Identifying Pedagogical Opportunities for Text Data Visualizations in English Language Arts through Co-Design

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Abstract: This poster reports on analyses of transcripts from seven co-design sessions between researchers and educators to identify pedagogical opportunities for including text data visualization in middle-grade English Language Arts (ELA). Findings include educators' nuanced preferences for word clouds, bar graphs, and line graphs and interests in visualizations for comprehension and multilingual student support as well as the use of student-authored texts.

Introduction

The current abundance of data and associated techniques for data analysis is changing many practices, including those used to construct new knowledge within disciplines. For example, literary analysis is expanding to include techniques that strategically integrate new data visualization and analysis techniques under the umbrella of the "digital humanities." The emergence of such new practices suggests an opportunity for researchers and educators to imagine new learning experiences in many disciplinary areas that involve working with data (Jiang et al., 2022). For instance, it may be fruitful to explore and develop new pedagogical activities in English Language Arts (ELA) that use data representations and analysis techniques to change students' relationships to literature. This poster shares findings from qualitative analyses of recorded co-design sessions with classroom teachers and district coaches in the US to gain insight on how to pedagogically leverage text data visualization capabilities in the context of middle-grade English Language Arts instruction in the United States.

Theoretical perspectives

This work is informed by a perspective on data science education across the disciplines and the growing practice and scholarship on co-design in the learning sciences. K-12 data science education is rapidly growing as an area of interest in the learning sciences (Wilkerson & Polman, 2020), although much remains to be understood about the appropriate experiences and trajectories for learners across settings and age groups. Recently, Jiang et al. (2022) have advocated for data science education across the disciplines as a needed approach for design work because it would be better aligned with learning sciences perspectives on situativity and responsive to concerns about equitable access. One pragmatic approach to pursue this is through educational co-design.

Co-design is an extended, collaborative design-based research approach involving practitioners and researchers (Roschelle et al, 2006). Its benefits include ready-to-use classroom products and novel understandings of complex educational contexts. Co-design varies, involving joint design sessions or critique of prototypes, yet it consistently values and centers practitioner input. Because so much emphasis is placed on encouraging practitioner talk, learning scientists are turning their researcher instrumentation inward to examine the co-design process itself (Masawi et al., 2023). This is yielding new empirical findings and guidance on how to both organize co-design activities and to gain new insights from practitioners about their own ideas regarding a discipline and how to design learning experiences. With that in mind, we ask: what pedagogical opportunities do middle grades ELA educators envision for text analytics visualizations during educational co-deisgn?

## Data sources and methods

The data for this analysis is based on transcripts from seven co-design sessions between a university team, two school district coaches, and two middle school ELA teachers from an urban district located in the US (NSF Grant #2241483). The overarching structure for co-design sessions was as follows: The teachers shared some of the texts they were using (e.g., *Summer of the Mariposas* by Guadalupe García McCall). In between co-design sessions, which were spaced roughly biweekly, the research team took the examples and ideas described by the district educators and mocked up visualizations for reaction and critique in the next co-design session (see Figure 1). Based on those discussion, the visualizations were revised and/or entirely new versions were created.

Three researchers iteratively reviewed, coded, and discussed the transcript data. Analysts independently coded a set of utterances (N=108) containing suggestions for visualization use. Codes were applied for data visualization, specific activity suggestions, texts being referenced, connections to ELA goals, and connections to data literacy goals. The team then met to review and compare coding, reach consensus, and run member checks.

Figure 1

Sample Mock-up Visualizations from Summer of the Mariposas Introduced in Co-design
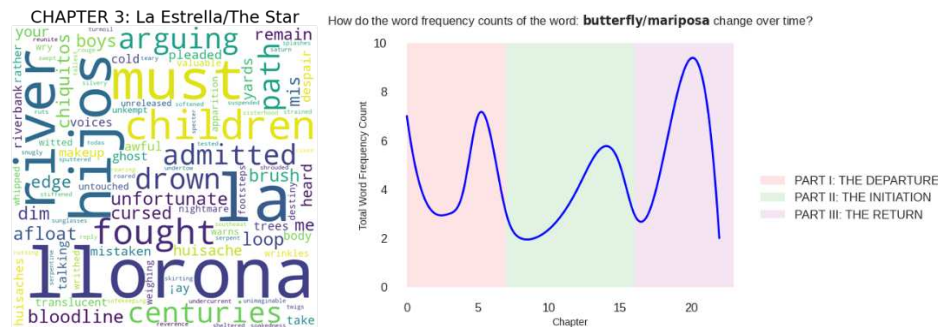
Results

Educators most heavily preferred and discussed visualizations were, in order of prominence, word clouds, bar graphs, and line graphs. The word clouds received extensive discussion with educators appreciating their familiarity as a visualization and the exploratory quality of recognizing specific words in them. Bar graphs were discussed primarily with the purpose of making connections between different data visualizations. They were seen as a less enticing adjunct to word clouds, but were thought to bear important connections to how students see data visualized in their other courses. Line graphs were recognized as being most effective for seeing change over time and as working only for longer texts (novels). Specific ideas for line graph usage included seeing narrative arc structure and tracking word usage or character appearances over different segments of a book. However, line graphs showing established natural language processing from techniques like sentiment analysis were considered too complex and likely to distract students and be difficult to explain.

While we initially set out to visualize literature and assigned class texts as data, educators also wished to visualize student-produced text as data. For example, one could create word clouds from class descriptions of chapter events or characters. One ELA teacher was excited enough by this idea that she subsequently implemented it in her classroom in between sessions, and stated that it sparked engaged student discussions about the texts.

Educators were especially interested in how visualizations could support student reading comprehension. One use that teachers and district coordinators emphasized for word clouds was for helping students to make predictions about who would be important characters and events in the upcoming reading (e.g., an upcoming chapter) based on what words were going to be the most frequent. Teachers also felt this would be especially helpful for multilingual students who were encountering new vocabulary and as integrations into known ELA activities such as constructing "found poetry" but augmented with information about word frequency.

Discussion

Educators co-design discussions about different visualizations revealed ways they thought specific visualizations could best support their teaching given real constraints and disciplinary learning goals. Examples include using visualizations for supporting prediction and text comprehension with multilingual students. Also, positioning students as authors of texts to be visualized was unexpected but welcomed as a way to forge student connections with data visualizations. As this project has transitioned to work in those teachers' classrooms with their students, we are now exploring how teachers envisionings are realized and shifted given real-time classroom complexities.

References

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