

The scalability readiness of WiREAD+: Perspectives of learners from three educational contexts

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Abstract: WiREAD+ is a web-based collaborative critical reading and learning analytics environment to scaffold learning and motivate students to develop richer dialogue and quality interactions with peers around multimodal texts. This paper reports on the pilots to scale up the use of WiREAD+ beyond the original context of Secondary School English Language (EL) learning to three distinct educational settings, namely, EL in a primary school, English Literature in a junior college (pre-university), and a tertiary-level Discourse Studies course. We report on learners' perceptions in response to the use of the system and reflect on the potential and challenges in scaling up the system across different educational contexts, specifically on the three augmentations to the system which we have designed to improve its scalability readiness. Drawing from the findings of the pilot studies, we briefly discuss how we can support the wider adoption and deployment of the system across schools and settings.

Introduction

WiREAD+ is a web-based collaborative critical reading and learning analytics environment designed to scaffold learning and motivate students to develop richer dialogue and quality interactions with peers around multimodal texts. In prior studies (Tan et al., 2017), the findings have shown consistent learning gains for Secondary school students across several trials. The success has led to a new research project with the goal of augmenting the design of the system for the scaling up to more educational settings. Research has shown the importance of engaging with students' responses to educational innovations to "make the invisible visible" (Osler, 2010, p. 1). Here, we report on the findings from the pilot studies across three educational contexts. These are: EL in a primary school, English Literature in a junior college (pre-university) and a graduate course on Discourse Studies at the tertiary level. We reflect on the perception of the learners in response to the use of the system and the potential and challenges of scaling up, specifically on the three key augmentations to the system to improve its scalability readiness. Our research question is: What are the students' perceptions on the augmentations in WiREAD+ to improve its scalability readiness (operationalized as perceived ease of use and usefulness for learning)?

WiREAD+ techno-pedagogical design

Theoretical underpinnings of WiREAD+ and its design

WiREAD+ was developed in Singapore through a design-based research process with EL teachers, curriculum specialists from the education ministry and education researchers as co-designers. The techno-pedagogical design of WiREAD+ has two key learning affordances (Figures 1 and 2): (i) multimodal social dialogic learning (learning space with scaffolding scripts to guide students' critical discussions of texts), and (ii) dynamic visual learning analytics (a dashboard with a blend of data-driven visualizations). These affordances are in turn underpinned by four embedded learning and pedagogical frameworks (Tan et al., 2017), namely, the multiliteracies pedagogical framework, dialogic learning, assessment for learning, and computer-supported collaborative learning. The system was implemented and validated in a seed innovation school, going through three trial cycles with Grade 9 (Secondary 3) students and teachers. The system was also trialed in four other secondary schools at the request of teachers who attended workshops conducted as part of the project's dissemination activities.

Designing WiREAD+ to scale: Technical, analytical, and pedagogical augmentations

Our efforts to support the additional schools highlighted key design enhancements and augmentations that needed to be undertaken to optimize WiREAD+'s scalability readiness. Three such augmentations were identified: (1) technical, (2) analytical, and (3) pedagogical. Briefly, technical augmentations involved the enhancement of the backend system and user interface for better customizability (such as metacognitive tags that could be easily modified). Analytical augmentations involved the extension of the current suite of learning analytics modules and visualizations to provide enhanced digital formative feedback and actionable insights in line with metacognitive regulation principles and good visualization principles. Pedagogical augmentations involved supporting teacher

practices such as re-designing the pedagogical scenarios for stronger alignment with current educational policy directions related to active learning (Singapore Ministry of Education, 2021) based on co-design with teachers and curriculum specialists from the Ministry of Education.

Figure 1
WiREAD+ with augmented multimodal social dialogic learning space

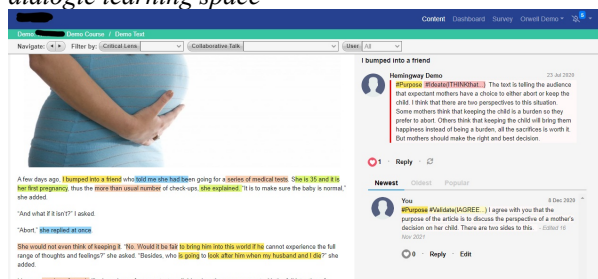
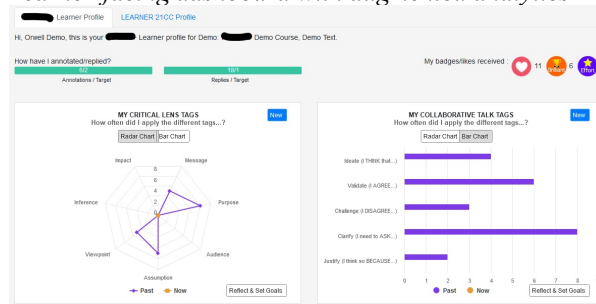


Figure 2
Learner-facing dashboard with augmented analytics



Methodology

Method

While the overall study adopts a mixed method approach, this paper focuses on the qualitative multiple case study of three educational settings (Yin, 2009). Each case study was analyzed individually to identify codes, sub-codes, and quotations. The individual case studies were analyzed in two rounds before a cross-case study was performed with codes compared across the three cases. Similarities and gaps were identified and a rise above was conducted to draw out the overall themes. We highlight key themes from the cross-case analysis in this short paper.

Participants and data collection

The main data sources for the case study analysis were field notes and transcripts from focus group discussions (FGDs)/interviews conducted with students, post-implementation. The FGDs/interviews were each 30-60 minutes and aimed to capture students' experience with the technical and analytical augmentations of WiREAD+, as well as areas for improvement. Maximum variation sampling of students' participation on WiREAD+ (high, medium, and low levels) and convenience sampling based on student availability was used. We were mindful of potential bias, such as social desirability, that might surface through the data collection. As such, we introduced the purpose of the study broadly to the participants and used indirect questioning where possible. Participant consent was obtained (IRB-2019-08-051). For the primary school (P), 31 students consented and 2 FGDs ($n=6$) were conducted; for the junior college (J), 18 students consented and 2 FGDs and 1 interview ($n=7$) were conducted; and for the tertiary institute (T), 9 consented and 1 interview was conducted.

Enactment and findings

WiREAD+ implementation

WiREAD+ sessions were based on active learning principles (Singapore Ministry of Education, 2021). Table 1 provides a summary of key details of the respective WiREAD+ enactments across the three case studies.

Table 1
Enactment details

Primary School	Junior College	Tertiary Institute
<ul style="list-style-type: none"> 3 in-class sessions across 3 weeks 3 different texts (2 newspaper articles, 1 poem) Customized tags created: Talk moves (e.g., start, affirm and idea) and Literary devices (e.g., tone-word choice, others) 	<ul style="list-style-type: none"> 5 sessions; WiREAD+ used as homework; annotations/replies discussed in class 3 different texts (poems) Customized tags created: Critical lenses (e.g., Viewpoint, Setting, Form) 	<ul style="list-style-type: none"> 2 in-class sessions, 1 e-learning session 2 different texts (2 book chapters) Customized tags created: Metacognitive scaffolds (e.g., Aha, Huh?) and Collaborative talk (Ideate, Justify, Validate)

<ul style="list-style-type: none"> • Minimum character count of 50 • Teacher introduced the tags; students had been taught these tags before • Teacher used the teacher dashboard to show students their progress • Students used the learner dashboard to monitor their own progress 	<ul style="list-style-type: none"> • and Collaborative talk (Explain, Challenge) • No minimum character count • Teacher introduced the tags which were new to the students • Teacher used the teacher dashboard to monitor students' progress • Students were informed about their own dashboard, but its use was not emphasized 	<ul style="list-style-type: none"> • Minimum character count of 100 • Teacher introduced the tags which were new to the students • Instructor used the teacher dashboard to show students their progress • Students were informed about the learner dashboard but no explicit instructions to use it
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Thematic analysis

We highlight themes from the rise-above analysis to understand the students' perceptions across the three cases.

Improved interface mostly well-received with requests for specific improvements

All participants responded that they could use the system although the J and T participants found that the interface and usage could be improved. P participants found WiREAD+ fun and interesting, with no need for further improvements. Student K reflected, *"I really like WiREAD+, it was very fun and interesting to like highlight and comment on people's annotation and stuff"*. While some J students found the user interface confusing at first, they reported getting used to it quickly. *"[The system was] pretty convenient to use, because you can just highlight parts that you want to annotate and the really good thing about this is, you can actually collaborate with your classmates... so you can give input on other opinions as well and receive input on your own"* (Student J). For improvement, Student T suggested a tutorial on the full functions of WiREAD+. The character count for students' responses was highlighted as a concern for P students who wanted a decrease of the minimum character count, as they felt it discouraged short replies to other annotations. The general receptiveness to the improved interface suggested that the technical augmentations to the innovation were perceived to be easy to use.

Dashboard visuals were well-received while metrics had mixed reactions

The bar chart was perceived by all participants as easier to interpret than the radar chart. A J student said that the bar chart encouraged further exploration, elaborating that *"it forces me to explore [a] different literary device... and not conform to what I know best."* This suggests the bar chart made it easy to see which tags were used frequently and infrequently by the student. The 'likes' and badge metrics on the dashboard received more mixed responses. Some students saw its benefits e.g., a J student *"found it useful because it helps to reinforce the fact that you're making a valid analysis[annotation] and that, you're... earning the validation of your peers and teacher so it's... a reaffirmation that you're on the right track."* Other participants suggested it might be helpful for certain learners only. The T student opined *"I think the like is fine, I can see the merit in there. For the kids, it's the social media age, it's all about the likes and about affirmation... For me, a bit old, so I'm not very concerned with the likes. But I think it's good."* A J student elaborated that *"I can foresee it being helpful for some people... which can be like a form of a reward perhaps... But personally... I think it's not very necessary, but it can be helpful."* While the responses indicated an overall positive reception towards the dashboard visualizations, the use of metrics such as the 'likes' seem to appeal more to the P students than the T students.

Metacognitive prompts promoted thinking but needed clarifications

Students found the metacognitive tags useful as prompts to promote thinking. For example, a P student reflected that *"(tags) were useful because when I did that, people know what am I talking about."* A J student also highlighted *"this platform is really useful because it provides prompts that makes you think about what you're actually annotating, which is a lot more useful compared to if you just write [it] down on hard copy."* However, students from the three cases also noted that they were uncertain if they had used the correct tags in their responses. Some students also felt that the tags were unnecessary. For instance, a P student noted *"I think it was okay... without the [tags]... because you can express what ... you want to say in your annotations so people will still understand and not many of my classmates actually chose the correct talk moves and literary device, so it was very ... messy."* The equivocal response towards the metacognitive prompts draws attention to the need for teachers to spend time helping students understand the categories of the prompts before using the system. This can address the anxieties amongst students regarding the accuracy in their use of the tags.

WiREAD+ facilitated collaborative knowledge building without divergent thinking

Most students across all three contexts attested to the usefulness of the system in facilitating collaborative knowledge building. A P student shared “usually if it's not online after [I] finish reading the article... I don't discuss it with my friends, but [here] the interaction is more active.” Similarly, J students also found the learning from each other rich and productive. For instance, a J student reflected that “WiREAD+ really does make it easier to reply to our classmates and collaborate with them and it helps us learn from each other, because each of us will have unique viewpoints, so it helps us to improve our own understanding of the poem.” In the tertiary context, the T student highlighted that “[another student's] comments were quite insightful.” One interesting observation raised by this participant was that disagreement amongst students was not common and most of the comments were building on each other's responses. While the reason for the lack of divergent opinions amongst students, even the adult students, were uncertain, and could be attributed to teacher instructions or classroom culture, it offered an interesting area for further exploration.

Discussion and Conclusion

The study has reported on the perspectives of students across three educational contexts that piloted the system. Students' perceptions from the multiple case study identified strengths of the system namely in facilitating collaborative knowledge building as well as areas of concern related to the dashboard metrics and usage of metacognitive prompts. The students' level of comfort and confidence in using the system also increased over time as they became more familiar and fluent in using the tags. This suggests that the implementation of techno-pedagogical innovations, such as the introduction of the system, require extended enactment time for students to reap the full benefits. While the students' feedback was similar in most areas, we found that certain features such as character count in responses were more of a concern for P students than J and T participants, whereas badge metrics and ‘likes’ were deemed more helpful for P students. Our study found that dashboards could have different effects for learners and is in line with literature criticizing one-size-fits-all dashboards (Teasley, 2017). Older learners, as compared to younger ones, appeared to be more critical about the system's ease of use. This could perhaps be due to having more experience with sophisticated web applications. Older participants could also have had different expectations of the teacher's role in relation to the preparation and facilitation needed for using the system. Though we recognize the limitations of the study including our unique system and contexts, the small sample size, and short duration of pilots (in part due to pandemic-related disruptions), our findings have resonance with other contexts reported in literature (e.g., Niederhauser et al., 2018). In view of this, our future research intends to investigate which dashboard designs would be better for whom (and when). The study also highlights the need for an extended incubation period for techno-pedagogical innovations, which contrasts with the ease and speed in which a lifestyle technological innovation can be adopted. A techno-pedagogical innovation requires time to develop both the teachers' and students' familiarity and fluency with its use, and this must be considered as part of adoption across educational contexts.

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