Computers & Education 56 (2011) 112–126

Contents lists available at ScienceDirect

Computers & Education

journal homepage: www.elsevier.com/locate/compedu

The role of tasks and epistemological beliefs in online peer questioning

Young Hoan Cho [a], Jaejin Lee [b], David H. Jonassen [a,*]

[a] School of Information Science and Learning Technologies, University of Missouri, 303 Townsend Hall, Columbia, MO 65211, USA
[b] Department of Curriculum and Instruction, The University of Texas, Austin, TX, USA

ARTICLE INFO

Article history:
Received 16 February 2010
Received in revised form
13 August 2010
Accepted 13 August 2010

Keywords:
Computer-supported collaborative learning
Peer questioning
Wikis
Epistemological beliefs

ABSTRACT

The current study examines the assertion that students are motivated and learn more by carrying out tasks consistent with their epistemological beliefs in web-based learning environments. In the study, 120 undergraduate students in an educational technology course participated as part of their coursework. Using a wiki, triads reciprocally asked and responded to questions as constructing either a group summary or a group argument. Students with less advanced epistemological beliefs more actively coordinated formats and procedures for group work and achieved higher comprehension of reading materials in the collaborative summary than in the collaborative argumentation. By contrast, these differences were not found for students with more advanced epistemological beliefs. However, the interaction effect between tasks and epistemological beliefs disappeared for the quality of argumentation on case problems. Independently of epistemological beliefs, collaborative argumentation promoted more constructive and interactive peer questioning activities and helped to construct higher quality arguments in case problems than collaborative summary. Therefore, the effects of matching tasks and epistemological beliefs varied depending on types of learning outcomes (comprehension vs. argumentation) in online peer questioning.

1. Introduction

Guided peer questioning has been effectively applied to improve the quality of small group discourse in face-to-face learning environments (King, 1989, 1990, 1991, 1994; King & Rosenshine, 1993; Rosenshine, Meister, & Chapman, 1996). While asking and responding to questions with peers, students monitor their comprehension, generate inferences, elaborate existing knowledge, and repair misconceptions (King, 1994, 2002; Pressley et al., 1992; Roscoe & Chi, 2007; Rosenshine et al., 1996; Webb, 1991; Wittrock, 1974). Although reciprocal peer questioning has not been adequately explored in online learning environments, it is reasonable to presume that online peer questioning will improve the quality of peer interaction and learning outcomes as face-to-face peer questioning does (Choi, Land, & Turgeon, 2008; Johnson, 2006).

Despite the potential of online peer questioning, simply requiring students to ask questions reciprocally does not ensure high-quality peer interaction and high achievement (Cohen, 1994; Fantuzzo, Riggio, Connelly, & Dimeff, 1989; Meier, Spada, & Rummel, 2007; Salomon & Globerson, 1989). Previous studies of computer-supported collaborative learning (CSCL) revealed that many students passively participate in online discussion, avoiding cognitive conflicts and negotiation of meaning (Chiu & Hsiao, 2010; Lipponen, Rahikainen, Lallimo, & Hakkarainen, 2003; Murphy, 2004). Choi and his colleagues (2005) found that college students overwhelmingly produced low-quality questions requesting clarification and elaboration of ideas rather than high-quality questions eliciting deep-reasoning and sociocognitive conflicts in guided online discussion. The low-quality questions may interfere with learning from online peer interaction (Bradley, Thom, Hayes, & Hay, 2008; King, 1990, 1994; Roscoe & Chi, 2007).

The goal of this study is to investigate the roles of tasks and epistemological beliefs as factors determining the quality of online peer questioning and achievement. Past studies have investigated the impacts of instructional interventions such as question prompts and modeling (Choi et al., 2008; King, 1994; Rosenshine et al., 1996), but the effects of tasks and epistemological beliefs have not been adequately investigated in reciprocal peer questioning activities. It is reasonable to expect that students will not ask deep-reasoning and critical

* Corresponding author. Tel.: +1 573 882 2832.
E-mail addresses: yhcho95@gmail.com (Y.H. Cho), jaejinlee@mail.utexas.edu (J. Lee), jonassen@missouri.edu (D.H. Jonassen).

0360-1315/$ – see front matter © 2010 Elsevier Ltd. All rights reserved.
doi:10.1016/j.compedu.2010.08.014

questions if tasks require only shallow reasoning and a single right answer (Arvaja, Häkkinen, Eteläpelto, & Rasku-puttonen, 2000; Choi et al., 2005; Graesser, Langston, & Baggett, 1993). Simple and close-ended tasks may not actively elicit cognitive disequilibrium as a principal source of questioning (Graesser & McMahen, 1993; Otero & Graesser, 2001). In addition, epistemological beliefs (i.e., beliefs about knowledge and knowing) may play a crucial role in online peer questioning because students who believe that knowledge is absolute may not actively participate in collaborative knowledge building (Tsai, 2000, 2004). Recently, a growing number of studies have explored the role of epistemological beliefs in pertaining to preferences toward web-based learning environments (Tsai & Chuang, 2005; Yang & Chang, 2009), information seeking and evaluation in the Internet (Bråten & Strømsø, 2006; Hofer, 2004; Mason, Boldrin, & Ariasi, in press; Tu, Shih, & Tsai, 2008), online learning processes and outcomes (Demetriadis, Papadopoulos, Stamelos, & Fischer, 2008; Pieschl, Stahl, & Bromme, 2008), and online peer interaction (Nussbaum, Sinatra, & Poliquin, 2008; Tsai & Liang, 2009). However, many studies explored the role of epistemological beliefs regarding individual performance or preferences rather than collaborative knowledge building in web-based learning environments.

A primary concern of this study is to examine the assertion that students learn more by conducting tasks consistent with their epistemological beliefs than conducting those inconsistent (Tsai, 2004; Windschitl & Andre, 1998) in the context of online peer questioning. Few studies have explored the assertion in regard to actual learning processes and multiple learning outcomes, although the interaction between tasks and epistemological beliefs can provide useful insights on design of online learning environments (Yang & Chang, 2009). This study therefore seeks new empirical evidence to advance research on the roles of learning tasks and epistemological beliefs in CSCL.

2. Learning from guided peer questioning

2.1. Constructive and interactive learning activities

Guided peer questioning improves the quality of peer interaction in a small group discussion (Choi et al., 2008; King, 1990, 1994; King & Rosenshine, 1993; King, Staffieri, & Aldelgais, 1998). In guided peer questioning, students are taught to ask constructive questions and to provide elaborated explanations, using generic question stems such as "What do you think causes…?" King (1990) found that college students in a guided peer questioning condition generated more critical thinking questions and elaborated explanations than those in an unguided peer questioning or a discussion condition. Extensive literature has indicated that the improved verbal interaction in guided peer questioning can foster understanding of content in two aspects: (a) constructive learning and (b) interactive learning (Chi, 2009).

The improved quality of questions by guides may enhance the quality of responses, which in turn leads to higher achievement. High-quality questions pertaining to knowledge integration, knowledge building, and deep-reasoning encourage partners to generate elaborated explanations during peer interaction (Ismail & Alexander, 2005; King, 1994; King et al., 1998). For instance, Roscoe and Chi (2008) found that deep responses were given to 71.8% of deep questions and 19.6% of shallow questions in peer tutoring. King (1994) also found that high-quality questions (i.e., integration) promoted responses being constructive, while low-quality questions (i.e. factual) elicited restating the information given or existing knowledge. In addition, previous research has indicated that elaborated explanations going beyond the given information enhance knowledge construction (Chi, 2009; King, 1994; Webb, 1991). From extensive literature reviews on peer interaction, Webb (1989, 1991) found that giving elaborated explanations to peers was positively correlated with achievement, but giving other kinds of help (e.g., simply giving a correct answer) was rarely related to achievement. Consistently, Roscoe and Chi (2008) found that peer tutors learned by generating knowledge-building explanations, not by simply doing more explanations. Therefore, guided peer questioning can foster constructive questioning and explaining.

Discussion of student-generated questions promotes interactive learning. By elaborating or challenging responses from each other, students collaboratively build knowledge and obtain deeper understanding which they may not accomplish alone (Barron, 2003; Chi, 2009; Hmelo-Silver & Barrows, 2008; King, 2002; Teasley, 1997). Sociocognitive research has found that two students who have different kinds of conceptual errors can construct a more correct solution through collaborative discussion about their different perspectives and strategies (Glachan & Light, 1982; Schwarz, Neuman, & Biezuner, 2000). Different answers to the same question may elicit sociocognitive conflicts, which lead to meaningful learning when group members resolve the conflicts through discussion. However, students may not benefit from sociocognitive conflicts in peer interaction if they simply reject or ignore different views. Barron (2003) found that more successful groups accepted or discussed correct proposals when collaboratively solving an authentic problem, whereas less successful groups ignored or rejected correct proposals. This finding indicates that the benefits of peer questioning may partially depend on how students respond to peers' ideas. If students engage only in generating questions and explanations but ignore responses of peers, the effect of peer questioning may not be different from that of self-questioning (King, 1989, 1991). However, few studies examined the quality of peer questioning in regard to the interactive learning aspect. Thus, this study investigates the online peer questioning processes from both constructive and interactive learning perspectives.

Although the effects of guided peer questioning have been examined mostly in face-to-face learning environments, guided peer questioning in online learning environments (i.e., online peer questioning) should also provide effective interactive learning activities. However, we also need to consider the features of online learning environments and how they are different from those of face-to-face learning environments (Andriessen, 2006; Jonassen & Kwon, 2001; Tutty & Klein, 2008). For instance, Choi and his colleagues (2005) found that online guides of questioning were not effective in improving the quality of questions in an asynchronous online discussion. One of obstacles in online peer questioning was delayed questions and responses among inactive group members. Thomas (2002) indicated that aynchronous and isolated participation and written discourses might discourage active peer interaction in the Internet. On the other hand, online learning environments can enhance critical thinking and questioning because social and contextual barriers which prevent students from spontaneously asking questions in face-to-face instruction are substantially reduced in the Internet (Tsai, 2001). Moreover, asynchronous interaction allows students to ask a question after reflective thinking of ideas and opinions. For a deeper understanding of online peer questioning, it is important to examine carefully the processes of asking and responding to questions and relationships among questions, responses, and learning outcomes.