The Project

This project (GIANT2021-03) presents findings from a survey that assesses the preferences and needs expressed by students with disabilities (SWD), students without disabilities (SWOD), and faculty in relation to textbooks and printed course materials and ii) New functionalities created to improve equity by supporting accessible digital book creation.

Background

Accessibility of Course Content
- 65% of students surveyed reported skipping a textbook because of cost
- 90% of the respondents who reported skipping a textbook were still very concerned that not purchasing materials will negatively impact their grade.
- 79% of students reported being impacted by the pandemic, which has exacerbated existing accessibility challenges

Universal Design for Learning (UDL)
The three core practices of UDL are:
1. Multiple modes of content delivery
2. Multiple ways of expressing learning
3. Students being engaged and motivated to learn in multiple ways

Adoption of ClassTranscribe in Engineering Education
ClassTranscribe is a new accessible video platform based on UDL principles, to provide students with multiple pathways to access video content.

With ClassTranscribe students can:
- View recorded live content asynchronously
- Read the captions and live transcriptions
- Read transcriptions in alternative languages
- Search for relevant content across an entire course

Digital Books
- Provide a compelling, text-based alternative to live and recorded lectures.
- Offer improved accessibility and features over traditional printed textbooks.
- Provide a compelling, text-based alternative to live and recorded lectures.
- Search for relevant content across an entire course

Method

The Survey
We adopted six of nine factors from the Collegiate Student Assessment of Textbooks (CSAT) survey to identify which factors students and faculty desire most in textbooks:
1. Practical application to student’s lives and convenience
2. Accessibility
3. Graphs and tables
4. Study aid use
5. Instructor use of the textbook
6. Ease of use

Integer values 1-5 were assigned to the responses to the Likert questions. The questions were on a scale from 1 (Strongly Disagree) to 5 (Strongly Agree).

Demographics
The survey included respondents (N=78) from 46 STEM and engineering courses. The responses were further divided into two subgroups: SWD (n=26) and SWOD (n=58) with the ultimate aim of creating inclusive and equitable educational resources where all students can thrive.

Data Analysis
The following analysis was performed without personal identified information:
- Cronbach’s alpha to check consistency
- Mann-Whitney U tests to find the inter-group differences between SWD and SWOD and between female and male
- False discovery rate (FDR) controlling procedure to correct for multiple comparisons

Results

Top-ranked textbook features for all students and faculty

Ranking Question Mean Median SDV Positive rates
1 There is a search feature in the book. 4.48 5.0 0.819 89.7%
2 The book is low-cost or free. 4.42 5.0 0.982 62.3%
3 The examples used in the book are relevant. 4.39 5.0 0.756 66.7%
4 The examples used in the book really match the definitions provided. 4.39 5.0 0.813 62.7%
5 There is a searchable interface. 4.36 5.0 0.862 83.8%
6 Concrete examples are used to help me understand and remember. 4.35 5.0 0.842 83.8%
7 The book is up to date. 4.35 5.0 1.00 80.0%
8 The book is accessible online as well as a print copy. 4.30 5.0 1.05 82.3%
9 Core ideas are presented. 4.27 5.0 0.878 80.1%

For each of these features, more than half of the students considered it a top feature and more than 80% of the students considered it positively.

Differences Between SWD and SWOD

Factor Mean SWD Mean Med SWD Median SWD Positive SWD Positive SWD p-value FDR p-value
Instructor Use 2.72 3.66 2.5 4.0 30.85 57.9% 0.004 0.014
Graph 2.94 3.60 3.0 4.0 26.9% 52.6% 0.010 0.14
Practical 3.64 4.04 4.0 4.0 67.8% 69.6% 0.006
Ease 4.05 4.15 4.0 4.0 73.6% 77.1% 0.012 0.14
Accessibility 4.02 3.93 3.0 4.0 53.8% 73.7% 0.012 0.14
Study Aid 3.19 3.79 3.0 4.0 42.5% 65.8% 0.012 0.23

These findings suggest that some SWOD may have disabilities that prevented them from benefiting from specific factors. Students who used a screen reader did not benefit from a lot of tabular data. Without additional research these interpretations are conjectures; other interpretations are possible.

Digital Book Creation

Creating Digital Books from Lecture Videos. We created a system to automatically convert a recorded video into a digital book that includes the presented content and the spoken transcript. Creation of the book includes several automated steps, a simple web-based editing interface and code to automatically assemble the book into the desired output format.

New Visual Table of Contents
Books now include a generate visual table of contents of chapter images with each image hyperlinked to the corresponding chapter contents.

Conclusion

Students prefer textbooks that are searchable, low cost, relevant, have concrete examples, and have both digital and printed options. Using these results and the principles of UDL, new features were designed and added to ClassTranscribe to create valuable digital books from videos.

Rethinking Books
As we continue to develop features for digital book development, we look forward to better understanding how these features lead to success for all students and can improve equity for students with disabilities.

Future Work
1. Develop conditional publishing features.
2. Work with students who are blind or have impaired vision to optimize readable access.
3. Use a learning analytics approach to correlate textbook use and student performance.

References