Building Knowledge from Challenging Text: Issues Associated with Moving Pedagogy from Traditional Classroom Delivery to an AI Enhanced Differentiated Instruction

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Abstract: A comprehensive classroom curriculum to help students learn from challenging text was re-invented in a web-based, individualized instruction platform. However, challenges emerge when moving a traditional classroom curriculum to individualized instruction with embedded AI. Overall, we found issues by classroom level, teacher, student, and application development requirements, and offer some solutions that we have implemented in our iterative, ongoing design process. We intend this poster to serve as a catalyst to discuss these issues.

Introduction

A reading comprehension curriculum called Boulder Reading Intervention (BRAVO), was previously designed to teach advanced reading skills to secondary students enabling them to build durable, generalizable content knowledge across connected texts about a science topic, ecology. BRAVO is innovative in that its pedagogy is organized and motivated by an explicit theory, Kintsch's (1998) Construction Integration (CI) Model of Text Comprehension, which explicitly defines the cognitive processes involved in successful comprehension and learning. The BRAVO curriculum is not just a collection of instructional techniques that were found to be effective in prior research, but a coherent, principled curriculum that systematically targets reading comprehension problems at local and global levels. This curriculum, developed in prior work and tested via a pilot efficacy study, targets well-documented weaknesses in reading comprehension (particularly for expository texts) that typically persist and significantly impact students' further academic progress. The current project is a web-based version of BRAVO that allows for personalization of the pedagogy to match individual student abilities and allows for flexibile use in a variety of general classrooms through the use of technology-supported classroom instruction.

Attributes and shortcomings of existing practice

Comprehension instruction is intended to give students specific tools that expert readers apply in situations where comprehension breaks down. For example, instruction involves teaching students how to apply
specific strategies before, during, or after reading, including unfamiliar vocabulary, anaphoric reference, understanding the meaning conveyed by signal and transition words, inferencing and gist-making to get to the main ideas of the text, using graphic organizers, engaging in self-explanation, generating questions, and summarizing (Caccamise, Franzke, Eckhoff, W. Kintsch, & Kintsch, 2007; Goldman, 2012).

Unfortunately, in the middle school years this instruction typically consists of isolated strategy or skill development taught in remedial reading and English/language arts classes with text passages that may reflect a variety of text genres. This approach often ignores the goal of cumulatively building knowledge from texts (e.g., Duke, Pearson, Strachan, & Billman, 2011). It fails to help students develop lasting and effective comprehension skills because faulty literacy skills are only part of the problem. Building the requisite domain knowledge is also essential for reading comprehension (Caccamise & Snyder, 2009; W. Kintsch & Kintsch, 2005; Torgesen 2007).

BRAVO helps students understand difficult content-rich, informational text, teaching them how to overcome misconceptions, understand the text meaning, and build knowledge. This joint focus on comprehension and knowledge building differentiates BRAVO from other reading programs.

The current project, called eBRAVO, expands on the original BRAVO and aims to solve issues identified in the traditional teacher-led, classroom delivery version where we learned that one size-fits-all doesn't work at the secondary level. To be efficient and therefore more effective, we felt it was important to differentiate the instruction, tailoring the content, pace and delivery to the needs of each student.

Subjects

The subject population were 7th graders from a suburban district with 37% minority (largely Hispanic). There were two design iterations: first in a regular semester STEM class where they engaged with the eBRAVO app

for approximately 30 minutes a day for 6+ weeks and then 3 summer school reading classes where the students used the eBRAVO app for approx. an hour a day for three weeks.

Results

Although this was a development phase without a control group we found a wide range of behavior and performance outcomes that are highly relevant to the design of this sort of curriculum. From previous work with a whole classroom, linear delivery format, this follow-on project tried to address the issues we found in that prior work: 1. Heterogenerity of student reading comprehension abilities from struggling to average to gifted. Previous outcomes indicated all could benefit from the BRAVO curriculum to improve their ability to learn from text, but at widely varying amounts of content and practice as well as pacing issues. 2. LA teachers are often not comfortable teaching subjects from content area classes, an essential aspect of BRAVO to get at underlying cognitive processes to learn from challenging texts. Content area teachers, on the other hand, are typically not comfortable with teaching comprehension skills and are not evaluated to do so.

Lessons learned translating traditional curriculum to individualized instruction

During our iterative design we have learned there are important design and implementation features to understand and overcome if we hope to move instruction from traditional classroom delivery to automated personalized instruction. Specifically, we found overall issues associated with individual pacing vs classroom connection. We divide and discuss these issues displayed in table 1, including solutions we have implemented thus far.

Table 1: Lessons Learned and solutions when transferring classroom to individualized instruction

Classroom	Teacher	Student	Application Design
Pacing of Students/ variable progress w/lessons	Felt out of the Loop	Lesson overload whether they needed them or not	Linear version had 5 lessons, we had to develop 60 more to be responsive to individual needs.
Students in class on all different chapters	Monitoring progress harder (did not use provided teacher dashboard.)	Engagement/boredom	Children Online Privacy Protection act (COPPA)
Traditional version had better check-in	Difficulty monitoring off-task behavior		Multiple platforms: mobile, PC, tablets: responsive design
Solutions:			
Teacher tried pairing struggling readers with more advanced	Designed whole class concept map activity at 3 milestones.	- Reduced # of lessons to 1 per chapter - Add progress feedback	- Private server, embedded curriculum. - Responsive design

These are some of the issues that must be addressed if the field is to move forward from traditional approaches to learning, to more individualized approaches to pedagogy afforded by the power of embedded AI.

References

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