

Grant R305F100007

Year of Study: 2011-2015

Title: Measuring multiple source comprehension with a rating task: a signal detection theory approach

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Citation: Yukhymenko, M., Lawless, K., Goldman, S.R., Shanahan, C., & Pellegrino, J. (In preparation). Measuring multiple source comprehension with a rating task: a signal detection theory approach

Strand of work: Development of Assessments

Purpose and Questions Investigated, Assessments or Tools developed

The digital age has provided not only the advantage of ease of access to vast quantities of information, but also created challenges regarding the assessment of students' capacity to parse, integrate and effectively use information distributed across multiple sources of information. To address limitations in the existing research examining multiple source comprehension and its assessment, we developed a measure that assesses both sentence and inference verification derived within and across nine sources of information that were either explicitly or implicitly stated.

Research Context or Methodology

Participants were 47 middle school students (18 males and 29 females), all 6th graders, from three history classrooms in schools located in a district adjacent to a large urban Midwestern area. Students were provided with nine sources of information to answer the guiding inquiry question, "Why did so many people move to Chicago between 1830 and 1930?" The sources of information varied in modality (i.e., map, table, picture) as well as content (i.e., transportation, immigration, employment, social conditions).

The verification task was constructed to measure students' representation of both explicit and implicit understanding of single and multiple sources. Four types of test sentences were generated, each of which could be derived from information in the source set: (a) *within source explicit statements*, paraphrasing a piece of information presented in a single source but retaining its original meaning; (b) *within source implicit statements*, which involved drawing an inference by connecting two pieces of paraphrased information presented in a single source; (c) *across source explicit statements*, paraphrasing two pieces of information presented in different sources but retaining the original meaning; (d) *across source implicit statements*, which involved drawing an inference by connecting two pieces of information presented in different sources to generate a new idea. Additionally, a set of *invalid* statements that contradicted information in the source set was also generated. The full assessment consisted of 21 sentences (four within source explicit, three within source implicit, four across source explicit, four across source implicit, and six invalid statements). Students were asked to indicate their responses to each statement using a 5-point rating scale (1 = *completely false* to 5 = *completely true*). Then, a nonparametric form of signal detection theory was used to analyze the performance of 47 middle school students using a rating response scale.

General statement of findings

Results from the present study suggested that a rating verification task with the four possible

types of verification (i.e., paraphrased and inferred within and across sources) allows for a better understanding of the full range of types of comprehension that students need to utilize when they read multiple sources. Specifically, the measures of sensitivity showed that the four types of statements behaved systematically. As expected, recalling information derived from a single source was the easiest for students; whereas, drawing inferences about information, which was not explicitly stated in the sources, and integrated across multiple sources was the most difficult. Finally, employing signal detection theory allowed for measuring students' performance in terms of their ability to differentiate between valid and invalid statements.

Implications

Our findings mean that our verification task is a viable measure of multiple source reading comprehension that is able to provide teachers with more information with regards to what students do well and what they do poorly. It provides a quick snapshot of students' comprehension that is relatively fast to administer and fast to score. While we are not suggesting that such verification measures should be used instead of constructed-response type questions, such as essays and short answer written tasks, verification tasks allow for rapid capture, analysis, and understanding of what students comprehend. Thus, a verification task such as the one used in this study is a practical tool that allows teachers to gain feedback about their students' performance, and to adjust their instruction.

Acknowledgements

The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305F100007 to the University of Illinois at Chicago. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.