4-2013

Case Study of Using a Social Annotation Tool to Support Collaboratively Learning

Fei Gao
Bowling Green State University, gaof@bgsu.edu

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1. Introduction

Web 2.0 technologies, with their affordances of interconnections, content creation and remixing, provide rich opportunities for personally meaningful, collaborative, and socially relevant learning (Greenhow, Robelia, & Hudges, 2009) and offer new possibilities of designing collaborative activities that engage learners in learning (Chai & Tan, 2009; Cress & Kimmerle, 2008; Halic, Lee, Paulus, & Spence, 2010; Redmond & Lock, 2006). Despite the enthusiasm of integrating Web 2.0 technologies into education, researchers found that "the pedagogies, supported by new technologies, that could lead to innovation are not enough known to instructors" (Collis & Moonen, 2008, p. 96).

Recently, the focus of Web 2.0 research has shifted from learner-content interaction to learner-learner interaction, and from the quantity of interaction to the quality of interaction (Woo & Reeves, 2007). In particular, researchers have stressed the importance to understand what learners do with Web 2.0 tools (Greenhow et al., 2009; Reich, Murnane, & Willett, 2012). Understanding how learners behave and interact in these environments is critical to develop appropriate pedagogical strategies to promote student learning in such environments. The purpose of the study, therefore, is to explore how students learn collaboratively with a Web 2.0 social annotation tool – Diigo (www.diigo.com). The findings of the study may offer insights on how to design and facilitate collaborative learning with social annotation tools.

1.1. Computer-supported Collaborative Learning

Computer-supported collaborative learning focuses on "how collaborative learning supported by technology can enhance peer interaction and work in groups, and how collaboration and technology facilitate sharing and distributing of knowledge and expertise among community members" (Lipponen, 2002, p. 72). Grounded in social cognitive theory (Piaget, 1985), social constructivist theory (Vygotsky, 1978) and situated learning theory (Lave & Wenger, 1991), computer supported collaborative learning has been reported to have a number of benefits to student learning, including promoting critical thinking skills, actively involving students in the learning process, and fostering peer modeling of problem solving techniques (Roberts, 2005).

Research on CSCL, however, is far from conclusive. According to Schellens and Valcke (2006), there are inconsistent findings across studies, and the specific weaknesses that account for the non-conclusive results include the following: (a) research instruments are weak operational translations of the theoretical base of CSCL; (b) there is a lack of information on the reliability of the instruments in the research report; and (c) there are limitations in research design, such as restricted number of subjects or short time span of the study, which affects the generalizability of the findings. In addition, emerging technologies such as Web 2.0 constantly reshape the extent and nature of collaboration among learners, which justifies continued research on CSCL.

1.2. Frameworks for Understanding Learning Processes in CSCL

To understand the communication that takes place in CSCL settings, researchers have proposed a variety of frameworks and coding schemes to analyze the conversations among learners (De Wever, Van Keer, Schellens, & Valcke, 2009). A number of coding schemes are based on the framework of social constructivism and collaborative knowledge construction

(Gunawardena, Lowe, & Anderson, 1997; Veerman & Veldhuis-Diermanse, 2001), and are used to identify participants' interactions at various stages of knowledge construction. Some other coding schemes are grounded in such theories as critical thinking (Buraphadeja & Dawson, 2008; Newman, Johnson, Webb, & Cochrane, 1997; Penny & Murphy, 2009), argumentation (Chinn & Anderson, 1998; Chinn, O'Donnell, & Jinks, 2000; Jeong & Joung, 2007; Jonassen & Kim, 2010; Munneke, Andriessen, Kanselaar, & Kirschner, 2007), and cognitive and metacognitive knowledge (Henri, 1992). The current study, which aims at revealing the nature of collaborative learning taking place in the CSCL, develops and uses a coding scheme based on (a) Dillenbourg and Schneider's (1995) eight mechanisms of collaborative learning and (b) the coding scheme developed by Pena-Shaff and Nicholls (2004).

These two specific frameworks were chosen because they captured not only the types of interaction but also the processes of learning occurring in collaborative learning (Pena-Shaff & Nicholls, 2004). According to Dillenbourg and Schneider (1995), the eight mechanisms of collaborative learning are as follows: (a) Conflict or disagreement, which triggers the process of seeking for consensus; (b) Alternative proposal, which broadens learner's understandings; (c) Self explanation, which improves the knowledge of the explainer; (d) Internalization, a process of integrating others' ideas into the learner's knowledge structure; (e) Appropriation, a process of integrate other's action into their own plan; (f) Shared cognitive load, where learners share the cognitive burden and build a joint solution to the problem; (g) Mutual regulation, where learners regulate mutually each other's activities by justifying why they did something; and (h) Social grounding, where learners attempt to repair communication when misunderstanding emerges. In addition, Pena-Shaff and Nicholls (2004) developed an instrument with 11 interaction and meaning construction categories to capture the cognitive processes taking place in collaborative learning environments based on a critique of previous frameworks developed by Henri (1992), Gunawardena, et al. (1997) and others. The full list of categories, which includes *questions*, *reply*, *clarification*, *interpretation, conflict, assertion, consensus building, judgment, reflection, support* and *other*, provides a systematic and meaningful tool to understand how learning takes place in collaborative settings.

1.3. Social Annotation and Collaborative Learning

With a social annotation tool, learners can make text-based annotations on a webpage or a document by highlighting a specific portion of the text and adding a comment. The annotations can be private or shared with a group. Members within the group are able to see and respond to each other's annotations. Social annotation tools, therefore, make it possible for users to discuss and learn a piece of text collaboratively without time and space constraints. Recently, researchers have showed an increasing interest in studying social annotation tools. Various collaborative social annotation tools have been developed (Chen, Hwang, & Wang, 2012; Desmontils, Jacquin, & Simon, 2004; Fu, Ciszek, Marchionini, & Solomon, 2005), and a number of studies have been conducted to understand the usability of social annotation tools as well as their effects on users' motivation, learning and social ability (Nokelainen et al., 2005).

A few researchers are interested in understanding the nature and characteristics of conversation afforded by social annotation tools. For example, when comparing the discussion using a social annotation tool – WebAnn with that in Epost, a typical discussion board system, Brush and colleagues (2002; 2004) found that there was more discussion in WebAnn, and students perceived the discussion in WebAnn more focused and more thoughtful. Davis and Huttenlocher's (1995) study suggested conversations supported by another social annotation tool

called CoNote was much richer as compared to those in a newsgroup, bulletin board or email distribution list. Consistently with these findings, van der Pol et al.'s (2006) study concluded that discussion supported by the social annotation tool referred more frequently to the text, and was more focused and communicatively efficient than discussion in the threaded discussion forum.

Some other researchers are concerned about how the use of social annotations tools affects student learning. Wolfe (2008) suggested that annotations stimulated readers to think through the issues more closely and reflect more thoroughly on their own positions, especially when readers encountered both positive and negative comments on the same segment of text. Hwang and the colleagues (2007) conducted a series of quasi-experiments comparing student learning achievements in different learning activities with or without the social annotation tool – VPen and concluded that students learned significantly better with the support of VPen. Similarly, studies conducted by other researchers (Johnson, Archibald, & Tenenbaum, 2010; Su, Yang, Hwang, & Zhang, 2010) revealed that the students who engaged with the text collaboratively using social annotation tools had a greater improvement in their reading comprehension than those who worked independently on the text with annotation tools.

Overall, researchers found that the majority of users reported a positive attitude toward social annotation (Samuel, Kim, & Johnson, 2011). In Hwang and colleagues' (2007) study, for example, when learners' perceived satisfaction with the annotation system was measured, researchers found that the annotation system increased learners' interest and achievements in learning and improved learner-content interaction. Similarly, Mendenhall & Johnson's (2010) study showed that students had a positive experience in using the social annotation system, and the annotations and tags were considered useful for peer critiques. Researchers also found links between the use of social annotation tools and users' motivation. In Nokelainen and colleagues' (2005) study, the level of students' self-rated motivation had a positive effect on their performance in the social annotation activity and their final grades, suggesting that motivation played an important role in learning with social annotation tools. Another study suggested that using social annotation tools could also promote users' motivation for reading (Razon, Turner, Johnson, Arsal, & Tenenbaum, 2012).

1.4. Research Questions

Though literature suggests the potential of using social annotation tools for learning, rigorous research on the educational effects of social annotation has been limited (Novak, Razzouk, & Johnson, 2012). In addition, most studies on social annotation focus on assessing participants' attitude toward social annotation tools or comparing learning outcomes between groups who used social annotation tools and who did not, few studies have analyzed how students interact with learning materials or with each other in collaborative annotation activities. To design effective learning activities, however, it is important to understand the nature of student interaction in such activities.

The case study was conducted to examine how students learn online materials collaboratively using a Web 2.0 social annotation tool – Diigo (www.diigo.com), because case study provides a systematic approach for researchers to examine a phenomenon of interest in order to describe and explain it (Yin, 2009). By creating a free Diigo account and installing a toolbar, users can highlight text information and add notes on the webpage. The notes and highlights can be shared with a group of people who may add their own notes and replies to previous notes. A more detailed video tutorial of how Diigo works can be found at

http://youtu.be/VHWapAF1Txw. Figure 1 shows Diigo toolbar as well as the highlights and comments students made on the webpage using Diigo.

Figure 1. Diigo toolbar and comments made with Diigo on a webpage

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The major research questions were:

1. How did students participate and interact when learning an online text with the social annotation tool?
2. How did students perceive their experience of using the social annotation tool?

2. Method

2.1. Participants

Participants of the case study were 33 preservice teachers enrolled in two sections of an undergraduate course on educational technology. These preservice teachers represented4 male and 29 female students between the age of 19 and 24 (M = 20.2, SD =1.1). None of them had used any types of social annotation tools prior to this study.

2.2. Settings

This undergraduate course is designed to acquaint pre-service teachers with technology applications commonly used in educational settings. Both sections were taught by the same instructor and followed the same instructional sequence. Students were expected to learn how to use a variety of emerging technologies to develop or enhance classroom instruction. Each week, students learned a few online applications and discussed how those could be used in the classroom. Students also read online articles on issues in technology integration.

2.3. Material and Activity

The activity involved in the study aimed to improve student understandings on how to use Google Forms in educational settings. Students read an online article titled "10 Google Forms for the classroom" (Barret, 2008) for ideas of using Google Forms in K-12 classrooms, and were instructed to use Diigo to make annotations, share annotations with their classmates, and respond to their classmates' annotations during the reading. The online article consists of ten sections, and each section introduces one possible way of using Google forms. For example, the first section, titled "Get to know your class", discusses how to use Google forms to gather student information and use such information to build a relationship with them.

The instructor asked students to focus on two major questions when they were reading the article: "Do you think the ideas mentioned in the article are effective and creative ways of using Google Forms? Why and why not?" and "Does the list of activities make you think of other possible ways of using Google Forms in the classroom?" The activity lasted one week, and all the 33 students were required to post at least one comment and one reply to their classmates' comments with Diigo. Thirteen students in Section 1 formed Group 1, while eighteen students in Section 2 formed Group 2. When they visited the webpage, students could only see and reply to the comments of their own group members.

2.4. Data Collection and Analysis

A week before the implementation of the study, all students learned and practiced how to make collaborative annotations on an online article with Diigo. During the study, students in both groups worked together asynchronously on the online article, "10 Google Forms for the classroom", throughout the week. At the end of the week, they completed a survey on their learning experience. Data including student online comments and student responses to the survey were collected and analyzed to address the research questions.

2.4.1. Participation

All student comments were tallied to determine the participation rates. The length of each comment was counted. In addition, to determine the focus, each comment was coded into one of the four categories: (a) response to a sentence or phrase: a response to a specific sentence or phrase in the text; (b) response to a section: a response to a section of the text; (c) general response: a response to the text as a whole; (d) response to peers: a response to peer comments; and (e) irrelevant: a response that is irrelevant to the text. Two raters coded the comments independently based on the categories. The proportion of agreement was 96.7%, which was higher than the minimum accepted level – 80% (Riffe, Lacy, & Fico, 1998, p. 128). The discrepancies were resolved by discussion.

2.4.2. Topics

The main purpose of the activity was to have students reflect on many ways of using Google Forms suggested in the article and discuss why and why not they were good ideas. To identify the topics covered in the collaborative annotation activity, student comments were analyzed and categorized using the grounded theory approach because it provides systematic means to create and develop analytic codes and categories based on the data not on pre-existing conceptualizations (Charmaz, 2006; Glaser & Strauss, 1967). Altogether, four major topics and six subtopics were identified (see Table 1). A comment may belong to multiple categories or a single category depending on its content. When one comment fit into multiple categories, it was coded into all the suitable categories. Comments that did not fit into any categories were coded as "Others". The two raters coded the comments independently, reaching an agreement of 85.2%. The Cohen's Kappa was .80.

Table 1

Topics Covered in the Collaborative Annotation Activity
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2.4.3. Types of Interaction

A coding scheme was developed to analyze student online annotation and capture the nature of interaction and collaboration in this particular activity. The unit of analysis (Rourke, Anderson, Garrison, & Archer, 2001) was message unit, i.e., a single comment. The development of the coding scheme involved an interactive top-down and bottom-up process (Chi, 1977). An initial set of categories and indicators was developed based on (a) Dillenbourg and Schneider's (1995) eight mechanisms of collaborative learning and (b) the coding scheme proposed by Pena-Shaff and Nicholls (2004). The initial set of categories and indicators was used as a guideline to create the coding scheme. Then, the grounded theory approach was adopted to fine-tune the categories to better describe the present dataset. Two researchers read all the online comments by following a "detailed line-by-line analysis" (Strauss & Corbin, 1998), asking questions about what each sentence was about and comparing it to the previous ones to decide whether it should be given

the same or a different category. The researchers were open to unanticipated categories as they assessed and categorized the data. Reassessments and revisions were made until further analysis did not provide new information or insights. Table 2 presents the coding scheme. Finally, two researchers worked independently coding the comments based on the scheme and the differences were resolved by discussion. The percentage of agreement was 84.4%, and the Cohen's Kappa was .81.

Table 2

Coding Scheme for Types of Interaction

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2.4.4. Student Perceptions

A brief survey was used to understand student perceived learning experience. It consisted of one Likert-question and three open-ended questions. The Likert scale question asked students to provide a general rating on how well the collaborative activity helped them learn the online article. Then the three open-ended questions asked student to explain their ratings and describe in detail the types of learning behaviors Diigo supported or failed to support.

3. Results

3.1. Participation

Students posted altogether 122 comments on the webpage. The average number of comments posted by a student is 3.70, with a standard deviation of 1.08. As suggested by Figure 2, the number of comments posted by students varied from one to six. The majority (69.7%) posted more than four comments, which far exceeded the minimum requirement of two comments.

Figure 2. Frequency of student contributions (n = 33)

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The average length of the comments was 47.6 words with a standard deviation of 23.4. An analysis on the focus of comments revealed that all the comments were relevant to the educational use of Google forms and there was no off-topic comment. In addition, as shown in Table 3, there was only one comment coded as a response to the article as a whole, where the student commented generally on the usefulness of Google forms. The majority of the comments were either responses to a section where a specific way of using Google forms was introduced (62 comments) or responses to the classmates' comments on the use of Google forms (57 comments). These comments were mainly floating notes placed adjacent to each section of the article. Interestingly, only two students used the highlighter function by highlighting and commenting on particular sentences.

Table 3

Focus of student comments (n=122)

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3.2. Content

Student comments were not limited to the two discussion questions raised by the instructor, which were "Do you think the ideas mentioned in the article are effective and creative ways of

using Google Forms? Why and why not?" and "Does the list of activities make you think of other possible ways of using Google Forms in classrooms?" Actually, only five comments directly addressed the second discussion question (see Table 4). Instead, the comments covered a variety of topics, including the educational benefits and challenges of the learning activities recommended by the article, the pros and cons of using Google forms, and suggestions on how to use Google forms in their future classrooms. In particular, students discussed how they themselves or other teachers could implement the activities in classrooms in 32 of the 122 comments, and many wrote about how they could adopt these activities to teach their own subject matters. Comments such as "As a Language Arts teacher, I can use this new strategy to help students create a more tangible feel for the literature..." or "As a future math teacher, I can see this as an efficient way to collect data personally related to the students..." were often observed.

Table 4

Topics identified in student comments (n=122)

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3.3. Types of Interaction

The analysis of types of interaction revealed that about half of the comments (46.72%) were individual self reflection on the article (see Table 5). students were also building upon and elaborating ideas proposed by others (10.66%), recognizing that they learned something new (7.38%), and showing agreement and support (13.93%). In addition, students were actively proposing alternative or complementary views (21.31%). None of the comments, however, was identified as a disagreement.

Table 5

Types of interaction (n=122)

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3.4. Survey Results

As for the Likert-scale survey item, a score ranging -2 to 2 was given based on student ratings of how well Diigo supported them to learn the article, where -2= "not at all", -1= "not very well", 0= "to some extent", 1="quite a lot", 2= "extremely supportive". Table 6 presents the frequency and percentage of student ratings. In general, the majority of students thought Diigo was somewhat supportive (54.5%) or quite supportive (33.3%). Only one student rated it as not supportive (3%). The mean of student ratings is 0.48, and standard deviation is 0.71. A one-sample t-test shows that the mean is significantly higher than 0 ($t = 3.91$, $p < .001$), suggesting that students had a moderately positive attitude towards using Diigo to learn online materials.

Table 6

The frequency and percentage of student ratings on the Diigo-supported learning environment (n=33)

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Several themes emerged from student responses to open-ended questions. First, about half of the students (17 out of 33) commented that Diigo was a useful tool to interact with their

classmates and learn their opinions. One student wrote, “It [the activity supported by Diigo] allowed me to see others’ opinions on the article and posed different ways of looking at the article... I got to see how others felt about the article and compare my opinions with theirs.” A few students also expressed that their opinions had changed after participating in the activity – “Submissions from my classmates opened my eyes to opinions other than my own and provided the opportunity for me to either change my mind or strengthen my own argument.” Second, three students explicitly mentioned the highlighting function of Diigo, seeing it as a useful tool to direct their attention to important issues. A student commented, “With the option of highlighting, leaving sticky notes, and leaving comments on the page you were able to understand what everybody thought was important.” Finally, some students believed that Diigo had made it easy to focus on specific content (“It let us discuss our opinions on the specific subjects within the article.”) and to leave a comment while they were reading (“While reading, if you have any thoughts you can comment right there and then. There’s no need to wait until you finish reading to reflect. Diigo makes the discussion really fun and easy!”). As a result, students tended to read more carefully -- “I had to really read the article to be able to make posts and comment on others' posts.”

Students, however, reported some disadvantages of using Diigo. Six students expressed the concern that it was hard to navigate through the comments when there were many on a single webpage – “The comments piled up and it was hard to see what you wanted to see initially. I had to scroll through comments to find the comment I wanted to see.” In addition, students felt because there were many mini-discussions on specific sections of the text, it is hard to have a holistic view of the text – “Diigo failed to support a holistic group collaboration effort. We were not able to all work together at once because there were numerous discussions that were being had.” Finally, a student mentioned that discussions supported by Diigo could sometimes be distracting – “The little comments can be distracting. They're more interesting to read than the actual article is.”

4. Discussion

In general, students participated actively in this collaborative learning activity, and the majority posted far more comments than required. Research on social annotation supported learning activities generally suggests that students were highly motivated (Hwang et al., 2007; Kawasaki, Sasaki, Yamaguchi, & Yamaguchi, 2008; Nokelainen et al., 2005; Razon et al., 2012; Samuel et al., 2011), and perceived the use of SA tools positively (Kawasaki et al., 2008; Mendenhall, 2010; Nokelainen et al., 2005; Novak et al., 2012), which may explain student active participation in this study. All student comments were relevant to the article, and no digression was observed. Among these comments, about half of them (50.1%) were responses to specific sections of the text, and only one comment was an overall response to the text. Student survey responses echoed the findings, where students felt that the social annotation tool did a good job of directing their attention to specific information in the text, but made it hard to develop a holistic view of the article. This is probably because of two reasons: First, the presence of text throughout the learning activity constantly reminded the students that the text was the central focus, so it is hard for discussion to digress from the text. Second, students made comments on the webpage when they were reading the text. As a result, the comments were targeted at specific sections rather than the text as a whole. The finding is consistent with previous studies that examined the nature of discussion in social annotation environments (Brush, et al., 2002; Gao & Putnam, 2009).

In this activity, students were engaged in a variety of behaviors, including self-reflection (46.7%), elaboration (10.7%), internalization (7.4%), and showing support (13.9%). It is interesting that although students proposed alternative or complementary views in 21.3% of the comments, no comment was identified as showing a disagreement or conflicting view. This may be due to the non-controversial nature of the text. Though few studies on social annotation have examined the processes of interaction and learning during the collaborative activities, the finding is consistent with the previous research on computer-mediated communication, which suggested a low rate of disagreement in online communication (Jeong, 2003).

Furthermore, the analysis of discussion topics revealed that, though each comment was not long (the average length was 47.5 words and the longest comment was 146 words), when considered as a whole, the comments covered a broad range of topics and addressed many important issues of using Google Docs for teaching and learning. It is worth noting, however, the breadth of topics covered in the comments does not necessarily suggest that every student carefully considered the multiple views presented by others. Some students might selectively or randomly read and respond to only a couple of comments, and did not synthesize most of the ideas to develop a comprehensive understanding of the topic. Though a number of students expressed that the activity allowed them to learn from their classmates' opinions and improve their own understanding, how the activity impacted student learning was not systematically assessed. As a result, it is hard to draw a conclusion on how much students learned from the activity.

5. Conclusion

Researchers believed it necessary to examine the effects of emerging CMC tools, such as web 2.0 tools in comparison with the traditional threaded discussion forums in mediating a conversational mode of learning in an online learning community (Ke & Hoadley, 2009, p. 506). This study represents an effort to understand the types of interaction and learning afforded by the social annotation tool – Diigo. The study shows that the social annotation tool supported students to examine and share ideas, and the majority of the students had a positive attitude toward learning with the social annotation tool.

The study, however, has its own limitations. First, the participants were preservice teachers and the majority (87.9%) were female. Research has identified gender-related differences in participation in CSCL (Prinsen, Volman, & Terwel, 2007a, 2007b), suggesting that the proportion of gender may have an impact on the patterns of online group communication. As a result, researchers need to be cautious when generalizing the findings of the study to other settings. Second, as mentioned previously, no assessment was conducted at the end of the activity, so it is uncertain what students learned from the activity. Future research that aims at understanding student learning in collaborative annotation activities should examine the process of learning in combination with the outcome of learning to better understand the links between the two.

In general, the study suggests that social annotation is an effective way to engage learners in collaborative reading activities, where students highlight and discuss important issues in the reading, share different opinions and learn from others' perspectives. The study also has pedagogical implications for designing future collaborative annotation activities. First, the findings of the study revealed that traditional ways of scaffolding discussion might not work in this new collaborative environment. In this study, the instructor attempted to scaffold the

discussion by providing two general questions, which is a common practice to encourage discussion in threaded forums. It turned out, however, that only two students addressed the second discussion question raised by the instructor. This was not surprising because students were focused on the text instead of the questions when they made comments with the social annotation tool. To provide scaffolds more effectively, instructors may consider embedding questions and notes within the relevant section of the text (which can be achieved by adding notes to the text) so as to direct student attention to important issues in a timely manner. Second, participating in collaborative annotation activities may expose students to a variety of ideas and perspectives. Sharing ideas, however, is not enough. To help students develop a holistic understanding, a synthesis activity that allow students to reflect on, synthesize and internalize what they have learned from the reading and discussion can be incorporated. Depending on the content of the reading, the types of synthesis activity can vary from writing a summary post to drafting an action plan based on what they have learned.

The study identified a few potential problems in using the social annotation tool. First, students found it a little hard to navigate through the comments, especially when there was a high volume of comments. Some students felt that the mini-discussions could distract them from reading the text. As a result, there is a need to develop new social annotation tools that offer learners multiple ways to organize the comments. For example, providing tags could alleviate cognitive overloads (Huang, Huang, & Yu, 2011) and help readers identify and organize the comments. Incorporating a rating system with which readers could rate or recommend the comments would direct their attention to valuable comments (Hewitt & Brett, 2011). Second, based on the findings of the study, social annotation tool may not be an ideal tool for students to synthesize ideas or discuss general issues. Given the availability of varied online communication environments, such as threaded discussion forum, blogs, wikis and so on, future research needs to identify what types of learning tasks are best supported by social annotation tools, or how social annotation tools can be used in combination with other tools to support different stages or types of learning.

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Table 1

Topics Covered in the Collaborative Annotation Activity

Topics	Examples
A. Educational benefits and challenges of the learning activities	A1. Benefits: "I agree! I think it is a waste of time to review something that the students already have a grasp on, or review too much. This will not only save time for the teacher, but it will also give the student an idea of how much they really understood the lesson." A2. Challenges: "While I think this is a great way to get student feedback on the books they have read, this could also pose potential problems. Students who read other students' comments could avoid reading a book because several students gave a book a bad review."
B. Pros and cons of using Google Forms to support the learning activities	B1. Pros: "I really like the idea of using Google Forms to get to know your students. Their personal information would be well-organized, simple to keep track of, and a quick way to gather a lot of information in an instant." B2. Cons: "I wouldn't use this for a spelling test either. #1 Technical difficulties. I can just see it now: 'Miss Engelhardt! I messed it up! How do I go back?' etc. #2 Practicing writing is important, and I don't think students should be typing out spelling tests. Spelling and writing go together in middle school."
C. Plans and caveats of implementing these learning activities in classrooms	C1. Plans: "The first reason why I like this is because it can be done before school starts. I can post this on my classroom webpage and sent a letter out to my students asking them to complete it. Now that I have all the information about my students that I want, I can study it and get to know some interesting things about my class before it even starts..." (S18a) C2. Caveats: "For my major (Spanish) I could use this for new vocabulary tests as well. Some of the things you have to consider when placing students on computers while taking an assessment are their competence and also their ability to

	cheat. I know for Spanish classes you need to use ALT codes to type accents, or else the spelling is wrong. My students should know how to use them. They should also be monitored when taking vocabulary tests because of the many translators available online."
D. New ways of using Google Forms in classrooms	"I agree with what everyone has said so far, but I think it's also important to point out that this could be used for older students too. This tool could be used for a vocabulary test rather than a spelling test. This could be applied to any subject area."
E. Others	"Yes, it is a very good way to prepare students for going to an actual library."

Table 2

Coding Scheme for Types of Interaction

Categories	Behaviors	Examples
Self Reflection	Learners reflect on and interpret what they have learned from the text	"I love the idea of a survey for a book review! It is a quick and easy way to get immediate feedback about books and choose future materials catered to your students' interests..."
Elaboration/ Clarification	Learners build upon an existing comment by adding supporting examples and justification	"I would agree with you both just thinking of my own experiences when a teacher would review something and I would look around and there would only be like 3 students that were paying attention because everyone else knew what they were talking about."
Alternative/ Complementary Proposal	Learners offer a complementary or alternative view	"While I think this is a great way to get student feedback on the books they have read, this could also pose potential problems. Students who read other students' comments could avoid reading a book because several students gave a book a bad review..."
Internalization/ Appropriation	Learners paraphrase the concepts/ideas presented by their classmates or acknowledge learning something new	"I agree with all of the above, each student is at a different level in the classroom. Review can be helpful but only to some in the classroom, others zone out because they already know the material. This is a great idea to avoid this."
Conflict/ Disagreement	Learners show disagreement or conflicting opinions	None

Support	Learners express agreement without further explanation, establish rapport, or share feelings	"I agree I didn't think that this would be a good way to use the form in the classroom."

Table 3

Focus of student comments (n=122)

Focus	Number	Percentage
Response to a sentence or a phrase	2	1.64
Response to a section	62	50.82
Response to peers	57	46.72
General response	1	0.82
Irrelevant response	0	0.00
Total	122	100.00

Table 4

Topics identified in student comments (n=122)

Topic		Number	Percentage (%)
A. The educational benefits and challenges of the activities	A1. Benefits	22	18.03
	A2. Challenges	1	0.82
B. The pros and cons of using Google Forms to support the activities	B1. Pros	35	28.69
	B2. Cons	6	4.92
C. Plans and caveats of implementing these activities in classrooms	C1. Plans	18	14.75
	C2. Caveats	14	11.48
D. New ways of using Google Forms in classrooms		5	4.10
E. Others		28	22.95

Table 5

Types of interaction (n=122)

Type	Number	Percentage (%)
Self Reflection	57	46.72
Elaboration/Clarification	13	10.66
Alternative/Complementary Proposal	26	21.31
Internalization/ Appropriation	9	7.38
Conflict/Disagreement	0	0.00
Support	17	13.93
Total	122	100.00

Table 6

The frequency and percentage of student ratings on the Diigo-supported learning environment (n=33)

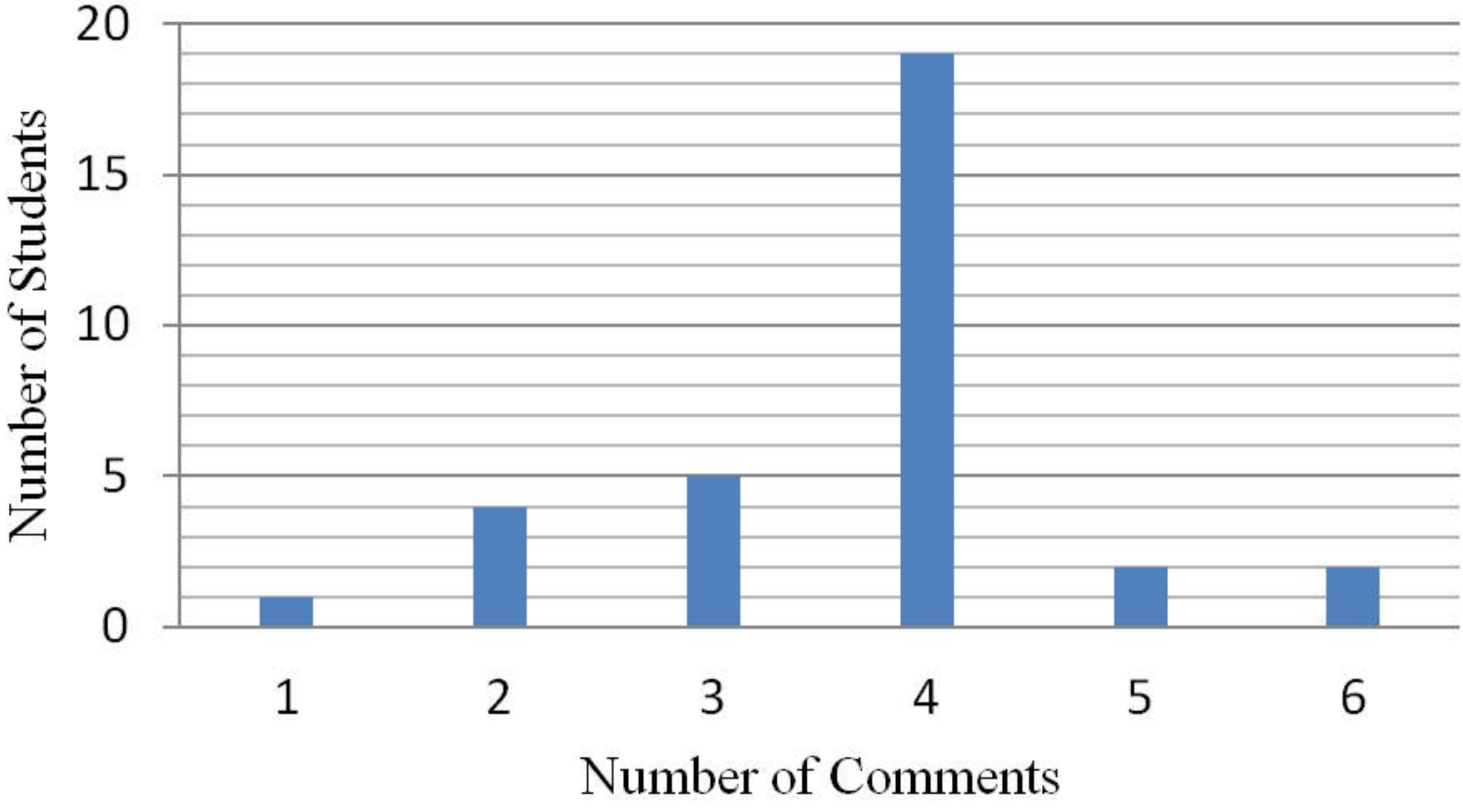
Student Ratings	Frequency	Percentage (%)
-2	0	0.0
-1	1	3.0
0	18	54.5
1	11	33.3
2	3	9.1
Total	33	100.0

5) Weekly reading record

1 children in our school have a reading diary that they use to record information about times that they read during the week. 1 They take it home as well as using it at school. A form could be created 3 by the children as a place to enter data about their reading. I hear "I haven't got my reading diary," so many times during the year, this way they have no excuses and can access it from any computer. Alternatively a class form could also be setup to gather together everyone's record 2 your own copy. 3

6) Maths data handling

Perhaps the easiest to pick up and run with, the idea of using a form to gather together maths data handling information. The form could be a simple way of collecting information about the class – shoe size, eye colour etc. It is obviously about what you do with the data that counts but their is no reason why children couldn't design and implement their own forms – with the attached spreadsheet for analysis – as part of independent data investigations. Get your own copy.


20
15
10
5
0
Number of Students
1
2
3
4
5
6
Number of Comments