

## **Engagement in Digital Social Reading: Use and Perspectives**

Joy Egbert, PhD  
Washington State University, Pullman  
[jegbert@wsu.edu](mailto:jegbert@wsu.edu)

Ali Asiri  
Washington State University, Pullman  
[ali.asiri@wsu.edu](mailto:ali.asiri@wsu.edu)

Naeima ElKialani  
Washington State University, Pullman  
[naeima.elkialani@wsu.edu](mailto:naeima.elkialani@wsu.edu)

### **Abstract**

Digital social reading (DSR) use can support student interaction with and around academic texts. DSR applications also provide affordances that can move individual reading to a more participatory event, facilitating task engagement. Given the central role of both reading and task engagement to learning in higher education, learners' engagement in DSR use warrants attention by educators at this level. Therefore, this article employs an action-research case study framework to explore the constructs of both DSR and task engagement with student-participants in 3 graduate courses across one academic year. Data include both analytic and descriptive data, with a focus on student voice. Findings include action guidelines and implications for future research.

### **Keywords**

Engagement, graduate students, social interaction, digital reading, case study

Most teachers have probably at some time used a type of social reading as an instructional strategy. In the past, activities such as “round robin reading” and shared reading were popular forms of social reading. During such tasks, the “social” aspect was generally that students talked about the reading with the teacher or listened to others read. More recently, however, digital social reading (DSR) applications (apps) have provided a different variety of affordances for interacting around and with texts, which means that social reading can have a distinctively different character and can be implemented in profoundly different ways than in the past (Alber & Miller, 2012). According to Zhu et al. (2020), social reading still emphasizes “group sensemaking, knowledge construction, and community building” (p. 262), but DSR use also provides opportunities for a wider array of reading content, diverse types and amounts of participation in reading events, and a transformation of reading as an individual endeavor into a shared one. Although the body of research around DSR use to date is not large, it has produced mostly positive results in regard to students’ achievement with DSR use (see, for example, Cao, 2017; Yang et al, 2011; Yeh et al, 2017).

One reason for student success with DSR use is that it may help students experience a greater degree of task engagement in their reading. Given the central role of both reading and task engagement to learning in higher education, learners’ engagement in DSR use warrants attention by educators at this level. Therefore, the purpose of this article is to explore the engagement of graduate students in DSR use in higher education classrooms. In this article, we first review the constructs of DSR and task engagement. We next explain the methodology for this classroom-based action research study, followed by a presentation of the study’s findings and interpretations. We end by discussing lessons learned and guidelines for future DSR use. This study heeds the call of Zhu et al. (2020) and others to evaluate different aspects of DSR use.

In doing so, it fills a gap in the research around both task engagement and DSR in higher education, and it provides an example of action research at this level.

### **Literature Review**

As DSR becomes more popular and free apps become easily accessible, more research is being conducted. In this section, we review the literature around DSR by first defining and exemplifying the term. We then address the extant research and link DSR use to task engagement. Finally, we develop research questions around both our classroom-based issues and gaps in the literature that leave those issues unaddressed.

### **DSR Definitions and Examples**

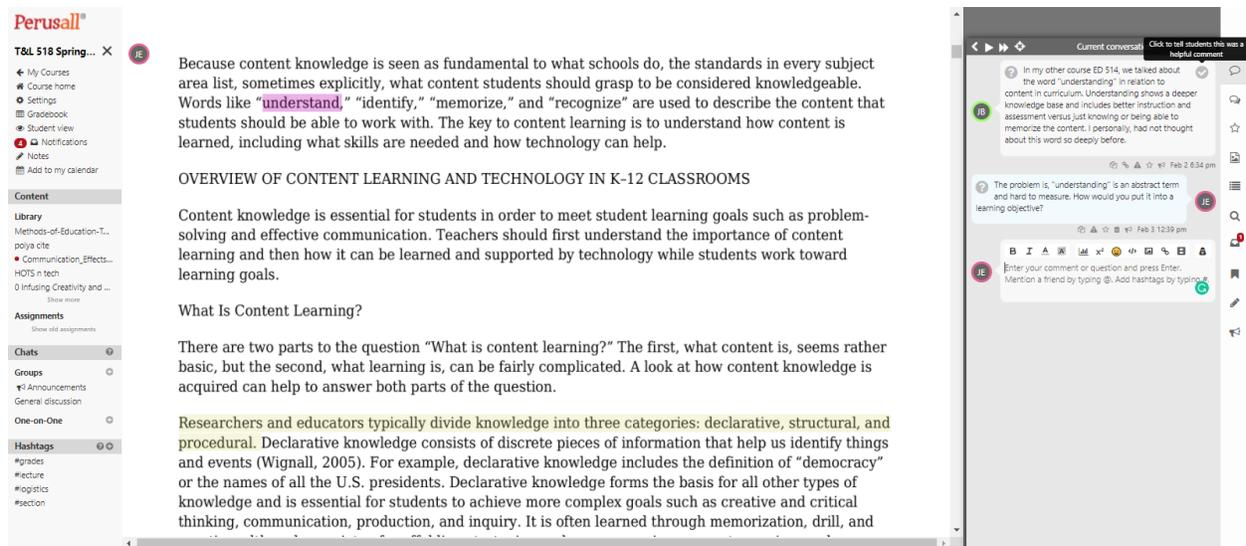
Digital social reading is, “a form of collective reading of digital texts and communication in reader-centred communities in digital networks” (Kutzner et al, n.p.). Blyth (2014) defines it as “the act of sharing one’s thoughts about a text with the help of tools such as social media networks and collaborative annotation” (p. 205); he adds that DSR should be considered a part of a participatory culture that moves the solitariness of print reading into a more social practice. DSR use can be public, through the use of a website such as Goodreads ([www.goodreads.com](http://www.goodreads.com)), or it can be set for a private group (such as a class) in other apps. In classrooms, depending on the affordances of specific DSR applications, learners can access text synchronously or asynchronously and interact in the margins of those texts.

Although different DSR applications have different affordances, in general they can be used with any digital text, including webpages, .pdfs., and MS Word documents. This means that the focal text can be anything from a chapter in an Open Educational Resource (OER) textbook to a podcast or a graph. DSR apps also can be accessed across or integrated with a variety of technologies, from web browsers and Google Docs to learning management systems like Canvas.

Figure 1 shows a screenshot of the DSR app Perusall integrated within the Canvas learning management system ([www.instructure.com](http://www.instructure.com)).

**Figure 1**

*Perusall in the Canvas LMS*



*Note:* On the left in this figure is a list of all the articles in Perusall for this class and a menu of options. In the center is the reading with student highlights. On the right is the comment box, with two comments in the highlighted item and an annotation menu.

As Egbert and Shahrokni (2021) note, typically, “DSR apps afford students the opportunity to read the content, select parts of the content, and annotate the selected parts. In some apps, the annotations can further be tagged, grouped, highlighted, searched, and filtered” (n.p.). Some apps allow only text-based annotating, while others include multimedia tools such as audio, video, text, and/or images. In some DSR apps, users can reply to comments in threads, making the interaction more focused. Further, some apps have preset types of comments, while others allow users to comment at any length (see Egbert & Shahrokni [2021] for a list of many DSR apps, and Blyth [2014] for a list of affordances of some DSR apps).

Because DSR apps are content-free until a text is chosen, there are many ways to use DSR applications and a variety of possible benefits. For example, Blyth (2014) supports the implementation of Hayle's (2012) 3 types of digital reading: close, hyper, and machine; however, Blyth also notes that when teachers assign these types of reading, they need to be aware of the affordances of each type. In addition, Zhu et al. (2020) state that the main classroom uses of DSR include processing content, supporting thinking, using skills such as argument and inquiry, improving reading comprehension and literacy competences, assisting with instruction and peer-to-peer evaluation, and relating different digital environments. In addition, Egbert and Shahrokni (2021) note that learners can participate in DSR to

critique literary texts, highlight important points, ask questions, express opinions, summarize, connect to external sources, link text to their own lives, consider other viewpoints, read critically, say what they do not understand, collect vocabulary, save instances of grammar for practice, organize ideas, predict, clarify, and interact with peers, teachers, and others...focus on both language and content, write text reviews, rate texts on a variety of criteria, mark up stories according to plot/ characters/ setting, and so on.  
(n.p.)

More specifically, using DSR, students might read different texts in small groups to share or all read and comment on one text, depending on the course goals. In another case, the teacher might annotate the text first and then have students compare the teacher and student annotations; the teacher may also choose to stay out of the DSR process completely. Further, language students might read in the target language and then annotate in their first language, while others can be encouraged to express their cultural experiences regarding the text content. Another task could have students read synchronously in class to pick out the main ideas and important

vocabulary of specific paragraphs to discuss and then read more deeply and annotate outside of class.

Most of the literature on DSR states that its use should be focused so that learners know what type of comments to make (e.g., experiential, factual, encouraging), how many comments to make (if there is a minimum or maximum), and when they should make them. In addition, the DSR literature notes that teachers can design DSR tasks to work from and take advantage of the ways that students already use digital tools. Of note, across the literature can be found the caution that, as with any classroom task, DSR tasks require planning and reflection to ensure that they meet the goals for which they were developed.

### **Research on DSR Use**

According to Blyth (2014), reading research provides plenty of evidence that note-taking and marking up texts improves comprehension, and it also shows clearly that collaborative digital reading can help students to use strategies such as “predicting content, identifying problems, getting the gist, and synthesizing textual parts into a whole” (p. 212). Many studies exist concerning reading on digital platforms in general (e.g., Amiana & Mayor, 2017; Gil-Flores et al., 2012; Ortlieb et al., 2014), and others of print-based social reading such as book clubs, reader response tasks, and academic classroom reading discussion (e.g., Allington & Swann, 2009; Zhang et al., 2021). There are some studies of social reading on social media platforms around chosen texts, e.g., WeChat Reads (Pianzola et al., 2020), Twitter (Pianzola et al., 2021) and GoodReads (Vlieghe et al, 2016). For example, Li et al. (2021) focused on the relationships among interactivity, social presence, and user satisfaction as a result of DSR use. In this quasi-experimental study, the researchers surveyed 377 random participants who used the WeChat Read platform for DSR. The study found social presence to be key to user satisfaction in

DSR, and more important, that the focus should be on interacting with the text more than interacting directly with peers.

In another study, Zhang et al. (2021) conducted a diary study with 14 volunteer Chinese participants recruited randomly from social networks who read different types of media online. As a result of interviews and diary entries, the researchers built a “Social Reading Journey Model” and concluded that the technology affordances can have an impact on how DSR is conducted and perceived. While their analysis is useful for educators in determining how and why students use DSR outside of class, how this evidence transfers to classroom uses of DSR is as of yet unclear.

In fact, the research on DSR in classrooms is still relatively new. Higher education environments in which DSR has been explored include studies of second language DSR use (e.g., Blyth, 2014; Solmaz, 2021; Thoms & Poole, 2018; Zapata & Mesa-Morales, 2018). There is also a small number of studies of teacher education/professional development (Michelson & Dupuy, 2018; Vlieghe et al., 2016) and online classes (Zhu et al., 2020). However, few if any of these studies address graduate students in regular classes. One study that does so is Vasinda (2020), who conducted a study with 12 graduate student in-service teachers who formed a cohort for their literacy specialist degrees. In groups of three to five, the students chose texts from a curated set. Students were trained and then held responsible for facilitating group study around the shared readings; they set up meeting times, found additional resources, and supported the one-hour sessions. Data sources included observations and reflections, in addition to DSR (Hypothes.is) data. The study found that short texts worked better and that the private DSR work helped the participants to sustain a focus on the course topic. Overall, the study provided evidence that DSR use can start lasting conversations and assist in the construction of

knowledge; however, in this study the DSR was set up with specific structures that may not be used in other contexts, and therefore studies in other contexts may find different results.

Overall, the extant research suggests that how DSR is used is the main factor in how it is perceived by both teachers and students and what / whether students learn from its use. For example, Blyth (2014) provides evidence that groups of 2-4 students are optimal. Further, the literature suggests that follow-up class discussion is crucial. Studies also show that students are more interested in the readings and more likely to do them if they are collaborating and the tool is easy to use (Chang & Hsu, 2011). The current study confirms these guidelines in addition to supplementing them.

### **Benefits and Challenges of DSR Use**

According to the DSR literature, benefits of DSR use can include being able to conceptualize in new ways, being able to quickly sort information based on others' marginal annotations, and support for comprehension. Solmaz (2021) notes that research shows that DSR can support not only comprehension but meta-cognitive skills, motivation, and socialization. Vasinda (2020) includes content-knowledge acquisition, support for inquiry-based learning, and "fostering authentic and spontaneous dialogue" (p. 218) as possible outcomes of DSR use. She adds that, as a benefit of DSR use, learners can share ideas in a space where the teacher is a co-learner/ co-inquirer and participants can delve more deeply into group ideas instead of working with traditional teacher-led interaction patterns.

Along with the benefits, however, come challenges. For example, Blyth (2014) notes the arguments about "reliance on crowd-sourced commentary" (p. 203; i.e., anyone can comment) that some critics say is a problem with DSR use; these are beyond the bounds of this discussion but important to understand for those who want to use publicly shared DSR on social media. An

additional challenge to DSR use may include that students need to have or obtain a number of skillsets, including using hypertext, images, video, and so on.

Overall, Li et al. (2021) suggest that DSR is becoming more common because it breaks down barriers like time and access to others. However, they also note that, “perception, use, and effect of digital social reading remain relatively underexplored, with few empirical studies investigating user attitudes toward digital social reading” (p.1). The authors add that studies that focus on participants’ cultures are also needed. In addition, the researchers claim that learner engagement in DSR use can mediate outcomes (p. 2); because task engagement can lead to achievement, it seems logical to use a task engagement framework to examine DSR use.

### **Task Engagement and DSR Use**

In addition to helping understand how and what students are actually reading, exploring DSR use, as described above, may help to engage students in course texts because DSR can include many of the facilitators that lead to task engagement (TE). Egbert et al. (2021) provide a description of six research-based TE facilitators in their model of task engagement. Essentially, these facilitators and their connections to DSR include:

1. *Authenticity*. This term refers to the perception that the task is connected in some way(s) to real life or is otherwise meaningful to the student. In social reading, authenticity can support TE when the reading itself or the process of reading with others is perceived of by the student as helping to meet their goals, such as succeeding in the course, learning new information, or forming a community of peers. DSR use may also seem authentic to students when they feel like they are conversing with peers who are interested in the same issues or ideas.
2. *Interest*. Interest is a crucial facilitator of TE and can be personal or situational (Schiefele, 2009). Interest refers to positive emotions raised by something that makes a person curious or

amused, or it catches (and keeps) their attention because it is something that they like, perhaps, or that they find satisfying. In DSR use, the text, the process, and even comments by peers can be seen as supporting interest (or not).

3. *Social interaction.* Social interaction, the fundamental idea of DSR, takes place with other people who can respond in creative and authentic ways. The type and amount of social interaction can be facilitators of engagement, but this will vary among interactants. In DSR use, because all participants have opportunities to participate, DSR use can potentially increase this TE facilitator.
4. *Support.* TE is facilitated when learners have the support they need to succeed at the task, including effective feedback. In DSR, the teacher can provide comments, encourage participants beforehand to participate, and provide questions for students to answer. Peers can provide vocabulary support, answer questions, explain, and so on, providing individual support that learners may not receive in the classroom. Links, memes, and videos that support learners can also be posted to some DSR apps.
5. *Challenge.* In order to engage students in DSR use, it is important that the challenge not be the use of the technology but rather the content itself. If students are too challenged by the technology use, they will never get to the reading. That said, if the readings are too challenging for some and not challenging enough for others, there could be varying amounts of engagement based on this facilitator. This indicates that the teacher should model the procedure and technology, making sure along the way that students continue to understand how to use DSR and that no one is falling behind. DSR use can help make the task optimally challenging for those students who do not know where to focus in the reading or have

questions that they want to ask. This idea predicates itself on the notion of students feeling free to participate without embarrassment, though.

6. *Autonomy*. To engage, students need different levels of autonomy. DSR can be used for a required number of posts or students can be given leeway in both how and what to post. However, students may not post if they perceive that the other TE facilitators are not present (e.g., the task is not authentic or interesting). Students have to perceive the facilitators to benefit from TE.

In short, in trying to solve problems such as uneven/unequal reading and participation in classes and of implementing DSR use effectively, it is useful to know how students react to and perceive DSR use, based in part on the TE facilitators.

### **Research Questions**

Our classroom experiences and understanding of the literature led to these research questions:

- 1) How do graduate education students use course-based DSR platforms?
- 2) How do the students perceive the use of DSR in their classes?

### **Methodology**

A qualitative methodological framework grounds this proactive action research-based case study. Action research focuses on real-world classroom issues, while case study allows for the deep exploration of the research questions in natural contexts (Baxter & Jacks, 2008). Our case is bounded by three natural, intact graduate courses at the higher education level, including the teacher and students. This design is appropriate for this research because of its focus on complex practices in field-based settings. Further, the study uses both descriptive and numeric data to describe the process and outcomes of DSR use and to provide multiple perspectives of

learners' engagement. This section presents the study participants, data sources and analysis, and methodological limitations.

### **Context**

The study took place over two semesters in three separate courses in the College of Education at a major university in the Pacific Northwest. As the course instructor and a professor in the college, I (first author) had taught many classes with diverse students (e.g., international and national, undergraduate, master's, and doctoral, male and female, recent graduates and returning students, and so on). I had noticed that participation among groups was uneven, and that even who had completed and/or understood the readings varied. Looking for a solution, I learned about new social reading apps while glancing through plug-ins in the Canvas learning management system. I was interested in understanding more and using them to try to ensure that all students would have equal access to class discussions and the information in the readings. After some basic searching, I found practical articles that made DSR use sound interesting, and I used DSR in one course. After this I explored DSR apps and co-authored a brief article describing DSR to help me process different ideas available in the literature (Egbert & Shahrokni, 2021). As a result, I become more intrigued in the idea of DSR use as a way for students to interact during the recent pandemic when all instruction was online, and I decided to use it in two courses the following semester. My goal in using DSR in my graduate courses was to engage all of the students in the course texts and with each other. More specifically, I wanted all students: 1) to be engaged to read and comprehend; 2) to have equal opportunities to participate, and 3) to perceive that they were part of the class community through DSR.

Although the literature recommends groups of 3-5 for DSR, this was a whole-class assignment. This is because this was the first DSR use in these courses, the classes were

relatively small, and participants were not required to post much. The DSR use was structured so that students read the assigned text(s) and were required to make at least one substantial comment before class. I posted general questions or comments for each reading to serve as a guide that the students could use to look at the readings if they wanted to. Then, the readings were referred to or discussed in class. In Course 3 (explained below), one student presented on the main theme of the reading(s) each week and incorporated the DSR comments and questions. This left some ideas untouched but main ones discussed deeply. Finally, students were graded simply on whether they participated on a weekly basis or not, since this was the first time DSR was used in each of these classes. All students received the participation points.

### **Participants**

During the study period, Course 1 used the Hypothes.is tool to read and annotate practical articles about computer programming/coding in education. This class was very applied. The following semester, Course 2 used the Perusall app to read and annotate articles about digital literacies in a mostly theoretical course. In Course 3, which also used Perusall, students read and annotated 10 text chapters and additional articles they chose about classroom technology integration in a theory-to-practice course. The change of DSR apps between semesters was because the Perusall app integrated easily into the Canvas learning management system being used, and it was an opportunity to explore the use of two somewhat different DSR apps.

Figure 2 presents participant data by course, including the number of participants in each course and the number of texts that were provided in the DSR apps. Other readings were often provided outside of the apps, the thought being that social reading might help with the more difficult readings and/or that students might prefer to read some items on their own without the pressure to respond or share.

## Figure 2

### *Participant Information*

Course	# of Students	# Texts in DSR	DSR App
<b>1 (Coding)</b>	12	14	Hypothes.is
<b>2 (Digital literacies)</b>	18	7	Perusall
<b>3 (Technology)</b>	9	21	Perusall

All of the participating students were studying in graduate programs in education, most in the same program with one or two in each course from a different program. The majority of students in Courses 1 and 2 were international students from many countries who knew each other from previous courses, while Course 3 students were mostly meeting each other for the first time. Students accessed all course sessions synchronously through Zoom, with additional asynchronous tasks throughout the semester. All students provided consent to participate.

The research team consisted of two advanced doctoral students and the first author, who was the instructor for all three courses. One of the students was from Course 2 and joined the research at the end of the semester when I asked if anyone was interested in studying DSR use, and the other joined after the data collection when she expressed an interest in the study. One of the graduate students helped to collect the interview/discussion data, and all team members were involved in data analysis, explained below.

### **Data Sources and Analysis**

We employed 3 data sources over the two semesters. These were:

1. *Digital analytics*. While the free version of Hypothes.is that we used did not provide automatic analytics (i.e., numbers for individual items were provided but had to be added by

hand), Perusall provided data such as who read, for how long, what parts of the articles were most read, and how many comments/ questions/ replies/ upvotes students made. Analytic data were captured for each DSR text in each Course. Analytic data were used to help explain how students used DSR.

2. *Student DSR annotations.* The annotations (comments and questions) posted by all students were printed and read, and a coding scheme was developed and normed among the three researchers using some of the data from each course. Codes included: The task engagement facilitators, broken down into subcodes such as topic, reading, and process for the “interest” facilitator and agree, disagree, extension, question a peer, question the teacher for the “social interaction” facilitator; initial comment (topic/content/DSR); extension; and initial question (topic/content/DSR). Teacher annotations were coded as comment, feedback, question, and action request, also divided into sub-topics. Each of us then coded two of the courses individually, parsing meaning units (one topic or idea) before assigning a code. The initial intercoder reliability was 98% for Course 1, 93% for Course 2, and 92% for Course 3. All codes were reconciled through discussion to 100%. These data help to explain the digital analytic data and provide anecdotes to exemplify our interpretations.
3. *Semi-structured focused discussion and field notes.* Because this study began after the first course had ended, focused group discussion around DSR use was only with the two courses held during the second semester. One graduate student researcher led a formal group discussion about DSR on the last day of Courses 2 and 3. As part of the course, the student was well-known to the students and encouraged them to talk. Questions addressed what students thought about the use of social reading, whether and how the students thought it supported their learning, how interesting social reading was (especially compared to

individual reading), how DSR use could be more effective, what challenges they faced, and whether they would recommend social reading. The interviewer asked follow-up questions and made related comments during the discussion process.

During the discussion, the first author took field notes and sent private questions or comments to the interviewer through Zoom chat but did not turn the camera on or participate, in order not to direct the responses. Video of the discussion was recorded in the regular Zoom classroom setting and transcripts were downloaded, edited according to the actual video, then coded by the lead researcher and the second graduate student. A coding scheme was developed based on the task engagement facilitators and other codes that arose from the transcripts. Codes included the 6 task engagement facilitators, statements about the DSR process (positive/negative or change suggestion), preferences (like/dislike), and affordances (features, possibilities). The coders normed the coding scheme with some of the transcript entries. Intercoder reliability for Course 2 was 91% and for Course 3 was 84%; all codes were reconciled through discussion to 100%.

These three data sources allowed us to triangulate and explain both students' use of the DSR apps and their perceptions of that use.

### **Methodological Limitations**

There are several methodological limitations with this action-based case study. First, there is a small number of participants, but this also allowed us to look at the groups deeply across the 3 intact courses. Further, no learning outcomes data were collected, which means that the use of DSR cannot be linked to student achievement; future studies may take this focus. In addition, based on the involvement of the researchers within the courses, there may be some bias toward positive outcomes; however, the systematic process of coding and the use of the software

analytics, along with researchers' awareness of this issue, helped to keep the data analysis and reporting as unbiased as possible. Finally, although patterns across the classes can be seen in the data, the findings and interpretations may not apply to any other set of participants or contexts.

### **Findings and Interpretations**

The findings are presented here thematically, with the analytic and descriptive data integrated to explain how the graduate students used and perceived DSR. All numbers have been rounded to the nearest whole number for ease of presentation. Student comments, when marked, are identified with the letter "S" and numbers that they were given, to conceal their identities. Student comments have not been edited for grammar or word use.

#### **Student Use of DSR**

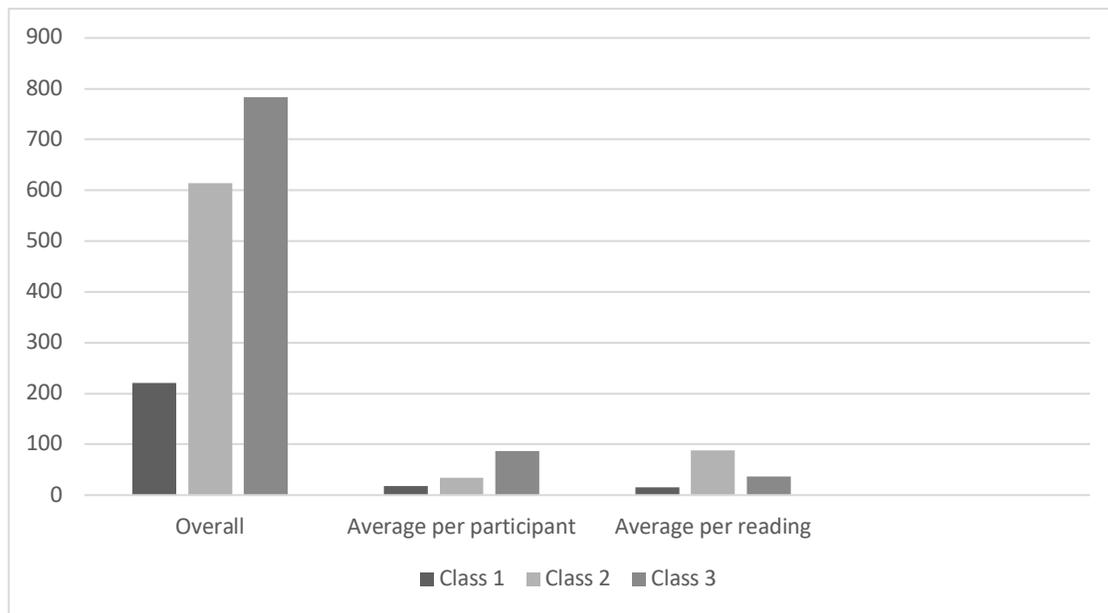
This section presents DSR use data from both the app analytic summaries and the coded annotations. These data are supported by explanatory student comments.

#### ***Overall Annotations***

Figure 3 presents a general overview of how students used the DSR apps according to the analytic data. "Overall annotations" indicates the total combined number of comments and questions recorded by the DSR app for the whole course, while "average annotations per participant" is the average of all the annotations during the course divided by the number of students in that course. "Average overall annotations per reading" presents how many times, on average, students annotated each reading.

#### **Figure 3**

##### *Annotation Patterns*



In addition to the numbers from Figure 3, Figure 4 includes the “range of annotations” that show the low and high ends of overall annotations by reading (in other words, for Course 2, the text with the least number of annotations received 66, while the most annotations on any text in the course was 109). Finally, the “range of annotations per participant across texts” shows the low and high participations by participant across all of the texts; in other words, on one or more readings at least one participant had no annotations, while on one or more readings at least one participant had 16.

**Figure 4**

*Analytic Data Annotation Results*

Course	Overall Annotations	Average Annotations per Participant	Range of Annotations by Participant	Average Annotations per Reading	Range of Annotations per Reading	Range of Annotations per Participant across Texts

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<b>1</b>	221	18	15-25	16	6-23	0-4
<b>2</b>	614	34	15-68	88	66-109	0-16
<b>3</b>	783	87	25-145	37	11-65	0-22

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The numbers and patterns in Figures 3 and 4 indicate that there was a relatively wide range of participation across texts, students, and courses, although some patterns also exist. The smaller number of students in Course 3 had a much larger number of annotations for each reading. Students in Course 2 explained that they would have participated more but they could not read all of the annotations in each reading, respond to some, post their own, and also read the text for complete comprehension. This finding supports the literature's suggestion that smaller groups be used for DSR and that easier readings may produce more annotations. However, whether more annotations are better, and in what way, is unclear. Students in Course 3 also participated much more in total because they had many more DSR texts; however, the nature of the process seemed to make most comments in Perusall relatively short (i.e., they can be difficult to read in the margins and the task might have been seen as pointing out important ideas rather than discussing them in depth). The comments in the Hypothes.is app (Course 1) were generally longer, but there were also many fewer of them. Additional analytic data also show that the shorter texts (e.g., a poster or graphic) garnered fewer annotations than other texts, as might be expected.

The analytic data also showed that, while some students did not participate in specific texts, all students made some contribution to most of the texts in their course; this might be more than some students would do if DSR was not used; it would be interesting to test this assumption. The analytic data by text also imply that students participated in a fairly random way during the semester, not annotating more as they became more used to the process and peers, as the

instructor expected. Further, no pattern in the numeric data was discerned as to why or what determined how often the participants commented, but one student indicated that it depended on how interested she was in the reading. She noted: “I like this class... the texts were so interesting for me that in this case it didn't matter if it was on a screen or on a piece of paper, I get distracted when the topic is difficult, or I don't like it as much as I like this particular topic.” This also speaks to the importance of the task facilitator of interest to DSR participation.

Other students noted reasons for why they did or did not participate. For example, one Course 2 student stated that it was a challenge to follow all of the comments when they were posted at random times and dates during the week. This student also noted that some others posted comments like “Oh, interesting” or “Sure,” which the student felt was not helpful or useful and did not need a response. Another student in Course 2 mentioned that time was an issue in doing the annotations, “because my time is limited, I feel like I cannot read everybody's comment, I cannot think of what everybody's think and it's like, the time constraint drives me crazy.” Other students indicated that time and other obligations often determined when and how they read and annotated. In addition, a student in Course 3 said that since there was no mandatory number of comments, he did not find it imperative to post all of his thoughts. To overcome these issues, one student said that the teacher should “require, like, original comments to be posted by a certain date. And like really follow up on it and say, if you haven't posted an original comment, you're gonna have points deducted...And then you know, the second comment, where you comment on a peer, also have that by a different date.” Student 457 agreed and also noted that “a little peer pressure is helpful” in getting the annotations done.

These data suggest that clearer requirements for both required number, type, and content of annotations might change the conversations, in addition to more well-defined goals developed

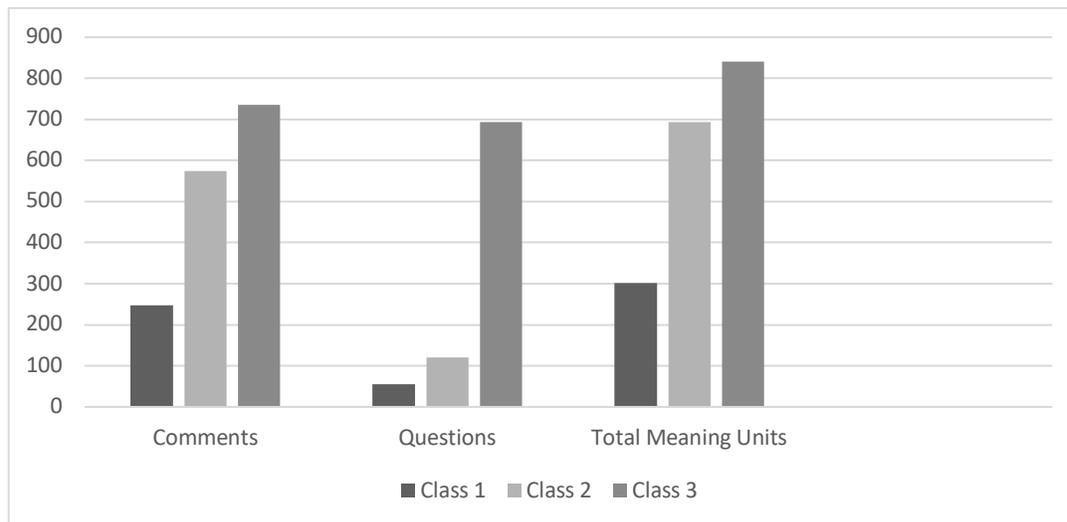
by the instructor and students. These data also suggest that, if a goal of DSR use is to consider ideas deeply, instructors may need to make sure there is room to elaborate in class if it does not happen via the DSR app.

### *Comments and Questions*

Figure 5 presents the total number of codes for comments and questions based on the student annotations in the DSR apps. Although the analytic data for questions and comments was provided in the Perusall app (Courses 2 and 3), the app considered any statement with a question mark to be a question, while any statement without a question mark was designated a comment. However, this is not an accurate representation of all of the annotations, some of which had forgotten punctuation, for example, or were rhetorical questions for which no answer was expected (or was given by the asker).

**Figure 5**

*Comments and Questions from Annotations in the DSR Apps (Coded)*



Although the figure shows that there were numeric differences, the percentage of comments to questions out of all annotations was similar across the classes – Course 1 had 18% questions,

while Course 2 had 17% and Course 3 had 13%. The percentage of initial questions, or those not addressed to another DSR user, out of all annotations was 9%, 13%, 7% for Course 1, 2 and 3 respectively). Course 3 students said that they had fewer questions (but more comments) because the readings were easy to comprehend, teacher-friendly, and related to their goals. On the other hand, Courses 1 and 2 dealt with topics that the students had not previously addressed, leading to more statements about what they thought the authors were saying and requests for explanation and support. At the same time, the coded data also indicate that these students commented less on readings that they described as having the most new ideas and vocabulary; this is the opposite of the expectation that social reading would help more with difficult readings and that students would negotiate meaning more. However, more annotations do not necessarily mean more learning, and it might be useful to look at the transfer from the DSR apps to classroom discourse and also measure in some other way what the actual takeaways were from each text. Further, more teacher support and feedback (discussed later) might help students feel more comfortable with commenting on unfamiliar items.

Further, the students' questions in the 3 courses were mostly connected directly to the texts. Students rarely questioned each other's comments unless it was to ask for clarification, rather, they regularly expressed simple agreement with others' comments ("I agree with you!"; 6%, 11%, 12% for Courses 1, 2, and 3 respectively). This indicates maybe some tentativeness or politeness that can interfere with students negotiating meaning in useful ways. The same did not happen as often in the regular classroom discussions using the Zoom application, where students regularly tested each other, provided alternate explanations, and demonstrated their knowledge of their peers. One student suggested that teachers could "divide [students] into some different groups according to their reading level or their research interests, so each group will read

different article and then, when we come back to class, we can discuss the article or when they read online, we have the same topic so we can communicate in depth for engaging.” Smaller groups, or student-chosen groups, might help with this sense of divide from the other students that online interaction can cause (Nyrop & Stuckey, 2005). The idea of students’ perceptions of written/permanent vs. spoken/temporary participation might also be a profitable way to study DSR use.

The data analytics from Perusall also show that, as in Blyth (2014), students made the most (but not a majority of) comments on the first and last paragraphs of the texts; this might have been because these text sections summarize what will be and what was read, and it is a way for learners to understand what the text is about and thereby determine its value and how to read it. Investigating this reading strategy through DSR use might tell us more about graduate student reading and where instructors might usefully provide strategy instruction.

### ***Most Common Annotations***

Figure 6 provides percentages for the most common types of annotations, which appear to be fairly consistent across the classes.

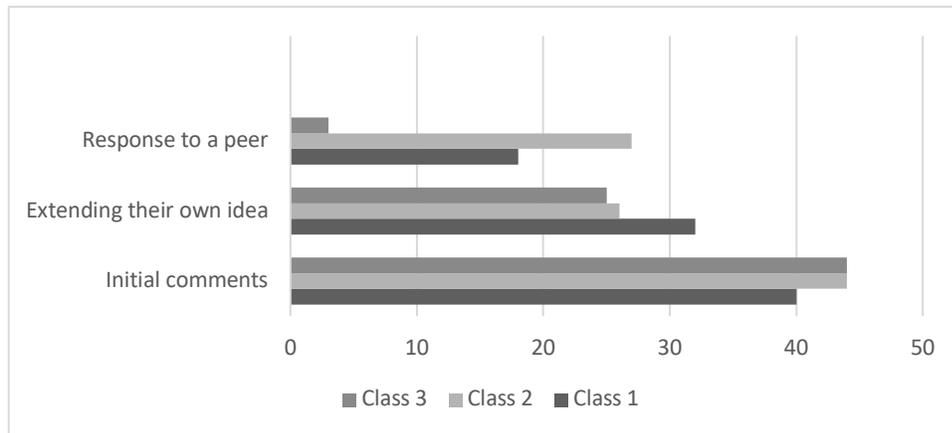
Blyth (2014) noted that DSR use can support distributed cognition, and our study found the same. In other words, students could choose how to read the text and different ways to contribute to group understanding of the text. However, the contributions across the 3 courses did not vary as much as expected. For example, across the courses, an initial comment (starting a new thread) about the reading content was the most common annotation. This was followed by students extending their own idea, and then half the number of responses to other students’ ideas. This implies that there was less conversation or interaction around the texts than there were students voicing and explaining their own opinions. One student noted that “...I feel like all

we're really doing is like demonstration writing. we're just trying to show the instructor that we understand the material, we understand what's important in the reading. I don't think we're necessarily like learning from each other.” Although this statement was not agreed to by other participants, S4570 noted: “it’s just kind of nice to hear a little feedback back so that you're not just reading in a vacuum so it's it is it's not just the personal notes I took that then I question later if they were valuable, is it gives you a little bit of affirmation that. maybe you're looking at the right thing or not looking at the right thing.”

Further, in their initial comments (not responding to someone else), students rarely included a statement about the broader topic area, sticking to comments directly related to some aspect of the text. For example, the students would highlight a statement and write “I was a little confused about this statement...” or “I think this means...” almost exclusively, rather than talking about the field of knowledge or more general ideas. This may not be a problem, depending on DSR goals, but it also may not lead to wider conversation. In the 3 classes studied, students may have interpreted this as their assignment; having to highlight specific text in order to comment might also play a role in how the participants focused their comments. Clear instructions and/or questions about transferring and applying the information in a broader sense may have changed this outcome, as may have a more thorough overview of the affordances of the DSR apps which allow students to comment without highlighting.

## **Figure 6**

*Percentage of Most Common DSR Annotations (Coded)*



In extending their own ideas, they included both personal experience and academic knowledge gained in other classes/contexts. In the more applied courses, the extensions focused more on application, while in Course 2 the extensions were more about explanations and understandings. Those students who often responded to peers explained, like S18, that “thinking about how other people might perceive the same thing as you is interesting to me, I like to look at that and then also the questions being placed for you to kind of to guide your thinking, while you're reading is also very helpful for me so.”

To help DSR meet its goals and engage all students, instruction should focus on facilitating interaction rather than simply posting. This might happen by providing feedback, asking students to address questions that others have, and making sure that the readings are authentic and of interest to the participants; in other words, by incorporating more of the task engagement facilitators or incorporating them in ways that work with the needs, wants, and abilities of the specific class participants. This suggests that the way DSR is used can but should probably not be generic across classes.

### ***Teacher Participation***

The teacher, in exploring the use of DSR, provided slightly different types of texts but relatively the same overall DSR experiences for each class. For example, in the very applied Course 1, graphics and posters were some of the texts. Questions that the teacher asked in the DSR app about these texts included:

- What do you think about this statement? (about a graphic with a slogan)
- Why is this poster in this section of the course? How does it relate?
- What is the overall argument of this article? Do you agree or disagree? Highlight and comment on at least two aspects that you agree/disagree with.

For Course 2, in which the texts were more difficult theoretical articles and the focus was on thinking deeply about the issues, the teacher asked more general questions, such as:

- Comment on important information, ask about something you're not clear on or question, or add any other kind of annotation that will help to focus this reading for you. How does this article apply to our class? What does it say about literacy? Keep these questions in mind.
- What questions would you ask the authors if you could? Which assertions do you believe require more evidence? Why? What are the most important ideas in this article?

In Course 3, a class in which the focus was on both theory and application, more detailed guiding questions included:

- How is creativity impacted by technology and vice versa? Think about the relationship between the two. How might creativity in technology benefit people in life (socially/ emotionally/ psychologically)? How does the teacher's role affect student creativity regarding technology incorporation?

- How might teachers use a future studies methodological approach to guide the integration of technology into the curriculum? If current technology trends continue, what will the future classroom look like? What is the future of Artificial Intelligence in the classroom? What are the dangers and the possibilities? "School will continue to be viewed as vehicles for solving economic and societal problems and in enabling transformation toward particular futures" (p.8). Do you agree or disagree with this statement, why or why not?

These questions were discussed in class, so the students knew what the focus was whether they actually responded to these questions during DSR or not. Without further analysis, however, it is unclear what differences the guiding questions might have made in students' annotations, especially because they were suggestions rather than requirements. However, even the guiding questions were too much structure for a few students; S5570 said that she did not like that there were questions that she felt she had to respond to that interfered with what she really wanted to say/ask. Another student in Course 2 said that the teacher questions were good for stimulating ideas but should not be required in order to allow students to post their own ideas. For future DSR use, it will be important to consider how participants react to the need for the engagement facilitator of a balance of autonomy and structure and to make sure that students understand whether the questions are required or just suggestions of things to consider in the text.

In addition to initial general questions or instructions about the text, the teacher averaged 2.1 per-text annotations in Course 1, 11 per text in Course 2, and 7 per text in Course 3. Of those annotations, almost all of them in Course 1 were questions about the reading content. In Course 2, the second semester of DSR use, the teacher still asked questions (16 overall) but gave a great deal more feedback (47 annotations). During Course 3, the teacher asked 99 questions about the

reading content and gave feedback 27 times. Feedback depended on the types of issues that students appeared to be having with text comprehension and the questions that they asked directly to the instructor within the DSR app. For example, one exchange in Course 3 was:

T: Do we believe this as a generic statement?

Only one student answered, noting:

S: This sentence in general is phrased in a weird way to me, but I don't really agree with this statement in the broader scheme of things. Not all students are born into technology.

Yes, there is a ton of technology in our world and it is way more prevalent for children to use it, but I don't feel you can say this as a generic statement because it's not true for all.

To a student question in Course 2, the teacher responded, "Someone look it up (online)!" and another student did. While the teacher appeared to be reactive to student comments and questions in the DSR apps, some well-designed balance between guiding, requiring, and supporting, clearly understood by students, might provide a better overall structure for DSR use.

## **Perceptions of DSR Use and Engagement**

### ***Students' General Preferences***

In the discussions at the end of the semester, the students explained their preferences for or against the use of DSR in their roles both as students and as teachers. Although all but one of the students appreciated the use of DSR in general, this preference varied in strength, and the reasons for the preferences were also diverse. For example, S10 said,

"At first I mean I didn't really like so much about the use of it because I don't because you know I always want to have my own reading, but then after doing it for some times I realized that, I mean, there are some sort of like, you know, benefit that I got from it like, you know, I think I am able to know some other people's perspective on a certain

paragraph or a certain topic or certain sentence, so it kind of like gives me another input, “oh I didn't think about this,” so I think, in that sense it's kind of you know, useful for me”

In other words, this student equates her liking of DSR use to its authenticity. Another student, S3570, stated, “I like what it what it creates after everybody puts the comments, you know, because there are different ideas and you can actually rethink about something that you thought before, when you were reading so that's a good thing, and the conversation that it generates.” However, this student added that they prefer to do the discussion in person and did not feel engaged in DSR as much as if the reading discussions were in conducted class. S75 also agreed with this sentiment.

One student, although he preferred not to use the DSR due to both a neurocognitive condition and what he perceived as a “generational gap,” commented that, as an older student, he preferred to read on paper. He noted, however, that for the undergraduates that he taught:

I'm actually using Perusall right now. It's like, you know, against my reason and all but we're doing social media because they're they love it. They're super engaged, they love commenting on each other, emojiing, you know, like everyone else is. It's like their element, so I guess, we need to consider that, when we are using whatever app or platform that that we're using, who is our audience, who, you know, like who are we using this with.”

This graduate student recognized the affordances of DSR use to provide a reading forum that his students could use in authentic ways so that he could engage his audience toward goals in his class. He may have a point – that graduate students have different experiences and expectations of coursework. This is additional support for making sure that the goals of the

experience are clear and in keeping with what the participants feel is authentic. As a student in Course 2 noted, “having the conversation between the peers is vital, but “whoa” and “wow” isn’t necessarily the pedagogical goal.”

As in Vasinda’s (2020) study, a number of the students in each course said that they preferred not to read online in general, but only one of them in this study said that they would absolutely not do it if it were not required/graded. Also, this same student found it distracting to read the text the first time with comments on it, so he read it separately and then came back and read the comments. This might be a good process to recommend so that students could understand the gist of the text before they comment. Other students in the 3 courses also talked about the processes they used that helped them to engage in DSR, whether reading alone before participating or turning off highlights until they were done. Students who were not familiar with the affordances of the apps explained that they did not know or had not thought of ways to circumvent issues that they had; this requires fairly thorough acquaintance with the apps and perhaps modeling of some of opportunities and strategies that could be used.

### ***Engagement Facilitators***

Students were not asked about the facilitators within the DSR apps and they were not mentioned specifically in the reading questions/prompts. However, they were sometimes mentioned in student annotations. Further, while no specific questions during the discussion asked about task engagement facilitators, of the 158 discussion comments, many of them mentioned one or more facilitators. The overall expression was that the courses were experienced differently due to the content and texts but also that the engagement facilitators were an important part of DSR use for the participants as students and as (future) teachers. This section

explains specifically both how participants perceived that the facilitators were integrated into the DSR use and the difference that it made for them.

*Authenticity and Interest.* In the annotation data, positive comments about the authenticity of the texts were made in each class 39 times in all, while interest in the topic or text content was expressed 5 times in Course 1, 33 times in Course 2, and 24 times in Course 3. Both authenticity and interest during DSR seemed to stem from students' ability to understand the readings and to interacting with peers. For example, S1570 noted that she had the most fun when the class was reading about memes because students were posting funny memes as examples, and she felt this was authentic and what they do a lot of the time. She and several others also said that the use of emojis (an affordance of Perusall) made reading the annotations more interesting. In addition, as in other studies, participants linked many of the annotations to their experiences as teachers, making the text and process more authentic to them since they could apply it or see how others did so.

During the discussions, a Course 2 student said: "On this [app], I could see everyone's comments and questions, and where they were referenced, and feel instantly connected to the paper and feel part of the conversation community." She concluded that this experience was both relevant and authentic for her as a student. Another student commented that she perceived that DSR use was authentic because she thought that the students had the same learning goals, that the social interaction in writing was authentic, and that its convenience made it interesting. In fact, participants in both classes indicated that the texts must be interesting and not difficult to be used authentically for DSR. While explaining this idea, they agreed that DSR should not be used as "a way to make student to read"; that its use must be manageable and meaningful.

Students often linked interest to authenticity in speaking about DSR use. This was demonstrated in comments such as:

“I’m looking forward to what the author has to say about this. “

“I’m retweeting this part.”

Further, students asked others to “share this [idea] in class” a number of times or pointed out that they would be interested in discussing some comments further in class. Summarizing her perceptions, S1 stated that “Everyone here pays attention to different things and comments on different sentences. And I think that is what is also very engaging because you are able to see from other teachers and from other opinions some of the things that maybe I didn't pay attention to before.” These data show that participants noted their perceived interest and authenticity and believed that DSR use could support these engagement facilitators.

**Interaction.** Some students mentioned the importance to them of interaction in DSR. For example, S16 noted: “I really love the Perusall because, and this is my first time to use this app, but I found that it easy to use, and I can while is a passage I can communicate with my classmates and show my do I idea or ask my question if someone can't answer my question, so I, I feel that I can get direct feedback and we can discuss the questions and I love the examples.” Other students voiced similar ideas, noting, for example, “...sometimes they use their personal examples to answer the questions, so I think it's very interesting.” Like Vasinda (2020), our students commented that how others replied made a difference in how the participants perceived one another’s contributions and added to them. In the same vein, our students also stated that they liked receiving email notifications from the app when someone responded to their comments; however, some had not set it up this way due to not being informed about this affordance. Students who did not know about this aspect of the DSR apps were disappointed to

only find out about it at the end of the course. For example, S18 explained: “I will make a comment, and then I might not go back in to see the discussion. But maybe alerting me to go back for it...” S10 agreed, noting, “I think it's really useful that notification. For you to go back and then look at what is in there.”

Students also noted the benefits of what they considered social interaction. For example, a Course 2 student explained that it “provides affirmation that I’m looking at the right thing.” Another said that “the comments that have really helped me to understanding what we talk about in the class and what the other people think.” Another student said that, as an international student, she appreciated the socialness of the DSR, noting that “Sometimes we do not understand the sentence structure of the sentence, paragraph, or something like this, so it can help, we help each other to understand the article.” In the annotations, students responded to some of their peers’ comments with, “I can relate now..” or “I can relate to your experience...” Participants appeared not only to appreciate the interaction around course goals, but personal interaction in the case of these graduate education students seemed to have influenced students’ engagement in the DSR as well.

Overall, the students often equated their perception of the social interaction within the DSR apps with the authenticity of the task and course. One student in Course 2, however, asked during class whether, if DSR use is asynchronous, it is actually “social.” This raised the question of whether and how DSR use is or can be “social.” The class came to the conclusion with the teacher that negotiation of meaning and response to peers is important to have the feeling that one is actually interacting.

***Positive Learning Support.*** Related to interaction, participants agreed during the class discussion that peer and teacher feedback was an important part of the process. They also noted that DSR

affordances supported their learning in several ways, including (as noted above) providing language modeling and support. One international student liked it because she felt she got direct feedback on her reading ideas that she might not otherwise get during a class discussion. Other non-native English students also noted that they like that with DSR use they could check their contributions, such as their typing, which could build student confidence to participate. The location of information in the DSR apps provided another example of positive learning support, according to S21. She said, “When I write stuff on notebook paper, so I end up losing it, so it was nice that you can always go back and the information is still there, and you can see it.”

Also about learning support, a student in Course 2 who had used DSR with her students noted that it might be important for the instructor to also provide a more private way for students to ask for help. While this could be accomplished through chat or students could be encouraged to ask in another forum, building trust among the students and making it part of the expectation for DSR use might also be beneficial.

***Challenges and Choice.*** Eighteen comments talked about challenges with DSR use. The majority of Course 2’s comments were negative about the challenge of the Perusall tasks but also contained solutions to the issues they faced. For example, S957 noted that she had addressed the issue with time by developing a system of going straight to the questions asked to see what other students answered. Another student mentioned a problem not with the app itself but with her use of it. She said that she kept getting notifications on her computer from other apps and would feel like she had to go check them – if she read printed text instead, she would take a highlighter and sit somewhere with fewer distractions. However, she did manage to participate more than any other student.

One student in Course 3 noted that he “found it to be most effective when it had a bit more structure around it”; he noted that “a lot of stuff goes unread and it just kind of in the abyss a little bit.” This student suggested that additional “boundaries or rules” would make the DSR use more effective and make this less of a challenge. It would also, however, take away some of the choice that other students desired. For example, a student in Course 3 noted that in DSR use it is important to provide students with “liberty to interact” but balance that with not allowing students to “tag along”; this student acknowledged that this balance is a “fine line” that he felt may be solved in part by making sure that students know that they will be doing something important with the information afterwards, and by suggesting that a simple “I agree” or thumbs up emoticon is not sufficient as a response. To this end, another student expressed appreciation of the requirement in Course 3 to address annotations that peers had made when the students led a reading discussion in class, saying that “there was a point in actually going through someone else’s comments.” The real challenge, then, might be balancing the needs of all of the students in the courses.

### ***DSR Process and Changes***

Overall, 40 comments were made in the discussions about the DSR process and possible changes in DSR use. These were useful both from an instructional standpoint and because the participants, studying to become or improve as instructors or professors themselves, had the chance to reflect on their learning and how they wanted to apply this experience in their own teaching.

One student introduced the idea that “I don't think that that like beauty of social reading is achieved in every single class.” Students discussed how this might be improved. S18 said, for example, “I think it needs to be structured... [the instructor] really mentioned like, ‘Okay, when

you do your presentation, make sure to reference the chapter.’ And then people will be like ‘Oh, you said this, ok let's talk about it more.’” One solution may be, then, to ask a student to lead each text – asking the questions, maybe in cooperation with the teacher or another student, that fit the course goals and their knowledge. Teacher education students need to learn how to lead discussions, and this might also help the participants focus on the authenticity of such a process.

Another student noted that in other classes “that’s just kill me” to both have a lot of readings in a DSR app and have required questions for each of them. He appreciated that in his course in this study he “Just have the freedom to critique the article.” Along the same lines, most of the students in Course 3 indicated that whether they would use Perusall again or in their futures as teachers would depend on the goals of their classes. For example, a student in Course 2 commented, “what is your goal in using Perusall. Are you trying to improve reading comprehension for students, are you trying to improve student engagement, are you trying to get them to socialize with each other.” S657 added that he did not perceive Perusall as necessarily the best tool for all of these goals, and it might be just as or more effective to have students read in whatever way is most effective for them. S135 also noted, “this is a PhD class, I believe every people, they will read an article by themselves they don't need that?” This implies that the teacher may need to provide more specific information about the goals of DSR use and show how and why it is necessary; in addition, allowing graduate students to help develop the DSR tasks could address some of these issues.

### **Action Guidelines**

There is much more in our data and about DSR use in general to explore. For example, it might be useful to know who responds to whom, what kind of connections students make, what role, if any, culture or language background plays in the process, or what parts of the readings

students actually respond to. However, based on our findings, we agree with Dean's (2016) call for higher education instructors to integrate the use of DSR in higher education. However, this comes with a caveat; as with all instructional tasks, following design guidelines can determine whether the task is effective and for whom. Therefore, we encourage use of the task engagement facilitators and the following guidelines (many of which concur with the extant literature on DSR and are explained below) but adapted for each context and student population:

1. **Develop clear goals.** Both the task engagement literature and our data show that clear goals are essential to any engaging task. Because DSR use can take many foci, it is important to develop tasks that focus on specific goals, whether improving information seeking, developing reading comprehension skills, gaining new knowledge, or building community. Goals should be based on the students who will use the DSR and may address the number of required posts, what type of posts would be useful and /or accepted, what they should contain, and how they will be graded. However, to maintain engagement in the DSR task, this structure must be balanced with student choice. One strategy is to explain and demonstrate the DSR app and then ask graduate students how they feel it might be best used, building on their knowledge and experience both of themselves as learners and as teachers/future teachers.
2. **Teach the app well.** Because the focus is on reading, and not necessarily on the technology, it is logical to focus on the texts. Blyth (2014) decided not to teach the app eComma to his student because he found it easy to use. However, some of his students had trouble using the app, like some of the students in the current study. In order to help students use a DSR app, it is important for them to see it modeled, practice it, and be able to comment on and question the affordances. In this study, students expressed the need to know how to search for

comments and questions, to access emojis and upvotes, to turn on notifications so that they could see when someone responded to their annotation/comment, and how to include different types of media such as videos, graphics, and audio files. Further, according to the field notes, some students also discovered that the Perusall app afforded them the opportunity to take private notes. In addition, in Hypothes.is, the more a piece of text is highlighted the darker it gets, but the teacher did not know this until after the end of the class and therefore could not point it out to the students. Further, S115 wanted the affordance of synchronous chatting with students who might be in the DSR app at the same time. It was there, but the teacher did not mention it. To use DSR apps effectively, the instructor must know them well and be able to help students understand the affordances and why/when they might be used.

Not only affordances, but strategies for using the app might also be addressed. For example, mentioning that students might be distracted by other apps and that they might want to turn off notification while they read could be useful for some. S105 noted that the highlights were distracting when other people did them, and S115 explained his strategy of turning them off until he had made his own highlights.

3. **Provide choices.** The instructor can explain about how cognition is distributed and provide students with multiple ways both to read and respond. For example, students could read the text alone first, and then annotate it. This strategy not only has them read the text more than once, but it might also make it easier to explain their thoughts when they go to annotate. Likewise, students with designated learning issues or preferences should have choices that help them participate but not suffer from reading on the screen; both of the DSR apps used in this study allow for the texts to be downloaded and/or printed, for example. Students might also be given a choice of media or of different texts with the same focal ideas.

4. **Preview the texts.** DSR use does not take the place of effective pedagogy. According to the field notes, students in both classes noted that pre-viewing vocabulary would support comprehension and discussion. While international participants, in particular, felt that DSR use was helpful and that it was easier for them to check their understanding before speaking in class with DSR use, a specific emphasis on pre-reading might help all of the students. Further, it might be useful in some cases, as Vasinda (2020) notes, for the teacher to annotate first in a general way to stimulate the first reader(s), but the challenge here is not to guide the readers to the teacher's interpretation of the reading or what is important in it.
5. **Decide how structured DSR use needs to be.** In the three classes in this study, the students rarely directly asked the teacher for help or information. This worked to an extent, but more direction or explanation might have helped the learners to focus more effectively on desired outcomes.
6. **Follow up every time.** DSR use should not only include a preview but also some kind of debrief to make the process of reading more meaningful and authentic. In this study, DSR use was not a substitute for the kind of deep conversations around issues that students needed and wanted to have. DSR use can be considered as necessary preparation for more in-depth discussion.
7. **Participate.** The students in this study noted that instructor involvement was helpful, not necessarily by setting required questions but as a facilitator of the discussion along the way. If DSR use is considered a course task, then the instructor should be involved. This involvement should consider the needs, wants, and abilities of the students, along with course and task goals.

8. **Make reading groups in large classes.** This can help to provide a sense of control and perhaps a better balance of challenge and support if students can trust their small group members and get to know them. They could also choose to read synchronously if in a small group and have opportunities to make other choices in their use of DSR.
9. **Consider DSR texts carefully.** Not every text needs to be in a DSR app. In this study, students said that they preferred texts that were familiar or through which they could learn without a lot of struggle. Providing content texts that all students can comprehend might enable students to interact more about the ideas.

### **Conclusions and Research Implications**

This action research has provided a firm grounding for future uses of DSR in these courses. The data show that DSR use in these courses was successful in a number of ways. For example, participants all participated in annotating the texts; although the amount and type of comments differed, no student was left out, as might be the case where individuals read and have no access to the group while doing so. Further, all of the participants perceived task engagement during DSR, although to different extents. The data also show many ways in which the DSR use here can be improved through use of the action guidelines. In agreement with the literature, we found that the digital and interactive nature of DSR can support learning because it affords both a focus on text and an emphasis on content through interaction. However, as with any technology, we learned that the use of DSR must be carefully and mindfully planned to have the most benefit. We plan to continue to refine our use of Perusall in future courses and explore how context, task, and audience may contribute to differences in outcomes.

Although this study has made a contribution to the DSR research, there are many more ways that DSR data can be parsed and analyzed; this study suggests some profitable ways to do

so. For example, future research could look more deeply into what participants actually say, using a scheme like Vasinda's (2020). In addition, language and/or discourse analysis might be useful for explaining student participation more in-depth. Correlating page views, time on task, and comments, or relationships among any of the statistics provided by the DSR apps could also provide useful information. It would also be valuable to understand relationships among DSR app affordances and outcomes. Further, in this study the students' perceptions were only obtained at the very end of the class; none was taken at the beginning or middle to see the progress of students' DSR perceptions and use. Future studies could take this into account. Finally, exploring the comments and participation of international students could be illuminating, and Li et al. (2021) recommend additional cross-cultural studies.

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