



Using Student Feedback and Machine Learning to Examine Inclusive Teaching

Presented by **Grant Crider-Phillips** and **Nathan Greenstein**

Using Students' Course Evaluations and Machine Learning to Examine Inclusivity and Accessibility

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June 9, 2022



UNIVERSITY OF
OREGON

Academic Data Analytics

Learning Goals

Understand the **machine learning analysis approach** to categorize and summarize text

Consider **student perspectives on inclusive teaching** practices

Identify **implementation opportunities** at home institutions

Redesigning Course Surveys



Small, **consistent bias** against female instructors

Question-dependent – more vague, more “room for bias”

The way the numbers are used = quantif**aux**cation.

Precise rankings with flawed measures... (Stark 2015)

Redesigning Course Surveys

Student Experience Surveys



Eliminate Numerical Ratings

Ask Questions about Student Learning Experience

Redesigned Student Experience Survey

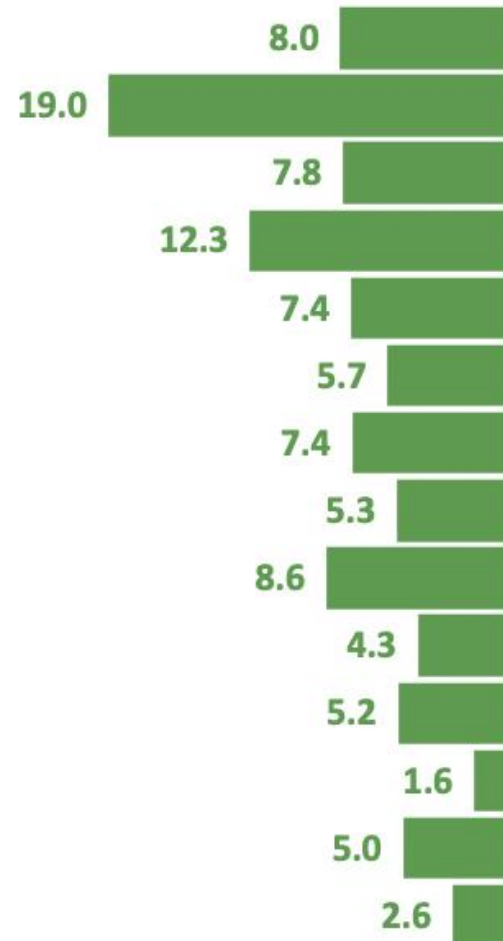
- **Organization**
- **Quality** of the course materials
- **Instructor communication**
- **Assignments or projects**
- **Inclusiveness**
- **Accessibility**
- **Relevance** of the course content
- **Clarity** of assignment instructions and grading
- **Feedback**
- **Active learning**
- **Challenge** in this course
- **Support** from the instructor
- **Student interaction**

**Most beneficial for
your learning?**

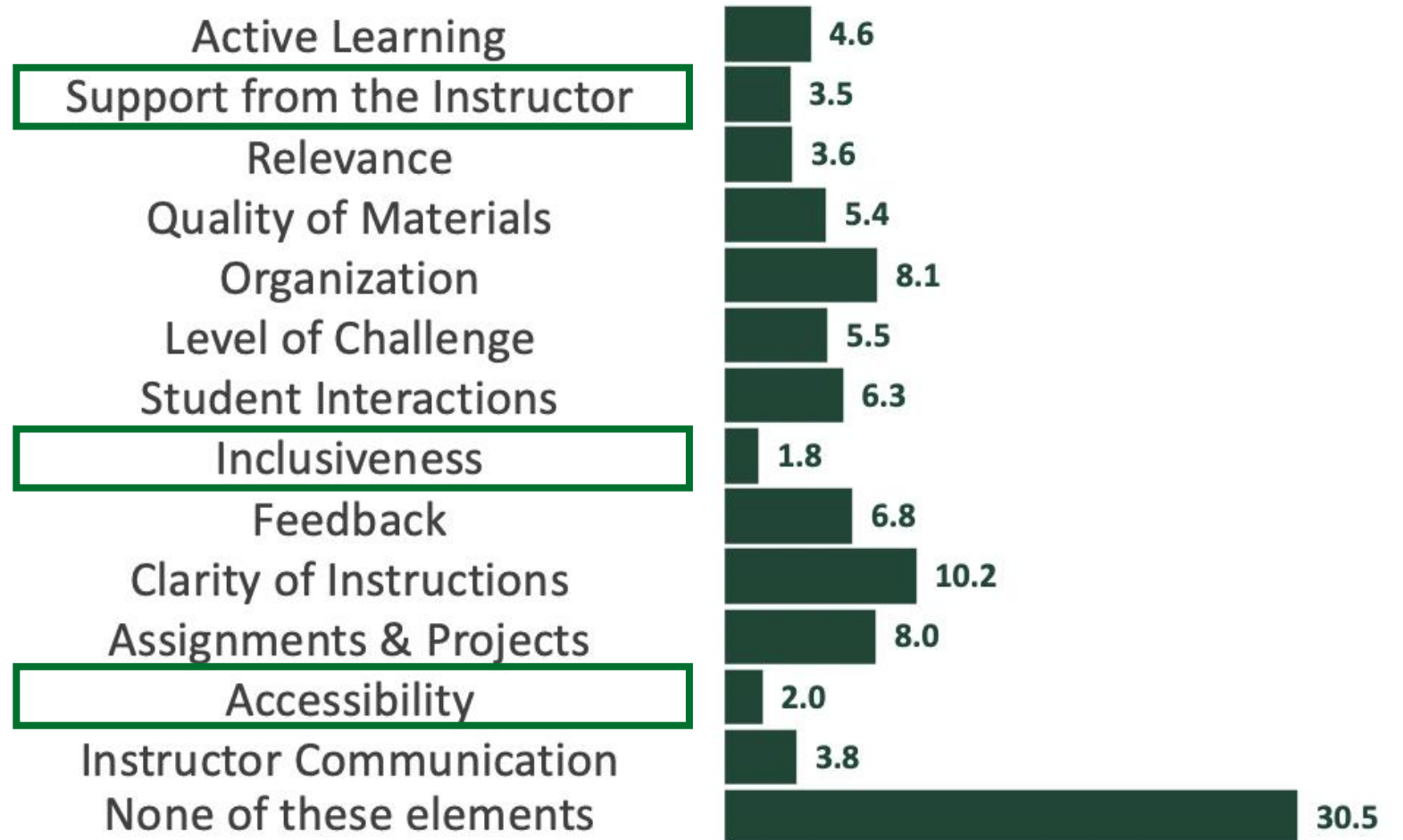
**Most in need of
improvement for your
learning?**

Most Selected Teaching Practices

Most Beneficial for my Learning



Most in Need of Improvement for my Learning



~200,000 student comments

Data Sources

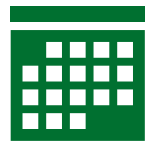
5-25k written
comments

13 teaching practices

*How do students describe
each teaching practice?*

Analysis Approaches

Thematic Analysis



Days/Weeks...

Common Words



Minutes

Topic Modelling &
Human Interpretation



Hours

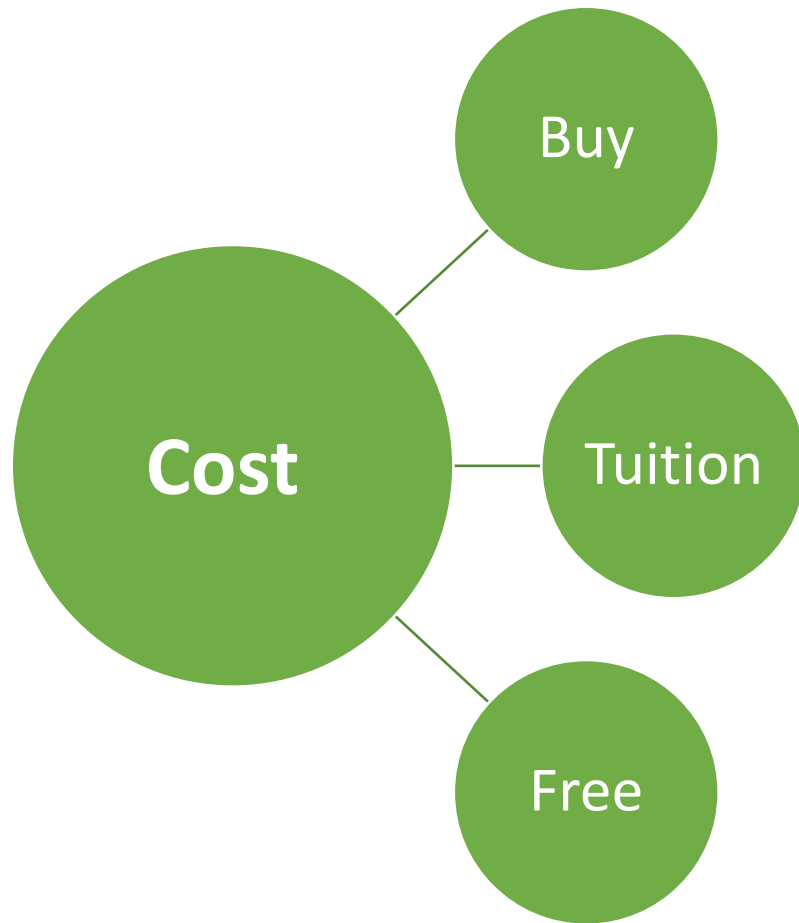
What is Topic Modelling?

Text Processing

Human
Understandable

Data
Summarization

What is Topic Modelling?



Individual **words**
combine to make
topics

Textual data is
simplified

Implementing a Topic Model



Preparing Text



Model Fitting



Interpretation

Text Cleaning & Word Removal

Purpose

Remove parts of text that **aren't interesting**

Example

"The teacher (Dave)"
→ "teacher dave"

Lemmatization

Purpose

**Combine all forms
of the same word**

Example

**"I'm about to be"
→ "I be about be"**

Latent Dirichlet Allocation (LDA)

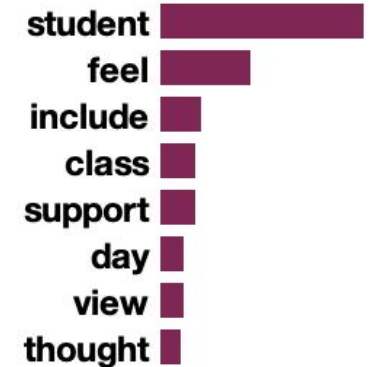
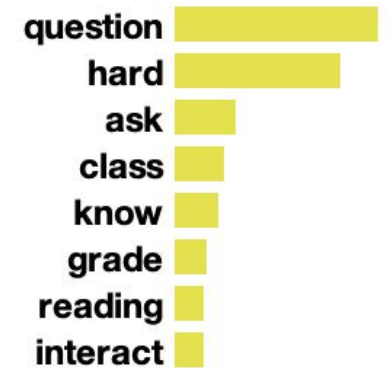
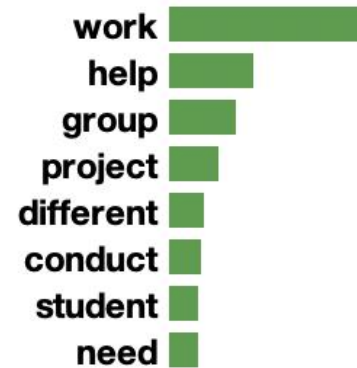
Models documents as a mixture of **topics**



Topics are distributions of words



6 Topics

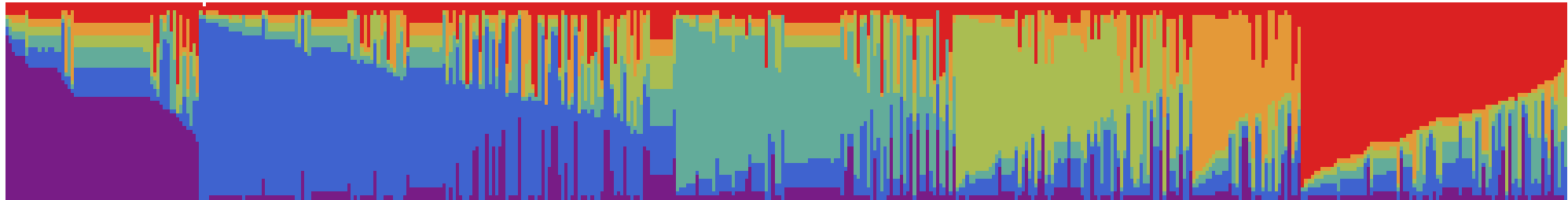


Latent Dirichlet Allocation (LDA)

Models documents as a mixture of **topics**

Topics are distributions of words

■ 0 ■ 1 ■ 2 ■ 3 ■ 4 ■ 5



Topic Breakdown of all "Inclusiveness" comments

Promises

- Harnesses **messy data**, like **text**
- **Automates** repetitive tasks

Concerns

- Might the algorithm be **biased or inequitable**?
- How much **transparency** will be offered?

Machine Learning

Implementing a Topic Model

Hybrid Approach



Preparing Text



Model Fitting



Interpretation

Topic Interpretation & Theme Synthesis

Read topic word lists for context



*Class conversations, discussions
voices, answering questions..*

Sample comments from each topic

Look for meaningless word patterns

"I feel" statements

Identify homonyms

"I mean" vs "is mean"

Different meanings based on context

*"class work" vs
"couldn't attend because of work"*

How do students describe inclusive teaching practices?

What specifically about the inclusiveness of the course helped your learning?

What specific change in the inclusiveness of the course would help your learning?

What would you say?

From your experience, what teaching practices do you think are inclusive or exclusive?

How do students describe inclusive teaching practices?

What specifically about the **inclusiveness** of the course helped your learning?

What specific change in the **inclusiveness** of the course would help your learning?

Student Voices

**Diversifying
content**

**Using inclusive
language**

**Understanding
student needs**

**Choice and
Relevance**

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Inclusiveness

Student Voices

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**Choice and
Relevance**

**Students
comfortable
speaking in class**

“I liked how we all were encouraged to speak in the class and that our opinions mattered.”

“although I'm not super comfortable talking in front of a class she made me feel comfortable and able to contribute!”

Inclusiveness

Student Voices

**Diversifying
content**

**Using inclusive
language**

**Understanding
student needs**

**Choice and
Relevance**

Students
comfortable
speaking in class

**Welcome more
voices/mitigate
dominating students**

“Give students the opportunity to speak up by encouraging those with louder voices to have others heard.”

“I think the professor does try to make all discussion inclusive but ends up not always being the case when certain students dominate the conversation”

Inclusiveness

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Relevance**

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Welcome more
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**Specific facilitation
recommendations**

“I think it would be helpful if the instructor set some standards for constructive and respectful discussion, especially in terms of acknowledging the life experiences of underrepresented groups in class...”

“She never attacks anyone's opinions, and she is great at hearing someone out and then condensing what they've said in an accurate way so everyone can better understand.”

Inclusiveness

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Specific facilitation
recommendations

**Welcoming
questions**

“I was terrified of asking questions because I was afraid of being ridiculed by even thinking of asking a question you didn't deem worthy.”

“It was almost embarrassing to answer his questions if you didn't 100% understand the topic at hand...”

Inclusiveness

Student Voices

**Diversifying
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Understanding
student needs

Choice and
Relevance

**Diverse perspectives
& impact on
communities**

“As one of the two women of color in this class, I appreciate [the instructor’s] effort to address racial issues in [class content].”

“Being Native American, I felt more invested in this class when everyone discussed the impacts that [topic] has had on Indigenous people...”

Inclusiveness

Student Voices

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Relevance

Diverse perspectives
& impact on
communities

**Authors &
Guest speakers**

“We need class materials written by black, indigenous and/or people of color. We need more guest speakers that come from intersectional identities.”

“I felt that the course could use more diversity in speakers.”

“Try to get some guest speakers of color.”

Inclusiveness

Student Voices

Diversifying
content

Using inclusive
language

Understanding
student needs

Choice and
Relevance

“Being a non-binary person it would have been nice to see more gender-inclusive language”

“Out of all my classes, I felt the most welcomed and respected here. I'm pretty sure everyone always used the correct pronouns (I'm trans) and I even had one instance of another student calling someone out for mis-gendering me.”

Inclusiveness

Student Voices

Diversifying
content

Using inclusive
language

Understanding
student needs

Choice and
Relevance

“In response to our needs, she adapted the course syllabus and modified some course expectations to ensure that (a) we continue to receive a quality education, and (b) we could maximize our learning in our changing context.”

“It would be beneficial to my learning if you said the exact same feedback, but in a more understanding way that acknowledges that you've been in our shoes at some point in your education...”

Inclusiveness

Student Voices

Diversifying
content

Using inclusive
language

Understanding
student needs

**Choice and
Relevance**

“Material tried to apply to many types of individuals and their goals for future practice (i.e. ethics, job search).”

“Because we each have to present on the readings as well as our projects, it really includes people and their interests in giving them the freedom to choose what they want to report on that interests them the most.”

Accessibility

**LMS
Organization**

**Instructor
Flexibility**

Accommodations

Affordability

**Auditory
Accessibility**

Support from the Instructor

**Learning Skills,
Study Strategies**

**Understanding
student needs and
flexibility**

**Availability: office
hours, rapid
responses, study
sessions**

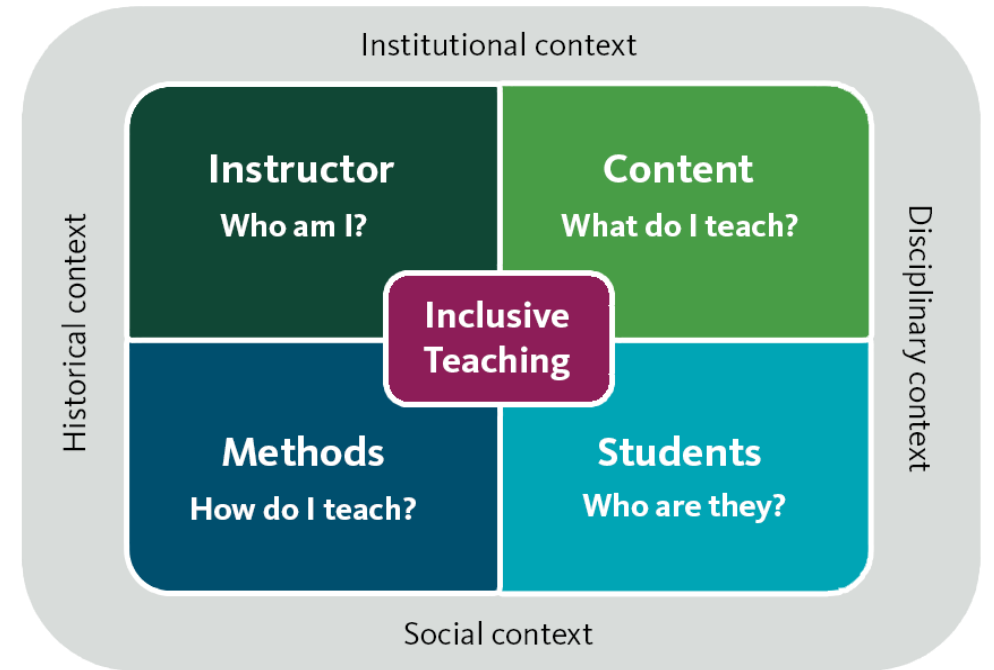
**Uncover difficulties,
answering questions**

Using student voices to define teaching practices

Workshops & Consultations

Practitioner Guides

Sharing Back to Students



Adapted from Linda Marchesani and Maurianne Adams, "Dynamics of Diversity in the Teaching-Learning Process: A Faculty Development Model for Analysis and Action," *New Directions for Teaching and Learning* 52 (Winter 1992): 9-20, and Bailey Jackson, unpublished paper (1988) cited by Marchesani & Adams.

Tools Used



Preparing Text



Model Fitting



Interpretation



Python – for process implementation



Azure – for computing resources



**Code Available on
GitHub**

Benefits & Limitations

Efficient & Scalable

Objective Topics

Question specificity helps

Doesn't provide exact response %

Not completely automated
(best as a hybrid analysis)

Many implementation opportunities...

What are other underused text-based datasets on your campus?

Learning Goals

Understand the **machine learning analysis approach** to categorize and summarize text

Consider **student perspectives on inclusive teaching** practices

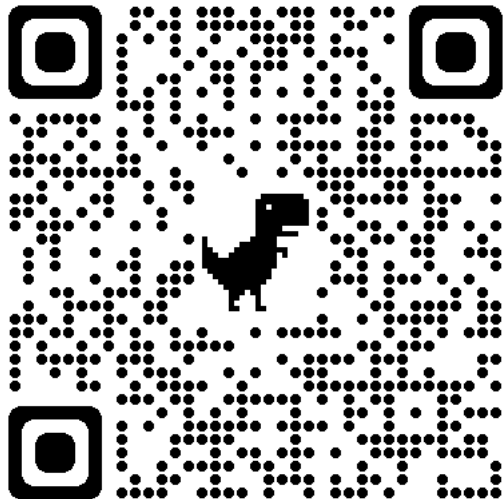
Identify **implementation opportunities** at home institutions

Implementation opportunities: Text-rich data sets on your campus?

What's needed to implement this approach?

Student Experience Survey Redesign?

Academic Data Analytics
Practitioner Guides & Methods



Revising UO Teaching Evaluation
Survey, Process & Resources

