THE USE OF CONCEPT MAPS IN PROFESSIONAL DEVELOPMENT AND IN TEACHING STUDENTS WITH LEARNING DISABILITIES: A RESEARCH AGENDA

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Abstract. Presenters will discuss two controlled randomized field trials that examined the effectiveness of concept maps on students' ability to comprehend text. The major theme will be professional development and teaching strategies that promote the solid use of concept maps for both teachers and students. The first study used concept maps as part of a unique professional development program, Teacher Study Groups. The purpose of the second study was to determine if middle school students with mild disabilities who are educated in general education settings can learn complex historical concepts when information is presented through videos and the use of research-based instructional strategies, such as concept maps and peer assisted learning.

1 Introduction

This paper discusses two lines of research that examined the influence of concept maps on student outcomes. Research has demonstrated that concept maps are useful tools for helping students develop an understanding of a body of knowledge, accessing prior knowledge, and exploring new information and relationships (Bulgren, Schumaker, & Deshler, 1988). The goal of the current research agenda was to establish that these outcomes could be accomplished in multiple contexts. The first study examined the use of concept maps as enhancements within the framework of Teacher Study Groups, a professional development activity. The second investigation uses concept maps and videos to teach complex social studies curriculum to students with disabilities. Taken together this research demonstrates how concept maps can be useful for both teachers and students, can be implemented across various curricula, and can be used with different populations.

2 Use of Concept Maps & Teacher Study Groups to Improve Student Outcomes

In recent years there has been an increased interest in the use of Teacher Study Groups (TSGs) or Teacher Work Groups as an approach to professional development because curricular coherence, content focus, duration/intensity, and collective participation are intrinsically integrated and explicitly used to link research to classroom practice (Carroll, 2005; Lambert, 2002; Meyer, Brown, DeNino, Larson, McKenzie, Riddler, & Zitterman, 1998; Murphy, 1992), there has been an increased interest in the use of TSGs as an approach to professional development. Teacher Study Groups are modeled after Japanese Lesson Studies, which emphasize collaborative lesson planning principles, structured discussions, and observations and evaluations of planned lessons.

Given the current emphasis on evidence-based instruction, there is a strong need for systematically evaluating the relative effectiveness of the Teacher Study Groups in promoting the use of the concept maps to enhance vocabulary and reading comprehension instruction. The purpose of the current study was to examine the effect of Teacher Study Groups that focus on the use of concept maps in improving classroom teacher practice and knowledge as well as student outcomes in reading, especially in the areas of comprehension and vocabulary. Specifically, our research questions were (a) What is the impact of TSGs on teacher knowledge and teacher practice compared to the professional development efforts being provide by the district and the State? (b) What is the impact of TSGs, particularly those that use concept maps, on student reading outcomes when compared with existing professional development efforts?

2.1 Intervention Program/Practices

TSG Condition: Teachers in the experimental condition attended 16 TSG sessions (2 per month) at their schools from October to mid-June. The first 8 sessions focused on vocabulary, while the remaining 8 focused on comprehension. Each session lasted approximately 75 minutes and was conducted either after or during school hours at the discretion of the principal. The research staff served as facilitators for all TSG sessions. Each session consisted of four distinct segments:

1. Debrief Previous Application of Research: The teachers report on the implementation of the lesson they planned collaboratively during the previous TSG session.
2. Walk through Research: Discuss critical instructional concepts from readings that were assigned at the previous TSG session.

3. Walk Through the Lesson: Examine the strengths and weaknesses of a lesson selected from their basal curriculum and determine how the lesson could be enhanced to reflect the critical instructional concepts identified during Walk through Research.
4. Collaborative Planning: Teachers work as a whole group or in pairs and actually plan the enhanced lesson that they discussed during the Walk Through the Lesson segment. These enhancements include concept maps to help students generate main ideas, understand story structure, and answer higher order questions.

Concept maps were used as a tool to aid in comprehension instruction. They were integrated into the Teacher Study Groups to help students generate main ideas, learn story grammar elements, and demonstrate cause and effect relationships. During the collaborative planning segments teachers developed lessons that integrated concept maps into their teaching practices.

Control Condition: Teachers in the control condition did not have access to the TSG sessions or materials. They participated in scheduled school and district professional development activities.

2.2 Research Design

Randomized field trials were conducted to assess the impact of the TSG intervention. Three school districts from three states agreed to participate in the study. Schools within each school district were matched on key variables such as performance indexes and ethnic composition. The schools from each matched pair were then randomly assigned to either the treatment or control condition. Overall, we had 10 treatment schools and 9 control schools. Participants were 85 first grade teachers from 19 Reading First schools. Seven students were randomly selected per teacher at pre-test and post-test time for evaluating outcomes at the student level.

2.3 Data Collection & Analysis

Data on all teacher and student measures were collected twice during the course of the study: once at the beginning of the study and once at the end of the study, with the exception of classroom observations, which were done only as a post-test. Our teacher measures included the *Reading Comprehension and Vocabulary (RCV) Observational Measure* (Gersten, Dimino, & Jayanthi, 2007) for measuring teachers' classroom reading instruction, the *Teacher Knowledge Assessment Measure* (based on the Teacher Knowledge and Attitude Survey) (Phelps, 2003) for measuring teachers' literacy knowledge, and the Professional Development Measure (based on a national survey of teachers' professional development in math and science and a Reading First Survey used in Califonia) (Birman, Desimone, Porter, & Garet, 2000) for determining teachers' perception of their professional development experiences and their thoughts on reading in general.

Student measures included subtests from two standardized tests that involved *Reading Vocabulary, Passage Comprehension, Oral Vocabulary,* and *Memory for Sentences.*

2.4 Findings

Impact Estimates on Teacher Measures: On the observational measure the impact estimates are moderate to large and statistically significant at the .01 level. Teachers in the experimental condition outperformed control teachers on the observational measure in both comprehension and vocabulary areas. As part of this measure we observed and calculated the frequency of concept maps used by teachers during or after a reading lesson. Teachers in the experimental condition used concept maps 75% of the time compared to teachers in the control condition who only used concept maps 35% of the time, a difference that was statistically significant at the .05 level.

On the Teacher Knowledge Measure of comprehension and vocabulary instruction, teachers in the TSG schools scored approximately .28 standard deviations higher on the measure of comprehension than control schools; this impact estimate was not statistically significant. However, teachers in TSG schools outperformed teachers in the control schools by approximately .68 standard deviations on the teacher knowledge measure of vocabulary instruction. On teachers' views about professional development in general and their thoughts on teaching reading, our findings suggest that teachers in the TSG condition expressed significantly more positive views toward professional development (*ES* = .40) than teachers in the control condition. Since there were significant differences in school variability on this measure, the multi-level model was the appropriate analytic strategy for estimating the impact on teachers' overall views toward professional development. However, there was no significant difference between groups on the scale measuring teachers' thoughts on reading. We replicated all analyses using MANOVA and obtained similar results.

Impact Estimates on Student Measures: For reading vocabulary, oral vocabulary, and passage comprehension, the results revealed no significant impact on the post-test WDRB measures of reading vocabulary and passage comprehension. However, the moderate effect size for oral vocabulary, ES = .44, was significant at the .10 level. Overall, the effect sizes were similar in magnitude to the estimated impacts for the reading accuracy and fluency measures. Children in the 16 schools located in California and Pennsylvania also took the California Achievement Test, 6th Edition, permitting us to estimate treatment effects on a widely used standardized test of reading comprehension and vocabulary. We found no significant impact on the CAT6 total reading score, reading vocabulary, and reading comprehension. However, the magnitude of these effect sizes (ES = .09 to .23) mirrored those observed for the reading accuracy, fluency, vocabulary, and passage comprehension outcomes.

2.5   Conclusions

Overall, our findings indicate that the TSG model is a promising professional development approach. TSGs have resulted in significant impact on proximal outcomes—teacher measures of instruction and knowledge. In general, these effect sizes are two to three times larger than student outcomes. While we saw significant impacts in teacher practice both for the areas of comprehension and vocabulary, the magnitude of the latter's impact is worth noting. We attribute the impact in comprehension to substantive discussions regarding explicit reading comprehension instruction and how concept maps can be used to bolstered students' comprehension of text.

Also encouraging are corollary gains we see in teacher knowledge. Given the explicitness of our TSG vocabulary sessions, which were based on Isabelle Beck's *Bringing Words to Life: Robust Vocabulary Instruction* (Beck, McKeown, & Kucan, 2002), this finding is clearly explicable. Although our student outcomes are not as significant as our teacher outcomes, they do fall in line with impact estimates from recent cluster-randomized trials of school-level interventions like Success for All (Borman et al., 2005). One limitation of the study is that we did not have enough power to detect significant impacts on students; we would need at least 40 schools to find effect sizes between .10 and .20. Another issue that needs to be addressed is the issue of scalability. Having researchers or staff developers spend significant amounts of time working alongside of teachers is not practical on a wide-scale basis (Putnam & Borko, 2000).

3   Thumbs Up: Using Video & Concept Maps to Teach Complex Social Studies Curriculum to Diverse Learners

Students with disabilities can learn complex history concepts in general education settings when provided with appropriate instructional support. The purpose of the study was to demonstrate how research-based instructional strategies, including concept mapping activities that required students to compare and contrast, dyad activities, inserted questions used to enhance student engagement, and film and videodiscs can be integrated to improve instruction in middle/secondary general education classrooms. With the reauthorization of IDEA, teachers are searching for ways to help students with disabilities access the general education curriculum.

Research-based instructional strategies such as concept maps and content enhancements in the form of material from popular media (videos/documentaries) were used as a foundation for teaching historical concepts. Through the use of a *formative experiment* methodology, these strategies were tailored to incorporate technology, to enhance comprehension, and to meet the needs of diverse learners.

3.1   Purpose of the Project

The goal of this investigation was to examine the effectiveness of specific instructional delivery approaches on the learning of a historical unit for students with LD as well as average-ability students in the classes. We believed that these specific instructional delivery strategies would increase student engagement and participation in the lessons, students' knowledge of the material, and students' understanding of a set of historical events.

The specific research-based instructional strategies included activities requiring students to complete concept maps in dyads to foster peer interactions and the use of inserted questions that highlighted the narrative focus of the information presented through videos. We thought the combination of these techniques would enhance active engagement of the students with LD in the lesson. For this objective, we employed rigorous research methodology (controlled randomized field trials). For this phase, the teaching unit was held constant, but the specified instructional delivery techniques varied from the experimental to comparison condition.

Our goal was overall understanding of the content of the unit, i.e. knowledge of the goal or causes of the actions, and an understanding of some of the long and short-range consequences of these actions. Our hypothesis was that by including activities such as concept maps using the compare-contrast structure, that required and supported active participation by students with LD, these goals would be accomplished.

3.2   Method

3.2.1   Participants and Setting

Seventy-six middle school students and two teachers participated in the study. Half of each intervention class were students with learning disabilities. On average, students with LD read at a level typical for third and fourth graders, i.e. three to five years below grade level (Hasbrouck & Tindal, 1992). There were 40 average-ability students (i.e., not receiving special education services): 20 in the experimental condition and 20 in the comparison condition. In terms of class size, one of our goals was to have class sizes that roughly paralleled what was typical in the local middle schools. Thus, in each school, we randomly assigned 18 students with LD and 20 average-ability students into one of two social studies classes for a six-week term.

3.3   Instruction in the Experimental and Comparison Condition

3.3.1   Materials

The primary mechanism for conveying critical information on the Civil Rights Movement was the documentary Eyes on the Prize (DeVinney, 1991). The documentary is 180 minutes in length. We showed the film in 18 segments throughout 4-5 weeks of instruction. In addition to the death of Emmett Till, the video highlighted about a dozen other critical events, which both expanded on the larger issues and focused on the consequences of powerful legislation.

3.3.2   A Typical Two lesson Sequence

Experimental Condition. We used a standard lesson format over a period of two days. On the first day of a new lesson, students watched a 6 to 12 minute segment of Eyes on the Prize. This would be followed by a series of questions about the segment. The series questions would range from "how would you feel if…" to questions that asked students to demonstrate their understanding of the event (e.g. "what happened to the protesters?"). Students might then watch another segment and answer a few brief questions. The next day would involve review of the earlier video and watching additional footage if there was any. Students completed a concept map activity in heterogeneous pairs (one LD, one average-ability).

Approximately, once a week, students would participate in concept map compare-contrast activities. Typically, these activities extended over two lessons. Teachers often modeled the first one or two comparisons, gradually fading their role as the course evolved. Concept maps were used to compare events, people, and concepts. Some examples of the specific comparisons students completed using concept maps included comparing the outcome of the Texas trial involving the racially motivated murder of an African American in 2000 with the trial of Emmett Till in the 1950's, and comparing boycotts to sit-ins. It was an intentional decision to limit the number of types of concept maps as approximately half of the sample included students with special needs. The goal was to teach a few so that students could master and apply them to a variety of concepts.
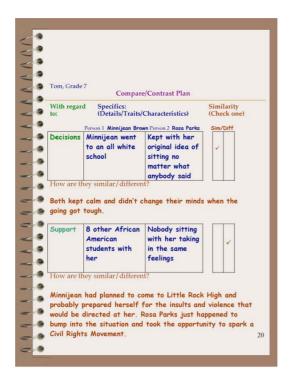
Figure 1. An example of a concept map compare-contrast activity

Figure 1 presents an example of a concept map compare-contrast activity. In this activity, students were asked to use the compare-contrast structure with (a) a black high school student named Minnijean Brown (one of the Little Rock 9 students) who was among the first to integrate a previously all-white school and (b) Rosa Parks, a black woman who refused to move to the back of the bus when ordered to do so by a bus driver (Rosa Parks' arrest is usually considered the event that triggered the Montgomery Bus Boycott). Then they were asked to identify specific issues or events associated with both Minnijean Brown and Rosa Parks that could be used for analysis. Finally the students had to determine, typically through discussion, whether the point being analyzed is the same or different in the two conditions.

Comparison Condition. Students in the comparison condition were taught the identical content as students in the experimental teaching condition; however, a more traditional approach was used in teaching the material. Students watched the same documentary video footage, but they did not answer the "how would you feel if…?" questions during various segments of the video like the experimental condition. Instead the teacher would set the stage with a brief mini-lecture and/or preview questions. The students would watch the entire video.

3.3.3   Measures

An important question for us was the extent to which students in the experimental condition, who were taught with activities that encouraged active cognitive engagement, would demonstrate deeper levels of understanding of the Civil Rights Movement than students who were taught the identical unit with more traditional teaching procedures. We were also interested in the extent to which teachers could work with students with LD in inclusive settings.

In all, we used three measures of content acquisition. Two of these were traditional measures of content acquisition: a vocabulary-matching task and a written exam measure that included both short answers and paragraph essays. As students with LD display consistent problems in writing (Baker, Gersten, & Graham, 2003; Thomas, Englert, & Gregg, 1987), and on multiple choice or matching tasks, we also used a third measure that did not rely on students' ability to articulate their ideas in these traditional ways. This third content measure was a Content Interview and it required students to verbally articulate their understanding of the Civil Rights Movement.

3.4 Findings

Posttest Performance: Students with Learning Disabilities. The difference between the experimental and comparison condition groups on posttest Matching was not statistically significant (F (1,34) = 3.07, p = .09). However, students in the experimental condition performed significantly better than students in the comparison condition on both the written exam measure (F (1,34) = 11.05, p = .002), and the Content Interview measure (F (1,34) = 5.12, p = .03).

Average-ability Students. On the matching test, the difference between students in the experimental and comparison condition groups was not statistically significant (F (1,38) = .99, p = .33). In noting the percentage of items answered correctly, students in both conditions had a mean score that was close to the highest score possible, indicating a potential ceiling effect.

However, on the Written Exam, which reflected students' ability to discuss historical issues, the difference was statistically significant (F (1,38) = 7.28, p = .01.) At .76, the effect size on the Written Exam measure is relatively large.

The results of this study demonstrate that students with LD can learn relatively complex and challenging material in American history when provided with instructional delivery and activity structures that support active involvement in the learning process. These students demonstrated superior levels of performance on both the written and oral examinations that asked them to discuss key issues and figures in the Civil Rights Movement. Effect sizes on both measures were large with values of 1.0 on the Written Exam measure and .72 on the Content Interview measure. Although the effect was not significant on the Matching test measure, which involved knowledge of definitions of key terms and key figures, the effect size was moderate (.56).

In addition, we concluded that use of the compare-contrast concept map throughout the unit was a strong vehicle in enhancing understanding of history, and retention of facts and concepts in a history unit.

Thus, this study indicates that the experimental condition is likely to be a viable approach in inclusive classrooms and seems to support our intuition that this would be a better way to teach history for the majority of middle school students. Students responded very well to the multiple formats (the interactive nature of class discussions, working with a partner, using compare-contrast concept maps to analyze content, and ongoing dissection of the video). These approaches seemed to make the content more engaging to students. In contrast, in the comparison condition, there was more traditional teacher lecturing and more independent student reading. Essentially, students had greater responsibility for learning the content in the comparison condition than they did in the experimental condition. In the experimental condition, the teacher had to play a more active role in making sure students were really understanding the content.

3.5 Conclusions

The pattern of significant findings on both the written exam and Content Interview did document that the instructional delivery practices (i.e., the use of concept mapping activities, peer-assisted learning, and the inserted questions during the video segments) led to significantly better understanding and recall of the content of the unit.

We would encourage teachers to experiment with using any or several of these techniques since we continue to think that all show promise and the combination was demonstrated to be effective for both the special education students and the students without disabilities. Future research can help unpack components that are particularly effective as well as examine the ease of implementation of the various techniques we used.

4   Summary

The results of these two projects indicate that, when used in concert with an array of effective strategies, concept maps can be an effective tool in teaching history to middle school students and in building comprehension in first graders. Teachers seem to require professional development to be able to use these tools effectively. If this is done, student learning, especially of conceptual material, appears to be enhanced.

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