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

HONGYE LIU, ANGRAVE LAWRENCE, JENNY AMOS, ZHILING ZHANG, YIYIN SHEN
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

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
- 15% 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:
- eMpowerment
- caring
- Success
- Usefulness
- Interest

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

1. Usage and satisfaction for each modality, including:
   - textbooks
   - lecture notes
   - PowerPoint slides
   - handwritten notes
   - lecture videos
   - captioned videos

2. MUSIC construct evaluation

3. Demographics info, including:
   - gender identity
   - race/ethnic
   - disability disclosures
   - anonymous disability service status
   - domestic/international

212 undergraduate students from 13 different courses completed the survey. Table below shows the demographic statistics of disclosed disability status and gender. Among the 27 students 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).

<table>
<thead>
<tr>
<th></th>
<th>SWD</th>
<th>SWOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>26</td>
<td>213</td>
</tr>
<tr>
<td>Female</td>
<td>28</td>
<td>173</td>
</tr>
<tr>
<td>Domestic/international</td>
<td>17</td>
<td>195</td>
</tr>
</tbody>
</table>

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.

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

SWD vs. SWOD

There were no statistically significant differences in the use of class transcriptions between SWD and SWOD. SWD appeared to be more satisfied with Class Transcribe/Transcripts than SWOD (p < 0.022). There were no unsatisfactory responses from SWD for Class Transcribe/Transcripts.

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 < 0.029), 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.

References


