Integrating reviewing strategies into shared electronic note-taking: Questioning, summarizing and note reading

Chiung-Hui Chiu, Chiu-Yi Wu, Hsiao-Wei Cheng*

Graduate Institute of Information and Computer Education, National Taiwan Normal University, No.162, Sec. 1, Heping E. Rd., Da-an District, Taipei City 10610, Taiwan, ROC

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ABSTRACT

This study compared the effects of reviewing strategies in shared electronic note-taking activities, including questioning, summarizing, and note reading, on elementary school student note-taking quality and achievement. A non-equivalent pre- and post-test design was adopted. The participants were 188 sixth grade Taiwanese students in six computing classes. Through random assignment, two classes were assigned to the shared note-taking with questioning condition (SN-SQ), two classes to the shared note-taking with summarizing condition (SN-SS), and two classes to the shared note-taking with note reading condition (SN-SR). Students in each condition were arranged into same-sex dyads. The members of a dyad were assigned to separate computers, seated side-by-side, and required to collaborate with one another on a shared note-taking with reviewing task. The results revealed that the SN-SS students' notes contained more facts and concepts than the SN-SR students', and the SN-SS students achieved better grades on the unit quizzes and overall assessment two weeks later than those in the SN-SR condition.

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1. Introduction

Note-taking strategy has long been recognized for its usefulness in helping students understand lecture materials. Empirical studies have shown that students who carry out the note-taking functions of both encoding and storage (i.e. taking notes and reviewing them) outperform those who do not (Kiewra, Dubois, Christensen, Kim, & Lindberg, 1989; Kiewra et al., 1991). Therefore, note-taking in this paper includes two sequential phases, encoding and then external storage, as Di Vesta and Gray (1972) and Kiewra et al. (1991) suggested. Since reviewing is a critical part of the note-taking method (Kobayashi, 2006; Pauk & Fiore, 1989), questioning and summarizing are considered effective note-reviewing strategies (King, 1992a), and the use of computer technology brings changes to traditional note-taking, this study aimed to investigate the effects of integrating different reviewing strategies into lecture note-taking in a computer-mediated context. The rest of this introduction reviews the literature on lecture note-taking and its effects on learning, the use of technology in note-taking and note-sharing, and questioning and summarizing as note-reviewing strategies.

1.1. Note-taking

Note-taking has been shown to be an effective strategy that can improve what students learn from a lecture (Hartley & Davies, 1978; Kiewra, 1985). It facilitates every phase of information processing by involving students in "attending to the lecture, locating targets in long-term memory, holding and manipulating the attended information in working memory, encoding ideas into long-term memory, and transcribing relevant notions" (Kiewra, 1988, p. 41). Besides encoding information from the lectures, such notes are valuable study materials for students to read afterward (Di Vesta & Gray, 1972).

Although considerable research has investigated note-taking more among postsecondary students, less work has been done among K-12 students, despite the fact that 7- to 10-year-old students already possess the metacognitive abilities required for note-taking, and that these abilities continue to develop over the following years (Trawick-Smith, 2010). In a meta-analysis, Kobayashi (2005) has observed that the

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advantages of note-taking over no note-taking were greater for 6th–12th graders than for undergraduate students. Lee, Lan, Hamman, and Hendricks (2008) also found that students as young as the 3rd grade could be instructed to develop note-taking abilities that promoted their learning.

However, notes are of limited value, if students do not make use of effective note reviewing strategies. The importance of reviewing notes has been confirmed in numerous studies (e.g., Kiewra, 1985; King, 1984; Kobayashi, 2006). Carter and Van Matre (1975) argued that reviewing notes might cue the students to reconstruct parts of the initially recorded lecture notes. Di Vesta and Gray (1972) found that if learners read their lecture notes immediately after class, they recalled more information. Fisher and Harris (1973), Kiewra et al. (1991), and Peper and Mayer (1986) suggested that the benefits of note-taking might derive from the review itself rather than the act of note-taking, and found that students who did not take notes but read those produced by others performed better in some recall and vertical transfer tests than those who wrote the notes themselves but did not review them.

1.2. Electronic note-taking

With the rise and widespread use of computer technology, learners are now able to take notes using digital devices (e.g., laptops/tablets/handheld PC's) and note-taking applications or word processors (e.g., Microsoft Word and Microsoft OneNote) instead of pen and paper. Matthíasdóttir and Halldórsdóttir (2007) investigated students' attitudes toward taking notes on paper versus on a computer at Reykjavik University. Based on 514 returned questionnaires, they found that 41% of the students recorded notes with a computer during lectures, 58% of the students believed that they were able to write more quickly on a computer, and 52% of the students believed that using a computer to write was more convenient. Furthermore, information can be easily organized with word processors, and the resulting organizational cues within lecture notes can help to reduce the cognitive loads of students by providing more structured information (Titsworth, 2004). Moreover, electronically stored information can be easily located and retrieved using search functions (Cutrell, Dumais, & Teevan, 2006), and web-based notes can be useful if students are absent from or distracted in class (Abowd et al., 1996).

1.3. Shared note-taking

When students take notes individually in class, the critical points made by the instructor might often be misunderstood or missing in their notes, and the resulting gaps would leave them confused when they go back to review their work. One way to avoid this is to put students in pairs and have them share their notes and compare them in order to supplement missing information and emulate good note-taking from their peers (Faust & Paulson, 1998). With the growing ubiquity of the Internet and the development of collaborative note-taking applications (Kam et al., 2005; Landay, 1999; O'Neill, 2005; Singh, Denoue, & Das, 2004), the note-sharing and peer interaction that occurs face-to-face in traditional classrooms can now be enhanced by computer-mediation. As indicated by Meskill and Anthony (2005), computer-mediation may improve face-to-face learning by providing an additional venue to practice and reinforce face-to-face interaction. Some studies on collaborative note-taking applications suggest that students could benefit from sharing notes with regard to recalling forgotten information (Landay, 1999), receiving feedback (Singh et al., 2004), and structuring their learning materials by developing relationships between the notes produced by other students (Miyake & Masukawa, 2000). Although there have been many studies on note-taking, and the benefits of note sharing have been widely recognized, there has been little research on such sharing in electronic note-taking contexts—either face-to-face alone or face-to-face enhanced by computer-mediation. Moreover, note-taking studies have tended to focus on college students, and more work is needed examining the effects of sharing electronic notes on K-12 students.

1.4. Questioning and summarizing as note reviewing strategies

Traditionally, notes are reviewed by simply reading them, although questioning and summarizing are two other approaches that can be adopted. Questioning and summarizing are two generative strategies based on constructivism. In a constructivist view, learner-constructed representations, such as questions, answers, and summaries, can enhance comprehension of the lecture content (King, 1992a). Generating questions requires the students to closely read the class materials, identify the main ideas, and determine the relationships among them (Laidlaw, Skok, & McLaughlin, 1993; Rosenshine, Meister, & Chapman, 1996). Answering questions prompts students to seek further information and process an answer (van der Meij, 1994). Summarizing requires a learner to focus on key points (Foos, 1995; Hashey & Connors, 2003; Jitendra, Cole, Hoppes, & Wilson, 1998; King, 1992a; Nelson, Smith, & Dodd, 1992), as well as identify and organize important concepts (Sedita, 1995), while preserving a record of what was learned (Kintsch & Van Dijk, 1978). This process also facilitates the construction of meaning by developing the connections among new ideas, and between these and the learner's existing knowledge (Friend, 2000; Susar & Akkaya, 2011), encouraging an active monitoring of understanding (Nist & Holschuh, 2000).

Self-questioning is often suggested as a reviewing strategy in many lecture note-taking skills guides, and it has been shown to have considerable value (Wright, 2008). In this approach, students need to look over their notes and write down possible questions from the content that might appear on a test, and then cover the notes and attempt to answer the questions that he/she has created. When implemented collaboratively, questioning has been found effective to improve lecture comprehension (Choi, Land, & Turgeon, 2005; King, 1991, 1992b). Call (2000) implemented peer questioning as a reviewing strategy in a college course. After the students read their lecture notes, they posed questions based on the class materials and answered the questions alone. The students then shared these questions and answers with their classmates and received immediate feedback. In this way, the students could further reflect and revise the answers to their questions. Call observed that this activity could help students organize their lecture notes and increase their comprehension of the instruction materials.

Knipper and Duggan (2006) and Sedita (1995) suggested using summarization to review notes. In an empirical study, Davis and Hult (1997) asked college students enrolled in an introductory psychology class to take notes during a 21-min videotaped lecture, which consisted of three 7-min segments. The students were randomly assigned to three conditions. The summary group wrote a summary during a 4-min pause immediately after each lecture segment. The pause group read their notes during the three 4-min pauses. The control group was not provided a pause during the lecture, and did not read their notes or write a summary during or after the lecture. The results indicated