.

> *I wanted to have that again. I'm going for a coffee for class talking to the professor and the breaks and things like that during COVID.*

Online students also reported a positive impact of bimodal delivery on their physical health as they had more time to better eat, exercise, and maintain their emotional and functional health as they felt less stressed especially regarding time and financial management.

> *I think it was a great experience during the pandemic. It saves time of having to commute or wait around physically in person before classes begin. Especially if you have large breaks in the day, it does not require you to have to be physically present in the university, having to wait around. Being online made my life much easier, I could use that time at home instead to exercise, eat properly, take care of my mental health.*

Some online participants reported a negative impact of bimodal courses on their well-being because of limited choice for the modality of attendance at the time of registration

> *Like everything becomes so flexible so it's easier. However, personally, for me, I found it pretty difficult because I am the person that will wake up at like 8: 29 to have class at 8: 30. Um, let's say that online school. I don't know. It made me more depressed.*

Instructors' policies regarding recording the sessions and flexibility in attendance have been also a source of stress for some students. On the other hand, online students note that if the instructor decided not to record the sessions, it was difficult to make up for a missed class due to the lack of connection with peers, especially as cameras do not capture the in-person students and as online students don't know the name of their in-person peers.

> *If our internet goes down during an online course, and the professor doesn't record their lecture to avoid the procrastination of students, well we end up having to rely on the other students for our notes. As part-time students, it's not always easy to get notes when you don't know the students in your cohort.*

Some participants also mentioned the negative impact of bimodal courses on the well-being of instructors, namely their technology anxiety, which impacts the quality of course delivery.

> *Most teachers do not know how to use the technology well and it is very obvious that bimodal teaching stresses them out. It clearly makes their jobs much harder which hurts the class, but it is evident that most of them are trying their best.*

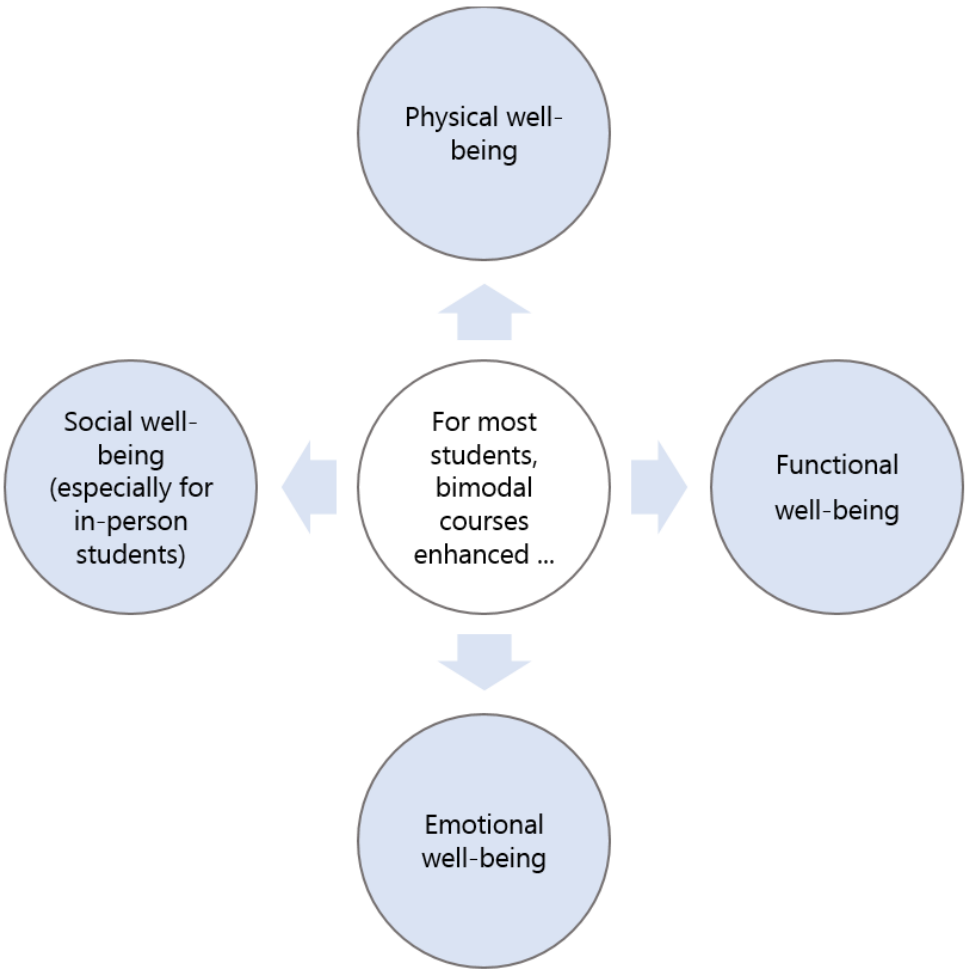


Figure 11. The well-being benefits of bimodality from a student perspective

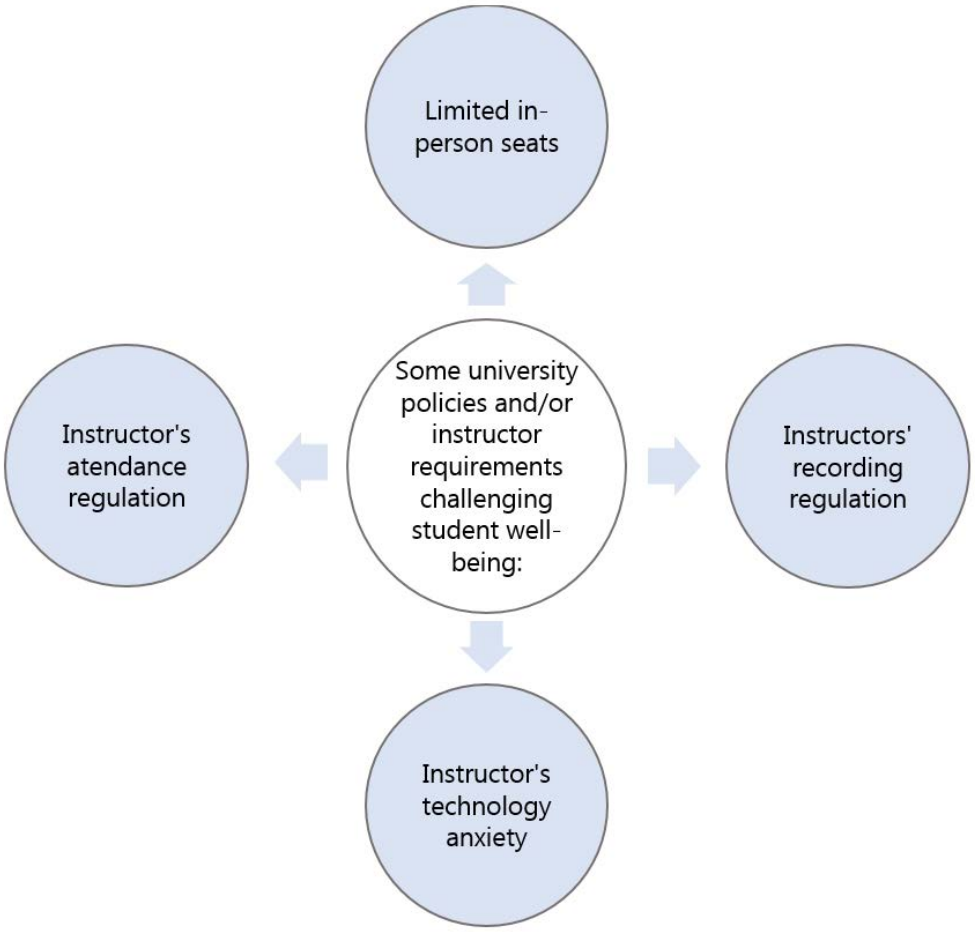


Figure 12. The well-being challenges of bimodality from a student perspective

Equity

Equity in the education system means that "access to education and learning outcomes should not be affected by circumstances outside of the control of individuals, such as gender, birthplace, ethnicity, religion, language, income, wealth or disability." (UNESCO, 2019, p. 11)[7]. Several studies have shown that open and online learning could contribute to enhancement of inclusion in education. However, in the context of bimodal education, other aspects of equity are added as an object of discussion and reflection: How to ensure equivalence of access to knowledge and quality of course for both groups of students, while guaranteeing social justice and education for all?

Students' comments presented in the previous sections about the improved accommodation and accessibility that the flexibility of bimodal courses offers them are closely related to inclusion and social justice aspects of equity. In terms of course delivery, assistive

[7] http://uis.unesco.org/sites/default/files/documents/handbook-measuring-equity-education-2018-en.pdf

technologies such as recording, automated transcription and captioning, and chat box were repeatedly mentioned as strengths of bimodal courses. Students reported that these learning supports fostered overall learning especially for those with attention disorder, language barriers and shyness.

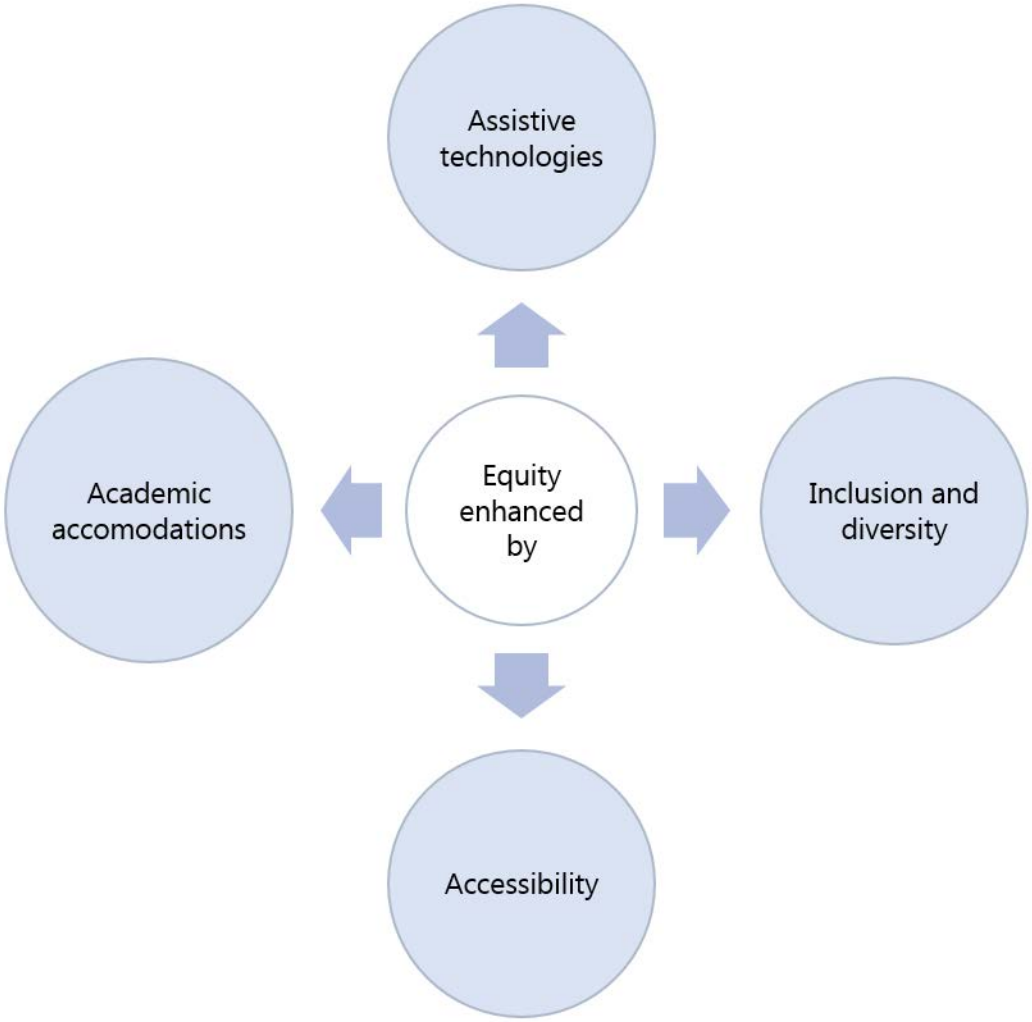


Figure 13. The equity benefits of bimodality from student perspective

However, equity was also mentioned by participants as a challenge when the technology setting, technology issues during the class sessions, and the instructor's management of bimodal environment created a non-equivalent learning environment for in-person and online groups.

Concerning classroom technology – and confirming findings from the quantitative measures - some students highlighted challenges regarding the lack of cameras facing in-person students, who therefore could not be seen, a lack of wireless microphones for in-person students, challenges of hearing online student questions, or in some cases high sensitivity of the audio devices, so that background noise in the classroom was captured. According to

students, technology supports did not always foster an equivalent experience for in-person and online learning.

> *I feel bad for the students online because there is always ambient noise in the classroom, and the professors don't always stand in a place that is visible to the screen online. Also, in [...], for the first 5-6 classes, we spent over 20 minutes each class setting up the technology for online participation in the room, which was a waste of everyone's time, including the professor.*

> *Les plus gros problèmes avec les cours bimodaux sont le fait qu'on ne voit pas bien les professeurs et qu'on n'entend pas les questions/commentaires des élèves en classe.*

In some classes, the instructor's management of bimodal environments disadvantaged online students for an equivalent learning experience.

> *All profs should have their equipment set up before class and be taught how to use all Zoom features. It is unfair to the professor and students when there's constant issues.*

> *Professors need to be aware of online chat boxes and the status of the battery on their microphones. Last class, the professor's microphone battery died, and online students were helpless for half the class as he continued lecturing [...]*

Students commented that some instructors cared little about "online students' presence" or "*completely ignored their online students (e.g., instructors turn off the microphones and don't look at the chat) which prevents online students from asking questions or engaging in the course.*"

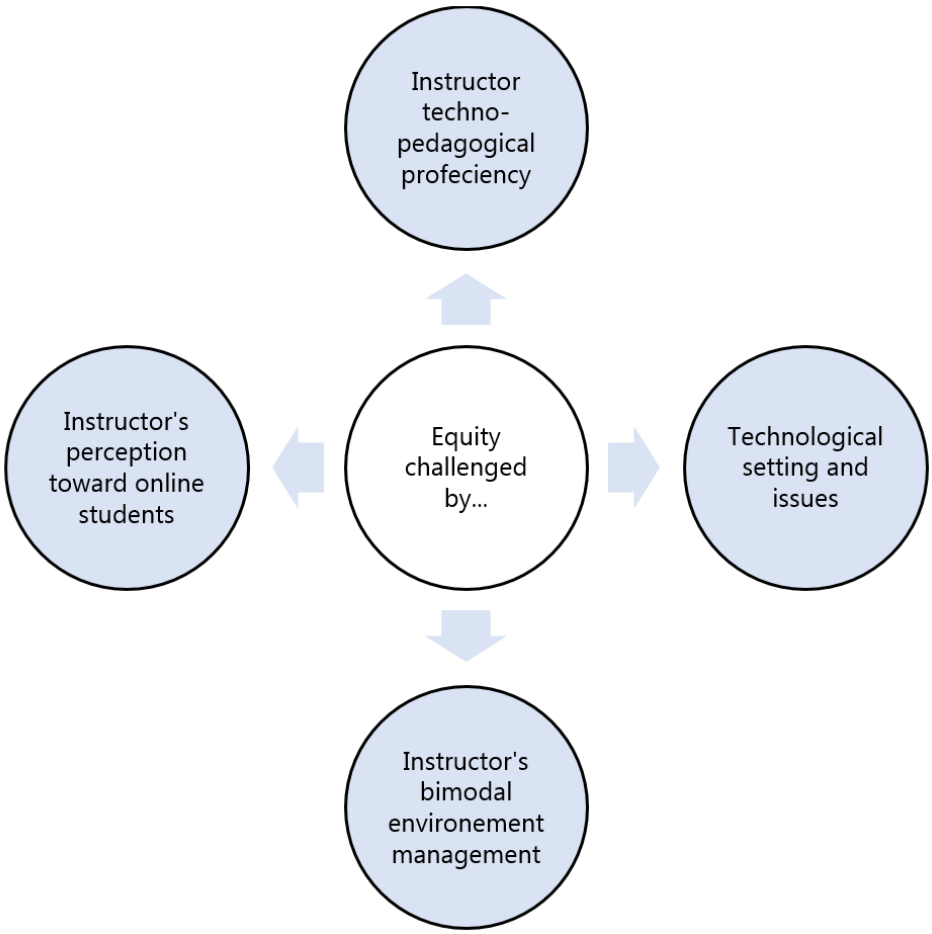


Figure 14. The equity challenges of bimodality from student perspective

Sense of community

Feeling a sense of community is a psychological concept. "A sense of community is the feeling that members have of belonging, the feeling that the members matter to one another and to the group, and a shared faith that their needs will be met through their commitment to be together."[8] In a learning environment, the feeling of community is shaped especially through interaction, communication, and the way the instructor and students act and fulfill each other's needs. However, because the bimodal course space is a combination of two settings, physical and virtual, creating a sustainable interaction within and beyond the walls of the classroom can become more challenging.

[8] McMillan, D.W, & Chavis, D. M. (1986). Sense of community: A definition and theory. *Journal of Community Psychology*, 14(1), 6–23. https://doi.org/10.1002/1520-6629(198601)14:1<6::AID-JCOP2290140103>3.0.CO;2-I

Some students reported that the online/bimodal format didn't have a great impact on group work functioning. Group work/breakout discussions had been challenging even before the pandemic and depend on the willingness of peers to participate.

> *Being online didn't have an effect on our work or our discussions because I think before COVID there would still always be one or two people on their phones. It didn't really change. Some people just don't talk in groups and that's how it is.*

French speakers reported an overall enhanced social-affective relation with their peers thanks to the inclusive aspect of online learning. For instance, this student describes her online experience in her bimodal course and compares it to her in-person experience before the pandemic.

> *Pour ma part, je pense que je me suis fait des belles amitiés et je pense que j'ai su me faire des amitiés qui sont authentiques, donc des personnes si qui ont les mêmes valeurs et les mêmes principes que moi au niveau académique, avec qui j'ai pu avoir de l'entraide, de l'étude. Ce qui n'est pas toujours évident quand on est en présentiel, puisqu'il y a souvent comme des gangs et des cliques.*

Regarding Instructor-student interaction, students qualified “easier for them to ask questions”. In their opinion, the instructors “were much more available” and flexible online office hours facilitated communication with instructors.

> *Je peux rajouter également quand les profs étaient de dos et peut être n’y voyaient pas que quelqu'un avait levé la main, les étudiants, souvent, disaient alors il y a quelqu'un qui a la main levée. Ça n'a jamais fait en sorte qu'on n'a pas été en mesure de recevoir les réponses [à nos questions]. Sinon, un autre aspect et moi j'ai vraiment aimé du bimodal, c'est le fait que […] s’il y a quelque chose qu’on ne comprend pas en classe, c'est quand même bizarre de parler avec notre collègue à côté quand le professeur parle, parce que c'est comme un peu un manque de respect, tandis qu’en ligne, quand il manquait quelque chose que prof venait de mentionner, on posait la question [dans le clavardage] et quelqu'un répondait… Je pense que de notre part, cela a été quand même très avantageux. Puis, si je peux faire une référence aussi à mon bac en développement international, il n'y a jamais eu nécessairement de problème si les profs, n'étaient pas là à 100 % […]*

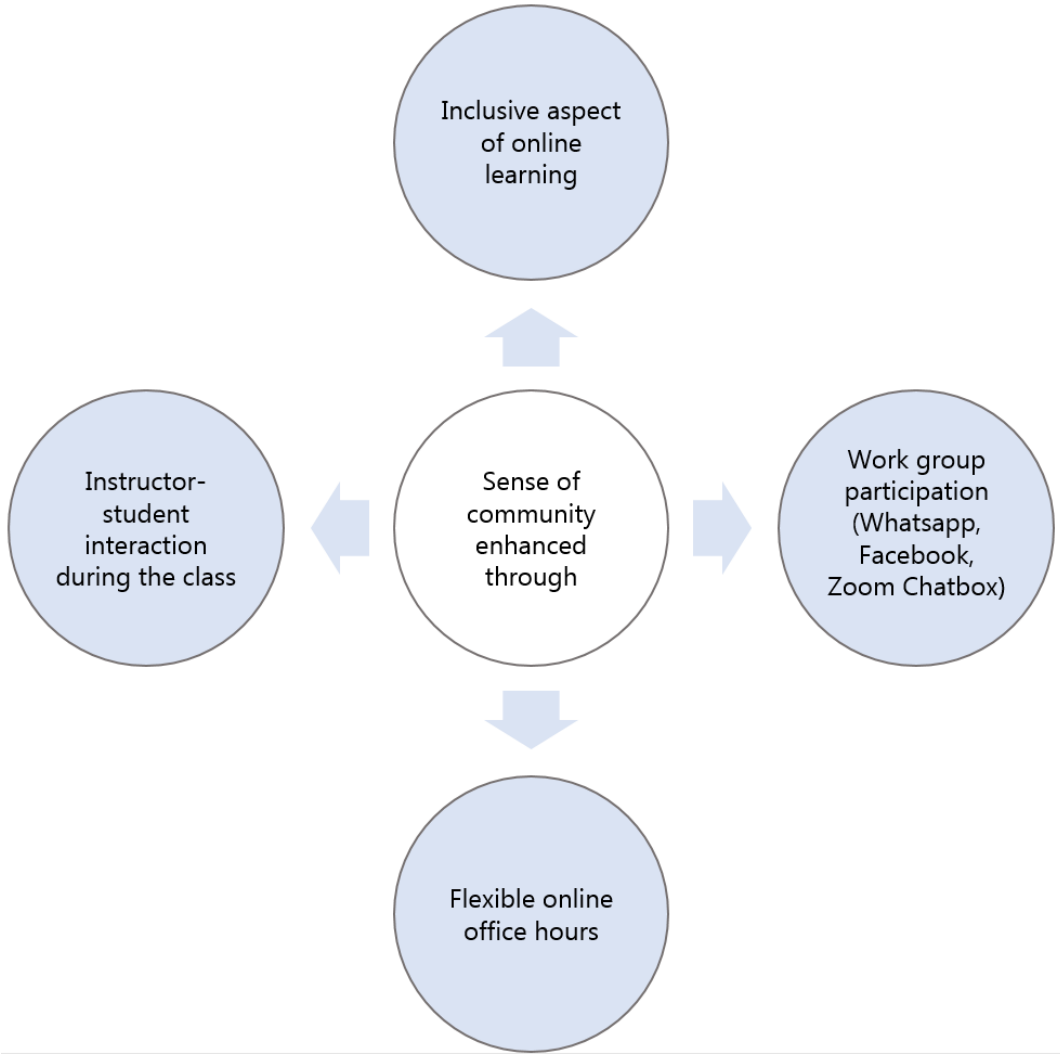


Figure 15. The sense of community benefits in a bimodal course from student perspective

Contrary to French-speaking students in the focus groups, several English-speaking students commented that there is less interaction between students in a bimodal course.

> *I did have one class that was very discussion-based and although people online were encouraged to participate, it was not the same. And we didn't get to laugh with each other and, you know, joke around, make those connections and get to know people in our program.*

> *But the online aspect of it with no cameras on, there was sort of a struggle in some cases where people didn't turn their cameras on. And I don't know if you can force that on people, but it definitely feels like there's a disconnect and you don't have any relationships with the people in your class and you don't develop anything.*

In terms of collaboration, learning activities such as breakout rooms were not always successful as many online and in-person students were not contributing to the discussions.

> *This isn't specific to bimodal courses, as only online courses would result in similar interactions, but often, when attending the class virtually, the class would be put into Zoom breakout rooms to discuss topics. On most occasions, not a single person would say anything in these breakout discussion groups which made the experience rather poor. This is not an issue with technology but lazy students. It would be nearly impossible for those students to remain silent during in-person discussion groups.*

On fewer occasions, group/project work was also mentioned as a challenge due to the unequal involvement of students in group work. Some students also raised the quantity of group projects as a problem.

> *There are so many group projects. It's such a difficult group project. I don't understand teachers that give us group projects, because it's just not the same.*

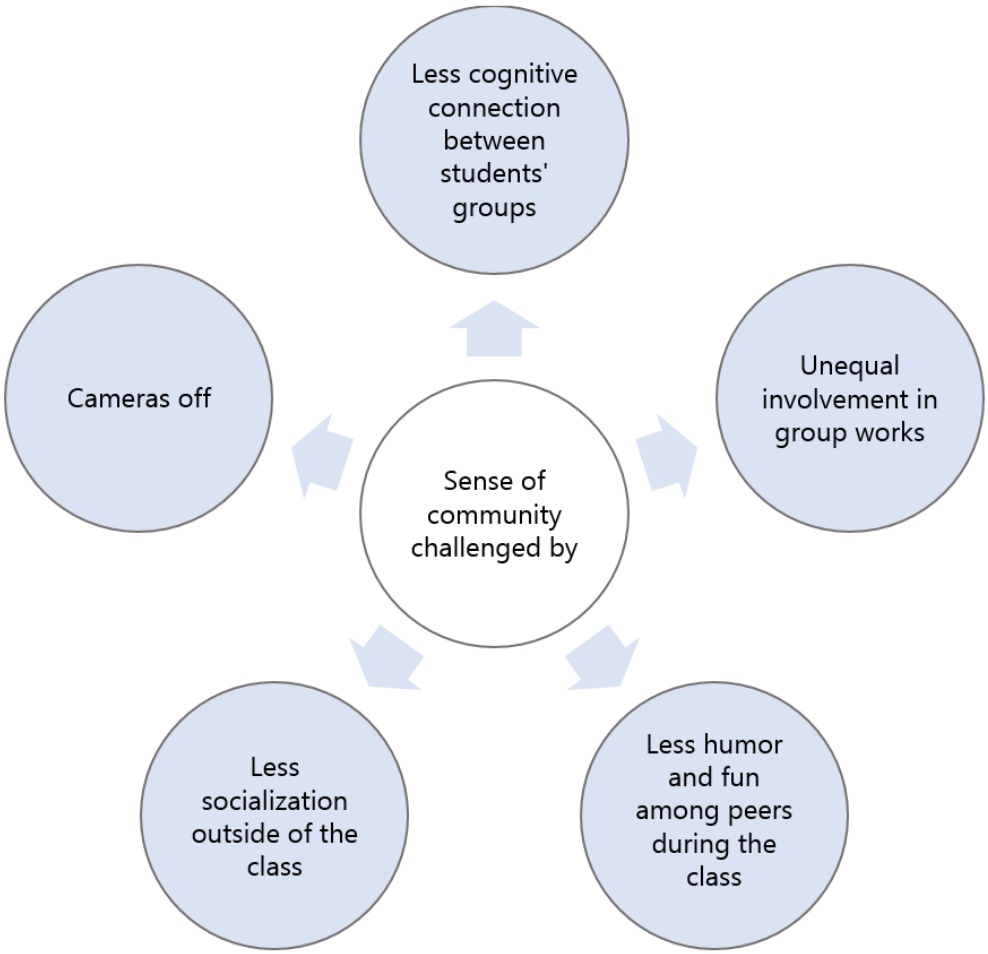


Figure 16. The sense of community challenges in a bimodal course from student perspective

Assessment

Overall, students expressed the view that professors need more support and/or training on assessment and evaluation and need to modify assignments for bimodal courses. They reported an increased number of assessments in bimodal courses but appreciated the change of assessment type, from exams focused on subject matter recall to more analytical and applied assessments. They also criticized online proctoring.

> *My only complaint about bimodal courses is that professors seem to think that because we're online, we need to be assessed more. My workload has drastically increased by taking online/bimodal courses in comparison to what it looked like pre-pandemic.*

> *Dans la vraie vie, là, il y a peu de personnes qui connaissent des choses par cœur. [...] Le domaine est important. Dans les domaines qui demandent moins de mémorisation et plus de compréhension, le sens d'association, comment on va associer les choses ensemble [...] pour moi, avoir l'opportunité de faire des examens de mise en situation dans les cours bimodaux, ça amène une richesse incroyable à mon parcours.*

> *I think exams specifically are very stressful and very hard online in my opinion. And based on my experience, especially for the math courses I'm taking, having the camera set up and not knowing when the camera falls while I'm writing the test. It's the worst thing.*

Table 5. Summary of themes and related sub-themes from qualitative analysis of students' comments in focus groups

Flexibility	**Well-being**	**Equity**	**Sense of community**	**Assessment**
• accommodation • accessibility **Benefits:** In-person and online students reported an adapted modality to their learning style. • Online students and those who used both modalities appreciated the opportunity to enhance time-management. • Most participants reported an enhanced motivation and participation in class activities. • Most students felt an enhanced overall well-being. • Students appreciated the ability to participate	• physical well-being • emotional well-being • social well-being • functional well-being **Benefits:** In-person students experienced an enhancement of social, functional, and emotional well-being. Student's socialization needs and learning style preferences were better satisfied. Online students moved at their own pace, ate better, got more exercise, felt less stressed, especially regarding time and financial management. **Challenges:** Some online students, who had been obliged to register online because of public health restrictions reported	• diversity • inclusion **Benefits:** Bimodal courses allowed students to use home computers and not be required to carry a laptop. Bimodal courses have allowed students with limited financial means to not be obliged to travel to the Campus and therefore optimize their living cost. Technologies such as recording and Zoom transcription facilitated non-native students' learning, those with attention disorder and shyness. **Challenges:** Technology settings did not always foster an equivalent experience of synchronous learning (cameras, wireless	• interaction • communication • socio-affective relation • participation • peer connection • student-instructor connection • office hours **Benefits and challenges of technology** (Facebook WhatsApp, breakout rooms, chat box, Camera on/off) Francophone students experienced increased participation including more interaction, more opportunities to create a community, more opportunities to learn from peers, and more opportunities to connect with professor. Anglophone students experienced fewer interactions with peers, fewer chances to create a	• number of assessments to complete • assessment type • technology **Benefits:** Students appreciated the change of assessment type, from memorization exams to more analytical and critical thinking exams. **Challenges:** Overall, students reported an increased number of assessments in bimodal courses compared with in-person classes. Students found online proctoring stressful.

even when facing illness or anxiety. • Students appreciated the ability to catch up when unable to attend a class due to an unanticipated event. • Students appreciated the ability to replay courses if some concepts were not understood.	a lack of peer connection, isolation, and depression. Instructor-related practices such as lack of session recording, strict attendance policies, such as grade penalization for absences, were reported as a source of stress for some students.	microphones, high sensitivity of ceiling microphones) among both groups. Recurrent technology issues in some classes during the class sessions created a non-equivalent learning environment for in-person and online groups. The instructor's techno-pedagogical proficiency level created a non-equivalent learning experience for the online group. The explicit and repeated mention by the instructor in class about their reservations concerning the bimodal format created a sense of unease among online students. Instructor's commitment toward online students: some instructors cared less about online students (e.g., microphone off, not attentive to raised hands online) or explicitly favored in-person students.	community and fewer opportunities to learn from peers. **Benefits and challenges of instructional practices** (breakout rooms, group projects) Same result as above **Benefits of student-instructor connection** Ability to ask more questions to the instructor thanks to the technology Ability to connect more with the instructor thanks to virtual office hours	

Students' suggestions for improving the bimodal quality outcome

The table below summarizes suggestions and recommendations made by students participating in focus groups.

Table 6. Students' recommendation for improving bimodal experience

Administration	Technology support	Instructor course design	Instructor in-class activities	Students training	Assessment
Students recommend: • Consider targeting specific courses for the bimodal format, especially lecture-based courses • Offer bimodal courses in the summer • Offer more attendance choices at time of registration • Consider involving students in decision-making	Students recommend • Consider consistency in choice and use of a single audio-conference tool (Teams or Zoom) at the program level or university-wide • Inspect classroom technology on a regular basis • Provide teaching assistant support to instructors • Consider instructor technological proficiency • Provide instructors with techno-pedagogical training	Students recommend • Plan and design courses carefully prior to the semester • Prefer a blended/hybrid design where lectures are pre-recorded, or some videos are pre-created, and the class time is dedicated to breakout groups and discussion • Consider using technology for enhancing engagement (discussion board, weekly quizzes, interactive class by Polls (Zoom, Wooclap), chatback system, Zoom transcription	Students recommend • Make material available in advance • Use their own device to monitor the chat box (rather than relying on the podium terminal) • Ask in-person students to connect their devices online • Adopt adjusted bimodal habits, such as not looking away from the camera, passing the microphone to in-person students, or repeating students'	Students recommend • Train online students to have more discipline while enjoying more autonomy in bimodal courses • Train students regarding different types of peer works (e.g., breakout room, group projects, etc.)	Students recommend • Make exams in person for everyone instead of proctoring them by Respondus or using cameras. • Use essays, case studies, critical and long answer questions instead of many multiple-choice exams.

			comments, not moving away from the podium and disappearing from the cameras, or if necessary, having their Zoom open on their cell phone so the online students can see them. • Record the course session and if possible, ask students to send their questions and recording a response session to answer students' questions at the end of the semester		

Conclusion

Despite some technological challenges and the ongoing need to provide training to instructors, students who participated in this study clearly indicate that it would be beneficial to keep offering the bimodal format at the University of Ottawa. It provides opportunities for students to overcome economic and social barriers, learn in ways that are tailored to their needs and preferences, maximize the accessibility of education, inclusion and diversity, and promote an overall better well-being among students.