



# A UDL-based Study on the Needs of Students with Disabilities in Engineering Courses

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## THE PROJECT

This project presents findings from a UDL-based large-scale survey on the needs of students with disabilities in engineering courses in FA2020 and SP2021 in Grainger College of Engineering. We concluded that providing multiple representations of course content in engineering courses can benefit all students and particularly students with disabilities.

## BACKGROUND

### Under-Reporting of Students with Disability

- 19% of undergraduates reported a physical or cognitive disability (Hamrick, 2019)
- 75 % of the respondents who reported a disability chose not to inform the instructor or the institution (Love, 2017)
- 27.8% of the students who reported a disability replied their disability needs were unmet
- 56% of the students with disability did not register for support services

### Universal Design for Learning

Universal Design for Learning (UDL) wants to improve learning outcomes for all students by recognizing that single methods of delivery, assessment and engagement are insufficient and may cause unnecessary hardships to minority students (Jones, 2018; Jones & Tech, 2009). This project focused on the first principle of UDL: multiple methods of representation that give learners a variety of ways to acquire information and build knowledge. Particularly, we are interested in the newly-introduced search-able video lectures. **Class Transcribe/Transcripts** provides students with multiple pathways to access content:

- view and review recorded live content asynchronously
- read the captions and transcriptions in original and alternative languages
- search for relevant content

We also utilized the **MUSIC** Model to identify factors that motivate students:

MUSIC Construct	Definition
eMpowerment	He or she has control or her learning environment in the course
Usefulness	The coursework is useful to his or her near future
Success	He or she can succeed in the coursework
Interest	The instructional methods and coursework are interesting
Caring	The instructor cares about whether or not a student can succeed in coursework and cares about student well-being

## METHODS

### The Survey

The survey questions focused on the following three areas of interest:

- Usage and satisfaction for each modality, including:
  - textbooks
  - lecture notes
  - PowerPoint slides
  - handwritten notes
  - lecture videos
  - captioned videos
  - captions in other languages
  - live Zoom lectures
  - online discussion forums
  - discussions/lab sections
  - office hours
- MUSIC construct evaluation
- Demographics info, including:
  - gender identity
  - race/ethnic
  - domestic/international
  - disability disclosures
  - anonymous disability service status

212 undergraduate students from 13 different courses completed the survey. Table below shows the demographic statistics of disclosed disability status and and gender. Among the 27 student with disabilities (**SWD**), 26 are with mental or cognitive disabilities and 1 are with physical disabilities. The few students who chose not to disclose their disability status are considered as students without disabilities (**SWOD**).

SWD	SWOD	Female	None-female	Female SWD	Total
48 (16%)	255 (84%)	127 (42%)	176 (58%)	32 (11%)	303

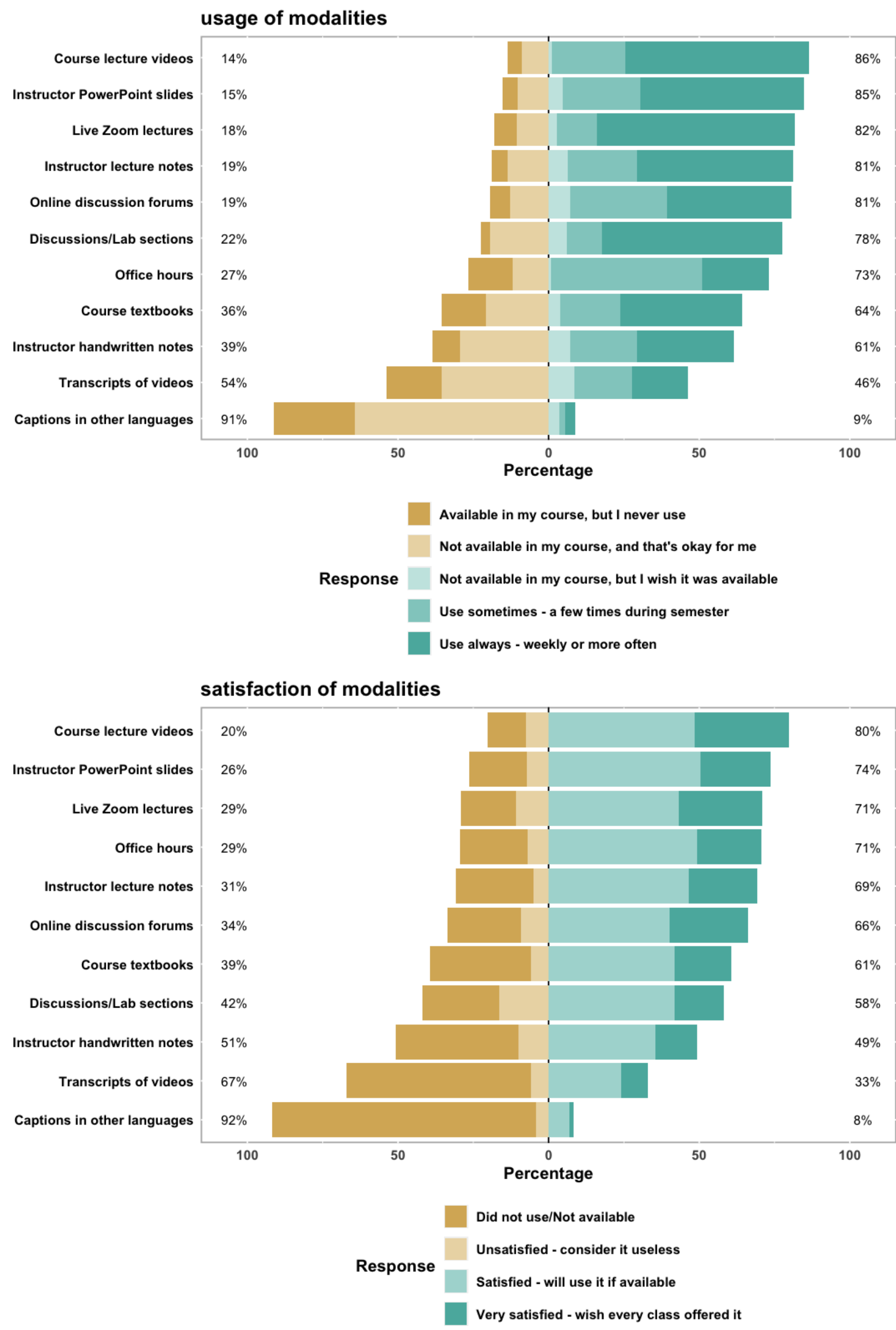
### Data Analysis

The following analysis was performed without personal identified information:

- Cronbach's alpha to check consistency
- Chi-squared tests and Wilcoxon tests for usages, satisfaction and MUSIC questions to find inter-group differences between SWD and SWOD and between female and non-female
- Correlation coefficients between usage and satisfaction for each course modalities

## RESULTS

### Usage and Satisfaction of Course Modalities

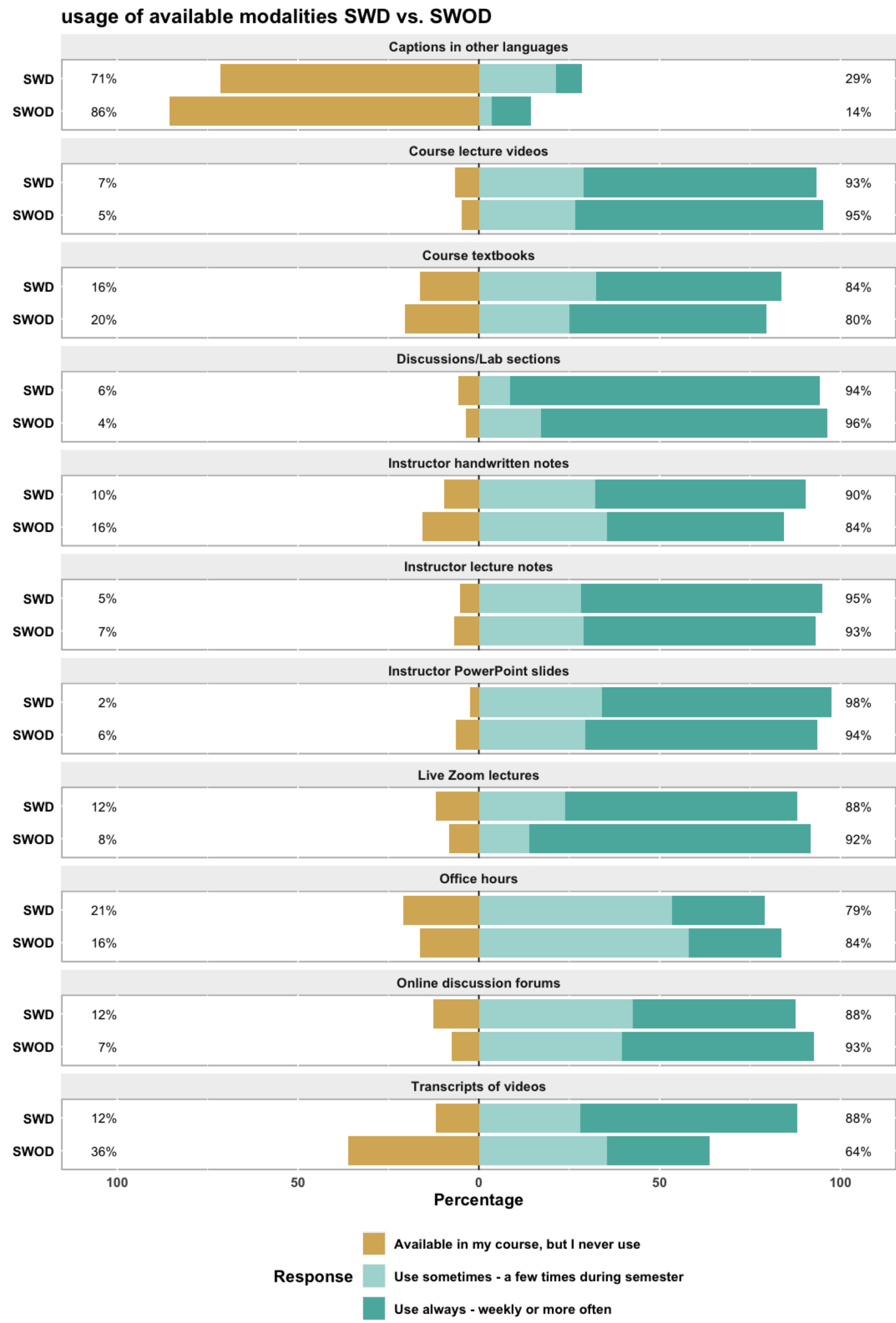


For both usage and satisfaction, a majority of responses indicates Class Transcribe/Transcripts and captions in other languages were never used or not available, but these modalities did exist in some of the courses we surveyed.

### MUSIC Evaluations of Courses

Students' MUSIC evaluations are generally high, but 24% of the respondents disagree that the instructional methods used in the course held their attention.

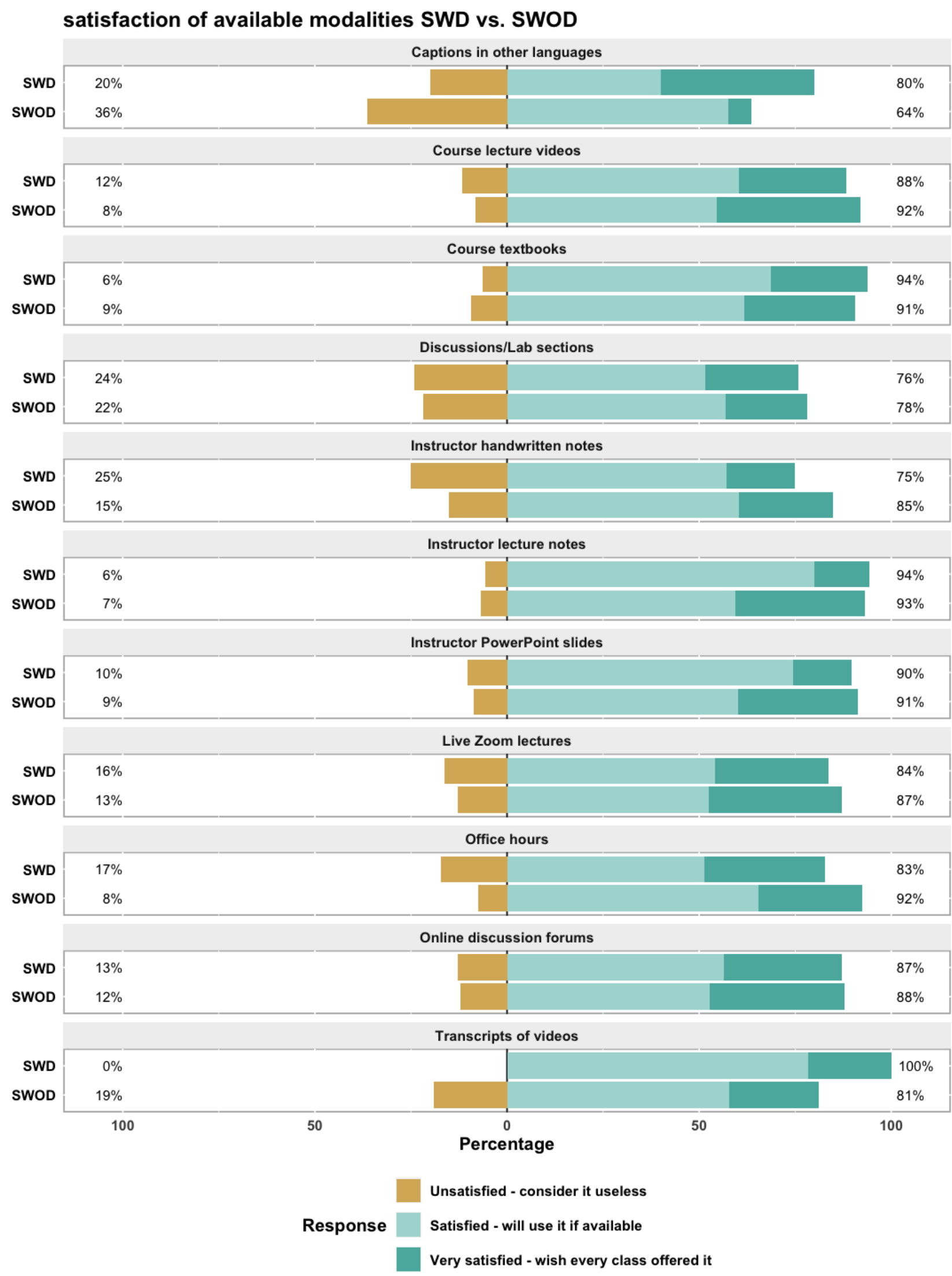
### SWD vs. SWOD



There is a difference for live Zoom lecture usage ( $p < 0.07$ ) and for Class Transcribe/Transcripts usage ( $p < 0.002$ ) between SWD and SWOD. SWD appears to use less live Zoom lecture (88% vs. 92%) and uses more Class Transcribe/Transcripts (88% vs. 64%).

## RESULTS (CONTINUED)

### SWD vs. SWOD (Continued)



### Female Students vs. Non-female Students

Female students appeared to be less satisfied with instructor PowerPoint slides ( $p < 0.01$ ), live Zoom lectures ( $p < 0.022$ ) and discussion/lab sessions ( $p < 0.028$ ), and less enjoyed the instructional methods used in their courses ( $p < 0.025$ ) than non-female students.

## DISCUSSION

- SWD have the highest satisfaction for Class Transcribe/Transcripts and textbook, which both include text-based narrative.
- SWOD are more satisfied with office hours which involves more personal interaction.

### Limitations and Future Work

Next round of data collection is needed to strengthen our conclusion and improve consistency of responses.

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