MultiTex – Process-based assessment of multiple documents comprehension

Schoor, C., Artelt, C., Kröhne, U., Goldhammer, F., Lockl, K., Roßbach, H.-G.

Abstract (max. 200 words)

In order to cope with the demands of their studies and their later profession, university students of all subjects have to be able to familiarize in a self-directed manner with different topics and filter out and integrate task relevant information. Especially in their academic life at universities, they are usually confronted with multiple sources (e.g., as a result of searching a database or the internet), which can be contradicting and which they have to integrate. These demands exceed the comprehension of (single) texts in such as that information from different sources have to be related to each other and, if applicable, the trustworthiness of the information has to be evaluated.

In the project MultiTex, a computer-based instrument to assess the competence of text comprehension with multiple documents (multiple documents literacy, MDL) of university students will be developed and validated. A special methodological focus lies in the usage of additional process-based diagnostics. Accordingly, in this project process-based measures will be used, first, as additional diagnostic information; second, in order to identify strategies of processing multiple documents; and third, to test theories of multiple text comprehension.

Aims and Research Questions

The aims of the present project can be characterized as follows:

1. Development of a theoretically sound computer-based test of multiple documents literacy (MDL)
2. Analysis of processes of multiple text comprehension for advanced diagnostics
3. Construct validation of the MDL text with two cohorts of university students of two subject groups at two locations
4. Empirical test of assumptions of theories of multiple documents comprehension

Theoretical Framework

The central task of multiple text comprehension is the integration of information from different documents that can be redundant, complementary or consistent (e.g., Bråten, Anmarkrud, Brandmo, & Strømsø, 2014) into a coherent mental model. While according to Kintsch (e.g., 1998) during reading of a text a surface representation, a propositional representation and a situational model are built, in the case of multiple documents the documents model is built in addition (e.g., Britt & Rouet, 2012). The documents model contains both a mental model of the topic that integrates information from all the documents and the intertext model. The intertext model contains a node per document in which meta-information such as author, genre, publication date, its intention, its intended audience etc. is represented. These document nodes are related to each other by predicates, like „are in accordance", „contradict each other" or „contains evidence for the claim". By means of the intertext model, also contradicting information can be integrated into a coherent mental model.

Since the analysis of multiple text comprehension is a comparably young field of research (cf. Maier & Richter, 2014), there are so far hardly any approaches for a standardized assessment of multiple documents literacy based on psychometric methods, especially for the population of university students. In addition, it is unclear how reading literacy (usually operationalized as comprehension of single texts) as a trait is related to multiple documents literacy (comprehension of multiple documents).

In prior research, multiple text comprehension has primarily been assessed by means of essays that had to be written by the participants on the topic of the multiple documents (e.g., Rouet, Favart, Britt, & Perfetti, 1997). This method is – at least in its current version where the essays have to be

rated by human raters – very time-consuming. Moreover, not only the intended receptive competences of MDL are assessed this way but also productive skills (writing skills), which may result in a bias in the assessment of MDL. Promising approaches that will be pursued in the current project are, first, verification tests in order to differentiate mental representations (e.g., Schmalhofer & Glavanov, 1986; or Strømsø, Bråten, & Britt, 2010, who suggested this in their inference verification task), and, second, the highlighting of information, where information has to be highlighted that fulfills certain requirements (like information that is contradicting across documents). Hereby it will be possible to assess subcomponents of MDL like conflict detection (cf. Stadtler & Bromme, 2014).

In previous studies the concrete processing of multiple documents has been examined only rarely. Computer-based assessment, however, provides the opportunity to assess traces of comprehension processes in a way that is both relatively easy and not influencing the assessment. These data can be used for advanced diagnostics. Computer-based log files can inform – on top of mere time data (cf. Goldhammer et al., 2014) – about the concrete behavior of the tested person. In the current project, we will concentrate on computer-based highlights and notes that the test persons make during reading (cf. Hagen, Braasch, & Bråten, 2014). These can indicate which information was judged important and was elaborated more deeply.

Study Design

For the planned MDL test, three to five units with two to three texts per unit will be used. Each unit will contain 5 – 15 items. The MDL test aims at covering the theoretical profile of requirements/demands needed for multiple documents comprehension. Furthermore, the test generates process data. For the computerization of the test, the CBA ItemBuilder software (Rölke, 2012) will be used.

The MDL test, which will be submitted to a pilot study for the purpose of item selection, will afterwards undergo a validation study at the universities of Bamberg and Frankfurt. In this study, 400 university students of educational science and psychology on the one hand, and history and German language studies on the other hand are supposed to participate. In a cross-sectional design, both first-year bachelor students as well as last-year master students will be tested in order to obtain first results on the change sensitivity of the test. In addition, the relationship of conventional reading competence (assessed with a computer-based test by the National Educational Panel Study) and MDL will be investigated. Further variables, like motivation, study success, and epistemological beliefs, will also be measured in order to obtain indicators for convergent and discriminant validity. Moreover, it might be possible to analyze subsamples with regard to suboptimal MDL or suboptimal MDL strategies.

Project data

Project management	Prof. Dr. Cordula Artelt, Universität Bamberg
	Dr. Cornelia Schoor, Universität Bamberg
	Dr. Kathrin Lockl, Leibniz-Institut für Bildungsverläufe e.V. Bamberg
	Prof. Dr. Hans-Günther Roßbach, Leibniz-Institut für Bildungsverläufe e.V. Bamberg
	Dr. Ulf Kröhne, DIPF Frankfurt
	Prof. Dr. Frank Goldhammer, DIPF Frankfurt
Contact	cornelia.schoor@uni-bamberg.de
Homepage	http://multitex.bildungsforschung.uni-bamberg.de/
Time frame	01.01.2016 – 30.06.2019

References

Bråten, I., Anmarkrud, Ø., Brandmo, C., & Strømsø, H. I. (2014). Developing and testing a model of direct and indirect relationships between individual differences, processing, and multiple-text comprehension. *Learning and Instruction, 30*, 9-24. doi: 10.1016/j.learninstruc.2013.11.002

Britt, M. A., & Rouet, J.-F. (2012). Learning with multiple documents: Component skills and their acquisition. In J. R. Kirby & M. J. Lawson (Eds.), *Enhancing the quality of learning: Dispositions, instruction, and learning processes* (pp. 276-314). New York: Cambridge University Press.

Goldhammer, F., Naumann, J., Stelter, A., Tóth, K., Rölke, H., & Klieme, E. (2014). The time on task effect in reading and problem solving is moderated by task difficulty and skill: Insights from a computer-based large-scale assessment. *Journal of Educational Psychology, 106*(3), 608-626. doi: 10.1037/a0034716

Hagen, Å. M., Braasch, J. L. G., & Bråten, I. (2014). Relationships between spontaneous note-taking, self-reported strategies and comprehension when reading multiple texts in different task conditions. *Journal of Research in Reading, 37*(S1), S141-S157. doi: 10.1111/j.1467-9817.2012.01536.x

Kintsch, W. (1998). *Comprehension. A paradigm for cognition*. Cambridge: Cambridge University Press.

Maier, J., & Richter, T. (2014). Verstehen multipler Texte zu kontroversen wissenschaftlichen Themen: Die Rolle der epistemischen Validierung [Comprehension of multiple texts about controversial scientific topics: The role of epistemic validation]. *Unterrichtswissenschaft, 42*(1), 24-38.

Rölke, H. (2012). The ItemBuilder: A graphical authoring system for complex item development. In T. Bastiaens & G. Marks (Eds.), *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2012* (Vol. 2012, pp. 344-353). Chesapeake, VA: AACE.

Rouet, J.-F., Favart, M., Britt, M. A., & Perfetti, C. A. (1997). Studying and using multiple documents in history: Effects of discipline expertise. *Cognition and Instruction, 15*(1), 85-106. doi: 10.2307/3233756

Schmalhofer, F., & Glavanov, D. (1986). Three components of understanding a programmer's manual: Verbatim, propositional, and situational representations. *Journal of Memory and Language, 25*(3), 279-294. doi: 10.1016/0749-596X(86)90002-1

Stadtler, M., & Bromme, R. (2014). The content–source integration model: A taxonomic description of how readers comprehend conflicting scientific information. In D. N. Rapp & J. L. Braasch (Eds.), *Processing inaccurate information: Theoretical and applied perspectives from cognitive science and the educational sciences* (pp. 379-402). Cambridge, MA: MIT Press.

Strømsø, H. I., Bråten, I., & Britt, M. A. (2010). Reading multiple texts about climate change: The relationship between memory for sources and text comprehension. *Learning and Instruction, 20*(3), 192-204. doi: 10.1016/j.learninstruc.2009.02.001