

Analysis of student engagement and critical thinking skills in digital annotation-assisted collaborative reading activities

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Abstract

This research is conducted to describe how digital social annotation media engages students and develops their critical thinking skills in collaborative reading activities. The research used a qualitative approach with a case study design, in which participants were fifth-semester college students. The data were collected through observations and reflections on students' digital annotations via online platforms, such as Google Docs. The results show that digital annotation-based collaborative reading engages students along behavioural, cognitive, and affective dimensions. Students evidenced active construction, information searching to support their ideas and deeper understanding. Further, the integrated use of the QAR strategy during collaborative reading pushed students to be more critical in analysing, evaluating, and reflecting upon the text. These findings indicate that, with the various advantages offered, digital annotation tools may provide a favourable potential to enhance student active engagement and support the development of critical thinking skills in collaborative learning environments. The current study underlines the integration of technology-driven approaches into curriculum design and further research on digital tools for the enhancement of critical thinking.

Keywords

Collaborative reading, Digital annotation, Critical thinking

Introduction

The PISA 2022 results indicate a worrying trend in Indonesia's reading proficiency. Only 25% of students in Indonesia reached Level 2 or higher in reading, compared to the OECD average of 74%. This highlights a significant gap in reading comprehension abilities. Since 2018, it has been shown that Indonesian students' critical thinking skills are lagging behind those of neighbouring countries, placing Indonesia in the low-performance quadrant [1]. This proves that the students have low critical thinking skills which can

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impact their academic success and future opportunities. Without the skill, they will not be able to read and make better decisions to solve real-life problems and demonstrate their competence and expertise. Therefore, Indonesia's literacy crisis has become a top priority for education policymakers in recent years.

In the 21st century, critical thinking has become increasingly prominent in language education [2][3]. This emphasis on critical thinking strengthens language learning by going beyond traditional language skills and rote memory [4]. However, despite its importance, critical thinking strategies are not consistently taught in educational settings, which contributes to the challenges many students face today [5]. To address this gap, equipping students with critical thinking skills requires the implementation of effective strategies and tools. One such method is collaborative reading, where students read a text together, engage in discussions to understand the message, ask questions, and share interpretations.

Collaborative reading activities offer numerous benefits in terms of students' critical thinking ability. Through this activity, students can understand the text more easily by asking each other about difficult concepts. They become more engaged in the reading process compared to reading alone. Collaborative reading also hones critical thinking skills by exchanging perspectives and evaluating arguments with supporting evidence. Additionally, students can improve their communication skills and self-confidence.

Research conducted by Roshesine & Chapman demonstrates that collaborative reading strategies enhance students' reading skills and promote their ability to ask questions related to the text's content [6]. Collaborative reading also fosters critical thinking among students, as demonstrated in multiple studies [7][8]. Furthermore, collaborative reading has been found to help students become meticulous readers who can evaluate the credibility and reliability of information in a text [9].

Conducting this activity through digital media can make it more engaging and effortless for students, especially since today's younger generation heavily relies on technology. It helps students become more actively engaged in the reading process and develop critical thinking skills. This collaborative approach, assisted by digital social annotation media, can lead to positive actions and outcomes in the classroom. Through this media, students can exchange opinions and ideas about the text they are reading, providing written comments online on the page.

Digital annotation is being used more and more by academics for extensive and intensive reading activities because of its proven ability to support the learning process. Johnson and Tenenbaum's study demonstrated that the use of digital annotation significantly improves reading and critical thinking skills [10]. This media motivates students to participate actively in learning and collaborate effectively [11].

Despite some of the benefits of digital annotation-assisted collaborative reading, some studies have also shown that the use of digital annotations for collaborative reading activities has some disadvantages. According to Kalir et al, digital annotations have been

found to enhance students' reading skills, despite the potential for interrupting the reading process and overwhelming students with information [11]. Furthermore, another disadvantage is that it can make students less capable of independent thinking or active engagement and too dependent on group thinking [12].

Nonetheless, Digital annotation media, and collaborative reading strategies have great potential to encourage students to actively engage and think critically. Proper and clear instructional design is key to overcoming any weaknesses associated with using these methods. Therefore, this study aims to examine the extent to which students can be actively involved in collaborative reading activities through digital social annotation media and the extent to which collaborative reading assisted by digital social annotation media helps students to think critically.

Method

This paper utilizes a case study design for qualitative research, a design that is primarily recognized for its ability to facilitate an in-depth analysis of a case that can offer valuable insights into an issue or phenomenon. To this end, the present study concentrates on the implementation of collaborative reading strategies and digital annotations as a means to observe the phenomenon of student engagement in learning and their critical thinking skills. This research design is appropriate because it comprehensively examines the case. The data collected for this non-numerical research includes how students engage and think critically while learning through collaborative reading activities with the aid of digital annotations.

This study involved 5th semester students in English Education who were selected through purposive sampling based on their reading interest. The participants were chosen based on their level of reading interest, with four students having the lowest level and another four having the highest level. This method of participant selection was employed because it enabled the researcher to choose participants based on specific characteristics that were relevant to the research question and provided detailed data, allowing for broader application of the conclusions. The research was conducted at Singaperbangsa University of Karawang, Faculty of Teacher Training and Education, English Language Education Study Program.

This study employed three data collection techniques: observation, reflection, and indirect observation of digital data in the form of annotations provided by students on digital annotation applications. The observation was conducted in two ways: direct observation during collaboration and discussion activities, and indirect observation through digital data. The method of interview used was in-depth interviews. Moreover, participants completed a reflection sheet to provide further insight into their experience, particularly regarding their involvement in the learning process and their critical thinking skills.

The data analysis technique used in this study refers to the stages of data analysis initiated by Miles and Huberman [13], which consists of: 1) data reduction to sort out qualitative data to find patterns and themes relevant to the research questions; 2) data display, which aims to get an overview of the data obtained so that it is easier to see patterns and themes; and 3) inference to ensure that the data obtained is accurate and meaningful so that it can answer the research questions.

Results

As stated above, the purpose of this study is to describe the extent to which students are engaged in collaborative reading activities through digital annotation and the extent to which collaborative reading supported by digital social annotation media helps students develop critical thinking skills. In this section, the findings are divided into two parts, student engagement and critical thinking skills.

Students' Engagement

From the findings, students' engagement in collaborative reading activities can be grouped into three aspects, namely: behavioral aspects, cognitive aspects, and emotional aspects.

1. Students' behavioral engagement in collaborative reading

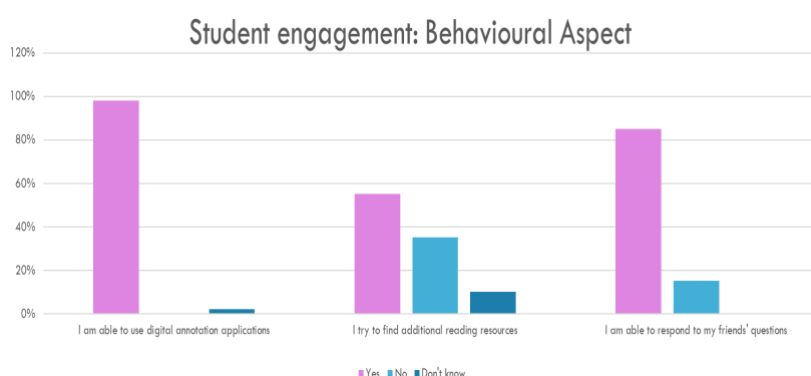


Figure 1. Student engagement: behavioural aspect

Figure 1 shows that the digital annotation application, which in this study is Google Docs, has become a familiar medium for most students. Almost all of the students were able to use various features of the application for collaborative reading activities. However, there is something interesting that we can see from the above data, which is that even though almost all students are familiar with digital annotation applications, there are still about 15% of the participants who are unable to respond to questions from friends or lecturers. Thus, it can be concluded that technical knowledge does not necessarily lead someone to actively contribute to reading activities using digital applications. This may be due to feelings of doubt and fear of being wrong when giving answers, as one respondent explained:

Respondent 1: *"I feel sometimes a little confused about what the text we are reading means."*

Another interesting finding is that more than 50% of respondents look for additional information to support their arguments when answering questions or to contribute to the overall discussion. This is already an indication that respondents are starting to become active readers, as can be seen in the Figure 2.

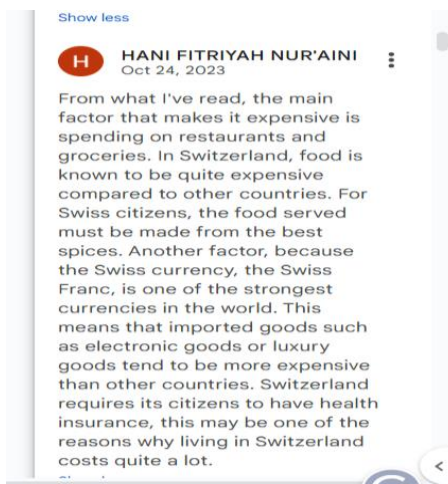


Figure 2. Student's annotation

One of the texts used in collaborative reading with digital annotation focused on tourism, specifically a travel blog where the author shared her experience visiting Switzerland. The blog highlighted the challenges of budget travelling in Switzerland, given that it is one of the most expensive countries to visit. When students were asked to explain why Switzerland is considered expensive for travel and living, one student provided an insightful response, as shown in the image above. This response demonstrated that the student not only summarized the text but also conducted additional research to explore reasons beyond the text. While the blog did not explicitly state these reasons, the student inferred and supplemented their understanding by finding external information. For example, the student likely considered factors like Switzerland's high cost of living and strong currency.

2. Students' cognitive aspects in collaborative reading activities

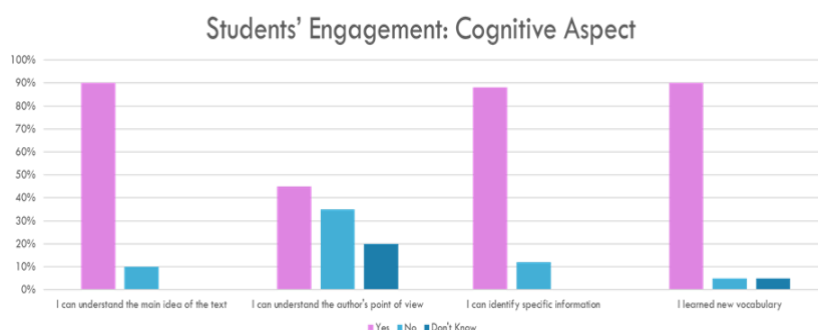


Figure 3. Students' engagement: cognitive aspect

Base on Figure 3, it can be seen that most of the respondents were able to master 3 key aspects of reading skills when they performed collaborative reading activities with digital annotations, namely, being able to understand the main idea of the reading text,

being able to identify specific information, and acquiring and mastering new vocabulary. As seen in one respondent's statement:

Respondent 2: *"I could understand the sentence patterns intended by the author, during the learning process I was introduced to many standard sentences as well as broader knowledge. I got the opportunity to see the point of view from a broader perspective, I was able to observe, digest, and also solve problems, especially assignments in this context."*

This statement aligns with the student's annotation, which demonstrates their understanding of the main topic discussed in the text. As shown in the following image:

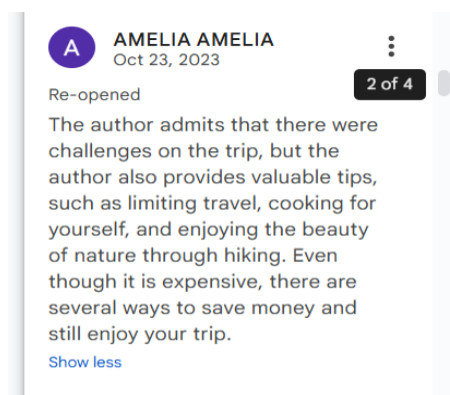


Figure 4. Student annotation

Figure 4 shows the student's annotation addressing the writer's motivation. In reading comprehension, answering such questions requires students to infer and grasp the main idea of the text.

The ability to identify the main idea and make inferences is considered a high-level reading skill. Collaborative reading activities, particularly when supported by digital annotation tools, have been shown to positively influence students' cognitive development in this area. However, this study revealed that less than half of the respondents were able to fully understand the author's perspective. This difficulty may stem from the challenge of interpreting implicit meanings, a skill that remains complex for many students.

3. Emotional aspects of students in collaborative reading activities

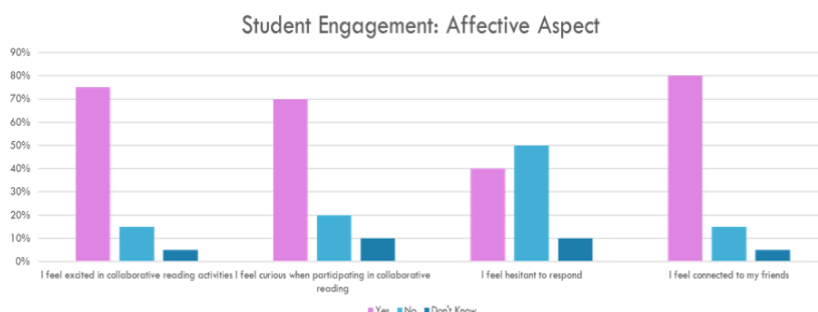


Figure 5. Student engagement: Affective aspect

Figure 5 shows that most respondents had positive feelings when they engaged in collaborative reading activities using digital annotation. They felt excited, their curiosity

increased, and they felt connected to their peers. Upon reflection, there are several factors that are the reasons for these positive feelings.

Respondent 3: *"I feel comfortable participating in this activity, especially since there is no pressure and I was given enough time to read well. I feel more enthusiastic about reading and understanding a text."*

The above quote suggests that to enhance the pleasure of reading, students should be given sufficient time and not be rushed, as reading requires concentration. When students feel at ease while reading, they are more likely to enjoy it and continue doing so. However, a small number of respondents still expressed negative emotions, such as hesitation or anxiety, due to their fear of being wrong. This is evident in the reflection excerpt below:

Respondent 4: *"I felt quite motivated when I saw my group mates giving answers in the comment section. It made me immediately answer based on what I understood. But on the other hand, I also felt hesitant about the answers I had given in the comment section."*

According to the above quotation, collaborative reading activities have the potential to motivate students to engage more actively in reading. Despite this, some respondents have expressed doubt and fear of being wrong.

Students' Critical Thinking Skills

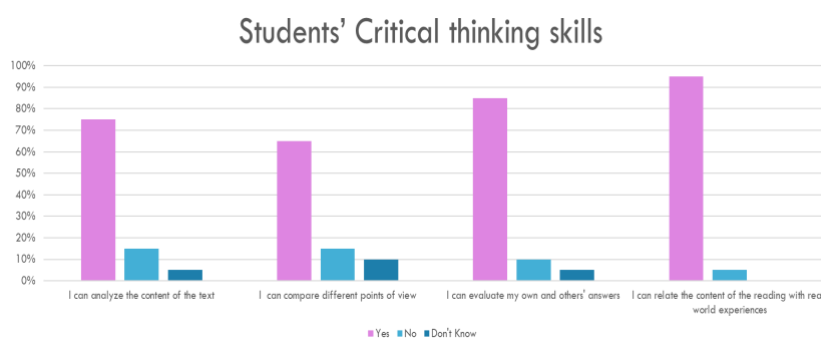


Figure 6. Student critical thinking skills

Figure 6 is evident that the majority of respondents demonstrated proficiency in all four types of critical thinking skills. This can be attributed to the implementation of collaborative reading activities, which utilize the QAR (Question Answer Relationship) reading strategy statement format to facilitate discussion and enhance comprehension. This approach involves four types of questions that should be considered when reading the text: analyzing and identifying specific information, comparing one's own opinion with the writer's point of view, connecting the content of the reading with the reader's experience in the real world, and reflecting on the reading. By answering these questions, respondents can improve their critical reading and thinking abilities, ultimately becoming more skilled in critical thinking. As one respondent noted in their reflection, this approach has helped them to develop their critical thinking skills.

Respondent 5: *"I was quite excited to answer the questions but also became a little hesitant when I saw other friends' answers when there were differences with the*

answers I found. From there, I got curious about why they could answer like that and started looking for other sources to read. "

This excerpt demonstrates how collaborative reading activities with digital annotation can effectively promote critical thinking, as evidenced by the respondent's ability to evaluate her perspective after comparing it to her group's responses. In addition, this activity motivates students to seek out additional sources of reference which means that students can develop critical thinking skills by evaluating multiple perspectives and seeking supporting evidence to construct a strong argument as can be seen in Figure 7.

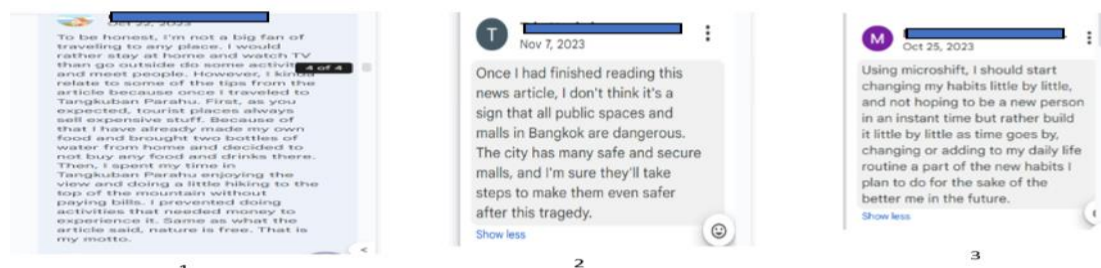


Figure 7. Student annotation

Figure 7 illustrate different aspects of critical thinking: the first one allowed the student to connect by generalizing budget travel tips from a text to broader contexts; the second one focused on reasoning and perspective-taking-in an objective manner, a student assessed a mass shooting event without making a generalization but sought more information in order to make a balanced view. The third is reflective thinking. A student reflects on one's personal shortcomings and ways to improve them using insights from The Mountain Is You. This shows metacognitive awareness and the ability to apply knowledge for personal growth. The annotations made by the students illustrate the multi-dimensional nature of critical thinking, which includes analysis, evaluation, application, and reflection. These depict the QAR strategy using digital annotation can be applied to encourage critical thinking through collaborative reading.

Discussion

The findings on student engagement align with previous research emphasizing the potential of digital tools to enhance collaborative learning. For instance, Johnson and Tenenbaum [10] found that digital annotation tools significantly improve student participation and interaction, which was evident in this study as most students actively engaged with texts and peers using Google Docs. However, about 15% struggled with hesitation or fear of mistakes, reflecting Kalir et al.'s [11] observation that digital annotations can overwhelm some students, highlighting the need for strategies to address emotional barriers.

Cognitively, the results support Rosenshine and Chapman [6], showing that collaborative reading improves comprehension and vocabulary acquisition. Students proficiently identified main ideas and enriched their vocabulary, suggesting digital annotations scaffold understanding and make reading more interactive. Positive

emotional engagement, such as excitement and curiosity, mirrors findings by Luo et al. [12], who noted that digital tools foster community and collaborative spirit, with flexibility in timing enabling deeper engagement, as Zhu et al. [14] also reported.

However, while collaborative digital annotation can foster a positive learning environment, it may also create pressure for some students. Kalir et al. [11] pointed out that digital annotations can introduce a sense of peer scrutiny, leading students to feel hesitant about contributing their ideas publicly. This aligns with the small number of students in this study who expressed feelings of anxiety or doubt in their responses. Addressing these emotional challenges is essential for ensuring that students fully benefit from collaborative reading activities.

Critical thinking development also aligned with Johnson and Tenenbaum [10], as students analysed texts and connected them to real-world experiences using the Question Answer Relationship (QAR) strategy. Chen et al. [8] similarly noted that web-based annotations encourage deeper engagement by fostering inquiry and evidence evaluation. However, some students hesitated to share differing opinions, echoing Luo et al. [12], emphasizing the importance of valuing diverse perspectives in collaborative settings.

Overall, while this study reaffirms the benefits of digital annotation tools for engagement and critical thinking, it also highlights the emotional challenges, such as anxiety and fear of judgment, which need to be addressed to optimize collaborative learning environments.

Conclusion

In conclusion, this study demonstrates that digital annotation-assisted collaborative reading activities can engage students and support the development of critical thinking across behavioural, cognitive, and emotional dimensions. While many students actively participated and benefited from the collaborative process, challenges such as hesitation due to fear of making mistakes were also observed. The implementation of collaborative reading using digital annotation is potentially beneficial in fostering engagement and critical thinking, though a comprehensive instructional design is necessary to address barriers and support all students in the learning process.

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