



Methodological Reviews

Using think-aloud protocol in self-regulated reading research

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ABSTRACT

This paper reviews studies that have used think aloud protocol to explore self-regulated reading process. The review intends to identify its major contributions and key methodological concerns related to the use of think-aloud protocol in self-regulated reading research. It addresses the following three questions: 1) what does think-aloud protocol enable researchers to learn about self-regulated reading?; 2) what methodological concerns do researchers have when using think-aloud protocol to explore self-regulated reading?; and 3) how can these concerns be addressed when designing think-aloud protocol for self-regulated reading research? In light of this review, suggestions are provided for further discussion on methodological issues in self-regulated reading research. Such discussions will inform researchers' efforts to use think-aloud methods in self-regulated reading research.

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1. Introduction

Reading attracts attention in research as it entails essential skills that individuals need to search for information, integrate information for understanding, as well as evaluate, critique, and use information in today's world (Grabe, 2009). Reading is a strategic process since it involves the use of different strategies such as cognitive (e.g., inference, brainstorming, reasoning) and metacognitive ones (e.g., clarifying the purposes of reading', 'monitoring ongoing activities to determine whether comprehension is occurring', and 'engaging in self-questioning to determine whether goals are being achieved') (Baker & Brown, 1984). When individuals utilized metacognitive strategies including planning, progress monitoring and reflection to regulate the reading process (Greene & Azevedo, 2009; Pintrich & Zusho, 2002), such reading process can be called self-regulated reading. Since self-regulation or metacognitive strategy use significantly contributes to learners' mastery of the learning content, it has attracted increasing attention in research, especially on reading, in the last three decades (Hu & Gao, in press; Roohani & Asiabani, 2015; Zhang, 2008). To gain understanding of readers' self-regulated reading process, researchers adopted a number of techniques, including questionnaires (e.g., Lyanage & Bartlett, 2011), interviews (e.g., Fadlelmula, 2010), observations (e.g., Veenman & Spaans, 2005), stimulated recall (e.g., Juliebo, Malicky, & Norman, 1998), on-line computer log file registration (e.g., Veenman, Wilhelm, & Beishuizen, 2004), eye-movement registration (e.g., Kinnunen & Vauras, 1995) and think-aloud protocol (e.g., Bråten & Strømsø, 2003). While all techniques have pros and cons (Veenman, van Hout-Wolters, & Afflerbach, 2006), think-aloud has emerged to be a popular tool for researchers to access learners' self-regulated reading process (Bråten & Samuelstuen, 2004; Bråten & Strømsø, 2003).

Think-aloud is a method to identify cognitive and metacognitive processes as participants are asked to talk aloud while thinking, problem solving, or learning (Ericsson & Simon, 1993; Pressley & Afflerbach, 1995). As Veenman (2005) observes,

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'people simply don't do what they say they will do [in prospective measures], or they do not recollect accurately what they have done' in retrospective measures (p. 13). Compared to retrospective measures such as questionnaire and interview, think-aloud protocol is regarded as more accurate for capturing learners' learning processes since learners are required to report on their learning process while they are working on a particular task (Yoshida, 2008). With the development of modern techniques, methods such as on-line computer log file registration and eye-movement registration have been increasingly popular in cognition and metacognition research (Rayner, 2009; Veenman & Spaans, 2005). These techniques, however, can only be used to infer cognitive/metacognitive processes according to participants' behavior (e.g., scrolling as indication of a participant's intention to check), and thus it is important for them to be used together with verbal report data so that researchers can be more confident about their conclusions (Brunfaut & McCray, 2015). For this reason, think-aloud protocol as a traditional technique remains as an important methodological tool in cognition and metacognition research, especially on self-regulated reading. Think-aloud protocol can help researchers elicit a wide array of responses from readers related to the reading process (van den Broek, Lorch, Linderholm, & Gustafson, 2001), which are normally silent, hidden, and cannot be easily observed or assessed through its product (Yoshida, 2008).

Given the importance of think-aloud protocol in self-regulated reading research, this paper reviews relevant self-regulated reading literature to identify its major contributions and key methodological concerns. Despite the strengths of think-aloud protocol as a data collection method, researchers have problematized their use in reading research (Pressley & Afflerbach, 1995). In particular, when the examined reading process is metacognitive rather than cognitive, think-aloud protocol could be even more problematic as a methodological tool to capture the reading process (Bowles, 2010a). Therefore, the results of this review would inform researchers' efforts to use think-aloud methods in conducting relevant research as the review focuses on answering the following questions:

- 1) What does think-aloud protocol enable researchers to learn about self-regulated reading?
- 2) What methodological concerns do researchers have when using think-aloud protocol to explore self-regulated reading?
- 3) How can these concerns be addressed when designing think-aloud protocol for self-regulated reading research?

2. Method

To conduct this review, four major academic databases of linguistics, education and psychology – Linguistics and Language Behavior Abstracts (LLBA), Educational Information Resource Center (ERIC), Web of Science, and PsycInfo – were searched for scholarly journal articles, using combinations of the following keywords: “self-regulated learning”, “self-regulatory skills”, “self-regulatory strategies”, and “reading” from 1980 to September 2016. All the empirical studies published in English, which reported using think-aloud protocol, were included for the analysis. Self-regulated reading studies using both think-aloud protocols and other research methods were also included but those deploying methods other than think-aloud protocol (e.g., questionnaire survey, semi-structured interviews) were excluded from the analysis. Articles discussing methodological concerns of think-aloud protocol without empirical data were consulted and informed the relevant discussions in this review, but they were not included in the data set for analysis. Backward citations were also retrieved for English empirical self-regulated reading studies where think-aloud protocols were involved. Twenty-nine papers were found in the search and these studies were grouped into two sets of studies. The first set includes six studies examining the reliability and validity of think-aloud protocol through experiments and the second set includes twenty-three studies using think-aloud protocols as data collection method. The descriptive information of the papers can be found in [Appendix 1](#).

To answer the first question, the research findings of the 23 papers in the second set were first coded. For instance, the paper that found readers' online self-regulated reading processes differed in different online environments was coded as “different self-regulated reading processes in different environments”, and the one that found self-regulated reading processes were positively related to reading outcome was coded as “self-regulated reading and reading outcome”. Then the codes were grouped based on the themes. For example, “different self-regulated reading processes in different environments”, “different self-regulated reading processes in different time periods”, “different self-regulated reading processes for different reading purposes” were grouped into the theme “dynamic nature of self-regulated reading”. With regard to the second research question, the findings of the experimental studies in the first set were analyzed and interpreted. To address the third research question, the findings of studies in the first set, which examine the validity of think-aloud design, were summarized, and the design of think-aloud protocol of the 23 papers in the second set were further analyzed, focusing on two techniques including training and prompting, to identify how the use of think aloud protocols can be improved to enhance its methodological rigour.

3. Results

3.1. Think aloud Protocol's contributions

Think-aloud protocol has been used in self-regulated reading research to answer a wide range of questions. Relevant answers have enriched our understanding of readers' self-regulated reading process. For example, Mateos, Martín, Villalón, and Luna (2008) investigated secondary school students' self-regulated reading process. Since they found that the

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