

Using Large-Scale Text Analysis to Create Recommendations for Effective Uses and Implementations of Educational Technologies

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About the University of Toronto

Canada's Largest University

- ▶ Research-Intensive Medical-Doctoral
- ▶ 3 Campuses Across Greater Toronto Area
- ▶ 20 faculties/divisions
- ▶ 90,000+ students
- ▶ 14,300+ faculty

How We Got Here

"To what extent can you use the numbers to make decisions?"

- ▶ Validation study and administrator's guide (2018)

"What is the quality of the comments?"

- ▶ Blue Text Analytics study of concerning comments (2019)



Research Goal/Question

“How do we use course evaluations to support practice?”

- ▶ Analyze large sets of comments for data-driven insights
- ▶ Link recommendations to specific technologies/features
- ▶ COVID-19

Dataset

Winter 2019

- ▶ Pre-COVID 19
- ▶ All comments in large multi-disciplinary undergrad division
 - ▶ 37.96% response rate (44,565/117,393)
 - ▶ 30,957 unique comments to examine

“Please comment on the overall quality of the instruction in this course.”

- ▶ Ask for all courses at the university
- ▶ Contextualized in-situ use of technologies

Procedure

1. **Flag/narrow potential items for review**

- ▶ Using word list

2. **Content Analysis**

- ▶ Identify comments & categories (features) for further analysis
- ▶ Calculate counts and agreement

3. **Thematic analysis**

- ▶ By sets (features) of comments
- ▶ Create recommendations

Creating Word Lists

1. Names of educational technologies in-use from internal lists
2. Looked at technologies to identify common **features**
 - ▶ Given educational technologies may have multiple overlapping features

Canvas, Quercus

- ▶ Recorded lectures/ educational videos
 - ▶ Recorded
 - ▶ Recordings
 - ▶ Video
 - ▶ ...
- ▶ Asynchronous collaboration tools

Creating Word Lists

Excluded technologies:

- ▶ Too many false positives
 - ▶ Comments usually not informative educationally
1. File sharing/collaboration tools (Google documents)
 2. Presentation technologies (PowerPoint)
 3. Direct communication systems (E-mail)
 4. Social media (Facebook)



Features

1. Synchronous response systems

- ▶ Clickers

2. Asynchronous collaboration tools

- ▶ Discussion boards

3. Asynchronous assignments & assessment

- ▶ Quiz/test tools

4. Recorded lectures & educational videos

- ▶ In-class
- ▶ Specialized videos

5. Course container

- ▶ Canvas course site



Flagging Items for Review

Excel

```
=IF(SUMPRODUCT(--ISNUMBER(SEARCH('scale scoring and search terms'!$G$2:$G$105,Q3:R3))), "1", "0")
```

- ▶ Searched within comments for words from our word list of technology features
- ▶ Question 7 **flagged comments: 5.20%** (1611/30957)

Content Analysis

False positive (is this of interest for further examination?)

- ▶ Yes/No

Features

1. Synchronous response systems
2. Asynchronous collaboration tools
3. Asynchronous assignments and assessment
4. Recorded lectures and/or educational videos
5. Course container

Valence (how does the student feel?)

- ▶ Positive/Negative

Content Analysis – Agreement

Interrater reliability (two raters)

	False positive	Feature agreement	Valence agreement	Total
	% (Frequency)	% (Frequency)	% (Frequency)	
Round 1	91.9% (147)	78.8% (126)	88.1% (141)	160
Round 2	88.1% (141)	80.0% (128)	84.4% (135)	160
Final Round	88.8% (427)	72.5% (349)	85.0% (409)	480

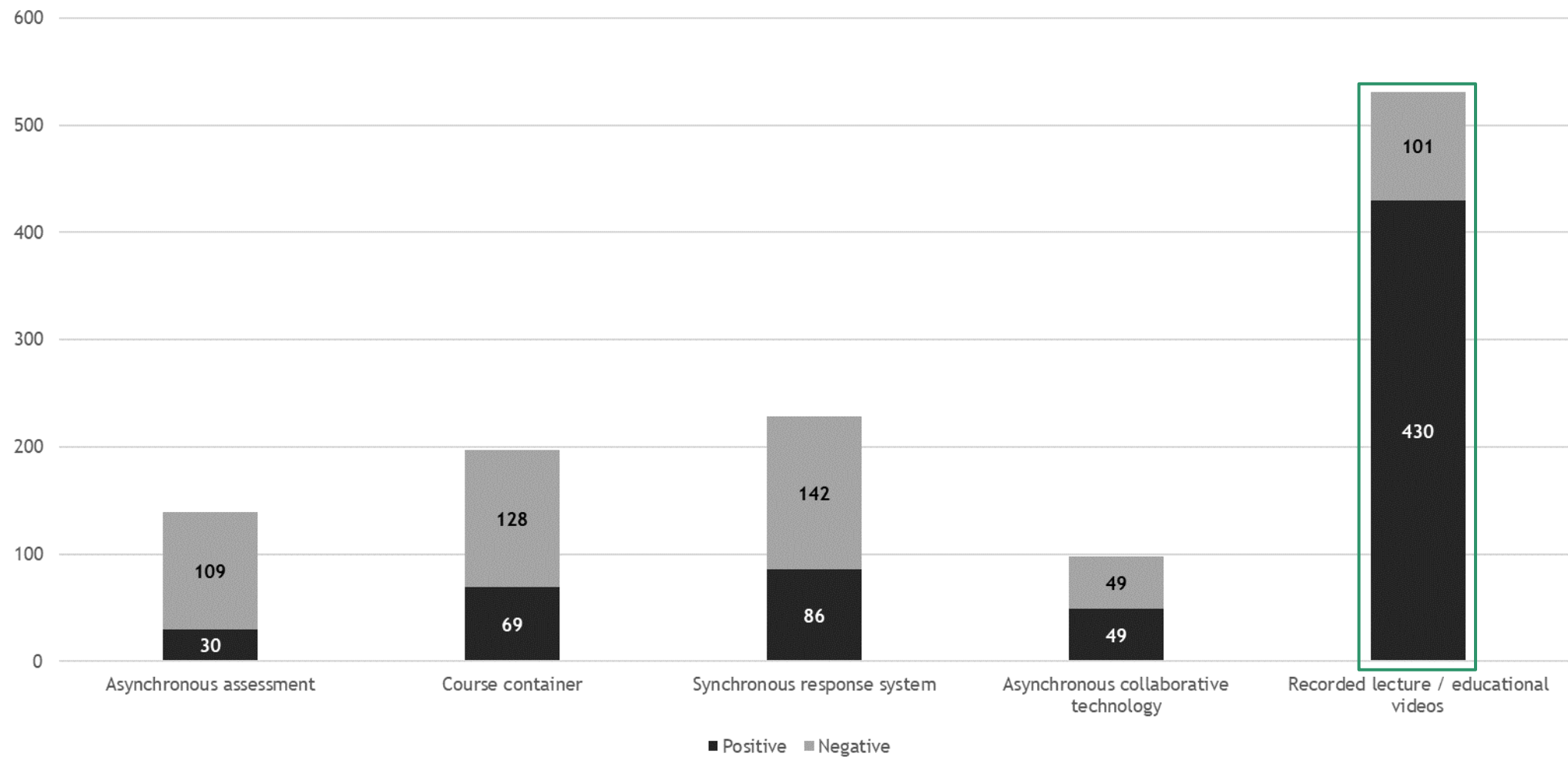
Content Analysis – Agreement

Interrater reliability (two raters) for true positives only

	Feature agreement % (Frequency)	Valence agreement % (Frequency)	Total
Round 1	85.0% (125)	95.2% (140)	147
Round 2	90.8% (128)	95.7% (135)	141
Final Round	81.5% (348)	95.5% (408)	427

Content Analysis – Numbers (Count)

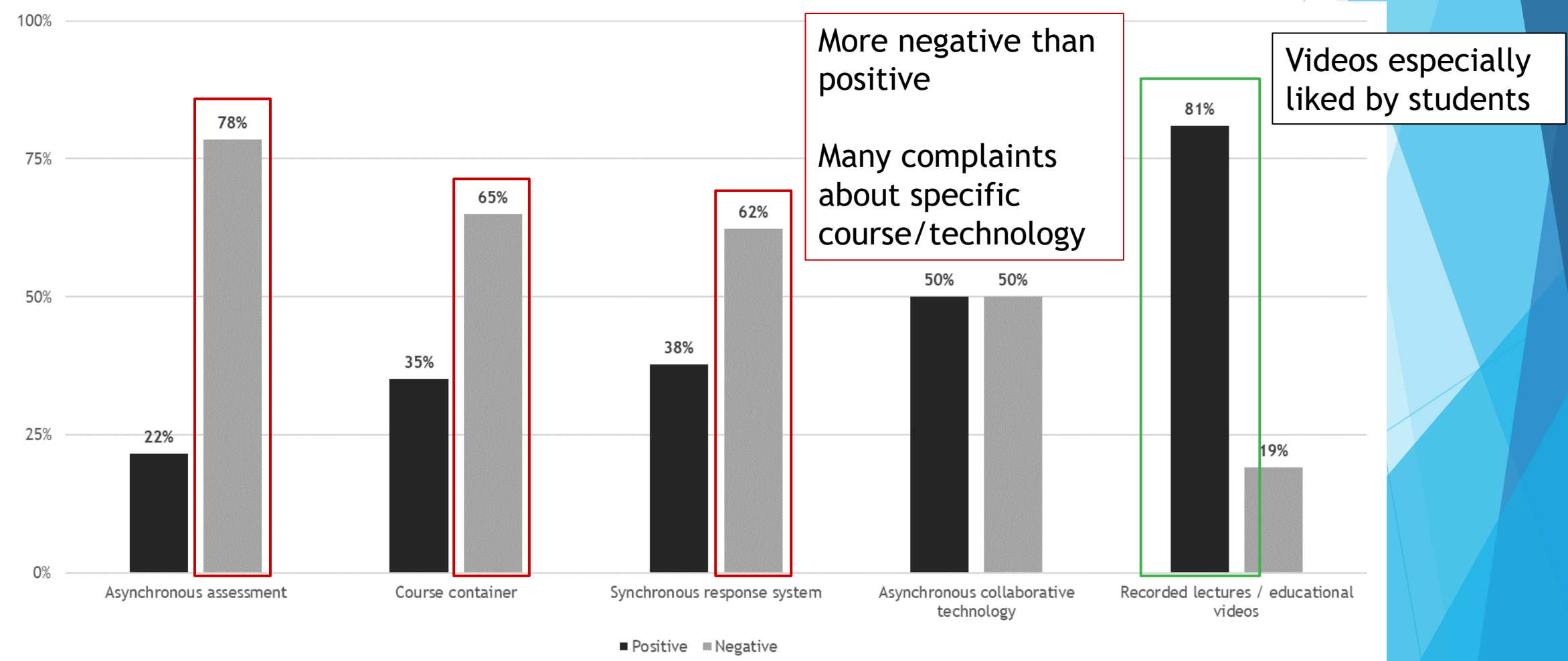
- ▶ **664 positive & 529 negative**
- ▶ All comments (multiple per course possible)



Large number of (positive) comments about videos

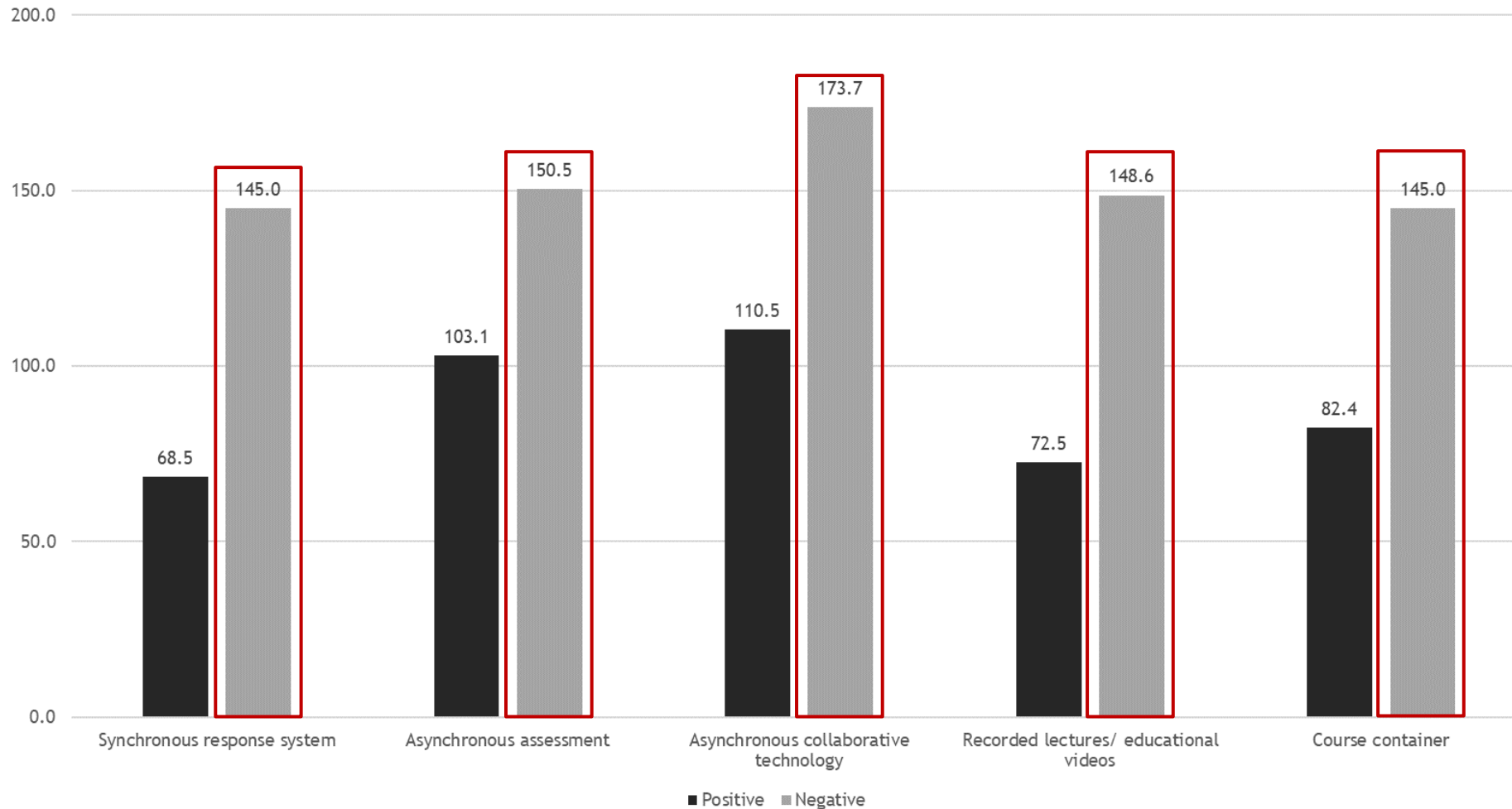
Content Analysis – Percentage of Total

- ▶ **664 positive (55.66%) & 529 negative (44.34%)**
- ▶ All comments (multiple per course possible)



Content Analysis – Word Count

- ▶ Negative comments much longer



Negative comments longer

Coding Procedure

Thematic analysis by feature

- ▶ Phase 1 – Familiarizing yourself with your data
- ▶ Phase 2 – Generating initial codes
- ▶ Phase 3 – Searching for themes
- ▶ Phase 4 – Reviewing themes
- ▶ Phase 5 – Defining and naming themes

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.



Themes

An overview of our **main findings** by feature:

1. Course container
2. Asynchronous collaboration tools
3. Recorded lectures & educational videos
4. Asynchronous assignments & assessments
5. Synchronous response systems

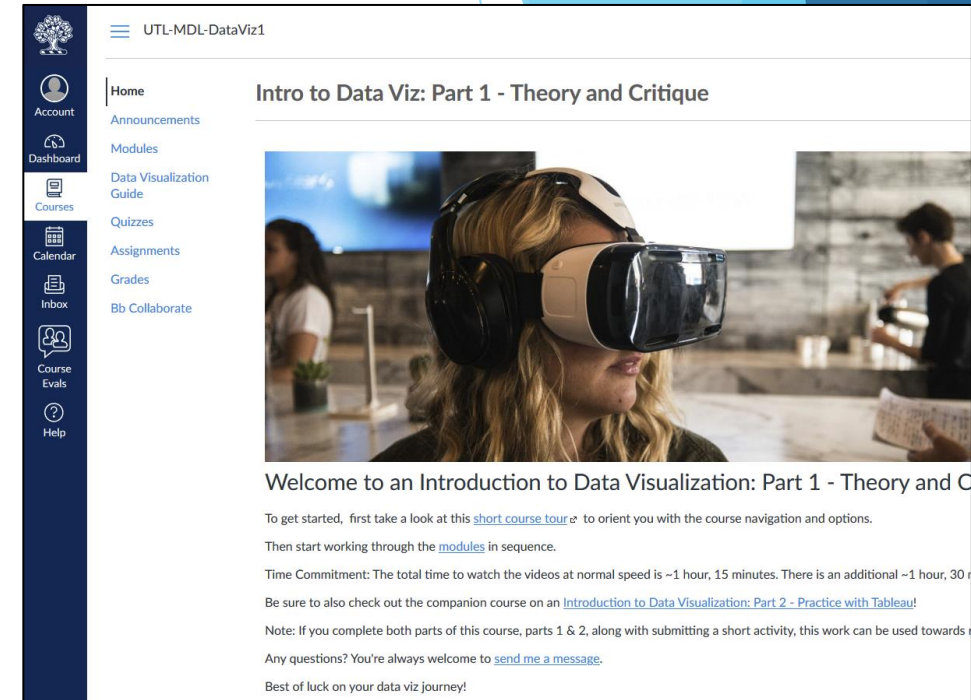
Themes

- ▶ Framed as recommendations
- ▶ Highlights here

Course Container

Should serve as a centralized, organized, easy to navigate, and clear course resource for course information, content, and activities

“...the professor...post[ed] rubrics on Quercus in a **disorganized manner** (some were in the comments of a discussion post, some in the announcement, some in the assignment page, etc).”

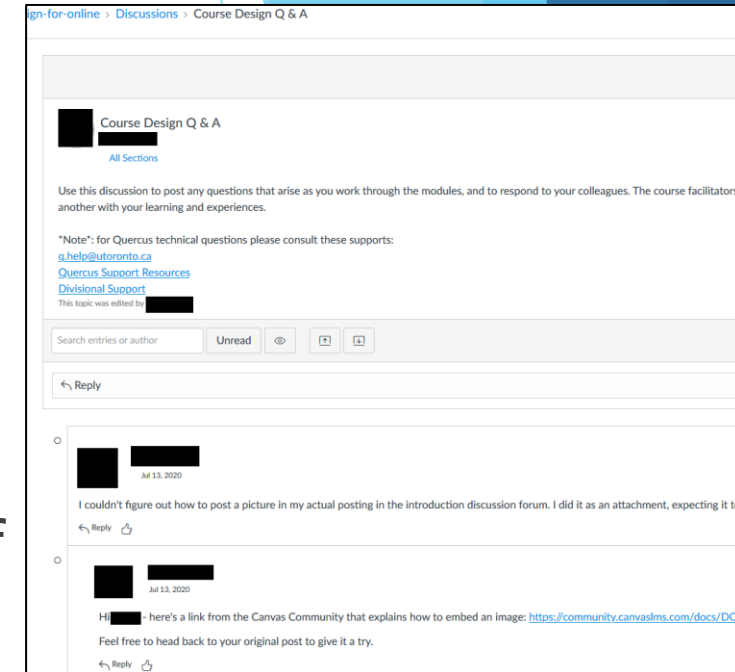


The screenshot shows a Blackboard course page for 'UTL-MDL-DataViz1'. The page title is 'Intro to Data Viz: Part 1 - Theory and Critique'. The left sidebar contains navigation links: Home, Announcements, Modules, Data Visualization Guide, Quizzes, Assignments, Grades, Bb Collaborate, Account, Dashboard, Courses, Calendar, Inbox, Course Evals, and Help. The main content area features a large image of a woman wearing VR goggles. Below the image, the text reads: 'Welcome to an Introduction to Data Visualization: Part 1 - Theory and Critique'. It includes instructions to take a 'short course tour' and work through 'modules' in sequence. It also mentions a time commitment of approximately 1 hour and 15 minutes, with an additional 30 minutes for a companion course. A note states that completing both parts of the course, along with a short activity, can be used towards a grade. The page concludes with a message: 'Any questions? You're always welcome to send me a message. Best of luck on your data viz journey!'.

Asynchronous Collaboration Tools

Instructors should be responsive, helpful, and engaged

"Professor [name] **never responded to any actual [topic] questions**...When he did respond...he would not address the concerns of the student, and was very dismissive and in fact **belittling**...ending with a... response...in the form of a meme."

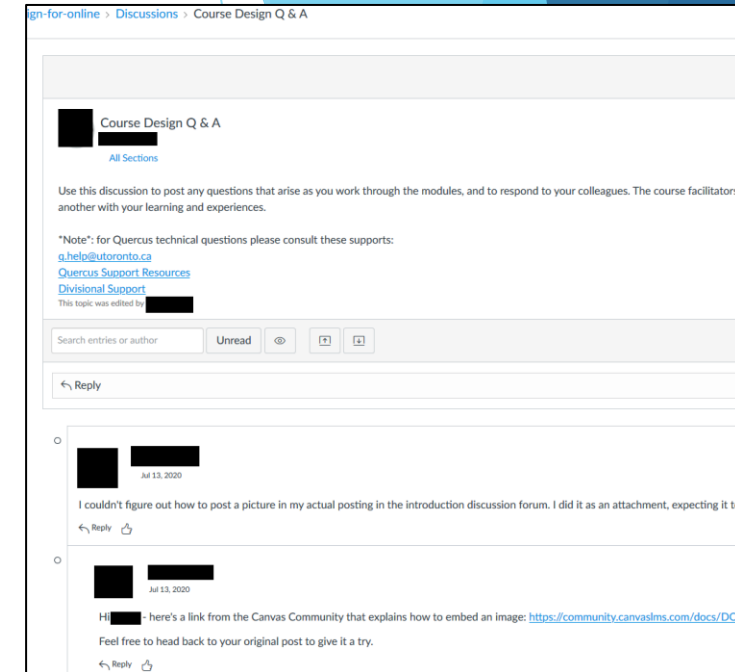


Asynchronous Collaboration Tools

Should foster a community of learners

"I know what other students are thinking and if I have a question about something, usually someone else has already asked it before."

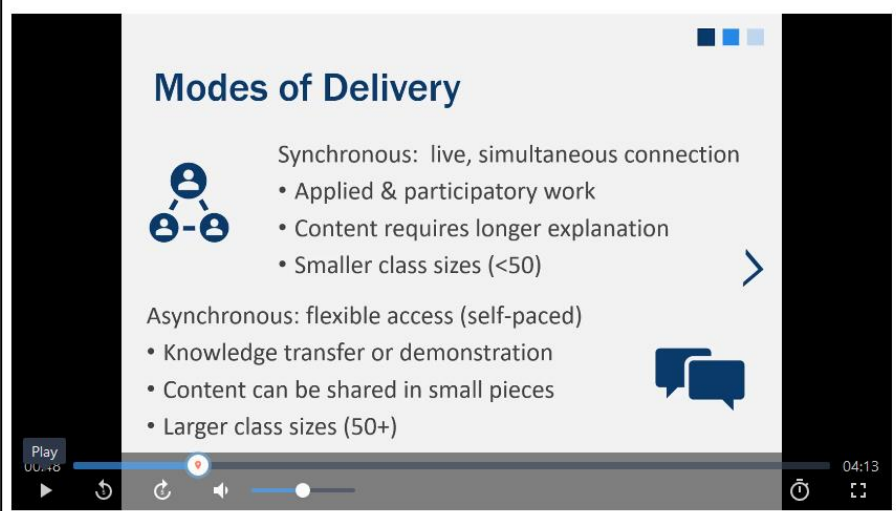
"The discussion board was a great idea so that we can engage with other students."



Recorded Lectures & Educational Videos

Can support self-directed learning/review

"...even if the concepts are complex and he explains them too quickly and sometimes messily out of excitement, I'm willing to **go back and watch the lecture videos because it's all there.**"



The screenshot shows a video player interface with a slide titled "Modes of Delivery". The slide content is as follows:

Modes of Delivery

Synchronous: live, simultaneous connection

- Applied & participatory work
- Content requires longer explanation
- Smaller class sizes (<50)

Asynchronous: flexible access (self-paced)

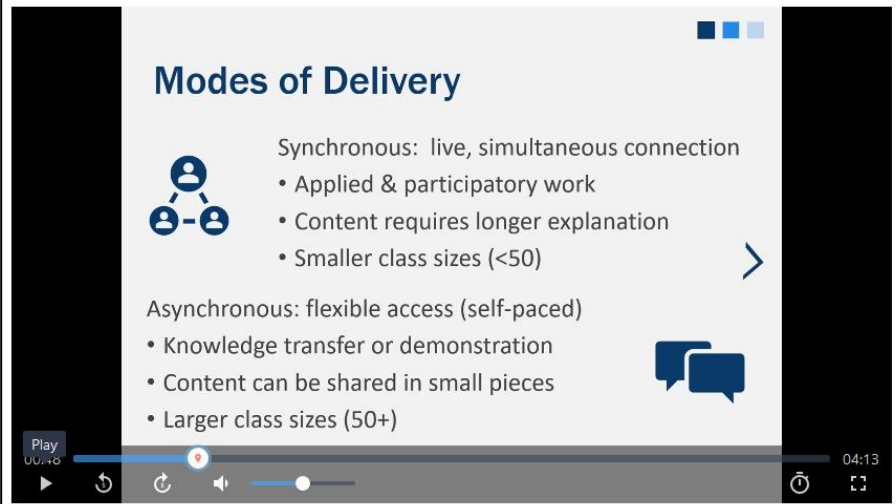
- Knowledge transfer or demonstration
- Content can be shared in small pieces
- Larger class sizes (50+)

The video player controls at the bottom show a play button, a progress bar at 00:48, and a total duration of 04:13.

Recorded Lectures & Educational Videos

Should leverage the medium to support learning

“The videos used for the first half of the course were **particularly useful for gaining an understanding** of how the whole process works, especially because all of the protein process we talked about in class were dynamic and **it is quite hard to visualize conformational changes on a 2D slide.**”



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The video player controls at the bottom show a play button, a progress bar at 00:48, a volume icon, and a total duration of 04:13.

Asynchronous Assignments & Assessments



Online assessments should be aligned with course progression

“Why would anyone think that it would be a good idea to have homework questions **graded** from marks on a topic be due **before we've even had the lesson on the topic.**”


“...homework was **great practice of questions** for studying, and really **helped me understand the content** better and prepare me for midterms.”

2.8 QUIZ: What Makes an Effective Learning Outcome? Part 2

ⓘ This is a preview of the published version of the quiz

Started: Jul 29 at 5:46pm

Quiz Instructions



In this module, we introduced some characteristics of effective learning outcomes that enable us to assess whether or not a learning outcome is supportive of student learning. This quiz will allow you to try your hand at assessing a couple sample learning outcomes using the criteria you will use to assess your peers.

Question 1

The following learning outcome statement is from a 2nd year course on enterprise information architecture. Assess whether the learning outcome meets the criteria outlined below.

"Demonstrate your roles and responsibilities in a team-based environment based upon pre-negotiated group timelines, roles, and deliverable"

- The learning outcome is specific and clearly stated
- The learning outcome is measurable in terms of student success
- The learning outcome is attainable by the students
- The learning outcome is relevant to the focus and level of the course
- The learning outcome addresses knowledge/a skill that is relevant beyond the course

Question 2

The following learning outcome statement is from a 3rd year course on the history of childbirth. Assess whether the learning outcome meets the criteria outlined below.

Synchronous Response Systems

Cost and technical issues should be considered

“The wifi disconnects a lot...which disrupts students when their devices cannot submit the answers.”

“it is clearly just a money grab on defenceless students... nowhere is it advertised when we signed up for this course that a percentage of our grade would be put behind a paywall...”



Synchronous Response Systems

Should emphasize formative feedback

"...the only reason why we...go to lectures, is for the mark... it is **unfair** how other classes are only marked on participation, yet ours is **participation and correctness.**"

"I find that doing the [poll] questions... **ensured we are fully comprehending the concepts** and made sure I was keeping up with the material. It especially helped when tests came along..."



Key Findings

Technology is...

- ▶ A common student complaint when used poorly
- ▶ Easy to use poorly
- ▶ Supports are important

General

- ▶ Institutional data can provide cross-context insights
 - ▶ Word lists can narrow comments for review
 - ▶ Negative comments long(er)



Next Steps

- ▶ Resource development
- ▶ More sophisticated flagging/analysis methods (natural language processing, machine learning)
- ▶ More topics (e.g., experiential learning)



Questions

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