



Wikis and forums for collaborative problem-based activity: A systematic comparison of learners' interactions



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ABSTRACT

This article describes an experimental study that evaluated differences in students' discourse and actions when they used a wiki with discussion (i.e., an enhanced wiki) vs. a forum with attached MS Word documents for asynchronous collaboration on two case problems. The study used a counterbalanced within-subject design with 34 online learners working in small groups. A systematic content analysis of learners' interactions coupled with visual, analytical techniques showed within-group differences in using the technologies. The study revealed the expanding nature of a forum and the condensing nature of a wiki. Also, findings suggest that in a wiki, groups tend to be more collaborative, whereas in a threaded discussion, groups tend to be more cooperative. The study provides insights for instructors who use wikis and forums in their online courses to support collaborative problem-based activity.

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1. Introduction

With the rapid expansion of Web 2.0 technologies, institutions worldwide have recognized e-learning as a viable alternative or supplement to traditional, face-to-face instruction (Allen & Seaman, 2011). Meanwhile, teamwork and collaboration are key competencies which higher education institutions should actively help their students develop (National Research Council, 2012). This claim has been made, in part, because problems faced by today's professionals are often multi-faceted and require group rather than individual solutions. As such, many instructors practice social constructivist pedagogy (Palincsar, 1998) in their online courses, encouraging collaborative work among learners and engagement with knowledge-building practices. Particular interest has been given to problem-based instructional methods in small groups—such as the case method—that situate learning in meaningful tasks and emphasize the importance of practical experience in learning (Derry, Hmelo-Silver, Nagarajan, Chernobilsky, & Beitzel, 2006; Dottin &

Weiner, 2001; Hmelo-Silver & Chernobilsky, 2004). In practice, such methods involve participation in shared activities, including decision making and negotiation of ideas, all organized into a learning environment supported by (Web 2.0) technologies.

Forums and wikis are widely employed in e-learning settings to support social constructivist pedagogy. These technologies made their way into online learning more than a decade ago and there is a dearth of research discussing their effectiveness and limitations. From a theoretical perspective – in this case, a social constructivist perspective – tools play an important role in extending human abilities and enhancing thinking processes (e.g., as in helping to explicate one's thoughts). Although researchers generally agree that wikis and forums are framed by social constructivism, there is a need to further theorize the relationship between tasks, tools and collaborators in computer-supported collaborative learning settings (Lund & Rasmussen, 2008). Furthermore, there is a need for more research examining differences between such tools and exploring how they might be used to serve different learning goals (Kear, Woodthorpe, Robertson, & Hutchison, 2010). The present study focuses on the latter, echoing the view of many researchers that different types of computer supports afford different opportunities for collaborative learning (e.g., Hmelo-Silver, Chernobilsky, & Nagarajan, 2009; Suthers, Vatrappu, Medina, Joseph, & Dwyer, 2008). In particular, this study aims to systematically assess differences in students' interactions when they use a wiki with discussion (i.e., an enhanced wiki) vs. a forum with attached MS Word documents for asynchronous collaboration on case problems.

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1.1. Online threaded discussion (or threaded discussion, or forum)

Threaded discussion captures the exchange of messages over time, organized in categories and grouped in threads (i.e., messages and responses grouped together). Typically, within a course management system (e.g., Moodle, Blackboard), threaded discussion is the dominant means for enabling dialog and collaboration. The affordances of threaded discussion for (online) learning have been extensively discussed in the literature. In particular, threaded discussion is considered an effective means for engaging learners in knowledge construction and critical thinking (Cheong & Cheung, 2008; de Leng, Dolmans, Jöbssis, Muijtjens, & van der Vleuten, 2009; Richardson & Ice, 2010), promoting participation and diversifying of ideas (e.g., Bruning, 2005; Hammond, 2005; Heckman & Annabi, 2005; Lapadat, 2004), enabling learners to reflect on peers' contributions and analyze their own ideas before articulating them, therefore improving the quality of their postings/overall discussion (Browne, 2003; Pena-Shaff & Nicholls, 2004), and facilitating learners' meta-cognitive awareness and development of self-regulatory processes and strategies (Vonderwell, Liang, & Alderman, 2007), among other benefits.

Despite the research on effective uses of threaded discussion, the technology is also associated with problems pertinent to collaborative learning. In particular, it has been characterized as lacking coherence and offering weak support for online collaborative knowledge construction (e.g., Eryilmaz, Ryan, Van der Pol, Kasemvilas, & Mary, 2013; Herring, 1999; Hewitt, 2001, 2003; Suthers et al., 2008). For instance, Hewitt (2001) examined graduate students' use of threaded discussion in three different online courses at the University of Toronto. His analysis revealed that students rarely engaged in convergent processes; virtually all messages were "add-on notes" (built on the ideas of another post in the thread), and only a few students attempted to tie together ideas from different posts. Other researchers explained that the tree/hierarchical structure imposed by standard threaded discussion tools – every contribution is connected to a parent note and leads to several other child notes – is too restrictive for collaboration (e.g., dePaula, 1998; Stahl, 2001). Specifically, Stahl (2001, 2006) argued that in order to bring several ideas together in a summary or synthesis, the technology should allow a particular contribution to be tied to several parent notes (see WebGuide interface in Stahl, 2001, 2006). He further advised that collaborative learning technologies should distinguish those features aimed to support discussion from those aimed to support collaborative knowledge construction, in a way that discussed ideas can be integrated into knowledge construction processes (Stahl, 2006). Similarly, others have argued that, in typical threaded discussion tools, discussion and group artifacts (e.g., a group document) are disjointed, which is not conducive to online discourse about artifacts (Eryilmaz et al., 2013; Suthers, 2001; Suthers & Xu, 2002). In particular, Suthers (2001) argued that collaborators should be able to carry on a discussion with reference to a visual artifact that they can manipulate; yet, as he explained, in typical learning management systems, discussion tools and shared artifacts are displayed on entirely different screens, which inhibits artifact-centered discourse (Suthers, 2001).

1.2. Wikis

Wikis are collaborative editing tools supporting the creation of cohesive artifacts authored by many individuals. In general, four design elements in wikis might support collaboration: 1) The existence of a group-owned document with editing capabilities that necessitates negotiation among participants; 2) The tracking mechanism for modifications to the group-owned document (so called, history documentation); 3) The integration of notification and alert features, which gives users the option of receiving automatic reports when the group-owned document is modified; and 4) The communication supports that are often included, such as discussion pages associated with group-owned documents or commenting features in which

collaborators can identify problems, resolve disagreements, and negotiate consensus, before altering content (Marandi & Nami, 2013). Morgan (as cited in Bruns & Humphreys, 2005) argued that a wiki with discussion (i.e., an enhanced wiki) serves "a kind of ongoing meta-analysis on the part of the authors," as collaborators move from discussion-mode (informal arguments) to document-mode (formal arguments), and vice versa (p. 28).

There is a substantial body of research showing the positive effects of wiki use in e-learning settings. For example, wikis have been found to enhance peer interaction and sharing of knowledge among participants in groups projects (e.g., Augar, Raitman, & Zhou, 2006; Boulos, Maramba, & Wheeler, 2006), to support the co-writing (e.g., TRENtIn, 2009), and to make the group task highly motivating (Wheeler, Yeomans, & Wheeler, 2008) among other benefits. In the past 15 years, wikis have been successfully used to support collaborative production of artifacts and learning resources, project planning in student teams, online debate, peer-review activities, and preparation of ePortfolios (e.g., Augar et al., 2006; Bruns & Humphreys, 2005; Forte & Bruckman, 2006, 2007; Ioannou & Artino, 2008, 2009; Lamb & Johnson, 2007).

Yet, barriers to the implementation of wikis exist. For example, previous studies have discussed issues such as that making a wiki available does not ensure students will work *together* as the functional affordances of the tool for supporting collaborative learning are not always perceived and utilized by the students (e.g., Choy & Ng, 2007; Ioannou & Artino, 2008), users are often reluctant to edit each other's work (e.g., Dalke, Cassidy, Grobstein, & Blank, 2007; Ioannou & Artino, 2009), and for a wiki implementation to be successful, scaffolding and instructor facilitation are required (e.g., Foley & Chang, 2008; Ioannou & Artino, 2009), together with carefully designed learning tasks demanding negotiated meaning and group interdependency (e.g., Bower, Woo, Roberts, & Watters, 2006; Ioannou & Artino, 2009). Despite the considerable adoption of wikis in education, evidence of their benefit as collaborative learning tools is equivocal to date.

Wikis and forums to support collaborative learning present online instructors with opportunities, but they also present several dilemmas. Both come with pros and cons in supporting social constructivist pedagogies and collaborative problem-based activity. Considering their wide adoption, coupled with the inconclusive research evidence, the present study sought to compare them systematically, as learners used them to collaborate virtually on case problems. There are very few experimental studies in the literature comparing these technologies, and when available, these studies compare different groups of learners using either wiki or threaded discussion (e.g., Ioannou, 2011; Ioannou & Artino, 2009; Vasquez & Potter, 2013; Wicks, Ellis, & Lumpe, 2013). The present study is unique in its design, assessing learners' use of *both* technologies (i.e., a within-subjects design) in the context of collaboration on case problems.

2. Method

2.1. Participants

The participants were 34 graduate students in two sections of an online course on learning theories, taught over 16 weeks at a public university in Northeast USA. The participants of Section 1 ($n = 20$) pursued a Master of Arts (MA) in educational technology; 90% of these students were in-service teachers. The participants of Section 2 ($n = 14$) pursued a MA in educational leadership; all of these students were in-service teachers. The complete sample ($n = 34$) included 79% women (21% men) between 22 and 54 years of age ($M = 37$, $SD = 10.8$). Each section was taught by a different instructor; however both instructors used the same procedures for the investigation as well as the same weekly activities and pedagogy throughout the course. Students completed all activities associated with this investigation as part of their class work.

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