Understanding the Needs of Students with Disabilities for UDL Based Best Practices Including the Utilization of Canvas

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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 Fall 2021 and Spring 2022 in Grainger College of Engineering using Learning Management Systems (LMS), like Canvas. We concluded that publishing content in engineering courses to LMS in more accessible formats 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)
- 28% 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 (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

UDL approaches can be facilitated through the use of Learning Management Systems (LMS) such as Canvas:

- Flexible deadlines
- Personalized prompt feedback
- Collaborative learning and active learning
- Different formats to submit their assignments
- Multiple modalities for the same content
- Unified calendar
- Discussion boards and group spaces for informal meetings

We investigated the following questions about learning technologies:

- What are student opinions of the system-wide quality of Canvas as an LMS?
- Are there differences between SWD and SWOD for system-wise constructs and individual LMS components that might be helpful for UDL design?
- Do teaching modalities (hybrid, in-person, online) have an effect on student opinions?
- Are there other groups in STEM that could be helped by a more inclusive UDL?
- Is there a difference between how different genders are being served by LMS?

Method

The Survey

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

1. Student demographics
2. General course website preferences and functionalities, representing:
   - Educational Equity
   - Performance Impact
   - Information Quality
   - System Quality
   - Service Quality
   - Self-Efficacy
3. Usage and satisfaction pertaining to specific course website elements
4. Other questions about organization of materials

Demographics

SWD	SWD-like	SWOD	Female	Male	Female SWD	Online	Hybrid	In Person	Total
37 (28%)	50 (38%)	94 (71%)	53 (40%)	70 (53%)	22 (16%)	32 (24%)	37 (28%)	56 (42%)	131

Data Analysis

The following analysis was performed without personal identified information:

- Cronbach alpha checks showed responses were consistent
- Wilcoxon tests used for various comparisons and all reported p-values.
- SWD-like vs SWOD comparisons for the above analyses

Results

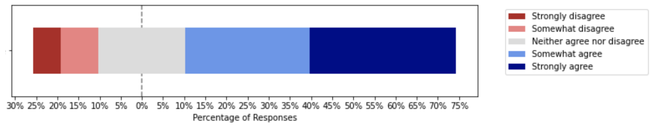
Gender Differences

We did not find any statistically significant differences between genders.

Results

Student Satisfaction with Canvas

Responses ranged from -2 to 2 where 2 corresponds to strongly agree/very effective. Students reported a **positive preference towards all UDL functionalities of Canvas**.



Student responses to 'The Canvas website contributed positively to the course'

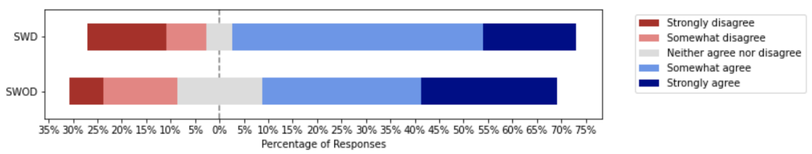
question	p	median (n=80)	% positive
Using the calendar feature in Canvas contributes to course quality	<.001*	1.0	53.8%
The Canvas system made it easier to accomplish my tasks for this course	<.001*	1.0	67.5%
Using Canvas has improved my academic effectiveness	.003*	1.0	52.5%
Using Canvas has improved my learning* performance (*teaching for faculty)	.005*	1.0	53.8%
I feel confident finding the information I am looking for in Canvas	<.001*	1.0	67.5%
I feel confident in uploading and downloading files from Canvas	<.001*	1.5	77.5%
I could use Canvas to view my course content anywhere, at any time I wanted	<.001*	1.0	75.0%
Canvas course offered reliable access to multimedia types of course content	<.001*	1.0	70.0%
Overall, I am pleased with the Canvas course website	<.001*	1.0	75.0%
I find Canvas easy to use	<.001*	1.0	72.5%
My interaction with Canvas is clear and understandable	<.001*	1.0	75.0%
The Canvas website contributed positively to the course	<.001*	1.0	72.5%

Differences between SWD and SWOD

In general, SWDs tended to be **less satisfied with the method in which content was delivered** to them and how they were collaborating with others.

question	p	SWD median	% positive SWD	SWOD median	% positive SWOD
Using Canvas has improved my learning* performance (*teaching for faculty)	0.132	0.0 (n=24)	45.83%	1.0 (n=56)	57.14%
Using Canvas has improved my academic effectiveness	0.081	0.0 (n=24)	37.5%	1.0 (n=56)	58.93%
I feel confident finding the information I am looking for in Canvas	0.067	1.0 (n=24)	62.5%	1.0 (n=56)	69.64%
Canvas course offered reliable access to multimedia (audio, video, and text) types of course content	0.165	1.0 (n=24)	62.5%	1.0 (n=56)	73.21%
I am pleased with message posting on the course website	0.130	1.0 (n=37)	51.35%	1.0 (n=85)	62.35%
Posting teaching materials (presentations, notes, readings, etc.) on the website contributes to the course	0.161	2.0 (n=37)	86.49%	2.0 (n=85)	82.35%
ClassTranscribe or transcripts of videos - Rating	0.200	2.5 (n=14)	92.86%	2.0 (n=38)	84.21%
I would prefer that my course only uses one website (i.e. Canvas)	0.002*	1.0 (n=36)	94.44%	1.0 (n=85)	67.06%

Students as a whole reported a **strong preference towards courses only using one website**, however, SWDs reported an even stronger preference (94.44% positive, p<0.003).



SWD and SWOD responses ("I feel confident finding what I am looking for in Canvas")

Differences between In-Person (IP) and Not In-Person (NIP) course delivery

Students taking in-person classes demonstrated lower usage of components such as recorded lectures and Canvas collaborative tools than students in NIP classes. This is understandable as NIP classes rely more heavily on such tools for delivering content.

Students from IP classes had much less appreciation of live lectures than students from NIP classes.

Results

SWD-like vs SWOD

SWD-like students are the group of students that includes both SWDs and the students who have not been officially accommodated but have unmet needs.

Construct	p-value	SWD-like median	SWD-like % positive	SWOD-like median	SWOD-like % positive
Accessibility - Usage	0.013*	1.0 (n=236)	60.17%	0.5 (n=348)	50.0%
Accessibility - Rating	0.912	1.0 (n=236)	58.05%	1.0 (n=344)	58.43%
Interactivity - Usage	0.015*	0.0 (n=236)	36.02%	0.0 (n=352)	28.12%
Interactivity - Rating	0.970	0.0 (n=236)	38.98%	0.0 (n=345)	38.84%

We found **SWD-like were using the accessibility and interactive elements of their LMS more** ($p<0.014$ and $p<0.016$, respectively, potentially as a result of inability to attend class or participate in person.

Conclusion

Material designed to better serve SWDs and increase educational equity will also lead to better learning outcomes for all students. SWDs needs are yet to be met with conscious UDL based design of learning.

Recommendations

- For instructors:
  1. **Utilize single LMS such as Canvas**, since all students reported a positive preference towards Canvas regardless of disability status.
  2. **Make use of the UDL best practices we identified or developed, i.e. make lecture videos on ClassTranscribe available for all students, provide alternative content delivery both synchronously and asynchronously**.
- For education researchers: **Support UDL based practices with technology and training, i.e. provide interface with LMS through Learning Tools Interoperability (LTI)**.

Future Work

- Develop materials and example modules to help faculty adopt UDL design principles in their courses.
- Follow up with SWD and SWD-like students to better understand how they may be supported using UDL-based course design, particularly through asynchronous group activities.
- Develop mini-course and seminars for training in UDL based course design.

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