

TITLE: Beyond the Science Domain: The Transfer of Reading Strategies To Non-Expository Text.

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ABSTRACT: We investigated the effectiveness of iSTART in facilitating understanding of non-expository text. Students self-explained text from three genres: science, history, and literature. Students then completed iSTART training (which includes practice with science texts) and were tested on their ability to self-explain a different set of science, history, and literature texts. Students' ability to self-explain improved in all three genres, but there were differences in SE quality as a function of genre.

SUMMARY: Beyond the Science Domain: The Transfer of Reading Strategies To Non-Expository Text.

Recent advances in computer technology have made it possible to build intelligent tutoring systems in order to improve student comprehension. Intelligent tutoring systems offer many advantages over human training, particularly training that is adapted to the user. However, like all training interventions, there is a strong possibility that students may not be able to transfer what they have learned in one context to new contexts (Resnick, 1987).

The purpose of the present investigation was to determine whether the impact of an intelligent tutoring program, called iSTART (e.g., McNamara, Levinstein, & Boonthum, 2004), transfers beyond the conditions in which the instruction was provided. More specifically, we examined whether reading strategy training with science text would transfer to the genres of history and literature. In addition, we assessed whether self-explanation (SE) quality would depend on genre, over and above the effects of training.

Examining transfer in the context of genre is important because text characteristics differ as a function of genre. The characteristic conventions of expository texts, for instance, present unique challenges to a reader as compared to that of history or narrative texts. Science material contains a greater number of unfamiliar concepts, such as low-frequency technical terms and information framed within compare/contrast, problem/solution, and cause/effect relationships (Yore, Bizanz, & Hand 2003). History and literature texts, however, tend to develop information in simple chronological series and contain more familiar material (Tonjes, Ray, & Zintz, 1999). The content and structural differences between domains may limit the generalizability of learning strategies. Consequently we examined whether iSTART training transferred to text genres other than science.

Method

Participants included 66 students from a mid-south college. The experiment was a within-subjects design with genre (science, literature, history) and time of test (pre, post) as within variables. The six texts (2 x 3 genres) were selected and equated on in the number of words, Flesch-Kincaid Grade level, and argument overlap. During the pretest, students typed SE's for eight target sentences within each of three counterbalanced texts (science, literature, history) presented in a random order. During the iSTART training, students progressed through the three main sections of the program: *Introduction*, *Demonstration*, and *Practice*. During the posttest, students typed SE's for eight sentences for each of the remaining three texts (science, literature, history). The quality of students' SE's was evaluated by the iSTART algorithm (McNamara, Boonthum, Levinstein, & Millis, in press) which rates the quality of SE's on a 0-3 point scale, with 3 being the best score.

Results and Discussion

For each passage, an overall SE quality score was generated by averaging across the 8 target sentences. One third of the SE scores from the college study were coded by hand and were compared to the computer rating. The average correlation between human coding and computer coding was $r(22) = .95$. Follow up analyses are displayed in Table 1, indicating that there were significant increases in SE quality across all three genres.

Further analyses indicated that there were significantly higher SE quality pretest scores in literature ($M = 1.95, SD = 0.59$) as compared to science ($M = 1.80, SD = 0.68$), $t(65) = 2.21$, Cohen's $d = .24$, and that this effect persisted at posttest, $t(65) = 2.68$, Cohen's $d = .35$.

Table 1. Pretest-Posttest SE quality scores for each of the three text genres.

Condition	Pretest	Posttest	Statistics	Cohen's d
Science	1.80 (0.68)	1.98 (0.67)	$t(65) = 2.28, p = .026$	0.27
History	1.90 (0.65)	2.08 (0.68)	$t(65) = 2.05, p = .044$	0.27
Literature	1.95 (0.59)	2.20 (0.57)	$t(65) = 3.64, p = .001$	0.43

One aim of this investigation was to explore the scalability of iSTART in terms of improving comprehension for non-science texts. We examined the quality of students' self-explanations before and after training in three genres: Science, history, and literature. Students' pretest SE quality for the literature texts was significantly higher than those given for the science texts. Moreover, this difference persisted even after training. Research has shown that narrative text is more familiar than expository text (Tonjes, Ray, & Zintz, 1999), and thus, people tend to make more inferences with narrative text (Graesser, 1981). Given that the computer-based algorithm is geared towards assigning higher scores for SE's with more elaborations (inferences), it makes sense that the overall SE quality is higher for the literature texts (narrative) as compared to the science texts (expository).

Our results also show that the effects of iSTART training can transfer to genres other than science. Namely, we found significant increases in SE quality for the history and literature genres, as well as for science. This is encouraging given that many studies demonstrate that comprehension strategies fail to transfer (Muramoto, 2001). Thus, our results provide promising data to explore the application of the iSTART tutoring system to genres beyond those of science.

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