

Improving Elementary Students' Literacy Through Knowledge Building

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Abstract: This study follows the Knowledge Building discourse of 4th graders in order to assess changes in literacy-related outcomes over the course of two semesters. Our analyses revealed that Knowledge Forum activities, such as use of scaffolding tools, increased over time and were positively correlated with improved essay writing, particularly for the low-performing group. Our findings add to the growing body of research that Knowledge Building pedagogy and Knowledge Forum technology together support the development of students' literacy.

Introduction

Knowledge Building (Scardamalia & Bereiter, 2014) is a pedagogical approach that aims to enculturate students into authentic knowledge work. During Knowledge Building, students engage in collaborative discourse in order to advance ideas in the community knowledge. Knowledge Forum serves as the online environment to make ideas accessible to all, with supports in place for sustaining idea improvement (Zhang, et. al., 2011). Using Knowledge Forum, students read and write for each other to elaborate their thinking, seek clarifications, make connections, and improve their ideas together. Such complex, discursively-rich interactions involving high levels of reading, writing, and revision have been shown to be positively associated with literacy outcomes like vocabulary growth (Zhang & Sun, 2011; Chen et. al., 2015).

Study design

The current study aims to explore how Knowledge Building and Knowledge Forum can enhance literacy outcomes related to essay writing. More specifically, the research questions are: (1) Which forms of engagement in Knowledge Forum enhance students' online collaboration over time? and (2) Which online activities on Knowledge Forum correlate with their writing performance over time?. We examined the Knowledge Building discourse of a fourth-grade class (25 students) in Taiwan, where an experienced Knowledge Building teacher used a principle-based approach to improve her teaching practices and instructional design process over two semesters. The teacher encouraged her students to work collaboratively on KF, to share, build on, and improve ideas in order to advance the collective understanding of their Chinese textbook. In the second semester, the teacher aimed to deepen collaborative reading and writing in Knowledge Forum. She asked students to self-organize into dyads and triads to read KF notes online and discuss ideas together face-to-face, before building on other groups' ideas in KF again. Students had the option to create individual or co-authored notes.

At the end of each semester, we examined students' literacy-related activities in KF, which included basic online activities (e.g., note writing, reading, revising), use of scaffolding tools (e.g., uses of keywords and epistemic markers in notes) and social interaction (e.g., note-linking and note-reading). In terms of students' literacy-related outcomes, they wrote an essay at the end of each semester, which was scored by the teacher. We also explored the relation between students' Knowledge Building activities and writing activities to measure students' progress in terms of the amount of online activities from the first to the second semester.

Preliminary results

Students wrote a total of 645 notes in semester 1 ($M = 25.8$; $SD = 7.67$) and 692 notes in semester 2 ($M = 27.68$, $SD = 8.71$). In semester 2, 92 collaborative notes were written ($M = 22.6\%$, $SD = 20.3\%$), with students gradually increasing the proportion of collaborative notes, despite given the option to create individual notes. A summary of students' online activities in Knowledge Forum are provided in Table 1. In order to investigate the relationship between students' Knowledge Building activities and their writing performance, we conducted Spearman correlation analysis. Students' essay writing is significantly correlated with their use of KF scaffolding tools ($\rho = 0.44$, $p < .05$), suggesting that their use of keywords and epistemic markers in notes were helpful to improving their writing skills.

Table 1: Summary of online activities in Knowledge Forum (N = 25)

KF activities		1 st semester Mean (SD)	2 nd semester Mean (SD)	Z
KF basic activities	# notes created	25.80 (7.67)	27.68 (8.71)	-1.20
	# notes read	171.28 (58.35)	104.64 (45.58)	-4.31***
	#build-on notes	15.00 (6.19)	14.56 (6.16)	-0.34
	# notes revised	7.32 (5.28)	3.76 (2.97)	-3.58***
Use of KF scaffolds	# of keywords in notes	20.24 (7.46)	22.92 (7.95)	-1.73
	# of epistemic markers	24.92 (8.15)	26.64 (9.09)	-1.31
KF social interaction	% of note-linking	57.00% (8.81%)	52.32% (20.25%)	-0.97
	% of note-reading	50.96% (18.61%)	39.40% (17.13%)	-3.52***

In order to understand the trajectory of students' improvement in writing, we compared three clusters (high-, medium-, and low-performing) based on the rank of their essay scores using the Kruskal-Wallis H test. The analysis indicated that in terms of their uses of KF scaffolding tools, there are significant differences between the three clusters ($\chi^2 = 6.99, p < .05$). While the writing performance for the high-performing and medium-performing clusters remained stable, the performance of students in the low-performing cluster improved over time, suggesting that the scaffolding tools (i.e., keywords and epistemic markers) in notes were especially conducive to fostering the writing abilities of students in the low-performing cluster.

Discussion and future directions

In this study, we examined the Knowledge Building activities and literacy development of fourth-graders in a Chinese language class over the course of two semesters. Several patterns emerged. First, students' online collaborative Knowledge Building activities, such as notes contribution and scaffolding tools use (e.g., keywords and epistemic markers) increased over time. Second, students' essay writing performance was improved, though no significant difference was found between the two semesters. Third, students' use of KF scaffolding tools was positively associated with their writing performance, with students in the low-performing group showing the greatest amount of improvement over time. Surprisingly, students' note-reading behaviours decreased over time, but it is likely due to the way collaborative notes were created in Knowledge Forum during the second semester. It should be noted that students' note-linking behaviours remained relatively stable.

Together, our findings suggest that when students engage in collaborative Knowledge Building activities and discussions with appropriate pedagogical and technological supports, all members benefit in a way that minimizes the gap between high- and low-achieving groups. This is of particular importance for literacy instruction where it is commonplace that the rich get richer, commonly referred to as the Matthew effect (Stanovich, 1986). Continued use of epistemic markers and keywords would help students sustain discourse that leads to continual idea improvement and progressively deeper understanding. Future work should aim to explore over extended periods of time the evolution of group knowledge processes that facilitate the development of students' multiliteracies during Knowledge Building.

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