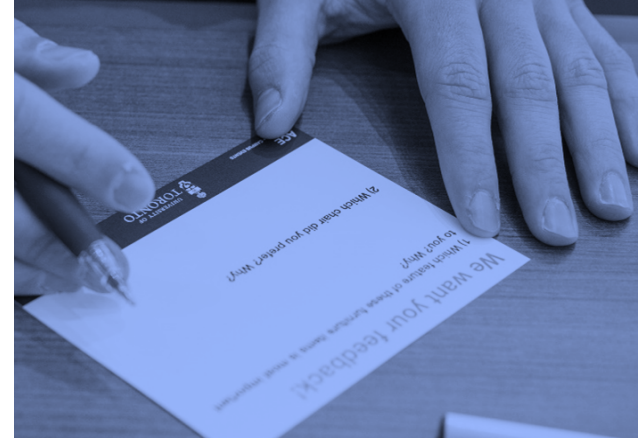
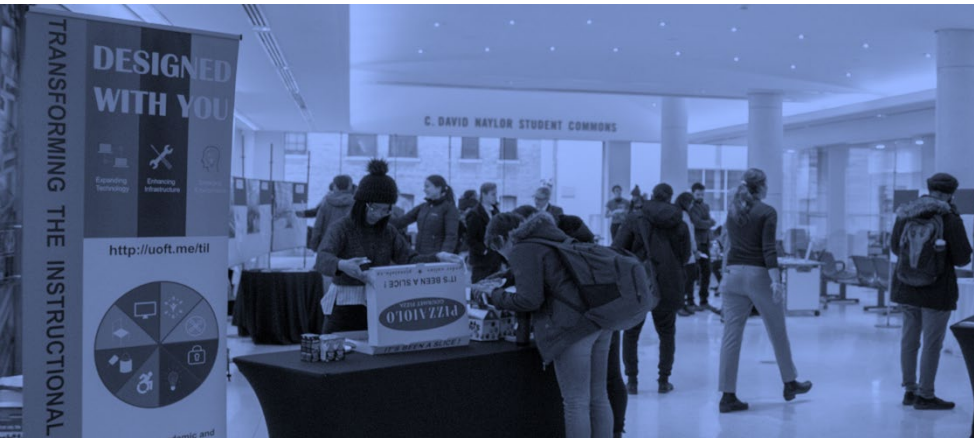


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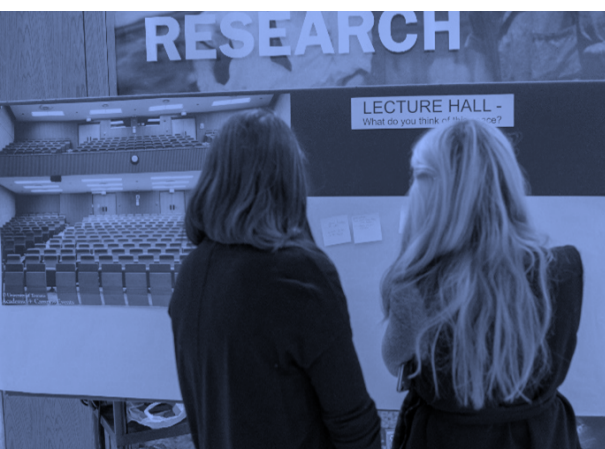


UNIVERSITY OF
TORONTO



Transforming the Instructional Landscape

Themes and Insights: Design Thinking Summary



ACE Academic and
Campus Events

innovationhub
deepening collaboration

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Executive Summary

Transforming the Instructional Landscape (TIL) is a major classroom re-design initiative at the University of Toronto (U of T) led by Academic and Campus Events (ACE) at U of T. TIL will support the University to “upgrade 174 classrooms in 23 buildings across the St George Campus, totaling an area of 15,700 NASM....(impacting) almost 6000 courses.”¹ ACE emphasizes that “engagement with students and instructors is a fundamental component of this project, and (will drive) this initiative’s roll out”².

The Innovation Hub, situated within the Division of Student Life is a “student-led initiative that collaborates with partners in the university community to inquire and ideate innovative strategies for improving the campus experience”³. Through student, staff, and faculty perspectives—with a particular focus on lived experiences, Innovation Hub design-based processes informs the development of new or refined concepts, systems, and practices.

To ensure stakeholder engagement in the TIL project, ACE initiated a partnership with the Innovation Hub in 2017. The main objective in this partnership is to ensure that classroom redesign happens **with** rather than **for** students, instructors and other important stakeholders. Initially, the partnership focused on student needs in classroom design (See Appendix B). In 2018 the partnership expanded to include a broader review of instructor and other key user needs.

This report presents findings derived from initiatives carried out between September 2018 and February 2019. The data collected comes through three primary avenues: long form interviews, classroom observations, and public feedback events. Additional project details and summaries of prior inquiries are provided for context.

Feedback collected from stakeholders highlighted the importance of connectivity in classroom environments. Connectivity is examined through five key themes, which are deeply intertwined and examined in the report: **interpersonal connections** between students and instructors, **physical connections** between bodies and the classroom environment, **virtual connections** between classroom users and classroom technology, **accessibility** as an approach to facilitating connectivity, and **emotional stakes** revealed through preceding themes and insights.

Additionally, several data visualizations within the report serve to provide additional insights. Quotations from interviews and events and user personas offer direct inspiration from the data to support the themes and insights provided. The data culminates in a set of design principles to use when considering important elements of classroom design, and a practical checklist to assess and reconsider classroom spaces. Limitations and next steps include suggestions for additional partners and inquiry to support the future goals of TIL.

¹ Academic and Campus Events, retrievable from here: <https://www.ace.utoronto.ca/til/introduction.html>

² Ibid

³ The Innovation Hub - ‘Our Work’, more at: <http://blogs.studentlife.utoronto.ca/innovationhub/our-work/>

Context

Project Background

Transforming the Instructional Landscape (TIL) is a major classroom re-design initiative led by Academic and Campus Events (ACE) at U of T. The following is a description of the scope of the work from ACE's website:

"With quality teaching as one of the University's core missions, instructional space plays an essential role in fulfilling that mandate. As a steward of these important facilities, Academic + Campus Events (ACE) is committed to developing accessible, innovative, and effective purpose-built classrooms that address the needs of all stakeholders...Overall, the Transforming the Instructional Landscape project will upgrade 174 classrooms in 23 buildings across the St George Campus, totaling an area of 15,700 NASM. A project of this scope will impact almost 6000 courses and has the potential to affect the experience of almost every student and instructor on Campus" ⁴.

ACE emphasizes that "engagement with students and instructors is a fundamental component of this project, and (will drive) this initiative's roll out"⁵. In order to meet this commitment, in 2017, ACE contacted the Innovation Hub, situated within the Division of Student Life, to partner in the creation of structured mechanisms to gain feedback from important stakeholders such as students, faculty, classroom technology support personnel, schedulers and others, such that the design and re-design of classrooms can happen with these stakeholders. Initially, this inquiry focused on student needs from classrooms, but later expanded to include all stakeholders such as instructors, instructional technology team members, staff members, accessibility services providers, and more students with diverse learning needs. This report presents findings derived from inquiries carried out between September 2018 and February 2019. The data were collected through three primary avenues: long form interviews, classroom observations, and public feedback events.

Prior Inquiries

Over the past two academic years, researchers at the Innovation Hub have worked to capture insights from students, instructors, and staff. In service of this goal, researchers have employed a variety of methods including long form interviews, participant observation, a social media campaign in 2017-2018, and public feedback events in the 2018-2019 academic year. Diversifying our inquiry methods allowed for both breadth and depth in data collection.

2017-2018 Student Feedback:

From September 2017 to February 2018, the Innovation Hub undertook design-based inquiry processes combining long form interviews, participant observation in classrooms around campus, and data lifted from a social media campaign as part of TIL's user engagement

⁴ Academic and Campus Events, retrievable from here: <https://www.ace.utoronto.ca/til/introduction.html>

⁵ Ibid.

strategy. Participants at this stage of the project were exclusively students. The report summarizing these findings (Appendix B) was delivered in April 2018.

2018-2019:

Feedback Events

Each feedback event for Transforming the Instructional Landscape occurred in a range of public on-campus spaces, including the Bahen Centre Lobby, Medical Sciences Lobby, Sidney Smith Lobby, OISE Library, and Robarts Library – 2nd floor, St. George Campus. The objective of these six events was to gather student and instructor feedback on classroom space and furnishings.

The event model of 'Explore, Imagine, and Play' gave each participant three unique and interactive experiences. "Explore" was a space to share thoughts regarding photos of different types of classrooms. "Imagine" asked participants to respond to open-ended, blue-sky style questions. "Play" was an opportunity to test classroom furniture and share their reactions using feedback cards. Over the course of the 6 separate events in the 5 locations across campus, 900 feedback cards were collected, 897 sticky notes posted, and participants provided 5,397 individual question responses.

Interviews

Five core Innovation Hub researchers (with assistance from eight volunteers) carried out forty-two long form interviews with students, staff, and instructors from an array of disciplines at the St. George campus. Our focus was on storytelling. These personal narratives allow us to understand many perspectives and voices, providing a holistic understanding of classroom use. Participants were asked to describe striking or memorable classroom experiences. The open-ended nature of this line of questioning allowed participants to guide these discussions and share their own experiences.

Observations

Observations included Innovation Hub researchers attending twenty-five active lectures, tutorials, and seminars with the permission of instructors. This was an important step to better understand the structure and flow of classes in different areas at the University. These sessions helped to contextualize student, instructor, and staff experiences that were captured during interviews and events – revealing the many interactions between classroom spaces and the individuals that use them.

Identified Connections

Consolidating data gathered through these methods, researchers identified the unifying theme of “connectivity”. Under the banner of connectivity, our insights were further organized under 5 key themes. These 5 key themes structure the following section of the report, in which we present the results of our analysis of interview, event, and observation data.

Classroom Connections

By promoting a multiplicity of connections, students are situated as active and invested participants in the learning process. Strong interpersonal connections support student-to-student engagement and connects instructors to students and class facilitation. The layout of the physical space is also integral, where comfortable and accessible furniture helps students feel that their physical presence is considered, welcomed and connected in the classroom. Virtual connections that are incorporated with the user in mind also allow for students to share with each other, the instructor, and the world beyond. By prioritizing accessibility to and within a learning space, this connection becomes an encompassing inclusive theme in approaching classroom design. Finally, emotional stakes are at the core of each of these connections – involving emotions that are connected to the functionality of a classroom environment.

These **interpersonal, physical, and virtual connections** are influenced by classroom **accessibility** and an acknowledgment of **emotional stakes**. As a result, truly inclusive and integrated learning requires all five connections working in tandem rather than being mutually exclusive.



Figure 1. Graphic representation of five primary themes for Transforming the Instructional Landscape

Themes and Insights

Theme One: Interpersonal Connections

Collaborative classrooms bring students and instructors together, but instructors need new strategies and support to manage these multiplying connections.

There are two major types of interpersonal connections that come into play in a collaborative or active learning classroom. The first is the interaction between instructors and/or teaching support staff and students. The second is interaction among students. **Effectively managing these connections is the key to an enriching classroom experience.**

In Harmony with Space

Instructors were excited by the opportunities offered by collaborative and active learning spaces to “invert” the typical unidirectional lecture structure. Rather than instructors exclusively delivering information to a class, students positioned in discussion groups with the ability to share and access information digitally can reverse this flow. Rooms with flexible furniture sparked the imagination of interviewees, who valued exchange and collaboration as educational principles:

“So these evaluations that happen (in collaborative spaces)... they are kind of nice because you think something is right but when the other person looks at it they have a very different perspective. ‘Why I didn’t think of that?’- you can talk to your peers and understanding their take on your work...”

“I do a lot of group work. I really like non-fixed structure (classrooms) and the ability to sit with the students. They can have eye contact within their group and see each other”

“I really value these kinds of things. Because in a group set up, I want the students to see each other to talk to each other- I want the students to be able to get a sense of who’s there. I found that when you work in a row it’s very difficult to achieve that- people want to be close to each other to work”

Instructors teaching classes where students speak about sensitive and sometimes personal subject matter are keenly aware of the effect space has on interpersonal connections. In these instances, the classroom should reflect the overarching goal of achieving comfort, intimacy, and engagement through discussion:

“I do think this (collaborative classroom) is something that helps make an intimate setting. I wouldn’t want to do it in a large classroom, for example. I wouldn’t want to do it in a slope classroom. Everyone being on the same level is kind of a metaphor for what we are trying to do”

Space as an Obstacle

Instructors thought deeply about the influence of classroom design on the tone and tenor of their classes. They noted clashes between the spaces they may have requested to those they may have been assigned and their teaching approaches:

"I'd say it's kind of formal, mainly because it's basically a full-blown lecture hall for a relatively small class, but still- a full-blown lecture hall. I previously taught the same course, but in a small tutorial room. Again, for tutorials... I was close to the students and it was easier to engage with them. In this room, it's more formal. I'm really at the front. And the students are in rows set up on a kind of hill, so that makes it seem like a 'proper teaching experience', I guess"

"The problem is, it's called lecture because it's reading from the screen and my students are also reading it as we go along. Most of the things I teach need that still. So regardless of whatever else is going on, I need my projector to be responsive, to be on-time, and to be high-resolution enough for some of the things we are doing"

"Well, it's a bit difficult because of the style of the room. Like the rows, right? So, if the students work in a group of four or three or five, it's difficult for them to see each other...the two that are the closest to each other can work together but the other two at the other end don't really see what's going on"

Ease of movement through classroom spaces (see Theme Two) was highlighted as another obstacle to establishing interpersonal connections. Classrooms tend to funnel instructor attention to easily accessible areas of the seating layout, isolating those in other sections of the room from the discussion. Sharing student work or insights with their peers during class also presented a challenge:

"They also fit a large number of students which we need because we can't afford to do small math courses. The downside is it's not easy for the students to collaborate...it's impossible for us to access any students who do not sit on the edges. We walk around the room, talk with them while they solve problems. We can only do that with a very small portion of the class"

"The most difficult thing to do in that room is to share student work- to share with the class...I have a document camera so I can share...the student has to pass me the notes so I can project it and then students can discuss it, but it's still challenging to do"

Making the Most of a Space

Though productive, instructors found the management of these proliferating classroom interactions to be extremely resource intensive. Changes in lesson plans and teaching techniques are necessary in order ensure meaningful interactions with students and the

proper operation of classroom technology. These changes can be a source of anxiety as their focus shifts from lecture content to lecture delivery:

"I have been assigned to teach Calculus II here, using a flipped classroom model next term, and I have no idea how I am going to manage this"

"I'm going to have to do a lot of work to prepare for the sessions in this room. How to evoke an air of active and enthusiastic learning seems a mystery to me at this point"

Some instructors felt they were unable to teach in collaborative spaces like Myhal 150⁶ as a solo lecturer. They imagined they would need a whole teaching team in order to manage the classroom effectively:

"If you are a TA, how many of the tables would you be comfortable with? I would need 10 TAs per class. Two or three per row"

Increased collaboration in the classroom is often accompanied by higher noise levels and a greater number of distractions, some of which could be classified as accessibility issues. For example, shared tables strengthen the connection between students and their classmates at the expense of their connection to the instructor. As a result, instructors need to be more proactive with interpersonal classroom management:

"Excessive talking was an interesting one. The open space promotes student chatter. It is quicker for them to disengage and they are louder when they do. They will carry on their own conversations."

"...it would get really, really noisy in here during group work. With individuals that require accommodations, the space could be problematic. This space is not friendly for them."

Students and instructors embraced classroom technology only to the extent that it facilitated and amplified interpersonal connections. They were consistently critical of personal electronic devices that were not integrated into the flow of the class. Their capacity to distract students, both from class content and from their peers, was an area of concern:

"My teaching style is very discursive. I like a lot of discussion, especially in tutorials. Often students have just come from a lecture where they just had to sit passively for one or two hours. So, I like to be able to walk and any sort of technology that makes it easier, whether it's just a smaller room or microphones that are easy to wear, rather than forcing me to stand at the desk, are much better"

⁶ A 468-person auditorium located in the new Myhal Centre for Engineering Innovation & Entrepreneurship outfitted with the latest technology and innovative designs. More at: <https://www.utoronto.ca/news/classroom-20-how-u-t-creating-innovative-accessible-learning-spaces>

“Last year I was taking [a class] and nearly all the notes we are taking are on the slides and a lot of people are just using computers. But that class does not require any interactions which is - the instructor just talks through all the lectures without asking any questions, so a lot of students can't fully understand the course content. They were just distracted by all kinds of things and started playing video games. If you are sitting at the back then you can see nearly all the students at the front are listening very carefully”

A Reconfigurable Future

Students and instructors expressed a strong desire for flexibility in classroom design. Though there were objections to mobile furniture options, primarily on the grounds that arranging it correctly is time consuming, most interviewees preferred flexibility to fixity:

“So, every week when we do these small group discussions, though there are some frustrations for me, I do really like that – the individual movable seats that afford better face-to-face interactions among the small student groups”

These classrooms are dynamic and provide an opportunity to instructors to create their own solutions to problems that arise in them. With room for adjustment, instructors can alter the flow of the class, redirecting student attention as necessary:

“I think that reconfigurability is really important. The biggest thing I ask my students right now is that for some parts of the class they have to all turn to face me, and for some parts they must face each other. Because there is not a lot extra space in the UX lab, that's very hard to do. People may not need to adjust their seating to where they need to be. People may decide to not look at me, they'll just listen and they'll just type on their laptops”

Instructors appreciated existing classrooms that were arranged or furnished in a way that naturally and intuitively led to connections between students without the need for additional forethought when drafting their lesson plan:

“A couple things have happened for which I credit whoever designed the space. One of the rules in the studio is every table needs to have one chair of each colour. The chairs have different colours and each table needs to have one of each. And I discovered that I can use that when I was organizing workshops. I can say that all the blue chairs, it's your time to present now. It was very easy to arrange that”

“I really like it (TEAL rooms). The way it's designed in the Myhal building is there's a lot of space to go around. So, there are round tables. Students can work in groups, small groups - three, four students, they can all see each other. I get the students to project their work when we do an exercise for half an hour. And then I'll get the students to plug in and show it to the rest of the class”

Theme Two: Physical Connections

Furniture, spatial arrangement, and the atmosphere of classrooms must accommodate a range of bodies and pedagogies.

Students feel connected to a classroom when they see that its design takes their body into consideration. Furniture that does not suit a student's body type literally and figuratively obstructs connections with the instructor, other students, and class content. Moreover, this furniture must be able to house the electronic and analog equipment on which students depend. Climate, including proper lighting and a comfortable atmosphere, is also important to support individual's engagement and energy levels.

Finding Furniture that Fits

Without comfortable and accessible furniture, students struggle to maintain their focus in class. Flexible furniture that can be re-arranged or adjusted to meet the individual needs of students was frequently requested by interviewees and event participants. Respondents would often reflect on their inability to find seating that suited their body:

"Comfort and leg space are the most important because it satisfies the relatively large guys and girls"

"Adjustable height of the chairs (is important to me). I have long legs and having to sit for extended periods of time without being able to change position ... makes class very uncomfortable"

"...how low to the ground the chair is (is most important to me) because having four hours straight of lecture hurts my back... I am short, so I don't like the high chairs"

Students emphasized the amount of time they spend seated in classrooms. Comfortable seating makes it possible for them to endure hours spent in class every day:

"Comfort (is most important to me), because after sitting and working for long periods of time, quality furniture stands out by not adding to the problems you have studying"

"I found the cushion feature of the chairs to be the most important. Given that class can run a bit long, it helps to add comfort when learning"

"If students are expected to study and sit all day, (furniture) should be comfy but also not cause neck strain or back pain"

The limited size of writing surfaces in lecture halls presents a major obstacle for students. During class, it is difficult to find space to house all of the necessary notebooks, textbooks, and writing tools in the space provided. Complicating matters is the fact that examinations are often written in these rooms, which have different desktop space requirements than standard classes:

"I absolutely disliked the chairs with a built-in side pseudo-table. Those are uncomfortable and cramped and to call those things tables is a disgrace to real tables"

"If you can't fit a ruler, a calculator, and an A4 sheet of paper on the desk, that's not a desk"

"Because lecture halls turn into exam rooms during exam season, it is important to have a large enough space to write your test, especially if its open book"

The arrangement of furniture in the class is as important as the furniture itself. Flexible furniture accommodates a wider range of body types and enables different classroom activities, but it also creates spaces without a consistent point of focus. This means that students may find themselves seated at uncomfortable angles in relation to the instructor:

"It's all about side angles. It's one thing that I think they should really look at. From every seat that you want students to be sitting at, what kind of angles are you asking them to turn their neck at for extended periods of time"

In lecture halls with fixed seating, ensuring every seat has appropriate angles and sightlines is of even greater importance. Lecture halls with multiple writing or projecting surfaces run into the problem of leaving certain sections of the room with a partially obstructed view. This leads to some creative student solutions:

"I guess one trouble is there is the projector, the side projector, and also the chalkboard...students at the back often have to take pictures with their phone and zoom in and see"

"Accessibility is important. The high desks/chairs would be great for those classrooms when it's harder to see in the back"

Freedom of Movement

Freedom of movement was flagged as an area of tremendous importance in interview data. For students, this was often expressed as an issue of accessibility. Like fixed seating, cramped classroom spaces exclude an array of body types. The long rows in lecture halls were a common pain point. Students tend to settle at the edges of these rows, leaving the middle seats vacant and difficult for others to reach:

"You have rows of long desks and then a bunch of chairs, but the space between the desks isn't always big enough. Sometimes it's really inconvenient. If you are trying to get out and you're not at the end of the row, you're trying to squeeze past people...[you] have to get people to get up so you can leave"

For instructors, movement played two important pedagogical roles. The first is in the movement of the instructor. A moving instructor can engage listeners directly, offering greater control over energy levels in the class:

"I prefer walking around because it helps me get into a rhythm. In the studio, I am mostly required to stand in front of the podium so that I don't block the projector"

They are also able to utilize body language to communicate their arguments:

"(Movement) also means that as I'm lecturing I can very physically make a point- like now I'm making a side point or going on a tangent by physically stepping to the side..."

The second pedagogical role played by movement is in facilitating interaction between the instructor and students. During group discussion or activities, the instructor can manage the room, moving to a student to better hear a question or to review written work. Mingling with students during class by leaving the podium and joining them mid-class is a crucial source of information for many instructors, allowing them to better gauge understanding of class material. Crowded aisles and long, interrupted rows of fixed chairs often limit instructors to interacting with students sitting at the front of the room:

"I tend to take the perimeter path around when I walk. I will dodge around where there are fewer students and occasionally I will bump to people's chair legs or backpacks with my foot. I don't feel great about that because they are working and I am trying to sneak past them"

"The primary thing that I want to be able to do is to walk around. This is useful, particularly when doing exercises where students sit together or maybe even by themselves, and people finish them at different paces. So, sometimes people will finish early, and I'd like to walk around and talk to them and see what they came up with. It's really hard to do that in a tutorial hall, or in a lecture hall, because people are seated in rows, and there's only one corridor down the middle I can walk down"

Climate Control

Lighting, sound proofing, and temperature exert a powerful influence on energy levels and engagement in classrooms. More than an issue of comfort, inadequate lighting or a lack of air circulation can disrupt the connection between students and course content:

"The room is dark. You cannot see the face of the prof or people around you. The prof is so far away. It's terrible. You feel you cannot understand anything in the lecture. It triggers (an) existential crisis"

"I have little control over the temperature in the room. When the ceiling is low and at full capacity, that becomes a problem for my students. I tend to teach in the evening and people tend to get sleepy. If they are sleepy and warm and they are cramped together, and there are no windows, it is a recipe for us having a hard time to focus"

In courses that deal with sensitive subject matter or require a level of privacy and/or intimacy, stuffy rooms present a special challenge. Opening a door or a window can make students less comfortable sharing with one another:

“Especially for courses like a course on human sexuality, I don’t want to have to open the door to get air flow. I want to be able to close the door. So, it was disappointing that it’s too hot to do that in summer”

Noise from neighboring classrooms is a similar distraction that interrupts the flow of a class. Instructors were especially frustrated by this issue because it falls outside the space they are meant to manage themselves. While they may be able to make alterations to their own classroom, they have little control over others in their vicinity:

“It is very echoey. When the classroom next door is watching a video or having a guest speaker, they’re super loud. On our test day, they had their microphone turned all the way up. The room is the same size as ours. I can’t imagine they actually need the microphone to be turned all the way up. But because of the combination of the microphone and the very echoey space, and I guess the thin-ish wall in between, it was very distracting”

Rooms with windows and bright, natural light are unanimously preferred by instructors and students. It ranks alongside “outlets” and “personal space” in the top three preferred classroom features according to data collected from the feedback events (see Figure 2). Excessive natural light is an issue in some spaces, but more important than the function of the light is its role in maintaining a calm and peaceful classroom atmosphere:

“As a human, I like windows because I like outside. That said, windows can be difficult to work with. When windows cross your screens and its day time, even with shades it will make it harder to see the screen. Having windows is good, having shades on them is better”

Theme Three: Virtual Connections

Students and instructors need dependable connections for personal electronic devices that are consistent across classroom spaces.

Virtual connections are increasingly the focal point of personal and physical connections within the classroom as well as pedagogical approaches. While many instructors recognize the value of incorporating new classroom technology into their lesson plans, these virtual connections must be reliable and consistent between classrooms in order to encourage widespread adoption.

The Risk Factor

Both instructors and students saw tremendous potential to change the way they teach and learn through diverse virtual connections. These were imagined as a remedy to classroom disassociation, offering a digital space for sharing ideas without necessarily sharing a desk:

“I wish there was a shared channel – like a sharing medium, where people can come together to collaborate. I don't know if that makes sense. Kind of like so we don't have to each look at our laptops. We have this shared platform, whether it's an iPad or any device that can help a group of people come together and just look at the same thing”

However, experimentation with new approaches incorporating virtual connections was limited to the extent that instructors felt they could not depend on the equipment to function when needed. During interviews, instructors shared stories of the added labour that goes into securing the classes they currently teach against technological issues:

“It gets to the point that I always make a PDF backup of every single slide because I can never assume that I will actually have Wifi access. Even if it's, for example, during a conference, the Wifi might still go out in the middle of a presentation and your live demo won't work anymore. I've seen that happen. Fortunately, it hasn't happened to me yet”

“I always bring a laptop, but then also a backup of my presentation and slides and files on a USB key. In case my laptop isn't compatible with the projector or the projector has to go through the main teaching station”

Different spaces require different adapters to synchronize instructor's or student's devices with classroom equipment. This requires forethought and additional planning and, as a result, is often overlooked or forgotten. In Myhal 150, for example, the HDMI connections on the student tables were under-utilized because students also did not have the appropriate cables. Instructors frequently highlighted this issue, recounting stories in which they relied on luck or coincidence to resolve it:

"The biggest pain is that every room has different needs. So, this is my... (instructor opens an adapter bag) - ...I left my adapter in the room again. This is the third time I've done that"

"It always varies a little whether they have a connection that is actually going to match what is available on the projector. Today one of the students had slides on her laptop. She just didn't have a connection but fortunately all three of them had brought their laptops so one of them had a connection."

Animating these discussions of prep work was the underlying question of risk. Instructors were keenly aware that taking full advantage of the new teaching technology available to them meant surrendering some control. Breakdowns in basic infrastructure - like Wifi - underscored this point:

"Actually, just getting consistent Wifi access is a problem which would certainly make any sort of live online teaching very risky, I would say. So, I definitely want more robust Wifi routers."

The problem of risk surfaced in discussions about the lack of consistency between classrooms and its influence on lesson planning. Instructors opted to stick to activities and techniques appropriate for use in spaces with only the most basic functionality. When they had the opportunity to teach in a space that afforded them a greater variety of options, instructors did not invest in learning how to incorporate these features into their established lesson plans:

"I guess if I want a PowerPoint presentation or something, or to show a video, it's usually pretty hard to do, especially at St. George campus, but even at Mississauga. It's still really old technology at this point. It's really unwieldy, but generally, my classes don't require those extra bells and whistles. So, I'm fine."

"I know some of the buttons there, right? I know, basically, there's an HDMI cable that connects to my laptop, I press the HDMI button and it works. If it doesn't work, I press the button that calls the technician and have them figure it out for me. Aside from that, I think there's a whole bunch of other things that are pretty interesting, but I've never used it"

Instructional technology that required little additional planning in order to utilize was strongly favored by those interviewed. The new teaching stations were warmly received by instructors because they are self-contained and fully functional, requiring no prep work:

"The teaching station is always ready to go. Turn on, log in. It's very quick. It's easy because you can just log in (with the classroom computer). You don't have to carry your laptop with you. Just need to show up. Use your information, in the cloud or something like that. So, it's really nice to do that. And if you forgot anything, you know you have the internet"

Powered Connections

Students require classroom spaces where their personal electronic devices can seamlessly integrate with existing classroom infrastructure. An array of accessible power outlets is a necessity in every classroom. Power outlets accounted for the highest proportion of the responses to the “most important classroom feature” question and their presence or absence was frequently cited in the picture and furniture review card activities:

“Some of (the desks) are built in with power, which is a big deal ... Power should just be standard at this point on all the desks”

Needing to find seating close to power outlets (either housed in furniture or positioned along the walls) meant students were sometimes forced to choose between seating that suited their body type or an operable laptop. Occasionally students had difficulty locating outlets already installed. Power outlets are also an important aspect of accessibility to ensure that adaptive technology may be used throughout the classroom (see Theme Four: Accessibility):

“I have really long classes so my electronics often don't last the whole day. Having plugs is very important”

“Good: outlets. Bad: didn't know they were there”

The furniture in some rooms, installed before portable computers became ubiquitous, do not meet the demands of students in 2019. Even if power outlets are available, insufficient desk top space makes the use of tablets and laptops difficult:

“In most lecture halls I actually don't find that the benches or desks are very good, because they're designed for supporting a notepad as opposed to what most people carry now, which is a laptop. And what's even worse is if they can't be put down. Then I have to balance it awkwardly”

Instructors want to utilize analog and digital teaching equipment in tandem, but projector screens and writing surfaces are sometimes arranged in ways that prevent their simultaneous use:

“The majority of our professors' staging point is a slideshow that they build on the board ... But they don't want to turn off the projector because they're just doing a quick tangent on the board. But the projector screen blocks all the chalkboards”

Theme Four: Accessibility

As spaces are being approached to support current pedagogical approaches, accessibility must also be a foundational consideration in classroom design.

The question of accessibility runs through each of the preceding four themes. Conversations with staff in Accessibility Services revealed the broad challenge of designing for accessibility: **how do we create flexible classroom systems that allow all students to participate in the classroom community fully and effectively while simultaneously removing the stigma often associated with accommodation status?** This entails creating spaces where accessibility needs are incorporated into the design of classroom fixtures.

Design for Accessibility

Providing students with opportunities to bring their own solutions into the class without requiring the intervention of instructors or Accessibility Services limits feelings of discomfort that sometimes accompany making requests for accommodation:

"I think if you're living with anxiety, walking into a 1500 person lecture hall is intimidating, and more importantly it's alienating. Right? If we want to draw people into the learning fabric, we need environments that permit that kind of interaction"

Having to dispatch accessible furniture piecemeal to classrooms based on student requirements creates an array of logistical issues. There is insufficient time between classes to relocate furniture. This equipment is often stolen or lost as well. Incorporating a wider array of accessible seating options into existing classrooms would save money and labour:

"We've tried to pre-enroll the students who need the furniture in courses so that ACE (ed.) can put the furniture in the classrooms before classes start. Because the classrooms are so heavily used they can't actually move it in"

"Getting accessible ergonomic furniture right into the classroom already installed, which would be a huge help to accessibility services because right now we struggle to get ergonomic chairs into classrooms when they're needed and the chairs are stolen. And it's also complicated to move the chairs around our large campus"

New Approaches, New Solutions

The University of Toronto's long history means that many of its spaces were designed to suit pedagogical approaches employed in decades past. New approaches that have emerged through advances in pedagogical inquiry consider a wider array of bodies and learning approaches. In many cases, updating classrooms to accommodate courses that are not lecture-centric is simultaneously updating classrooms in favor of accessibility:

"It's partly the physical environment. So, can people navigate the space? Does the furniture move? Movable furniture is number one. And good instructional design requires interaction. People can listen for 20 minutes. And then they need to process

what they've heard. So, is the space designed to create opportunities for interaction? And if you look at most of our instructional environments, they're based on a model that's several hundred years old. There was one book that got read at the front of the room"

"Old is what I would describe it as. Maybe what I mean by that is it's not suitable for contemporary students or contemporary learning or teaching and learning strategies that are being used. It's not very accessible for students who have physical issues (in) I would call it auditorium style (classrooms)"

As TIL continues to develop classroom infrastructure, new instructional technologies could simultaneously generate new accessibility solutions. Interviewees identified tremendous potential in lecture capture and sound transmitting equipment:

"It's often a struggle to actually hear what the lecturer is saying on the recording. I guess this falls under the umbrella of lecture capture. If the classroom was set up to facilitate lecture capture, that would be a huge gain for accessibility"

"It would be great to get the sound directly to hearing aids and FM systems. But if it was even more universal than that- if a student could access the sound straight from their device, their note taking device that was recording, that would also be amazing"

Basic infrastructure requests, such as calls for an increased number of outlets, are also a boon to classroom accessibility:

"As an accommodation, some students can't hand write their notes, so using a computer becomes very important to them. Where does this intersect with the classroom itself? For instance, the availability of power outlets becomes an accessibility issue in these cases with respect to recording and sound"

Students with accessibility needs have access to customized note taking and lecture capture solutions on their personal electronic devices. Spaces like Myhal 150 which offer more opportunities to integrate these devices into the existing classroom infrastructure might increase the functionality of these solutions:

"So, in the situation where there are iPads, is it possible for the student to bring their own device and participate with their own device? Because the nice thing about that is now you're not trying to think of every single exceptionality and solution. That's already there in the classroom. Allow a student to bring their own solution into the classroom"

Theme Five: Emotional Stakes

Empathetic classroom design considers both function and feeling. A student, instructor or staff member can feel many emotions when interacting with a classroom or its participants.

Interviews with students, staff and instructors acknowledged an ongoing presence of having emotional stakes in a space. This can include both positive and negative emotions, such as anxiety, stress, or excitement that is often felt in a classroom environment. These feelings are driven by interactions that are varied but inherent to a classroom's functionality – from finding a seat in a large lecture hall to facilitating a class that supports a desired style of teaching.

Feeling Welcome

Instructors strive to create an environment where students feel safe and comfortable sharing ideas. Classrooms arranged to facilitate conversation and create a welcoming, communal atmosphere do more than smooth the flow of activities. They meet emotional needs by making both instructors and students feel as though they belong:

“(The important aspect is) the comfort level. A cozy, nice place to join the conversation”

“The students of University of Toronto don’t know each other very well...but when they sit next to each other and share the space with each other, I think they become friendlier with each other. So, for me the tables help create a social environment; a community-oriented environment”

Feelings of comfort and belonging were also associated with architectural features. Instructors and students felt connected to iconic spaces, like University College, because their classic design reflected an idealized version of the “traditional university experience”:

“I mean, maybe this will sound frivolous to some people, but I like the decor of the older buildings, which again, makes it feel like a more comfortable or enjoyable teaching experience. Certainly not the most important thing, but the nice old rooms with the wood tiling or something like that looks nice”.

Classroom design sometimes has the opposite effect, creating feelings of unease. Navigating crowded rows to find a seat, for example, was not only described as a physical challenge or inconvenience, but also as a source of embarrassment:

“I am not a fan of long rows... because if you are the unfortunate person who has to make it to the middle of the row- smacking people with your backpack, also with Con Hall [laughs]... You are desperately hoping you don’t fall into someone’s lap...”

"Since the only way that you could enter the rows of seating is ...from the extreme ends, we couldn't get in from the middle. So, if you are sitting in between you have to say "excuse me, excuse me" to at least 10 people before you move to (the seat)..."

"How am I supposed to pee?"

This situation draws attention to students in a way that made them uncomfortable. They were keenly aware of the impact their actions had on their peers, but the design of the room provided no alternatives.

Coordination Under Pressure

Instruction is more than preparation and delivery. Each class is a set of coordinated elements that require instructors to maintain energy levels, to think on their feet to field questions, and to adapt to unexpected changes. Generalized feelings of stress, anxiety, and exhaustion were commonly associated with managing classroom space. Interviewees would sometimes bring these emotions into technical discussions of classroom equipment with iHub researchers:

"You're asking me earlier what I value in classes? Microphones. Because the junior stations don't have microphones. And I found that I personally need a microphone because I get too exhausted at the end of the week. It's too much for me."

More common, though, was an emphasis on the mental load instructors carry. Ensuring the best classroom experience for their students requires additional inquiry, organization, and preparation for contingencies:

"I care a lot so I'm going to go to (ACE). I go to the website, I look at the different classroom, the different setup and I'm asking myself, okay, what do I want to do with my course? In what type classroom? What do I need to support that? ... So, you need to be proactive a lot. That's one thing I don't like about this. Space is very limited...it's a bit of a difficulty because you spend time investing a lot of resources and energy to design your course that way and the next year after you don't get that classroom anymore."

Much of this additional preparatory work is incorporated as a safeguard against breakdowns in classroom equipment (see Theme Three), which are a deterrent for many instructors who might otherwise be keen to experiment with their teaching approaches. Discussions with members of the instructional technology team revealed the tensions that sometimes arise when they are called in to offer support mid-class. An instructor's anxiety surrounding their students' perception of their preparedness and professionalism as they troubleshoot in front of a crowded lecture hall exacerbates the situation. Like students pushing through crowded rows, instructors grapple with feelings of embarrassment when the equipment they depend on refuses to cooperate.

As teaching evaluations are taken into consideration as a source of data in tenure, continuing status, promotion, and annual review processes, issues of this sort are a special concern for all instructors, but especially early career faculty. While instructors are generally technologically

literate and open to change, deviating from a traditional lecture format carries a certain amount of risk:

"...Experiential learning takes more time. The students don't always like it because it's new and they're there to get good grades, so they complain. And then you might- unless you are an associate professor with tenure you might not take the risk because you're teaching evals could get dumped or your chair hears about complaints. So why take the risk? Why not do the tried and true, right?"

Facilitating support systems for instructors is one way of mitigating these anxieties. Digital communities connecting users of specific spaces, for example, carry the added benefit of sharing experiences and expertise in maximizing classroom resources:

"(It would be good to have) a sort of community of practice of people who teach in some of these specific newer, more modern rooms and get a sense of what they do with the structure, the technology in that environment, the space- so that we can we can piggyback on each other"

Data Visualizations

The following images are visual representations of student responses collected during the “What Makes a Classroom Great?” events held as part of the Transforming the Instructional Landscape initiative. These data visualizations complement the preceding theme discussion, allowing us to gauge relative levels of student interest in the topics addressed there based on the frequency of responses.

Preferred Classroom Features

This chart shows the summary of responses received for the Question Poster “What features matter most to you in a classroom?”. Power outlets were the most desired classroom feature followed by natural/brighter lighting and individual space. Notable responses included seats with writing pads that accommodate left-handed students and height adjustable furniture.



Figure 2. Post-it note responses to the question: "What is the most important classroom feature?"

The responses to this prompt help quantify some of the comments grouped in the “physical connections” and “virtual connections” themes. The primacy of power outlets illustrates the centrality of laptop, cell phone, and tablet technology in the contemporary classroom.

Preferred Classroom Furniture

This chart shows the summary of responses received for the feedback card questions “Which chair did you find most comfortable?” and “Which table did you find most comfortable?” at the feedback events. The Doni Task Stool was strongly favored by students, followed by the Pirouette Table and the FT20. The Trapezoid Table, Perry Stack Chair, and M50 Fixed Table received the fewest positive responses.

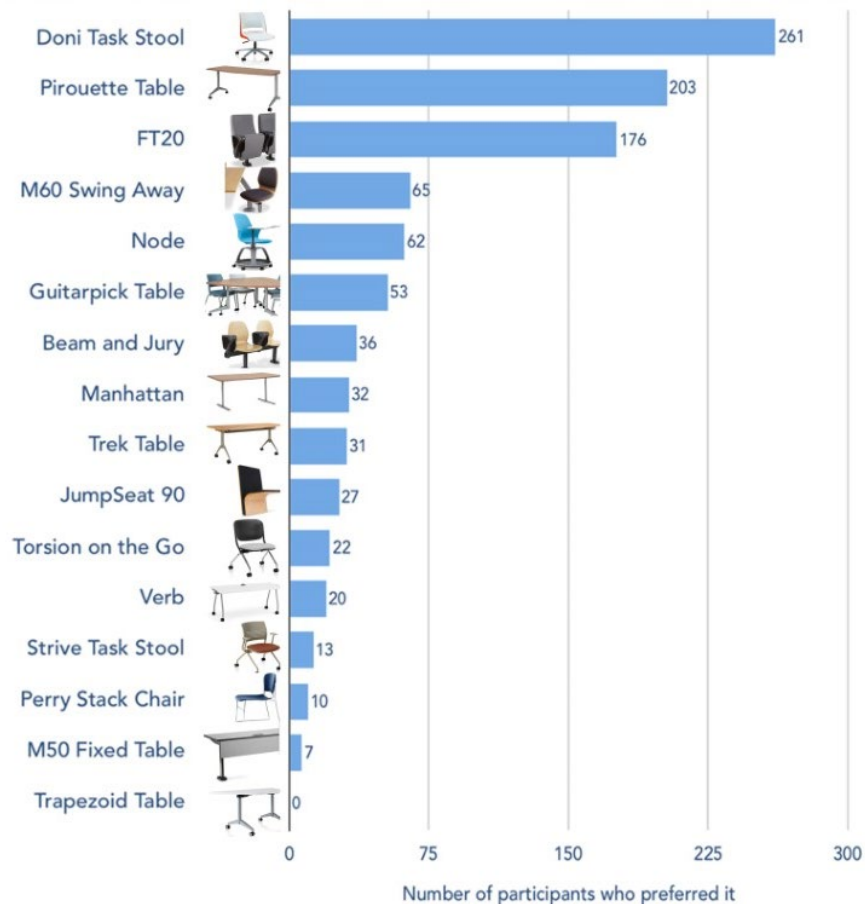


Figure 3. Responses from feedback cards indicating the participant's preferred chair and table.

Comfort was the most frequently cited feature of importance for furniture, though the exact qualities that make furniture “comfortable” were ambiguous. Typically, height adjustable chairs (with padding) and desks were categorized as comfortable, whereas unpadded chairs and fixed chair/desk units were categorized as uncomfortable. The FT20 was favoured for its power outlets (the most requested feature in the “Classroom Features” activity), cushioning, and attached desk, though the desk was sometimes described as being “too small”. The flexible back support, cushioning, and adjustable height of the Doni Task Stool were cited positively by its supporters. The adjustable height of the Pirouette table was its stand out feature. Despite its strong showing, opinions on the M60 were polarized. Some enjoyed its ample table space, but others expressed concerns about comfort for different body types and worried about its durability. This is in line with other comments made by students regarding accessibility issues with fixed seating units.

Classroom Photo Prompts

During the “What Makes a Classroom Great?” events held as part of Transforming the Instructional Landscape, photographs of four major classroom types were displayed. Students were invited to respond by writing on post-it notes and contributing their thoughts.

Lecture Hall

Responses towards the lecture hall photo were influenced by a general aversion to lecture style classes. While students acknowledged the necessity of these “traditional” classes, they also expressed feelings of disconnect and alienation which extended into their interpretation of the space itself. The lecture hall inspired few responses regarding its potential use in experimental instruction:

“Typical U of T undergrad space -> students won't talk to each other, won't connect our similar interests. Focus only to the front. Might as well watch a MOOC (ed: Massively Open Online Course) video as be in a classroom like this”

“Easy to lose focus. Hard to ask questions. Hard to move around. Hard to take notes”

Responses returned to the key theme of interpersonal connection. Respondents expressed feelings of anonymity and passivity during lecture:

“Only works if the lecturer has stage presence – restrictive”

“Great if you like to blend in or be unnoticed”

While acknowledging student ambivalence regarding this style of instruction, the lecture hall featured in the display was praised by many respondents. The size, efficiency of space, and furniture were met favorably:

“Great space for large lectures/presentations: the ascending descending concept of the room is very efficient. Allows everyone to see the stage properly, sometimes mic/speaker doesn't work!”

“Very pretty and aesthetics are great! The space between each chair is wide enough, I love how comfortable the seats are, I look forward to my class when it's in a lecture hall like this”

The lecture hall responses highlight the difficulty students and instructors have separating space from pedagogy. Attitudes towards one inflect attitudes towards the other. An assessment of the design of a space is simultaneously an assessment of instructional style.



Figure 4. Image used as visual prompt for "Lecture Hall" post-it note activity.

Collaborative Classroom

Respondents were split in opinion over the collaborative classroom. **Comments pivoted around individual interpretations of the space's purpose.** Those who saw the collaborative classroom as a space for dynamic project and group-based instruction expressed strong, positive sentiments:

"I feel this works best for classes/events that need teamwork e.g. tutorials, love the spacing in between"

"Love it! perfect for group work but not for lectures"



Figure 5. Image used as visual prompt for "Collaborative Classroom" post-it note activity.

The ease of movement through the space was also praised:

"Easy to walk around, nice to have 6 at a table. Not a great place to give a traditional lecture"

Respondents who envisioned using the space for lecture-style instruction had difficulty understanding the intent behind its design, interpreting features of the room selected for collaborative exchange-like the range of visible whiteboards-as flaws:

"Not sure what the intended teaching purpose is?"

"I like sitting in groups to discuss with friends but in classes that are more lecture like I find it distracting"

Respondents consistently expressed concern regarding the orientation of the seats in relation to the instructor. They worried awkward lines of sight would create neck pain issues:

"Good for group work (but) neck has to tilt to look at the front. Tiring to keep neck tilted for 2 hours"

One comments chain saw this polarization payout as a back and forth between respondents:

Post-it 1: *"No please no, these are horrible to lecture in. Students never put things back"*

Post-it 2, affixed to Post-it 1: *"but it's not a lecture room...it's a tutorial room!"*

Students and instructors interpret spatial design through a personal lens. They imagine space as it might intersect with their own lives, rather than intersecting in the lives of its intended users.

TEAL Classroom

(Technology Enabled Active Learning)

Reflecting the same trend found in the collaborative classroom comments, the **TEAL classroom comments were polarized**. Many respondents saw tremendous value in the room, noting that it facilitated student interaction and allowed for new instructional strategies and class styles:

"Most relevant in the 21st century, addresses all types of learning"

"Flawless! Shame the student clubs can't book it"

"Building is very good for grad school setting to force discussions"

However, respondents who imagined the class as a space housing lecture-style classes held overwhelmingly negative opinions:

"Terrible, cannot look at front and use desk at same time"

"Distracting in conventional classes"

"TVs pointless, too far away, low quality, distracting, students facing away from the speaker"

TEAL classroom responses reinforce the lesson learned from collaborative classroom responses. Students and instructors imagine space as it would be used in their own lives, not in the lives of its intended users. The intent of a space is typically evident from design: this activity was created, in part, around this assumption. **TEAL and collaborative spaces are an example of the powerful influence exerted by personal history on user experience**



Figure 6. Image used as visual prompt for "TEAL Classroom" post-it note activity.

Continuous Classroom

The continuous classroom responses draw our attention to the **importance of aesthetics, accessibility, and freedom of movement**. Respondents associated the space with traditional lecture-style classes, an assumption that elicited a range of emotions. Some described it as “traditional”, “boring”, and “inflexible”, and expressed concern about the difficulty of forming groups and connecting with peers:

“Too inflexible. Plugs for laptops? Not conducive to students participating and engaging with one another. The chairs are too small and too close together”

“Instructor can't get to all the students, so no good for active learning”

In contrast, others praised the room for its “focused” and “clean” design, praising its efficiency.

“This is my favourite. Everyone's attention is to the front of the class”

“I like how it is a moderate size, bright, clean, intimate. Can turn to neighbor because of mobile seats”

Though opinions were somewhat divided, respondents in both camps consistently and explicitly highlighted an array of issues related to comfort and accessibility in this classroom. Chief among them were the narrow rows (which made accessing seats difficult and disruptive for other students), lack of storage space, and restrictive seating:

“More aisles (and more aisle seats) would be nice. It's not fun squishing through rows with a backpack on your back, umbrellas/bags on the floor, coffee cups/tablets on the tables”

“Don't like the bolted tables and chairs and not a lot of accessible seating for larger size students”

“Excuse me... allow me to squeeze through!”

Unlike the TEAL and collaborative classrooms, the continuous classroom was perceived as struggling to provide the best experience for its intended teaching style because of issues related to accessibility. The staging of this photo also proved significant. During the November event, a version of the photo in which the windows are obscured by blinds was used, leading some students to describe the space as “dark” and “depressing”. In contrast, the February events presented a photo of the same classroom in which the blinds were open. Students responded to this photo with greater positivity, noting the “bright” and “natural” lighting.



Figure 7. Image used as visual prompt for “Continuous Classroom” post-it note activity

Student and Instructor Personas

Personas are realized through authentic student and instructor stories. Through these personas we can see the themes described reflected in lived experience, and how they can either affect or empower the user (see Appendix A: Journey Mapping).

Student Persona

Anton's Story

- Third-Year Engineering Student
- Classes in Galbraith, Bahen, and Sanford Learning



"Learning is a dynamic, interactive process for me. I can't sit at home and work out of a textbook. I need to ask questions and to discuss my ideas with others."

I'm a third-year Engineering Science student. Most of my classes are in Galbraith, Bahen, or Sanford Fleming. Learning is a dynamic, interactive process for me. I can't sit at home and work out of a textbook. I need to ask questions and to discuss my ideas with others. This is an approach I want to apply across a variety of contexts, from larger lectures to small, discussion-based classes. I'm willing to try new thing in order to improve my classroom experience. For example, unlike most of my classmates, I take notes with pen and paper. Many of my professors have explicitly said that students learn better without electronic devices. I like to believe this is true. Writing things out by hand helps me with memorization and I'm not tempted to check social media or respond to emails during lecture.

Classrooms where I can focus on the instructor and on my peers- not on a screen- draw me into course content. I'm easily distracted, so I try to position myself in a way that won't draw my attention to other student's screens. When I take my seat in class, I unpack my textbook, notebook, graphing paper, ruler, and calculator. With the tiny writing surface attached to individual chairs, the only hope I have of accessing all this equipment during class is if I stack them on top of each other. My classroom routine is like playing Jenga. Constantly switching between my textbook, notebook and graph paper means pulling one from the stack and placing another on top. I spend most of my time just making sure my belongings stay off the floor. When I finally get everything in order, the professor has already moved on to his next slide before I can ask further questions.

In spite of my best efforts, it's hard for me to be an active participant in class. I ask questions frequently. In my elective course, held in a small room with 15 other students, this is not an issue. The class itself is held in the basement of New College. The seats are mobile. We can reposition ourselves so each meeting of our class feels intimate. I talk to the professor not only about course content, but also about personal development. In larger classes, I don't feel this level of connection. I speak quite softly, so audibility is a major issue. More than one professor has asked me to sit closer to the front because they find it difficult to hear me. I've tried to move closer to the front of the room, but the low seats in these tiered classrooms but a lot of strain on my neck. I have to crane my head upward to see the projector screens. That neck pain is aggravated during tutorials. Clustered around desks with my group mates, I have difficult repositioning myself to get a clear view of the TA. It feels like I'm constantly fighting against the layout of my classrooms.

Student Persona

Erin's Story

- Second-Year Computer Science Undergrad
- Classes in Convocation Hall, Ramsay Wright, and Bahen



"I constantly feel like my presence is inconveniencing those around me; like the room itself is drawing attention to each of my movements in a way that makes me feel uncomfortable."

I am a second year undergraduate studying Computer Science. This semester, I am taking a course in Convocation Hall, one in Ramsey Wright, and three classes in Bahen. My home is out in Scarborough, and the commute can be a real time sink if the weather is poor or if there are disruptions on the TTC. One time, as a result of one of these disruptions, I was 30 minutes late to a lecture in Bahen. The seats in the room are arranged in long rows and there's absolutely no space between them to move around once everyone is seated. I had to take the stairs up to the aisle in the middle of the room to the sole seat I saw floating in a sea of students. My face went red as I apologized and pushed my way through, hoping I didn't hit anyone with my backpack or coat until I finally reached my destination. For some of my classes, I don't even have this option. I end up sitting on the floor.

I have one instructor who is the biggest stickler for lateness. Sometimes he'll shame students in front of the whole class. It's obvious when people come in late because the door is loud and positioned right at the front of the class. I know it's disruptive and I feel tremendously embarrassed. I'd rather wait out in the hall until break than draw attention to myself like that. I have similar experiences during class. There is no elegant way for me to exit when I need to use the bathroom, to remove books from bag, or to take notes by hand. I constantly feel like my presence is inconveniencing those around me; like the room itself is drawing attention to each of my movements in a way that makes me feel uncomfortable.

As a commuter, I always bring a ton of equipment with me: a laptop, my notebooks, my lunch, sometimes my gym clothes. When I don't have time to go to my locker, I end up lugging it all with me to class. I understand how embarrassing it is to push through crowded rows of students, so I'm keenly aware of how inconvenient it must be for those around me when my belongings occupy so much floor space. In Con Hall and Ramsey Wright, there's no alternative storage options in the classrooms. Even if there were a place to stow my things, I'd feel wary leaving them out of sight. I think this semester, I might give up on bringing my notebooks- even though I prefer to learn by writing things down- to save myself the hassle. These issues just add to the anxiety I already have with my coursework and being a commuter.

Student Persona

Haesun's Story

- First-Year Undergrad at Rotman Commerce
- Classes in Rotman School of Management; collaborative and lecture-style classrooms



"I feel like my issues are relatively minor and, as a result, I'm a bit shy about asking for assistance ... I'd rather not go to accessibility services and my professor if possible."

I am a first-year undergraduate studying commerce. In large rooms with mumbling students, rustling papers, and clacking keyboards, hearing the instructor clearly can be a struggle for me. I use a voice recording device which I position on a table near the lectern at the start of every class. This way, I can review the lecture afterwards in the quiet of my dorm room. This is an imperfect solution. As the instructor moves throughout the class or plays a video, the recording quality declines significantly. I am a fan of larger lecture halls that are wired for sound. When the instructor uses a microphone, I don't have nearly the same difficulty following lecture content.

I feel like my issues are relatively minor and, as a result, I'm a bit shy about asking for assistance. Though they might be able to come up with an effective accommodation for me, I'd rather not go to Accessibility Services and my professor if possible. I've been fortunate to take classes with dynamic, animated instructors that bring these lecture halls to life. Many of my courses have smaller tutorial or task-oriented sections, and in these cases my experience with classroom space have been mixed.

I have one section in a collaborative classroom space with large tables and mobile chairs. These rooms are ideal for group work. My classmates and I can organize our material in the centre of the table and speak eye to eye. If we encounter any issues, we can flag down the instructor and speak to him directly and show him our outline. These spaces can get quite loud when students are left to their own devices, an issue which is exacerbated by my hearing issues. Sometimes I feel the instructor is too "hands off" when it comes to classroom management here, making it difficult for me to follow my group's conversation and contribute to the work.

These are relatively minor issues compared to those I have in similar, group-work focused sessions held in rooms with fixed seating. These are clearly meant for small, lecture style classes. We can't pivot in our chairs at comfortable angles for conversations. The desk tops are too narrow to use as a shared workspace as well. I can imagine myself having small tutorial sessions in these rooms where a discussion is led by the T.A. and our focus is drawn to the front of the class. Assigning a class where close, collaborative work with other students is critical to a space like this doesn't make sense to me. I wish my classes were given space based on our needs so we could make the most out of it.

Instructor Persona

Theresa's Story

- Associate Professor
- Teaching two courses per semester; Lecture style classrooms



"I spend a good deal of time trying to develop lecture plans that incorporate collaborative learning. But every day there was a new problem..."

I am an associate professor. I teach two courses per semester in a variety of spaces across campus. The size of the courses - about 200 students each - is large enough that it restricts the types of classrooms available to me. I am often assigned older lecture style classrooms where I struggle to incorporate collaborative learning activities. This year I was assigned to teach in an old physics classroom that seemed to originally function as a demonstration laboratory. There was a lab bench at the front with a bunch of piping running to it. The fixed seating allowed little room for the students and myself to maneuver. This classroom was a problem from day one. The space is not accessible as you have to walk upstairs- then downstairs- to get to the seating. I immediately started receiving feedback and complaints from students struggling to get into the room. The lack of space between students made the midterm exam a nightmare to proctor.

Lighting is a consistent issue. For example, I would like to turn down the lights near the screen to prevent glare and make it easier to see. At the start of the first class, my students helped me hunt for a switch. The only one we found was loose and didn't seem to control anything. Normally it is not a big issue, but one day we came into class and there were no lights on at all! None! We made it through using the light from laptops and cell phones. The audio-visual equipment in this room has also been a challenge. Videos project on the screen, but there is no sound. I tried playing the video files on the teaching station and running it through my laptop with no success. By this point, the class was already running behind and I didn't want to call and wait for support staff. We had to improvise. I took the mic that I used during lecture and put it right next to the laptop speakers. The timing between the sound and video was obviously a bit off, but it worked well enough. I sent an email about the situation after, but it continued to happen throughout the semester. The laptop-mic hack was a lecture-saver.

I spend a good deal of time trying to develop lecture plans that incorporate collaborative learning. But every day there was a new problem, a curveball that threw off my game and forced me to improvise. I am frustrated because I feel like I'm expected to plan for every contingency instead of focusing on what I am really here to do: teach.

Instructor Persona

Ashik's Story

- New tenure track hire
- Teaching in various classrooms; lecture and collaborative



"We are performing every time we walk into class. When that performance fails, because of technology issues or space limitations, it is very stressful..."

I am a new Assistant Professor, tenure stream hire. I was excited when I was offered the position but, coming from a research heavy institution, I felt I needed a bit more classroom experience before I could be truly comfortable lecturing at a school the size of University of Toronto. I am very interested in incorporating new teaching techniques and technologies, but I find there are many roadblocks. For example, I never know where I will be teaching. I can create a teaching program that incorporates collaborative activities, but I may be assigned a large lecture hall where it just doesn't work. Even when the physical space is appropriate, the equipment may fail. If there is an A/V problem and I cannot complete the activity, I end up having to deliver a standard lecture. The prospect of speaking for two hours without adequate preparation sets me on edge. As a result, I always end up developing a backup plan in case there is a technical issue, effectively doubling my workload. Students tend to think that lecturing comes very easily for professors: that we just show up for an hour and talk. In reality, a huge amount of effort and emotion goes into teaching. We are performing every time we walk into class. When that performance fails, because of technology issues or space limitations, it is very stressful to maintain composure and think quickly on your feet to keep the class going. The 'lecturing professor' is a persona that takes a lot of energy to maintain. It is tiring at the best of times, but exhausting when there are unforeseen complications.

On top of teaching, I also have professional considerations. I am a new professor and my progression is partially tied to my teaching evaluations. Ideally, I would like to flip a class. I would incorporate an online lecture component and make classroom time fully collaborative. I know that many students are very keen on sharing ideas in this sort of environment, but such a change from the traditional lecture style can be difficult for others. In a traditional lecture, students know what to expect and how they are going to be graded. In a collaborative classroom, the expectations are not as familiar nor clear cut, which can lead to anxiety. As an instructor I learn from iteration: I redefine my goals for the class week to week and semester to semester. I often learn the most from my failures. But in my new and somewhat precarious position, I am always walking a fine line between my desire to provide an innovative and collaborative learning experience, my emotions, and my need to meet criteria that are central to advancing my career.

Instructor Persona

Karishma's Story

- Associate Professor, Teaching Stream
- Teaching in Myhal 150



"Myhal 150 has an array of features ... that seem well suited to my strategy. These positive feelings are tempered by concerns regarding classroom management."

I am an Associate Professor, teaching-stream who has been assigned to teach in Myhal 150. Upon seeing the space for the first time, I felt a mixture of excitement and fear. When I was planning this course, I had imagined something that oscillated between lecture and groupwork. I wanted students to share their findings with one another and generate new ideas through group discussion. My role as the instructor would be to bring these individual discussions back to the group. In a typical classroom, this would involve me arranging the furniture into discussion groups, assigning students to a team, wading through the room to listen in and jot down notes, then reconvene the class for discussion that I would mediate and supplement with prepared talking points. Myhal 150 has an array of features like ready-made group seating and desktop microphones that seem well suited to my strategy.

These positive feelings are tempered by concerns regarding classroom management. I worry that I won't be able to hold the attention of students- especially those seated at the back- when the furniture invites them to chat freely amongst themselves. Managing the microphone queue, PowerPoint, screen sharing with students- there is so much to do beyond conveying course content. While the classroom feels like an easy space to move through and spend time face to face with students, the sheer number of students it houses makes this sort of close connection difficult to perform consistently. With a TA or two to help manage the classroom, I think it would be feasible, but we simply don't have the hours for it.

I can see potential in this space to fundamentally alter my teaching approach. My anxiety stems from a lack of experience working in similar classrooms. Becoming familiar with the equipment is only a partial solution. I feel like I need new techniques and strategies to effectively manage this classroom.

Design Principles

Design principles are guidelines derived from the knowledge of researchers and practitioners to help organize and prioritize design features. They are useful for weighing the benefits of potential designs against one another by offering a unified set of criteria and come from a place of empathy for the user and their needs. The core features of future designs should draw inspiration from these principles, established through this process and with the contributions of staff in Accessibility Services and Academic and Campus Events Classroom Technology Support.



Accessibility Comes First

Designing with accessibility in mind creates classrooms where *everyone* can access course content in the way that best suits them. This benefits instructors and students with identified needs and those without.



Instructors as Partners

Frequent and open communication with instructors allows us to design and assign classrooms effectively, to adapt to changes in course structure or teaching strategies, and to establish best practices on a space by space basis.



The Right Room for the Right Course

ACE has an array of classrooms that many instructors are eager to teach in, but they often find themselves assigned to spaces that don't suit their needs. Effective room assignment is as important as any individual classroom feature.



Purpose-Driven Design

Rather than offering generalist spaces suited to no particular class structure or teaching style, specialized spaces make the best use of available resources. The design of a specialized space is intuitive and requires little additional preparation or modification on the part of the instructor.



Movability Supports Learning

Students and instructors engage with class content physically as much as they do mentally. Whether this means rotating groups in a classroom, instructors ascending the stairs in a lecture hall to answer a question, or students scribbling notes at their desk, classroom space should facilitate moving bodies.



Individuals, Not Averages

Students and instructors feel welcomed and recognized when they see their *specific* needs reflected in classroom design. In cases where this is not possible, create opportunities for them to bring their own solutions.



Consistency Builds Trust

Instructors who can depend on classroom infrastructure to deliver a consistent experience have the confidence to experiment with their teaching approach. Without this trust, innovative classroom technology often goes unused.



Accessible Classroom Information

Everyone benefits when information about our classrooms and their equipment is readily available and easily searchable. Letting instructors know certain approaches can be accommodated is important but introducing them to possibilities of which they were previously unaware can be revolutionary.



Seamless Designs Empower

When students, instructors, and instructional technology are seamlessly integrated, classroom features move to the background and the lesson takes center stage. This allows for instructors to be supported by the design of the space, and for students to be better connected to the learning experience and improve interpersonal connections.



Emotional Stakes Matter

When considering the emotional stakes for students, staff, and instructors, needs can be recognized and met. Is it difficult to connect a laptop to the projector? Are seats close together in long rows? What emotions might be felt by the user in these situations? By recognizing that emotions are linked to class design and a user's routine, solutions can be considered for a more accessible space.

Draft Design Checklist

This design checklist is a draft starting point for practical ways to assess if needs are being met in classroom spaces. This can be used as a procedural tool, developed by considering the design principles and the five connectivity themes. Items may also shift depending on a space's intended pedagogical approach.

Interpersonal Connections: *Does this space support a range of interactions between staff, instructors and students?*

For teaching:

- ☐ Projectors can be used alongside writing surfaces (whiteboards/chalkboards)
- ☐ Instructors can hold a dialogue with a single student seated anywhere in a quiet room
- ☐ A student's work can be visible to instructors via screen sharing or through ease of movement
- ☐ The classroom can support different styles of teaching (if possible), or is focused on a specific pedagogy (lecture style vs. smaller collaborative tables)

For student engagement:

- ☐ Students can comfortably see the instructor during class and engage with classroom discussions
- ☐ Student-to-student engagement is supported by the classroom design (if possible), or instructors can communicate with students on best practices to connect with each other
- ☐ Students (and instructors) have resources to easily connect with AV & Accessibility Services
- ☐ The space allows for students to ask questions, or to easily approach instructors during breaks/after class for discussing coursework and assignments

Physical: *Is the classroom infrastructure supporting a range of body types and learning preferences?*

For comfort:

- ☐ Work surfaces suit an array of needs to be physically comfortable (surfaces support left/right handed students, options are available for those with physical limitations)
- ☐ Individual desktops/working surfaces are at least large enough to hold a laptop computer
- ☐ Seating is comfortable, adjustable, and considers an array of body types
- ☐ Classroom furniture considers the length of lectures/classes to maximize student comfort

For atmosphere/climate:

- ☐ Lighting can be manually adjusted to accommodate different teaching styles
- ☐ Windows can be opened and closed (if possible)
- ☐ Natural light can be utilized with installed window coverings (where possible)

For movability:

- ☐ Students can move in and out of their seats when the desks around them are occupied
- ☐ Instructors can move between tables or rows to be able to facilitate discussions/ coursework
- ☐ There is space for students & instructors to store their backpack/belongings at their seat

Virtual: *Are there reliable connections for virtual accessibility?*

Preparing for class:

- ☐ A list of adapters needed for the class are online in a searchable database based on room
- ☐ 360 degree photos of the room are available to clearly visualize the classroom atmosphere. This includes images of power outlet locations, teaching stations and more (depending on class)
- ☐ Information regarding a classroom's features, accessible services, capacity and options for room setup is also available

For staying connected:

- ☐ Every seat has an accessible power source
- ☐ Options for audio and video lecture capture/recording are integrated into classroom infrastructure
- ☐ Resources are readily available so that instructors and students can troubleshoot connectivity issues when facilitating classes

Accessibility: *Does the room meet accessibility standards? Does it allow for learners and instructors of all types to engage in the learning environment?*

For engagement:

- ☐ Rooms are assessed for audibility while classes are in progress in neighboring rooms
- ☐ Microphones and speakers have an FM option or are compatible with hearing aids; volume levels can be adjusted to meet hearing needs
- ☐ Students can have a designated space to record the audio of lectures
- ☐ Lighting can be adjusted for those with visual sensitivities
- ☐ The space includes features that support users with depth-perception needs

For being a part of the class:

- ☐ Ramps are installed or accessible seating is designated in areas that are incorporated with other students/ discussion spaces
- ☐ Seats and desks can be adjusted to suit different body types and/or furniture with an array of fixed dimensions
- ☐ Student devices that help meet accessibility needs can be safely housed and powered at desks
- ☐ Adequate space is provided at a desk or workspace for service animals, accessibility equipment and student belongings

Emotional: *Are emotional stakes considered for individuals to better engage with the learning environment?*

For an empathetic experience:

- ☐ Students can perform necessary tasks (finding a seat, taking notes etc.) without drawing unnecessary attention to themselves
- ☐ Students can enter/exit the space with minimal disruption
- ☐ Enough seats and writing surfaces are available to avoid working in alternate areas (e.g. the floor)
- ☐ Instructors can receive discrete support when dealing with technological issues; they are informed of features (or limitations) in a class to help prepare and avoid stressful situations during class
- ☐ Resources are available help instructions that are new to the space/teaching at U of T, including resources to Health and Wellness for both students and instructors

Limitations and Next Steps

There are limitations to data and findings in every project and it is important to consider how the analysis may fall short or require follow up. Suggestions for next steps to be taken suggest inquiries or actions that may be incorporated into future work related to this project.

Limitations

Limitations include areas of inquiry that may need further attention. This may have been due to existing barriers or unforeseen circumstances that prevented researchers from examining certain areas. Innovation Hub researchers noted that feedback and interview data separated students and instructors. Engaging both parties in conversation simultaneously (in a roundtable format, for example) might reveal new ideas or questions.

In addition, though a crucial element of the classroom redesign project, the pedagogical considerations are beyond the scope of the Innovation Hub's inquiry. However, this will be a focus in the next phase of inquiry to be carried out with the Centre for Teaching Support & Innovation, in partnership with ACE and informed by the findings in this report.

It is also important to note that the TIL project is limited to classrooms on the St. George campus at this point. While students from the Mississauga and Scarborough campuses may take courses there, the data collected was predominantly focused on students registered at St. George campus.

Next Steps

There are various steps to consider in the next stages of this project, particularly to increase the scope so that classroom pedagogies and current topics in accessibility can be incorporated.

This includes:

- 1) Exploring partnerships that can help in incorporating pedagogical inquiry and insights
- 2) A new wave of feedback events that focus on instructor and student collaboration
- 3) Potential instructor training sessions that focus on classrooms and equipment, and incorporating this into a part of Innovation Hub observations
- 4) Working closer with students on various accessibility issues and connecting further with the accessibility community on campus

Each of these steps would move further into addressing pedagogical approaches and how supportive classrooms - through infrastructure and services - will connect instructors and students in more meaningful and effective ways.

Conclusion

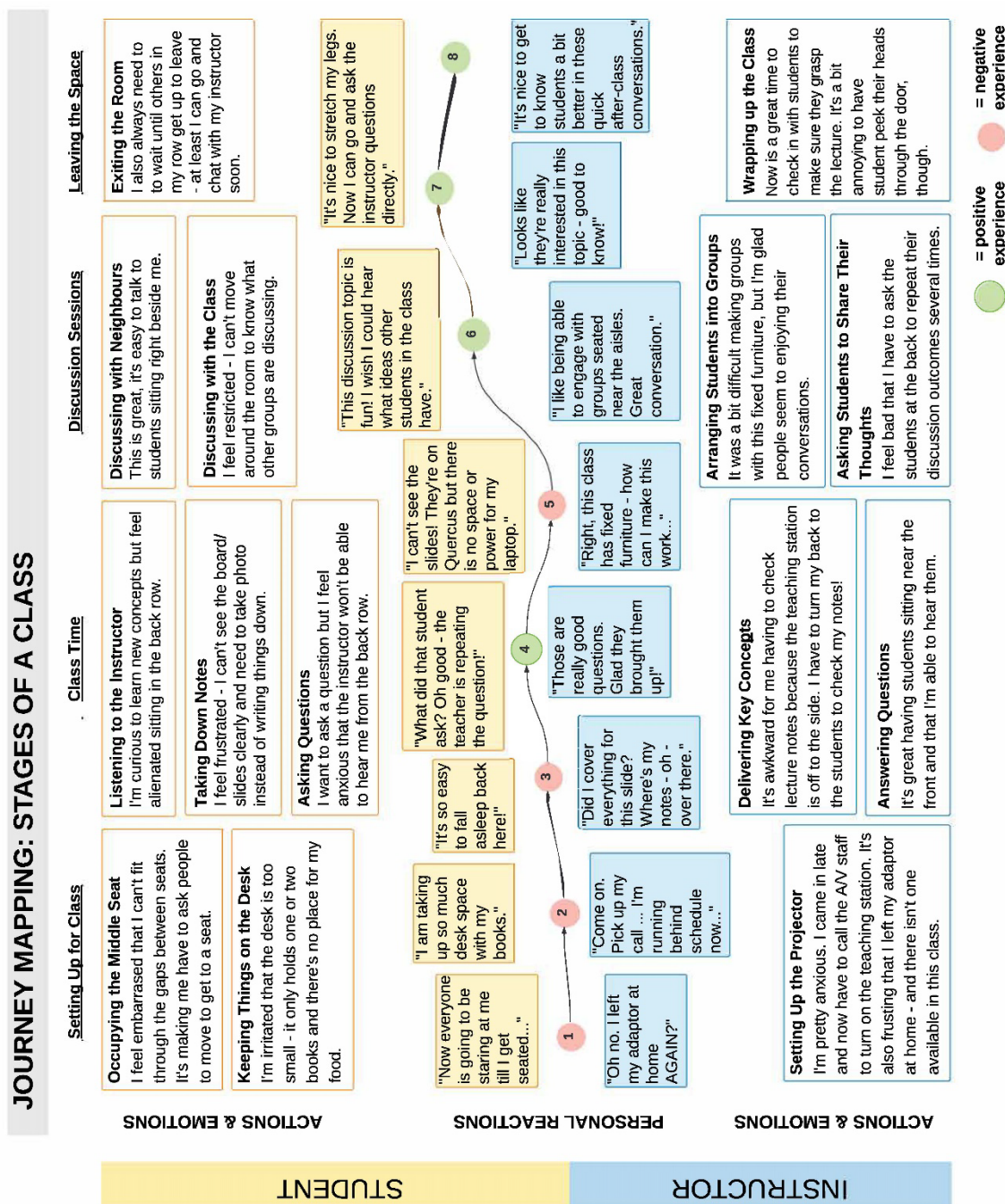
The data gathered in this project demonstrates that students, instructors and staff have many connections and lived experiences at the University of Toronto when attending their respective tutorials, lectures and classes. Many individuals emphasize the importance to be able to connect with each other seamlessly in a classroom environment, with the class design supporting these types of interactions. The inquiry processes from 2018-2019 expanded the understanding that accessibility and emotional stakes need to be considered in tandem with interpersonal, physical and virtual connections to truly design integrated learning environments. These insights are supported through personas that address barriers in a learning environment that prevent students and instructors to learn or teach in a seamless manner. The Design Principles and Checklist can be utilized to help assess, organize and prioritize these needs, and can be shifted to support different classroom types.

Future work with Academic and Campus Events will benefit by diversifying the types of observations that researchers conducted with students, instructors and staff for this report. The insights presented also support a potential need to increase the scope of inquiry to consider current pedagogies in learning spaces, and how to remedy possible disconnects between users and the operative space. This could include new feedback events, exploring partnerships, potential instructor training sessions, and working closer with Accessibility Services, units and communities on campus.

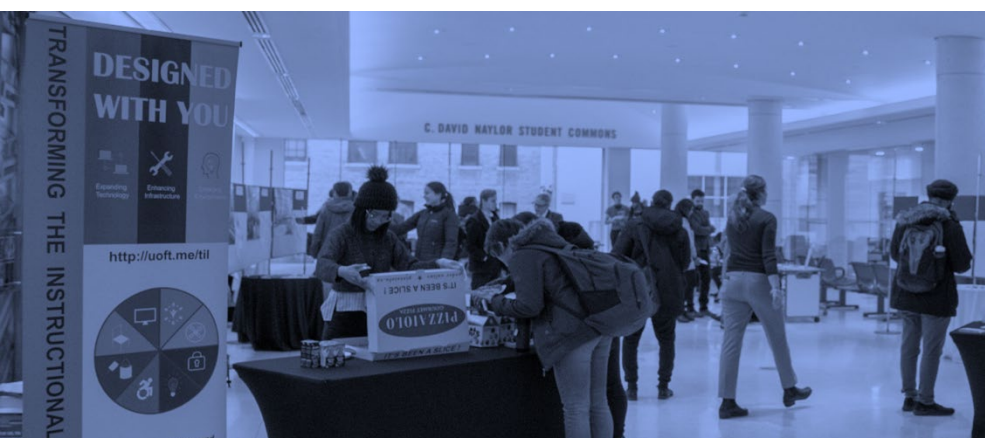
Appendix

Journey Mapping

The class journey map shows the emotional ups and downs for both students and instructors in the classroom and illustrates the complexity of the design challenges when thinking about classroom design. Central to each is the journey of negative/tension points (red circles), and positive reactions in the class (green circles) that reflect what a student and instructor may be thinking or experiencing.



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