

LOL Lab

Language Of
Learning Lab

Est. 2018

The Multiple Sources of Coherence:

MODELING THE DYNAMICS OF STUDENTS' MULTIPLE DOCUMENTS SOURCING BEHAVIORS

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WHY MULTIPLE DOCUMENTS?

1. Energy Research & Social Science journal page: A screenshot of a journal article from Energy Research & Social Science (ERSS) volume 67 (2020). The article, titled "Oil sands, pipelines and fracking: Citizen acceptance of unconventional fossil fuel development and infrastructure in Canada," is authored by Todd Brunner* and Jonn Axsen. It includes a figure titled "Check for updates" and a link to the journal homepage.

2. The New York Times article: A headline from The New York Times reads "Fossil Fuels Aren't Going Anywhere." The author is Alex Epstein. The article discusses Exxon's \$60 billion acquisition of XTO Energy and its commitment to oil and gas.

3. National Geographic video thumbnail: A thumbnail for a National Geographic video titled "How Hydraulic Fracturing Works." The video shows a shale rock formation being fractured by hydraulic fracturing.

4. Environmental campaign image: An image showing a large oilfield with many drilling rigs and oil wells in a dry, arid landscape. The image is part of a campaign against fracking.

5. Environmental campaign footer: A footer for an environmental organization featuring a "DONATE NOW" button, a newsletter sign-up form, and a call to action to "Get the latest on our work for biodiversity and learn how to help in our free weekly e-newsletter."

Alexandria Ocasio-Cortez (@AOC): You absolutely love to see it. This along with record low interest rates means it's the right time for a worker-led, mass investment in green infrastructure to save our planet. *cough*

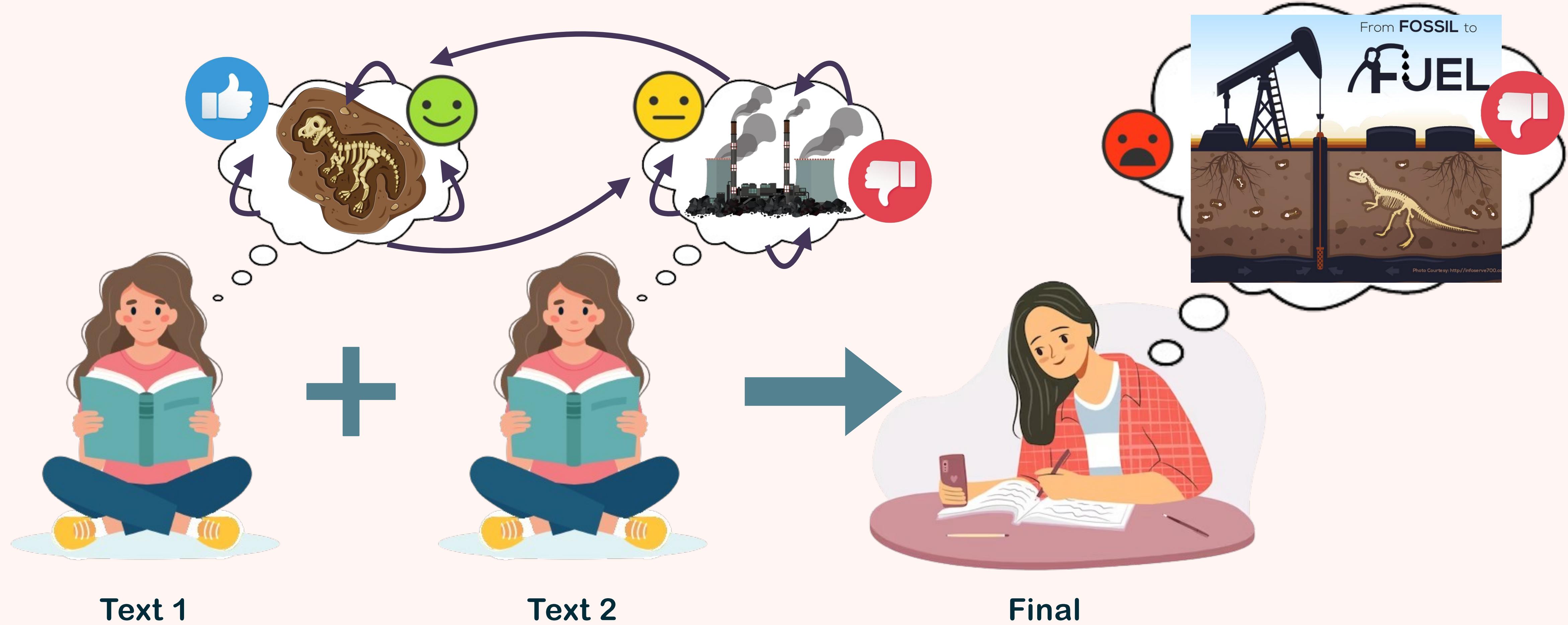
Brandon Smith (@muckrakery): Oil prices now at "negative values," meaning oil producers have to pay people to take it off their hands and store it because when demand plunges (like now), that is less expensive for them than building more storage and/or shutting wells down. twitter.com/no_such_zone/s...

12:34 PM · Apr 20, 2020 · [Twitter for iPhone](#)

TEXT COMPREHENSION



MD COMPREHENSION



Text 1

Text 2

Final

THEORY → **ASSESSMENT**

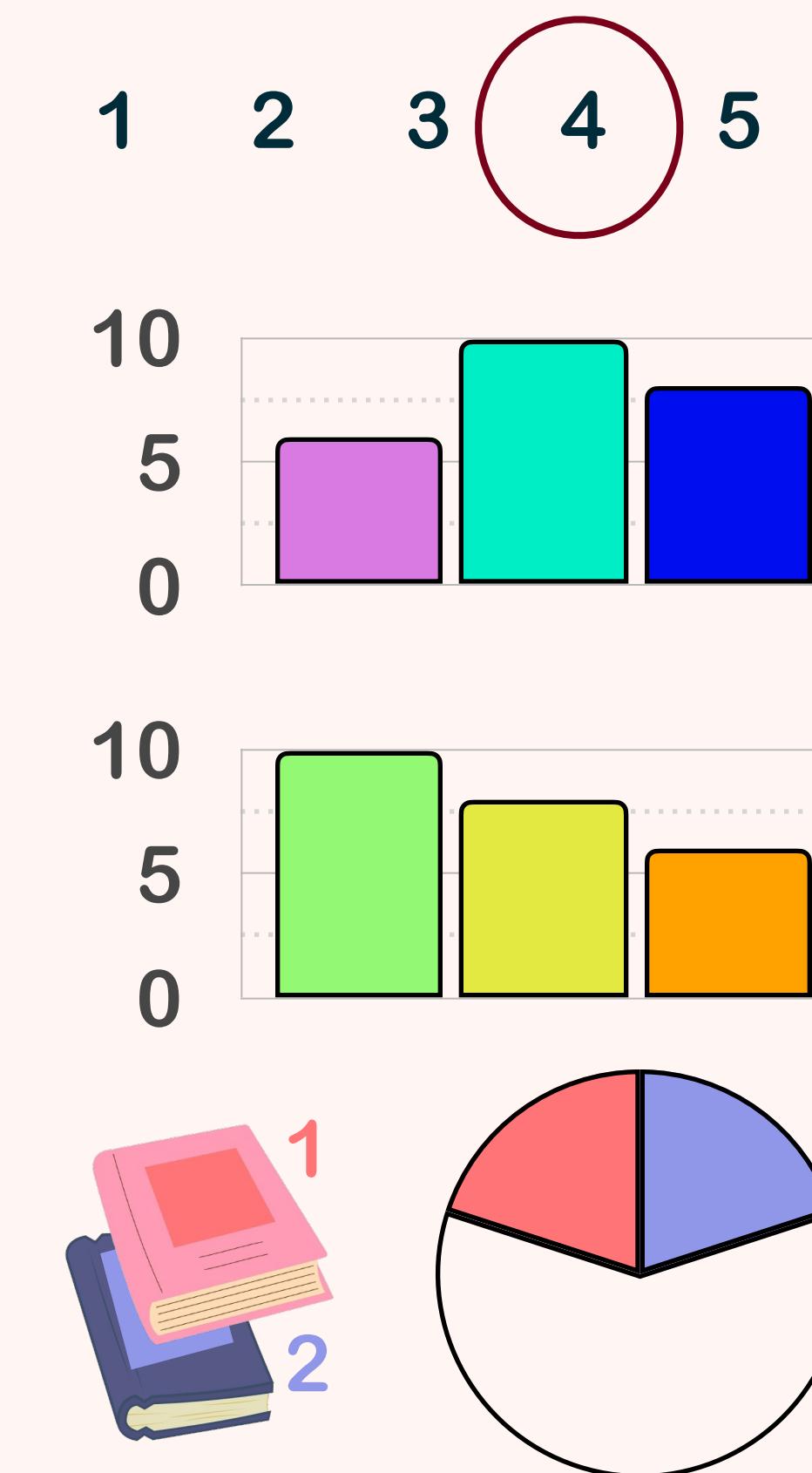
STATIC MEASURES

➤ hand-coding comprehension:

- ▶ **assigning each essay an overall holistic score**
- ▶ **classifying sentences as adding, borrowing, or transforming source information**

➤ automated writing scores:

- ▶ **counting approach (e.g., # of connective words used, citations, citation switches)**
- ▶ **overlap approach (e.g., proportion of words used from source set, proportion of unique sources used)**



In the pursuit of energy independence and economic prosperity, humanity has embarked on a perilous journey marked by the exploitation of fossil fuels. Among the myriad extraction methods, hydraulic fracturing, or fracking, stands as a contentious practice that has sparked intense debate. While proponents extol its benefits, the dangers it poses to our environment, public health, and future generations cannot be overstated. Moreover, the continued reliance on fossil fuels perpetuates a cycle of environmental degradation and geopolitical instability. This essay aims to elucidate the multifaceted dangers of fracking and advocate for a transition towards sustainable energy sources.

Fracking involves injecting a cocktail of chemicals, water, and sand deep into the earth to release natural gas or oil trapped in shale formations. This process not only consumes vast quantities of water but also poses a grave risk of contaminating groundwater supplies. The leakage of methane, a potent greenhouse gas, during drilling and extraction further exacerbates climate change. Moreover, the disposal of fracking wastewater, laden with toxic chemicals and radioactive materials, poses a significant environmental hazard, risking contamination of soil and water resources.

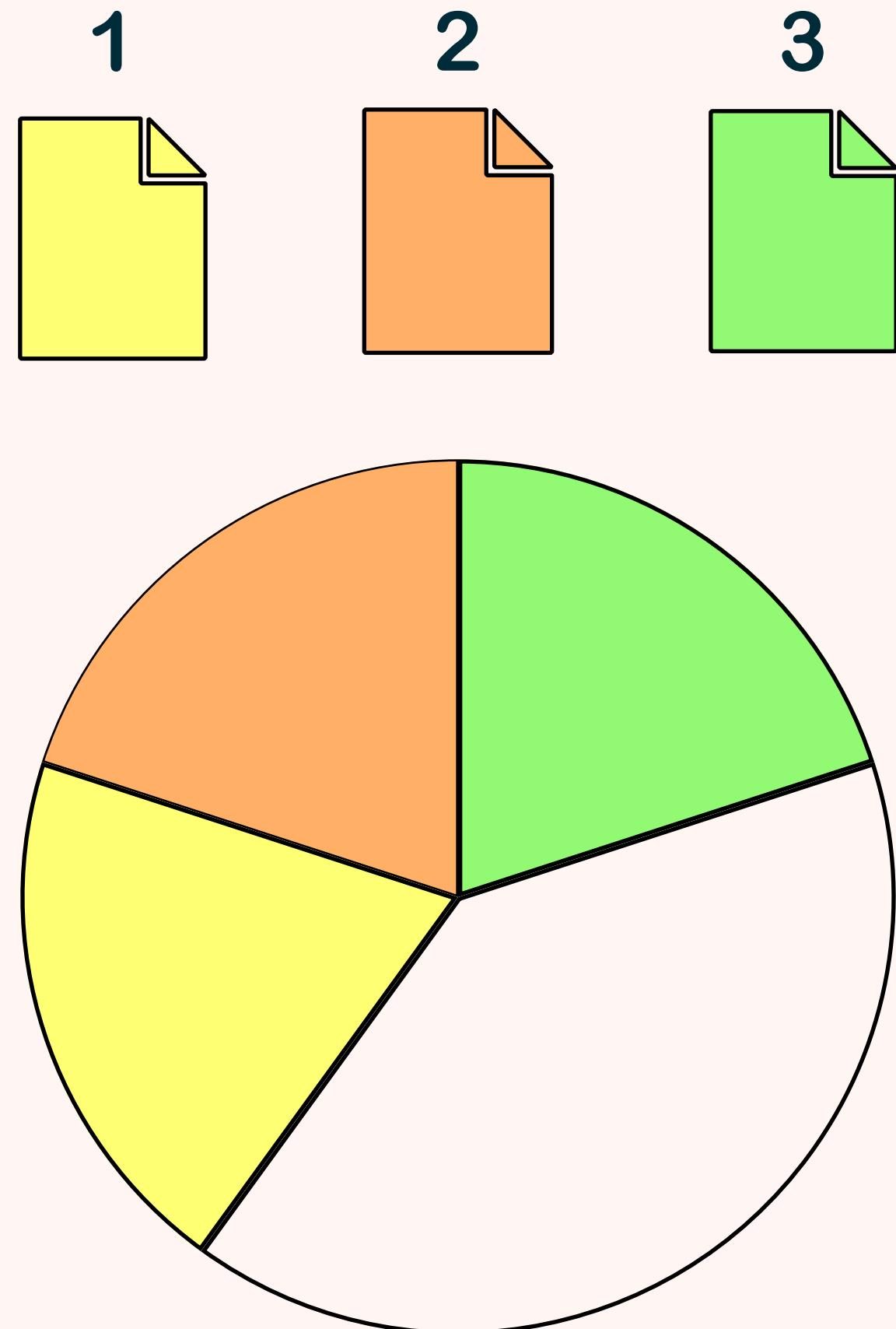
The proximity of fracking operations to residential areas has raised legitimate concerns about public health. Studies have linked proximity to fracking sites with increased rates of respiratory ailments, neurological disorders, and even certain types of cancer. The release of volatile organic compounds and hazardous air pollutants during drilling operations further exacerbates air quality, posing a grave risk to the health and well-being of nearby communities. Additionally, the stress and disruption caused by incessant noise, traffic, and light pollution associated with fracking operations adversely impact mental health and quality of life.

SOURCE INTEGRATION

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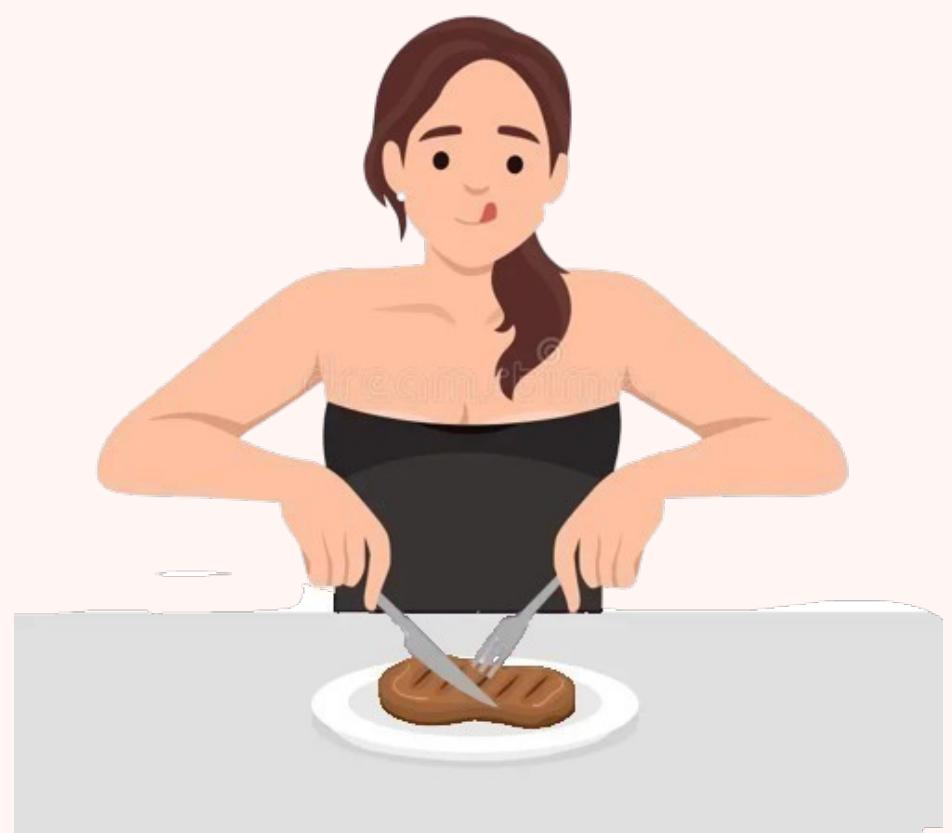
DYNAMIC MEASURES

- account for temporal relations (time provides context) and ordering effects
- sequential analyses used to examine recurring states over time
 - ▶ produces qualitative visuals to see transitions over time
 - ▶ calculates a set of statistical indices for quantitative analyses



PRESENT STUDY

94 Participants



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Reading Task

1 2

A blue rounded rectangle containing a white square. Inside the square are two numbered options (1 and 2) next to small colored rectangles (orange and yellow), and a drawing of a pink pencil and a pink ruler.

Instructions: Please write an essay about the “effects of meat consumption and the extent to which meat should be part of the human diet.”



25 mins.

Expert Rated (0-4)



SEQUENTIAL ANALYSIS

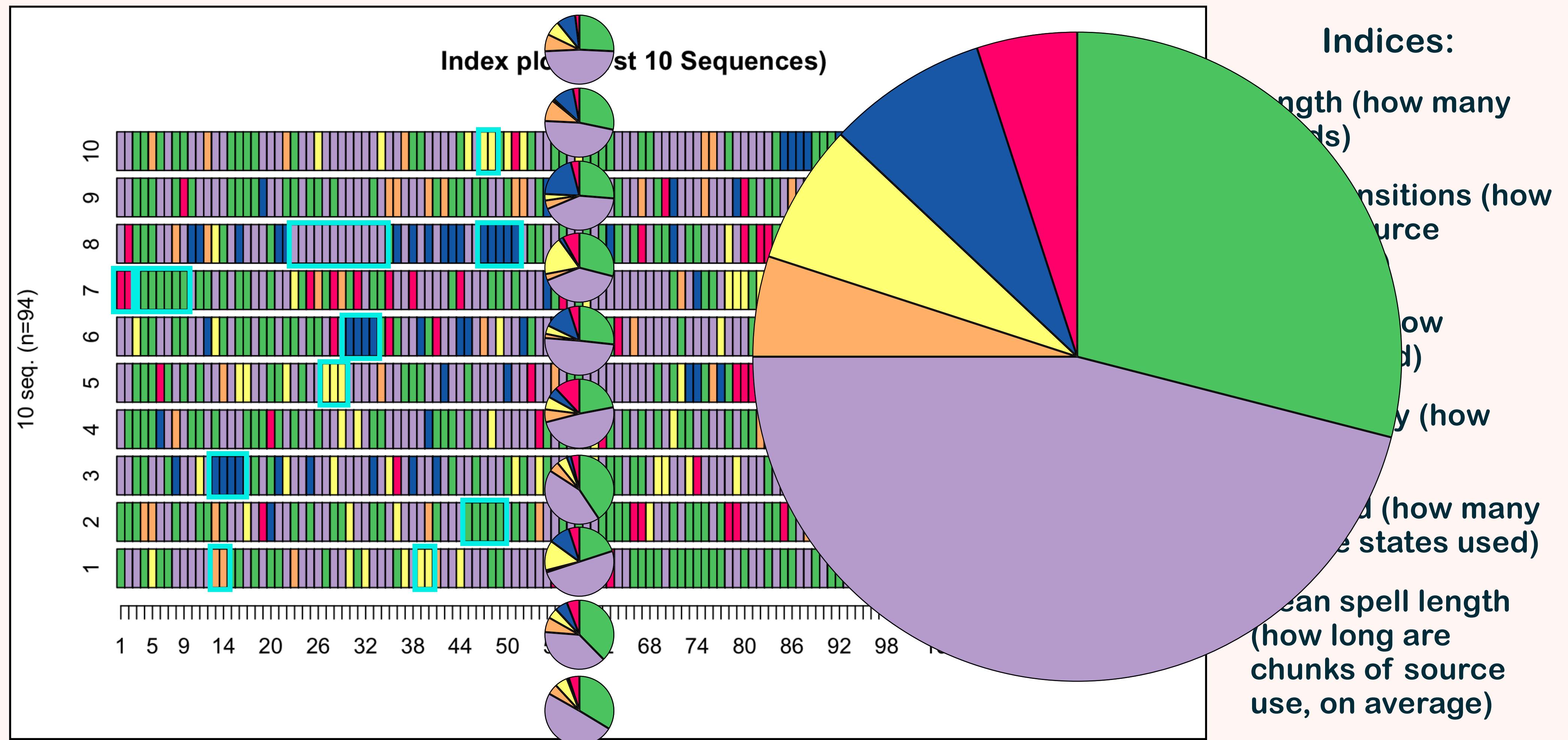
States:

- █ elab
- █ multiple
- █ Source1
- █ Source2
- █ Source3
- █ Source4

- ▶ elab = elaborations (words found in no source)
- ▶ multiple = words from more than one source

Indices:

- length (how many words)
- transitions (how many source changes)
- low word density (how many words per sequence)
- state diversity (how many unique states used)
- mean spell length (how long are chunks of source used, on average)



RESULTS

Static Indices	Holistic Score
Prop. of Elaborations	-0.21*
Prop. of Multi-Source Words	0.05
Prop. of Unique Source 1 Words	-0.11
Prop. of Unique Source 2 Words	0.22*
Prop. of Unique Source 3 Words	0.19
Prop. of Unique Source 4 Words	0.19

Elaboration associated with lower writing scores

Dynamic Indices	Holistic Score
Length	0.19
# Transitions	0.31**
Entropy	0.28**
Complexity	0.26*
# Visited	0.25*
Mean Spell Length	-0.12

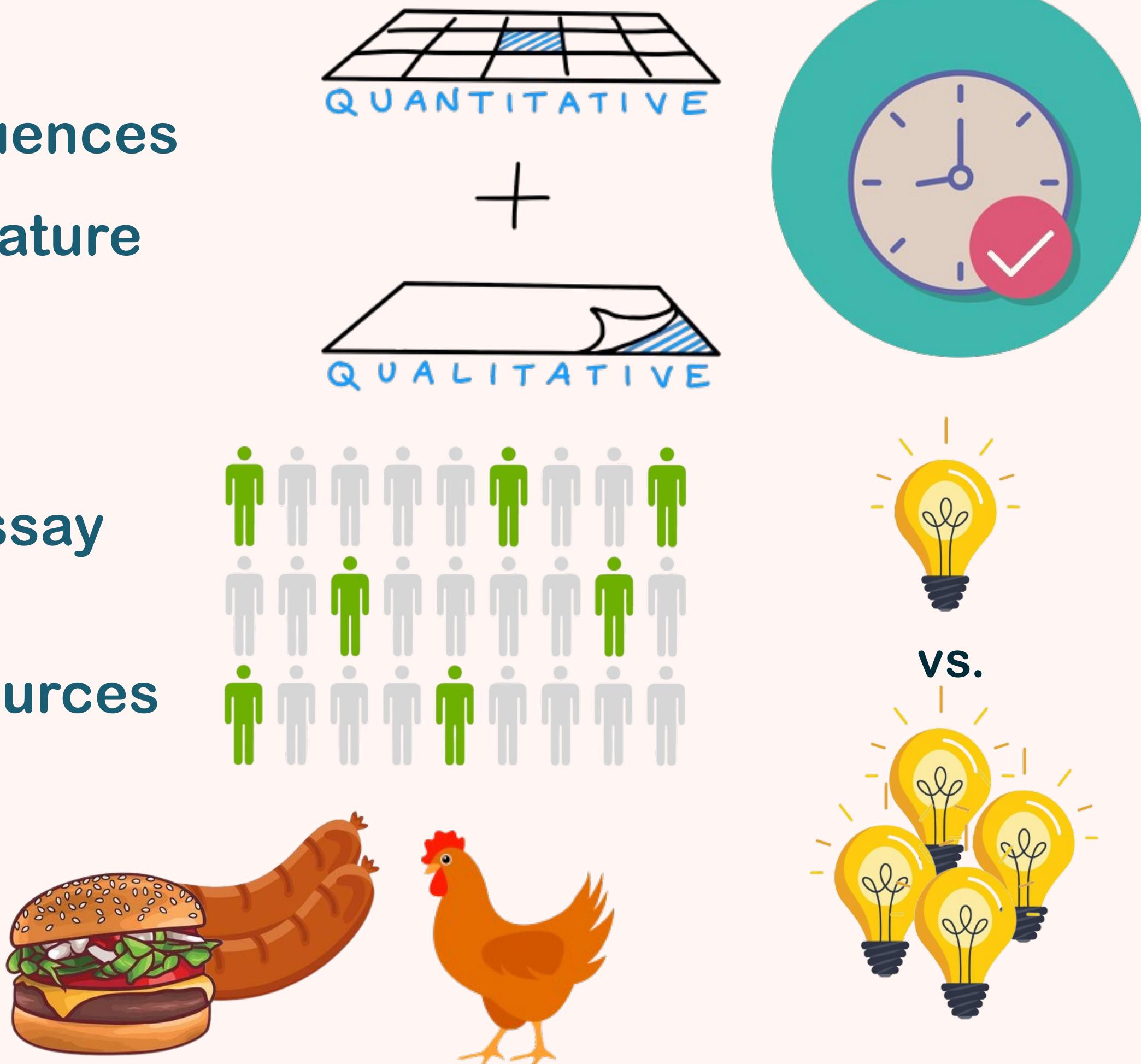
Length not correlated with scores

Source switching related to higher scores

Source stagnation related to lower scores

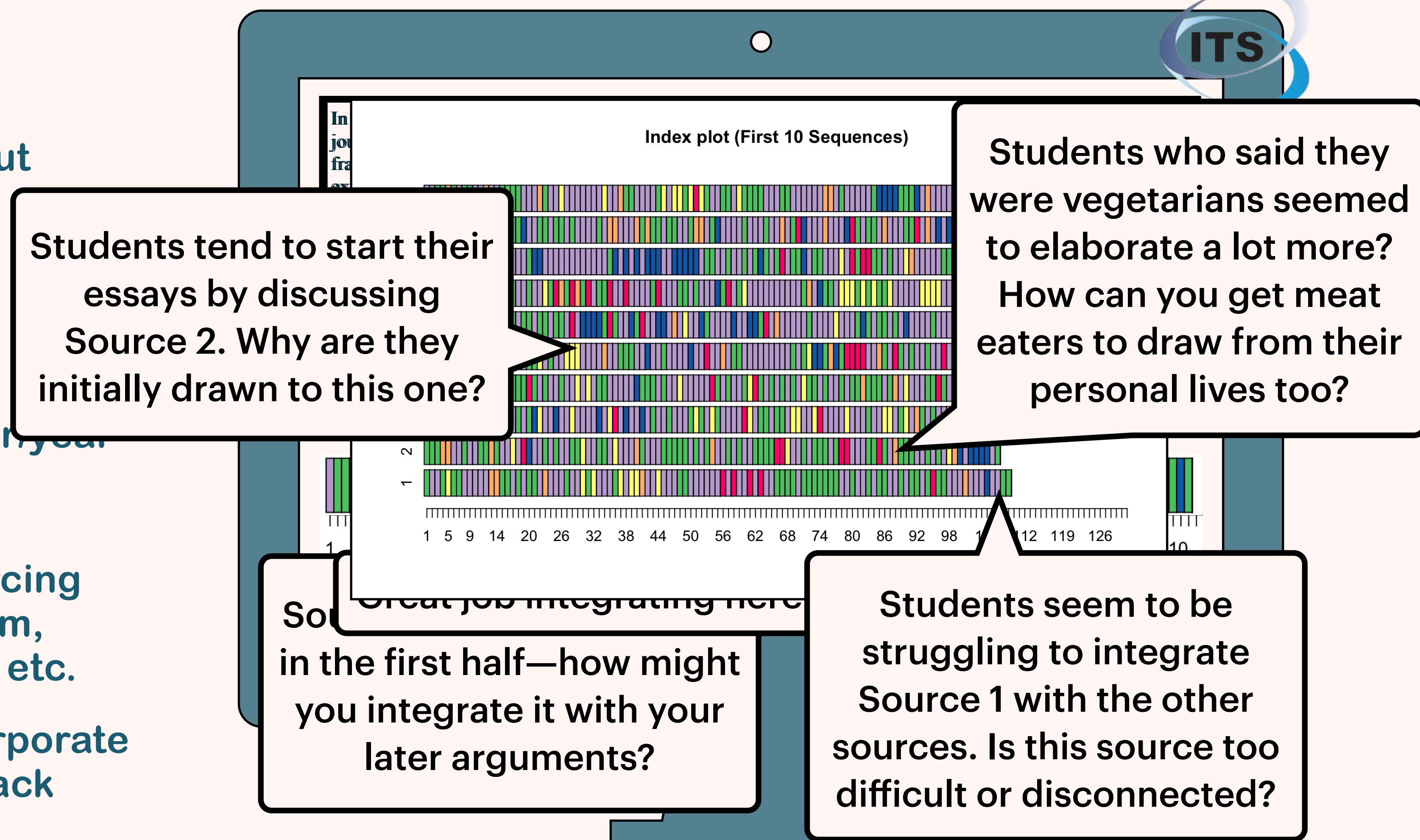
DISCUSSION

- sequential analyses offer both qualitative and quantitative statistical indices to describe sequences
- incorporates time as a necessary contextual feature
- limitations of current study:
 - ▶ small sample size (low variance in holistic essay scores)
 - ▶ # of idea units unique to or shared across sources not controlled for
 - ▶ only accounted for exact word matches (not semantically similar synonyms)



FUTURE DIRECTIONS

- for students:
 - ▶ provide formative source integration feedback without human coding
- for teachers:
 - ▶ assess class strengths/weaknesses and track improvement over semester/year
- for researchers:
 - ▶ test for differences in sourcing behaviors by source medium, reliability, political leaning, etc.
 - ▶ analyze how students incorporate visual and formative feedback



THANK YOU!

QUESTIONS?

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