The Future of Classroom Design

Qualitative Data Analysis

Danielle Pierre
Research Analyst Student
Research Analyst Postgraduate Program
Humber College
Executive Summary

“The design of classroom space has a profound influence on student learning. It can significantly enhance the learning experience for the student, allowing good teachers to work creatively and not limit their options in terms of activities and processes. Good design cannot turn poor teaching into good teaching, but poor design greatly limits a good teacher's ability to motivate and inspire students.” ~ Online Survey Respondent

This project provides an interpretive illustration of the features and traits that students and faculty see as complimentary to the perfect classroom. The main themes derived demonstrate respondents’ desire for flexible, pleasant and specialized spaces for learning, an engaging atmosphere for teaching and learning, and reliable technology that is supportive of a more virtual classroom. The following report outlines the results of the inquiry into future classroom design initiated by Humber College’s Centre for Teaching and Learning (CTL).

Humber’s CTL solicited ideas from students and faculty regarding new standards and new designs for college classrooms. Data were collected from two sources, Town Hall style discussions and an online survey. By collecting data from different sources the information collected is more trustworthy and reliable. The Town Hall meetings produced 150 data points transcribed from 27 video recorded responses taken during the brainstorming sessions and the survey produced 430 data points from 112 individuals. Data were analysed using an inductive approach to content analysis, where categories, codes and themes were derived from respondents’ own words and thoughts.

Responses were sorted into three main categories: space, experience, and technology. Within these categories the following main themes were drawn:

- Classroom layouts, furniture and room size need to be flexible
- Pleasant classroom spaces are achieved through appropriate lighting, windows, colour, accessibility, and lines of sight
- Classroom space should to be program specific
- Andragogic teaching style, preparation, positive attitudes, and smaller class sizes work towards a better teaching and learning experience
- A comfortable classroom atmosphere is effected by class size, movement, noise, temperature control, comfort, cleanliness and safety
- New and existing classroom technologies need to be reliable and are preferably wireless

By providing flexible, pleasant, specialized spaces, teaching and learning can occur in an inspiring atmosphere supported by reliable technology. Once this is achieved, the move can be made to hybrid classrooms that make use of both high and low technologies in on and offline environments. The ultimate goal in redesigning new and existing classrooms should be to provide students and faculty with classrooms that support the collaborative, interactive learning experiences they value most.
This project provides an interpretive illustration of the features and traits that students and faculty see as complimentary to the perfect classroom. The main themes derived demonstrate respondents’ desire for flexible, pleasant and specialized spaces for learning, an engaging atmosphere for teaching and learning, and reliable technology that is support of a more virtual classroom.

The following report outlines the results of the inquiry into future classroom design initiated by Humber College’s Centre for Teaching and Learning (CTL). Humber’s CTL collected ideas from students and faculty about new standards and new designs for classrooms. Data were collected from two sources, Town Hall style discussions and an online survey, providing some triangulation of the data points. By triangulating the sources in this way, more reliable information can be collected.

**Data Collection**

Data were collected from six Town Hall style meetings held at the Humber College’s North and Lakeshore campuses. An online survey was also made available for those who preferred to submit their ideas. Both student and faculty voices are represented in the data set.

**Town Hall Meetings**

Town Hall discussions focused on the development of new standards and new designs for classrooms at Humber College. Each session started with a learning portion for attendees and was followed by a group brainstorming session. These discussions produced 150 data points transcribed from 27 video recorded responses taken during the brainstorming sessions.

**Online Survey**

The online survey was made available to collect input from those who could not attend the Town Hall meetings and/or those who had attended and had more ideas to share. The survey focused on the positive and negative aspects of current classrooms and respondents’ desires for the future. The survey asked:

1. What are some of the worst learning experiences you’ve had in the classroom?
2. What are some of the best learning experiences you’ve had in the classroom?
3. What are some of the biggest issues you see with the current classroom layouts?
4. What is your vision of the perfect classroom?
5. Additional Comments.

The survey produced 430 data points from 112 individuals, 73% of which answered at least four of the five survey questions.

**Data Analysis**

The research analyst took an inductive approach to the analysis process. With this approach, no pre-established theories or ideas are imposed on the data. Categories, themes, and sentiments emerge from respondents’ own words through a content analysis procedure that employs open-coding. In this way, findings are revealed in respondents’ own language helping the analyst to determine

---

**Table 1: Distribution of responses across categories and codes.**

<table>
<thead>
<tr>
<th>Code</th>
<th>Responses per Code*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td></td>
</tr>
<tr>
<td>Technology</td>
<td>36</td>
</tr>
<tr>
<td>Power</td>
<td>39</td>
</tr>
<tr>
<td>Hardware</td>
<td>103</td>
</tr>
<tr>
<td>Software</td>
<td>34</td>
</tr>
<tr>
<td>Wi-Fi</td>
<td>32</td>
</tr>
<tr>
<td>Computers</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>272</td>
</tr>
<tr>
<td>Experience</td>
<td></td>
</tr>
<tr>
<td>Experience</td>
<td>24</td>
</tr>
<tr>
<td>Temperature</td>
<td>32</td>
</tr>
<tr>
<td>Noise</td>
<td>30</td>
</tr>
<tr>
<td>Safety</td>
<td>12</td>
</tr>
<tr>
<td>Attitude</td>
<td>25</td>
</tr>
<tr>
<td>Class Size</td>
<td>24</td>
</tr>
<tr>
<td>Movement</td>
<td>12</td>
</tr>
<tr>
<td>Preparation</td>
<td>15</td>
</tr>
<tr>
<td>Teaching</td>
<td></td>
</tr>
<tr>
<td>Style</td>
<td>72</td>
</tr>
<tr>
<td>Cleanliness</td>
<td>16</td>
</tr>
<tr>
<td>Comfort</td>
<td>26</td>
</tr>
<tr>
<td>Total</td>
<td>288</td>
</tr>
<tr>
<td>Space</td>
<td></td>
</tr>
<tr>
<td>Space</td>
<td>10</td>
</tr>
<tr>
<td>Layout</td>
<td>144</td>
</tr>
<tr>
<td>Lighting</td>
<td>50</td>
</tr>
<tr>
<td>Windows</td>
<td>39</td>
</tr>
<tr>
<td>Colour</td>
<td>22</td>
</tr>
<tr>
<td>Room Size</td>
<td>61</td>
</tr>
<tr>
<td>Accessibility</td>
<td>18</td>
</tr>
<tr>
<td>Furniture</td>
<td>107</td>
</tr>
<tr>
<td>Line of Sight</td>
<td>11</td>
</tr>
<tr>
<td>Type of Room</td>
<td>30</td>
</tr>
<tr>
<td>Storage</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>507</td>
</tr>
</tbody>
</table>

*some responses were double coded and so they appear multiple times across different sections; totals will not add up to total data points used
what is most important to the group and maintain context. Three clear categories were evident after the first reading of the data:

1. Space – anything having to do with the physical attributes of the classroom
2. Experience – anything related to the use of the classroom
3. Technology – any reference to technological equipment in the classroom

Within these categories, a second reading of the data revealed several features and themes encapsulated by the main categories (see Table 1 and appendix). Once the data were organized according to category and code, general sentiments and main themes were drawn out.

Findings

Interestingly, although the overall themes were similar between the Town Hall meetings and the online survey, the distribution of responses across the three main categories is different (see Figure 1 and Figure 2). The distribution of response across categories seems to reflect the setting and nature of each data collection method. The data coming from the public Town Hall meetings is evenly distributed versus the more private survey method where Space shows overwhelming importance. It seems that the focused nature of the Town Hall meetings produced more focused data and the open-ended survey returned raw individual ideas.

Responses were generally symmetrical across the three main categories. For most bad experiences or issues reported, best experiences and perfect classrooms were the opposite. For example, one respondent explains their worst classroom experience as, “when I am sitting in a large classroom and I end up sitting at the back of the classroom I am unable to [hear] the professor/instructor speak clearly.” They go on to express their biggest issues with classroom layouts as, “the most major problem in the classrooms are the lack of power outlets. I like using my laptop in class and my battery only lasts a little over an hour so it would be nice to have outlets to charge it.” The respondent then goes on to say, “my vision of the perfect classroom consists of power outlets on every desk/table and for large classrooms to have surround sound speakers to distribute sound equally.”

The following findings discuss the main themes that run throughout each category in order of the categories prevalence in the data; first ideas concerning space, then experience, finally technology.

Flexible Space

Flexibility proved to be a highly desirable trait of classroom layouts, supported by moveable furniture and accommodating rooms. Flexibility of the classroom layout means that the furniture and equipment in the classroom can be easily rearranged to suite the task at hand. Flexible layouts would make it easier to use the classroom for different purposes, like group work, lecture, group discussions, and lab work. As mentioned, flexibility must extend to the classroom’s equipment. In the case of whiteboards and projectors, if projector screens and whiteboards were on different walls, this would allow for simultaneous use of the two, further contributing to the flexible use of the classroom.
In the data, references to classroom furniture contain two main themes: those of comfort and mobility. Students desire more comfortable seating to get through long classes; students, as well as faculty, desire mobile furniture to assist in rearranging classroom layout. Classrooms themselves should be large enough to easily change the layout and allow for the free movement of students, faculty, and furniture. References to layout and furniture combined make up almost 50% of responses in the Space category.

**Pleasant Space**

Respondents desire more pleasant classroom spaces. Lighting, windows, colour, accessibility, and clear lines of sight are all factors that contribute to a more pleasant classroom space. Responses expressing the desire for better lighting and more windows make up 18% of data in the Space category. Reading the lighting and window codes together shows that the perfect classroom would have a good combination natural and artificial lighting. This could be made possible with more windows but, it is important that windows have retractable blinds or shades to reduce glare on screens. The ability to adjust the lighting extends to artificial lighting as well, such that there are multiple combinations for overhead lights. Sentiments under the colour code call for walls that create a stimulating space for learning. With the right lighting and the right colours, the classroom space could be much brighter and more inspiring.

Responses coded to accessibility express two main sentiments. In one sense of the term, the ideal classroom would offer full accommodations for people with disabilities. One respondent expressed the concern that, “accommodations seem to be an afterthought of many faculty, it makes self-advocacy the "extra class" every semester of the Humber experience for the disabled student.” Large rooms with more space for free movement have the potential to increase accessibility to disabled students. In another sense, the ideal classroom would be easy to find, as in rooms could be numbered in a more intuitive fashion. Lastly, respondents expressed the need for better sight lines between students and faculty. Current classroom layouts – computer towers on desks, orientation of labs, structural obstacles – are interrupting sight lines and making it more difficult for faculty to keeps students engage with the class and each other.

**Specialized Spaces**

Although the desire for more specialized spaces represents a fairly small portion of the data, there was a definite recurring pattern nonetheless. Respondents expressed a desire for different types of rooms; those that provide program specific and activity specific spaces. The prevailing sentiment was the idea that more specialized spaces would offer students the opportunity to experience unique, hands-on learning environments. With more specialized spaces comes the need for more storage, i.e. space for program specific supplies and larger student projects. References to storage also express a need for appropriate places for students to keep their belongings in the classroom.

**Teaching & Learning Experience**

A look at Table 1 shows that a large proportion of responses under the experience category refer to teaching style. Reflecting one-quarter of responses, a move towards more student-centred classroom seems to be an important part of the classroom experience for these respondents. Ideally, teaching and learning will move away from pedagogical styles towards more andragogical styles that consider who students are, and who they are becoming. Redesigned classrooms should offer many opportunities for collaboration and interaction amongst students and faculty, making use of content that is practical and related to students’ previous, current, and future professional lives.

Preparation, attitudes, and class size also appeared to contribute to respondents’ best teaching and learning experiences. Students and faculty must come to class prepared and, at the same time, the classroom must be prepared for teaching and learning. All necessary equipment should be stored in the classroom and ready for use, including projectors, remotes, computers, flip chart paper and markers. Across 9% of respondents, engaged attitudes were important contributors to a positive teaching and learning experience. This engagement seemed to be impacted by class size in such a way that respondents believe smaller classes encourage more social interactions within the class room, thus promoting positive, engaged attitudes.
Atmospheric Experience

One respondent says, “Positive things happen when the temperature is comfortable, the technology operates well, the room has space to exist and also to move around a bit, and the furnishings have some flexibility in terms of placement.” Showing that positive use of the classroom is affected by many different factors. In terms of experience specifically, patterns could be seen across class size, movement, noise, temperature control, comfort, cleanliness and safety.

Interaction and collaboration are important components to student learning, and while smaller class sizes promote these activities, the ability to move throughout the room plays an important role. Smaller student-to-faculty ratios (class size) as well as more square footage per individual (room size) thereby promote free movement and show a close relationship between class sizes and actual room sizes. Ideally, the number of students would be proportional to the size of the classroom in order to avoid over-crowding and foster a collaborative environment. Smaller classes also provide a quieter environment that would be more conducive to learning. Respondents expressed the need for measures that minimize atmospheric noise, for example better soundproofing could help towards minimizing noises outside of the classroom such as slamming doors and building facilities (ductwork, HVAC, etc.).

Appropriate climate control in a classroom setting was another concern within the experience category. Sentiments referring to classrooms that are too hot, too cold, or have poor air circulation were related to respondents’ worst classroom experiences. Better temperature control and airflow could contribute to more comfort in the classroom. Responses referring to comfort frequently mention cleanliness as well; these sentiments were double coded to both sections. A small number of responses expressed concerns regarding safety in “lockdown” situations. These respondents desired front and back exits for classrooms and windows that open completely, outfitted with retractable coverings. Safety also extends to the safe use of classrooms. These sentiments included mentions of ergonomic furniture and layouts that reduced tripping hazards.

Reliable Technology

Within the technology category, hardware was referred to in a significant number of responses. The general sentiment reflected a desire for reliable, high-functioning technologies starting with the projectors, audio systems and podiums already in use in the classroom. In addition to traditional whiteboards, respondents would like to see interactive screens and Smartboards introduced to their teaching and learning spaces. This hardware would also facilitate the recording and sharing of lectures and class materials. Along the same lines, the incorporation of web cams and microphones could work towards the same end. Interactive technologies should allow students to share their work in real-time; the addition of personal tablets for students could facilitate sharing capabilities.

The inclusion of these electrical tools will require the incorporation of more electrical plugs in the classroom. The data suggest that there are currently not enough electrical outlets in Humber classrooms to accommodate all students who need them. Not only are there not enough electrical outlets but, the ones that are present are reported to be located in inconvenient places. Ideally, electrical outlets would be embedded in the surfaces of desks and tables.

With specific reference to Humber’s computers (representing 10% of responses coded to the technology category, a large enough proportion to warrant a separate code), the main issues are slow start-up and login speeds. As articulated by one respondent, “you can spend 20+ minutes logging onto the generic workstations throughout the school. Even if you are on time, you can still fall behind.” Students and faculty desire faster computers, and enough of them to meet demand.

Virtual Classroom Technologies

Reliable devices would not be useful without effective software and programming. Important features of software used in the classroom should provide the ability to share content in real-time and later upload that content to Blackboard (or any comparable system that Humber may use in the future). Making further use of hardware that could facilitate video recording of lectures, students and faculty express the desire for software that would allow video conferencing and foster a more virtual classroom. The perfect virtual classroom would be completely wireless. Wi-Fi connections need to be fast,
reliable, and powerful to support this attribute. Ideally, web connectivity would by controlled by faculty i.e. they would be able to turn the connection on or off depending on the circumstances. The wireless network should also be compatible with a wide range of devices.

**Conclusion**

The ultimate goal in redesigning new and existing classrooms should be to provide students and faculty with classrooms that support the collaborative, interactive learning experiences they value most. To accomplish this, classrooms need to have:

1. Flexible layouts
2. Comfortable, moveable furniture
3. Opportunities for student-centered, hands-on learning
4. Reliable wireless technology and equipment

Flexibility, directly achieved through layout, furniture, and room size, reaches beyond its main themes. It is the flexibility of a multi-purpose, fully prepared space that allows for more flexibility in the types of equipment, technology, and teaching style used. In this way, the theme does not stand alone; rather it runs throughout many of the sentiments expressed by respondents and works in close relationship with the most important classroom traits.

Moveable furniture certainly helps to achieve flexibility in use but, also contributes to a more pleasant classroom space and furthermore, a more comfortable atmosphere. It is in this type of classroom that rich learning experiences occur – those that are hands-on, interactive, and engage the students at a deeper level than the traditions of pedagogy many students are accustomed to. Finally, the role of technology should be supportive of the classroom space and experience. Completely wireless equipment is more conducive to a flexible space and provides a quick, seamless way to transition between devices. At the same time, reliability – in the sense that all equipment is in full working order, properly maintained, and widely available – for new and existing classroom devices in crucial to the integration and acceptance of newer high-tech devices and programming.

By providing flexible, pleasant, specialized spaces, teaching and learning can occur in an inspiring atmosphere supported by reliable technology. Once this is achieved, the move can be made to hybrid classrooms that make use of both high and low technologies in on and offline environments. Students and faculty appreciate having their voices heard in the classroom design process. The sentiments of classroom users should prove insightful during future classroom (re)design projects. One respondent reminds us, “the design of classroom space has a profound influence on student learning. It can significantly enhance the learning experience for the student, allowing good teachers to work creatively and not limit their options in terms of activities and processes. Good design cannot turn poor teaching into good teaching, but poor design greatly limits a good teacher's ability to motivate and inspire students.”
Appendix

Coding Frame
The following list displays the codes, by category, used to sort the raw data and defines each code as it was used by the analyst.

Space
Space: general references to the physical classroom space
Layout: specific reference to the placement of furniture and equipment
Lighting: any mention of lighting, both artificial and natural
Windows: any mention of windows
Colour: responses that talk about the colour of the classroom space
Room Size: any reference to the size of the classroom and/or crowding in the classroom; often double coded to class size
Accessibility: references to getting to classrooms, and references to the accessibility and usability of classrooms by those with disabilities
Furniture: specific references to furniture
Line of Sight: responses that mention physical attributes of classrooms that make it difficult to see the front of the room, faculty members, or other students
Type of Room: responses that talk about alternatives to traditional classrooms; labs, kitchens, studio space, multi-purpose space
Storage: any reference to storage/storing equipment and belongings

Experience
Experience: any responses that talk about how students experience classroom spaces; no specific references to other themes
Temperature: any response that refers to the temperature of the classroom
Noise: responses referring to disruptive noises and sounds
Safety: references to security of classrooms and hazardous attributes of the layout
Attitude: any reference to student or faculty engagement; often double coded with teaching style
Class size: any reference to the number of students in a class and overcrowding
Movement: any mention of desires/attempts to move around the classroom
Preparation: the readiness of classrooms, faculty, and students
Teaching Style: references to class content and how that content is conveyed to students; activities in the classroom
Cleanliness: any reference to how clean or dirty classrooms can be; often double coded with comfort
Comfort: responses that allude to individuals’ comfort; air quality, feelings about being in the classroom

Technology
Technology: responses that use the generic term “technology”
Power: responses having to do with electrical outlets
Hardware: responses referring to technological equipment (i.e.: projectors, podiums, webcams, tablets, etc.)
Software: responses referring to the functioning and uses for hardware (i.e.: PowerPoint, Blackboard, video calling, etc.)
Wireless: responses that mention Wifi or wireless use of technology
Computers: responses that specifically refer to computers