Final report

An evaluation of undergraduate classroom technology at Simon Fraser University: The student perspective

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Executive summary

This evaluation aimed to shed light on the technologies undergraduate students would like to see implemented in the classroom in order to be better engaged and have a more fulfilling educational experience and the criteria they believed to be important in selecting these technologies. The collected data through survey and focus group interviews provided an opportunity to learn about students’ technology use, barriers for using technology effectively in classroom, and their recommendations for providing effective technologies in undergraduate classrooms. The students' top criteria in choosing technology to support their learning were cost, ease of use, the belief that the technology brings them success, and long-term use. When asked about the technologies they would like to see in classrooms, the majority of the students in the focus groups pointed to infrastructure such as more power outlets, more large monitors, microphones for both the instructors and students in lecture theatres, buzzers for asking questions and responding to instructors’ questions. They were also concerned about lack of interactivity among themselves and between themselves and the instructor. Students also observed that their instructors could benefit from training in classroom technologies in order to make more effective use of class time.

Introduction

In the past decades, classroom technology has been a staple of classrooms in post-secondary education in North America. Technology has been used in classrooms in meaningful and transformative ways and to improve learning opportunities for students (Boling, 2008). Moreover, classroom technology has been shown to have a role in student engagement—a key factor in successful learning (Lutz & Culver, 2010). Smith, Sheppard, Johnson, and Johnson (2005) define student engagement as “the frequency with which students participate in activities that represent effective educational practice” (p. 87). However, engaging students in large undergraduate classrooms has been a huge challenge for educators as has been noted by several researchers (e.g., Long & Qin, 2014; Reid, 2012; Klegeris & Hurren, 2011).

A wide range of pedagogical practices has been used to overcome the challenge of engagement, including problem-based learning, collaborative learning, and undergraduate research (Macgregor, 2000). An element shared by all of these practices is increased contact between instructor and students, as well as material resources. Digital tools, such as electronic student response systems (e.g., iClickers), online discussion boards, and blogs have been used in large classrooms to increase student participation and interaction (Revell & McCurry, 2010; Gibbings, Lidstone & Christine, 2015). Despite these efforts, students’ perspectives on how they use technology and in what ways technology can increase their engagement in classrooms are underrepresented in the literature.
Aside from the issue of engagement, throughout the history of instructional media, failure of state-of-the-art tools has been a recurrent theme, largely due to the top-down process of integration, the lack of innovativeness, and the teachers’ resistance to using them (Selwyn, 2010). In other words, what policymakers and administrators see as valuable tools backed by research is still prone to fail simply because students and/or instructor don’t use it. It seems that the first step to overcoming such top-town integration of classroom technology is learning more about what tools students believe could enhance their educational experience in the classroom.

Accordingly, this evaluation study set out to explore the technology students use, the barriers to using technology effectively in classroom, and above all, the criteria students consider in choosing an educational technology.

The evaluation

To learn about the students’ perspectives on the above issues, focus group interviews and an online survey were implemented. Thirty-seven students participated in the focus group interview sessions and 53 students completed the online survey. Thirty-six of those who participated in the focus group completed the survey while 17 of those who completed the survey did not participate in the focus group. In this section descriptions of the focus groups and the online survey will be presented.

The focus groups

Interviewing is chosen as a data collection method to obtain unique information, or interpretation, held by the interviewee or discovering “a thing” that the researcher was unable to observe (Stake, 2010). It is also appropriate “when interpersonal contact is important and when opportunities for follow-up of interesting comments are desired” (Westat, 2010, p. 64). Therefore, interviewing was used because the focus is on the participants’ perspectives. Focus groups, in particular, allow for natural patterns of conversation which, in turn, help us learn about the participants’ group dynamics and the patterns of their interaction. Moreover, the exchange of views among participants in focus groups is an opportunity for the participants to learn from each other. Finally, focus groups are ideal for producing the insights that result from group interaction.

For the purpose of this evaluation, we recruited 37 students and divided them into four focus groups. In each two-hour focus group session, we further divided the students into smaller groups, so they could interact with each other more meaningfully as they answered the questions. We asked seven questions that covered technology use, barriers to using technology effectively, criteria in choosing a technology, and how Simon Fraser University (SFU) can do better with classroom technology (See Appendix A for the focus group questions). More specifically, the first and the second questions—What software/programs/apps do you use for
school-related purposes or to support your studies? and What technologies are usually used in your classroom and for what purpose?—were intended to prime the students on the topic of classroom technology and, therefore, were regarded as precursor to the next questions. We asked the same questions in the online survey and the results are presented in this report. Moreover, question six—What criteria weigh most heavily with you in determining the desirability of a classroom technology?—was included in the focus group question in order for us to come up with appropriate options for a similar close-ended question in the survey. As a result, the responses to questions three, four, five, and seven are reported here.

The survey

In addition to the focus groups, an online survey was administered to collect information about participant demographics, a self-report of their ability to use technology, what technology they used to support their learning and in what ways, and, above all, how they ranked a set of 13 criteria in choosing an educational technology. The items were derived from students’ responses to the open-ended version of this question in the focus groups (see Appendix B for the survey items). The survey was developed and analyzed using the online survey software, Fluid Survey.

Survey results

The survey responses were analyzed quantitatively via Fluid Survey’s reporting feature. In the following pages, results of the analysis are presented. First of all, the demographics of the students are shown in the figures below.
As shown in Figure 1, 64% of the students were female and 36% of them were male. Figure 2 shows that 81% of the students were between 18 and 22 years old, 17% between 23 and 27 years old, and 2% between 28 and 32 years old. With regard to their faculties, Figure 3 shows that 36% were in Arts and Social Sciences, 24.5% in Applied Sciences, 17% in Science, 9.4% in Communication, Art and Technology, 7.5% in Business (Beedie), 3.8% in Environment, and 2% in Education.

The survey also asked about students’ ability to use technology, the digital devices they own, and the software they use. The following figures show the frequency of their responses to each question.
As shown in the figure above, 70% of the students believed that they had “adequate” ability to use technology, followed by 28% who believed that they had “superior” ability. These figures imply that ability to use technology may not be a barrier to effective technology use in the classroom.

We also asked about the hardware and software students use to support their learning.

The above figure shows that all the students own smartphones and 96% of them own a laptop computer. Moreover, 68% of the students have tablets or other types of portable computers and 51% own desktop computers. These results show that any software or service to be considered needs to be accessible on smartphones and/or portable computers, as these are the devices most readily available to the majority of the students. Besides, those are the devices students use most frequently in classroom, according to Figure 6 below.
FIGURE 6. PARTICIPANTS' FREQUENCY OF DEVICE USE IN CLASSROOM

As shown in the figure, 42% of the students ranked laptop computer as their most used device in classroom, followed by smartphones and tablets.

Regarding the software students use to support learning, Figure 7 shows the results.

FIGURE 7. SOFTWARE PARTICIPANTS USE TO SUPPORT LEARNING
Not surprisingly, almost all students reported that they use productivity programs, such as MS Office. More than half of the students also reported that they use reference software and/or web services, such as dictionaries and encyclopedias. The other types of software are used by approximately a quarter (or less) of the students who responded to the survey. These results indicate that most students use technology for productivity purposes (e.g., MS Office, Adobe Acrobat) and referencing (to look up a word, concept, etc.).

We also asked students about how often they use these programs. Figure 8 shows their responses.

![Figure 8: Participants' Frequency of Educational Software Use](image)

Finally, the respondents were asked to rank a set of 13 criteria in terms of which are most important to them in determining their satisfaction with technology used in the classroom. The 13 options were derived from students’ answers to an open-ended version of the same question in the focus groups. They ranked the criteria from 1 (the most important) to 13 (the least important). Figure 9 shows the results of their ranking. These rankings were further analyzed and amalgamated in terms of their top three choices.
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<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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<th>10</th>
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<th>13</th>
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<tr>
<td>It is easy to use (e.g., interface, functionality, ease of navigation etc.)</td>
<td>15.4%</td>
<td>25.0%</td>
<td>19.2%</td>
<td>19.2%</td>
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<tr>
<td>I believe that this product will improve my educational experience</td>
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<td>10.0%</td>
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<tr>
<td>Cross platform (i.e., you can use the product anywhere anytime on any device)</td>
<td>1.9%</td>
<td>7.7%</td>
<td>9.6%</td>
<td>17.3%</td>
<td>9.6%</td>
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<tr>
<td>I will be more successful in my course</td>
<td>15.4%</td>
<td>19.2%</td>
<td>9.6%</td>
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<td>The reputation of the creator/brand of the product</td>
<td>0.0%</td>
<td>2.0%</td>
<td>0.0%</td>
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<td>2.0%</td>
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<tr>
<td>I believe the product will enhance my career opportunities</td>
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<td>11.8%</td>
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<td>0.0%</td>
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<td>7.7%</td>
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<tr>
<td>Can be used across courses</td>
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<td>15.4%</td>
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<td>9.4%</td>
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<td>17.0%</td>
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<tr>
<td>Supports collaboration</td>
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<td>0.0%</td>
<td>2.0%</td>
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<td>2.0%</td>
<td>5.9%</td>
<td>13.7%</td>
<td>15.7%</td>
<td>21.6%</td>
<td>13.7%</td>
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<tr>
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<td>0.0%</td>
<td>0.0%</td>
<td>4.0%</td>
<td>10.0%</td>
<td>6.0%</td>
<td>10.0%</td>
<td>10.0%</td>
<td>12.0%</td>
<td>28.0%</td>
<td>20.0%</td>
<td>20.0%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Integration with other software</td>
<td>0.0%</td>
<td>0.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>7.8%</td>
<td>2.0%</td>
<td>5.8%</td>
<td>7.8%</td>
<td>11.8%</td>
<td>17.6%</td>
<td>21.6%</td>
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<td>9.8%</td>
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</table>

**FIGURE 9. PARTICIPANTS' RANKING OF CRITERIA IN CHOOSING CLASSROOM TECHNOLOGY**
According to these results, 73% of the respondents ranked *cost of the technology* as the top three most important criteria in choosing a classroom technology. The second most important criterion is *ease of use* with 60% of the respondents choosing it as their top three criteria. *Belief that the technology could improve their educational experience* is the third most important criterion with 48% choosing it as their top three criteria. Finally, *success in courses*, with 44%, is the fourth most important criterion. At the other end, *aesthetic design* (60%), *brand reputation* (59%), *accessibility* (58%), and *integration with other software* (39%) were the least important criteria, as students ranked them from 11 to 13. Figure 10 shows the ranking.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Variable</th>
<th>Respondents who chose it as their top three</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The cost to me as a student</td>
<td>73%</td>
</tr>
<tr>
<td>2</td>
<td>It is easy to use (e.g., interface, functionality, ease of navigation etc.)</td>
<td>60%</td>
</tr>
<tr>
<td>3</td>
<td>I believe that this product will improve my educational experience</td>
<td>48%</td>
</tr>
<tr>
<td>4</td>
<td>I will be more successful in my course</td>
<td>44%</td>
</tr>
<tr>
<td>5</td>
<td>Long-term use</td>
<td>24.5%</td>
</tr>
<tr>
<td>6</td>
<td>Cross platform (i.e., you can use the product anywhere anytime on any device)</td>
<td>19%</td>
</tr>
<tr>
<td>7</td>
<td>I believe the product will enhance my career opportunities</td>
<td>14%</td>
</tr>
<tr>
<td>8</td>
<td>Can be used across courses</td>
<td>11.5%</td>
</tr>
<tr>
<td>9</td>
<td>The reputation of the creator/brand of the product</td>
<td>2%</td>
</tr>
<tr>
<td>9</td>
<td>Supports collaboration</td>
<td>2%</td>
</tr>
<tr>
<td>10</td>
<td>Aesthetic design</td>
<td>0%</td>
</tr>
<tr>
<td>10</td>
<td>Accessibility (can be used by people with special needs)</td>
<td>0%</td>
</tr>
</tbody>
</table>
Focus group results

For the reasons discussed earlier in this section, the responses to questions three, four, five, and seven were analyzed and will be reported here. The analysis involved listing all the responses students gave to each question and making sense of them as coherent narratives. In this section, their responses, together with my comments on them, will be presented.

Question #3: What technologies would you like to have in classroom?

When answering this question, almost all students had large lecture classrooms in mind. Students’ suggestions ranged from infrastructure features, such as more power outlets to charge their devices, to visionary ideas, like personalized AI tutors and live lecture translation.

The most frequent technologies students referred to were related to the lecture experience itself. Many students would like microphones to be used by both the lecturer and by the students so both can be heard. They also wanted to see more large monitors, so that everyone in the room can perfectly see the slides regardless of where they are sitting. Interaction was also an important theme in their responses. Students wanted to be able to connect with the instructor during the lecture, as well as with other students through a group chat application. They suggested “a live stream for typed questions, so that students can submit questions during the break in the middle of the lecture, and the prof can respond to some of those questions after the break.” They also mentioned “a sort of interactive technology with lecture slides. Something like an advanced version of iclickers that goes beyond multiple choice interaction and enables students to write up texts for interactive discussions.” Other answers included “an app for students to add notes to lecture in real-time on the big screen” and “some kind of interactive check for understanding—and not just grades. Something like iclickers without the pressure” and “tablet drawings that can be projected on the big screen that can be drawn on a mobile device.”

Furthermore, the majority of the students were concerned about access to the lecture materials. They wanted pre-lecture materials, such as the lecture notes, or anything that would prime them for the lecture before it begins. Almost all of them needed the lectures to be video- or audio-recorded and so they can be downloaded for later use. Finally, logistic needs also received a lot of attention. Students needed more power outlets, improved Wi-Fi connection, remote control for changing slides and other useful functionalities, and above all free licenses for the software they are required to use in courses.

Question #4: Do you feel you could be better engaged in classroom, if you had access to a given technology? If yes, what kind of technology?

This question is similar to question three with the focus being on engagement here. The majority of the answers to this question regarded novel ways to participate during lectures. Some of the students did not see the solution to the engagement issue in technology. Their
suggestions included pre-lecture materials, more quizzes, dividing students into smaller groups for collaboration, using more visuals and examples in lecture notes, and providing more opportunities for students to interact. One student said, “The problem is not really about technology, but human interaction in lecture classes. Create more discussion questions. How to promote discussion/interaction in class.” Others noted that “you should find a way for people to use the already existing technology.”

However, many students suggested that they need tools to facilitate connection between students and the instructor, as well as other students. They believed they could be better engaged, if instructors receive immediate feedback from students on the lecture to modify their teaching. For example, they mentioned a tool that could enable the instructor to receive questions/comments, preferably from anonymous students, and answer them immediately. They also suggested an online space where students can share their notes, questions, and comments on the lectures, as well as polling systems to measure understanding during lectures.

There were also demands for a microphone for students, or buttons to notify the instructor when a student had a question, buzzers to answer questions, and touch screen screens and stylus to draw, edit and share work easily. Moreover, they referred to the distracting nature of note taking and suggested novel ideas to overcome it. One student said, “Any tool that results in minimizing note-taking will allow for more attentive listening. Often, students get caught up in writing so much that they can’t follow the lecture beyond what is in the slides. So they are confused after lecture.” Others suggested note sharing and a “note feed” that could be updated on every student’s screen as others take notes.

**Question #5: What do you think some barriers for using technology effectively in classroom are?**

The most frequent response to this question was cost—both to the students and SFU. Students believed that the cost of high quality software and hardware is a great barrier leading to ineffective technology use. They also asked that SFU pay for, or at least subsidize, the software required by their courses. Moreover, some students stated that there is a false assumption by institutions and instructors that all students own certain devices with results that can impact the learning experience, since some students either do not own that device or are not able to use it in the intended way.

The second most important theme was technical glitches and technical support. Many students would say that technical glitches are routine in their classes and that this causes class delays. Distraction was also an important theme. Access to computers during class involves distraction, as students would check their emails, social media, and irrelevant web pages during lectures—a prominent cause of disengagement. Students also believe that students and instructors are sometimes inexperienced in using a technology, which often results in more challenges. For example, online discussion could be an effective strategy to engage students in meaningful learning. Frequent polling using audience response systems could help both students and
instructors in many ways; however, instructors use them sparingly, possibly due to the preparation it requires. Other instructors are simply reluctant to use technology. Finally, spotty, slow Wi-Fi connection was another barrier students talked about, followed by the fact that some technologies/equipment are available on only one campus.

**Question #7: What could SFU be doing better with classroom technology to improve your educational experience?**

This was the last question in our focus groups. Some of the answers to this question were roughly the same as those students gave to the other questions. Specifically, they asked for microphones for themselves and for the instructor, improved Wi-Fi connection, more smart boards, more laptops available to students, online chat for students and instructors, support for small group work, subsidizing the cost of required software, and more power outlets. Other suggestions regarded infrastructure, technical support, and training. Students would like SFU to make sure the tools available in their classrooms are working. They also believed that some instructors and students are not able to use classroom technology (particularly Canvas) effectively and they need training through instructional videos or workshops. They also called for at least one mandatory interactive technology in classrooms. Students would also like to see improvements in SFU mobile applications. They believed that the mobile applications could all be combined in a single, more useful application. Moreover, they believed that SFU should learn about students’ attitudes on their plans for classroom technology before implementing them. Finally, they suggested making Canvas more like Facebook, where students can connect to each other and share materials, organize events, and comment on each other’s work.

**Conclusion**

In this evaluation of undergraduate classroom technology, we focused on students’ perspectives regarding the technology they would like to see implemented in their classrooms, the barriers for using technology effectively in classrooms, and their criteria in choosing technology to support their learning. Survey and focus group interviews were used to collect data. The data were analyzed both quantitatively and qualitatively. The results of the survey indicated that most students own portable computers and smartphones and believe they have adequate ability to use technology. Moreover, most students used productivity programs, such as MS Office and Adobe Reader, as well as reference, graphic and data analysis software. These findings indicate that students use technology as a supplement that could help them accomplish learning tasks more efficiently. It seems that the programs they used most help them with their assignments or achieving a product, rather than the learning process itself.

Students’ top criteria in choosing technology to support their learning were cost, ease of use, the belief that the technology brings them success, and support for long-term use. These criteria imply that, first, students are concerned with easy access to their ideal technology, and second, students want the technology to be of use beyond a specific educational purpose. It
appeared not to be important to them if the technology could not be used across courses, or is created by a well-known brand. Furthermore, aesthetic design and integration with other software was of least importance to the students.

The focus group responses were interesting in many ways. When asked what technology they would like to see in classrooms, the majority of the students referred to infrastructure, such as more power outlets, more large monitors, microphones for instructors and students in lecture rooms, buzzers for asking questions and responding to instructors’ questions. Aside from infrastructure improvements, most students were concerned about interactivity in lecture classrooms and the barriers to engagement during lecture. They believed technologies could support more interactivity between instructors and students. They suggested live stream question boards, pre-lecture materials, video-recording of lectures, immediate feedback to instructor on students’ understanding, touch screens that can be projected on big screens, elimination of note-taking, and more advanced iClickers that allow for personalized responses could lead to better engagement during lectures. Some students did not see a need for new technology and believed if instructors and students are trained to use the existing technology more efficiently, the existing tools in their classrooms would suffice.

As for barriers to using technology effectively in classroom, cost, shortage of access to certain tools, distraction, slow and spotty Wi-Fi connection, and lack of skills in using technology were the most prominent themes. Students suggested SFU subsidize software and train instructors on using technology effectively. They also called for a kind of intranet where the instructor can decide what websites students can access to reduce distraction.

In conclusion, it seems that students do not look for revolutionary technology that would drastically change their learning experience; rather, they are looking for incremental improvements to the existing tools, easier and less costly access to them, and above all, more meaningful instructor-student and student-student interactions in classrooms.
References


Appendix A: Focus group questions

1. What software/programs/apps do you use for school-related purposes or to support your studies?
2. What technologies are usually used in your classroom and for what purpose?
3. What technologies (hardware/software) would you like to have in classroom? How would they help?
4. Do you feel you could be better engaged in classroom, if you had access to a given technology? If yes, what kind of technology?
5. What do you think some barriers for using technology effectively in classroom are (e.g., cost, lack of enough time in class, distraction, etc.)?
6. What criteria weigh most heavily with you in determining the desirability of a classroom technology? In order of importance. (e.g., quality of the content, quality of the user interface/engagement mechanisms, etc.)
7. What do you think SFU could be doing better with classroom technology that would improve your educational experience?
Appendix B: Survey items

1. Gender: Female    male    other
3. Level of study: Undergraduate    Graduate
4. Faculty: a) Applied Sciences b) Arts and Social Sciences c) Beedie School of Business d) Communication Art and Technology e) Education f) Environment g) Health Sciences h) Science
5. Department: ___________________
6. Did you attend the focus group? Yes    No
7. How would you rate your ability to use technology?
   a) Superior (one of the best in class)
   b) Adequate (I can do what most can do)
   c) Inadequate (I can do some of what others do)
   d) Very inadequate (I struggle with technology)
8. What digital devices do you own?
   a) Desktop computer
   b) Laptop computer
   c) Tablet/other portable computers
   d) Smartphone
   e) Videogame console
   f) E-book reader
   g) Others (please specify)
9. What type of software do you use to support your learning?
   a) Graphic software
   b) Reference software/websites
   c) Productivity programs (e.g., MS Office)
   d) Simulation software
   e) Special needs software
   f) Data analysis software
   g) Design software
   h) Numerical analysis software
   i) Multimedia software
   j) Others (please specify)
10. Please rank these devices in order of your frequency of use in classroom:
    - Desktop computer
    - Laptop computer
    - Tablet/other portable computers
    - Smartphone
    - E-book reader
    - Audience response systems (e.g., iClickers)
11. How often do you use digital educational products for learning and/or school-related purposes?
- Many times a day
- Once a day
- Several times per week
- Once a week
- Others (please specify)

12. Please, rank the following criteria in terms of which is most important to you in determining your satisfaction with technology used in the classroom. (i.e., #1 matters most and #13 matters least).
- The cost to me as a student
- It is easy to use (e.g., interface, functionality, ease of navigation, etc.)
- I believe that this product will improve my educational experience
- Cross platform (i.e., you can use the product anywhere anytime on any device)
- I will be more successful in my course
- The reputation of the creator/brand of the product
- I believe the product will enhance my career opportunities
- Accessibility (can be used by people with special needs)
- Can be used across courses
- Long-term use
- Supports collaboration
- Aesthetic design
- Integration with other software