CONTENT ANALYSIS OF 1998–2012 EMPIRICAL STUDIES IN SCIENCE READING USING A SELF-REGULATED LEARNING LENS

Received: 20 March 2014; Accepted: 25 August 2014

ABSTRACT. There is an increasing interest in conducting reading-related studies in science education using a self-regulated learning (SRL) lens. This exploration involved a content analysis of 34 articles (38 studies in total) in highly regarded journals from 1998 to 2012 using an SRL interpretative framework to reveal critical features and relationships in the science reading research. A cross-study comparison revealed that most researchers had applied mixed methods approaches (68 %), used instructional cues as an intervention (47 %), and collected both performance and process data (50 %). The summary figures indicated that a variety of instructional cues had different effects on science reading and SRL strategies and that there were interactions between task conditions and cognitive conditions. Customized or personalized metacognitive prompts are especially useful for comprehending hypertexts and conducting online information searches. Based on the findings, it was suggested that future research should apply the COPES model for SRL to design instructional cues for learners and to investigate how external task conditions influence cognitive conditions, self-regulated processes, and reading performance across different science text genres.

KEY WORDS: content analysis, metacognition, science learning, science reading, self-regulated learning, SRL

INTRODUCTION

Scientific literacy has been a central goal of international science education reforms for over 20 years, and locating and reading science texts are widely accepted by researchers and teachers as being a part of fundamental literacy in science (Norris & Phillips, 2003; Yore, 2012). The new science education framework in the USA has reaffirmed this priority by stating:

An education focused on a limited set of ideas and practices in science and engineering should enable students to evaluate and select reliable sources of scientific information and allow them to continue their development well beyond their K–12 school years as science learners, users of scientific knowledge, and perhaps also as producers of such knowledge. (National Research Council [NRC], 2012, p. 31)
Moreover, the Programme for International Student Assessment (PISA) and Progress in International Reading Literacy Study (PIRLS) emphasized content reading comprehension and higher-order thinking competencies. Correlations of the 2000 – 2009 PISA student-level scores for reading literacy (emphasizing informational text) and science literacy (socioscientific issues) revealed strong associations (0.75 – 0.88) compared with correlations (~0.35 – 0.50) found for reading (emphasizing narrative text) and science achievement (emphasizing content knowledge) in other large-scale test results (Yore et al., 2014). These results suggested that the shared variance for reading informational text and science achievement is much greater than traditionally expected for reading narrative text. Furthermore, the second-generation science education reforms emphasizing scientific language abilities dealing with knowledge construction, communication and persuasion, informal learning, and the potential relationship between science reading and achievement in an information communication technology (ICT) era justify an in-depth exploration of empirical science reading research and self-regulated learning environments.

This study addressed the calls for science literacy, especially the science reading component, in an information-rich, self-regulated environment by conducting a content analysis of empirical science reading research during the 1998 – 2012 period following the introduction of the highly regarded self-regulated learning (SRL) framework (Winne & Hadwin, 1998). Their condition–operation–product–evaluation–standard (COPES) interpretation of SRL provided a basis to consider task conditions and cognitive conditions, which were not considered by other interpretative frames. Task conditions include resources, instructional cues, time, and social culture. Cognitive conditions include beliefs, motivational factors, domain knowledge, and knowledge of study tactics and strategies. This review applied the COPES model for analyzing literature selected from the Web of Science to identify the trends of published Social Sciences Citation Index (SSCI) journal articles and interventions with potential for supporting learners. The results of this search and analysis could provide a basis for designing evidence-based professional development programs and classroom practices for science and literacy teachers. Moreover, identifying missing research foci will be highlighted for science educators and researchers to establish a research agenda of needed inquiries integrating reading comprehen-