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Effects of Dissuading Unnecessary Help Requests While Providing Proactive Help

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Abstract. We tested effects of dissuading students from requesting help unless they really needed it. The manipulation occurred while the students solved problems on an ITS that provided proactive help. Compared to their counterparts, *dissuaded students* requested help much less often. Moreover, the less help students requested, the higher their posttest score. Among students with lower pretest scores, dissuaded students marginally gained more than their non-dissuaded counterparts. We discuss our results, a new type of help abuse, some ramifications of proactive help, and the generalizability of our results.

Introduction

A scourge of the ITS field is that students often misuse help – for instance, using help excessively to avoid thinking or learning, or under-using help when they need it [1, 2]. The reasons for help-seeking behaviors can be complex [3] and so influencing them is likely to be complex as well. Empirical information about the effects of interventions can be used to begin to unravel the complex relationships among the factors that influence help-seeking behavior.

We tried a small set of easy-to-implement interventions intended to dissuade students from asking for help when they did not need it and thereby to improve their learning. Featured among these was a delay before students received requested help. It is widely thought that help delay might reduce help requests and improve learning, which is why Cognitive Tutors, used in hundreds of schools, now delay before they provide bottom-out help (K.R. Koedinger, personal communication, 2005). However, we know of no research that tests such hypotheses.

We implemented these interventions in an ITS that expands upon the traditional reactive role of computer tutors by providing unsolicited, *proactive* help as well as *reactive* responses to help requests. Our Calculus Tutor [4] attempts to look ahead to anticipate a student's need for help, just as human tutors often do [5], rather than always waiting for the student to request help or make an error. This experiment was conducted during a data collection phase when the Calculus Tutor did not use its decision-theoretic capabilities but instead selected randomly from relevant help messages and randomly chose to provide proactive help on about 50% of its opportunities. The Calculus Tutor considers providing proactive help (1) when the student selects an uncompleted step to work on, and (2) when the student makes an error.

1. Experimental Manipulation

Only students who had not yet encountered the domain material covered by the Calculus Tutor

participated in the study. These students were randomly assigned to one of two conditions with 27 students in the experimental condition and 33 students in the control condition. The only difference between the two conditions was a set of three interventions in the experimental condition: (1) students were asked not to request help unless they really needed it; (2) students were told that there would be a "substantial delay" when they asked for help; and (3) the Calculus Tutor delayed 10 seconds before it provided reactive help. For the control condition, students were not told anything about requesting help or a help delay and the Calculus Tutor did not delay before providing reactive help. Before using the tutor, all students studied a printed tutorial for about 45 minutes and then took a 28-item pretest. The tutorial and pretest covered all of the main concepts required to solve the Calculus Tutor's problems. Students then used the Calculus Tutor to solve the same 5 multi-step problems. Afterwards, all students took a posttest which was isomorphic to the pretest. There were no significant differences in the groups' pretest scores or time on task.

2. Effects

2.1 Dissuaded students requested help less often

The mean number of help requests for students who were dissuaded from requesting help (*dissuaded students*) was 7.4, while the mean number of help requests for *non-dissuaded students* was 22.8. This difference was significant, $t(58)=2.43$, $p<.01$ (1-tailed).

Therefore, dissuaded students requested help significantly less often.

2.2 For all students, number of help requests was negatively correlated with posttest scores

For students in both conditions, pretest and number of help requests accounted for 61% of the variance in predicting posttest scores, adjusted $R^2=.611$, while pretest alone accounted for 41% of the variance, adjusted $R^2=.407$, a difference of 20%. ANOVAs for the ratios of variances explained by both models were significant, $p<.001$. The standardized Beta coefficient for number of help requests was -.472 and this was significant, $t = -5.163$, $p<.001$.

Thus, students who requested help less often scored higher on the posttest, whether or not they were dissuaded.

2.3 Among students with lower pretest scores, dissuaded students marginally gained more

Overall, there was no significant difference between dissuaded and non-dissuaded students in learning gain. To test for an aptitude-treatment interaction, we divided the students using a median split based on pretest scores. The median pretest score was 19 and the *low pretest* group consisted of 28 students with scores ranging from 8 to 18, of which half were dissuaded. Among low pretest students, the mean net gain for dissuaded students was 4.9 out of 28, while the mean net gain for non-dissuaded students was 1.8. Measuring learning gain (LG) using the formula LG = (posttest % – pretest %) / (100% – pretest %), this difference was marginally significant, $t(26)=1.713$, $p=.099$ (2-tailed).

While our intervention didn't help all students, it may have helped those with the most to gain, the students with lower scores on the pretest.

3. Discussion and Conclusions

The intervention was successful at dissuading students from requesting help. Our intention was to motivate students to strive to make connections between their existing knowledge and the task at hand before requesting help, and then if they really needed to request help, to try their best to learn from the help that they received before requesting help again. We hypothesized that such behavior would lead to more learning and thus to higher gains and posttest scores. Supporting our hypothesis, we found a strong negative correlation between number of help requests and posttest scores. However, we found that only dissuaded students with lower pretest scores marginally gained more than their non-dissuaded counterparts. We suspect that this is the result of a classic aptitude-treatment interaction. Higher pretest students likely had better learning skills. Students with better learning skills are more likely to use help appropriately – e.g., when they really need it. Thus, dissuading higher pretest students from using help except when they really needed it had little effect on their behavior – they didn't need to be dissuaded – or their posttest scores. In contrast, non-dissuaded students with poorer learning skills or less motivation to learn were more likely to avoid engaging with the material by requesting help until the tutor gave the answer away.

We observed a few instances of a new type of help abuse that may have been elicited by dissuading help requests while providing proactive help when the student selects a step: repeatedly selecting a step and then canceling it until proactive help is received. This is similar to making frivolous errors when proactive help for errors is available. The decision-theoretic version of the Calculus Tutor incorporates a model of the student's manner of help usage partly to recognize and counteract such behaviors.

Our results are linked to proactive help because students were able to receive help without requesting it. We hope that with more carefully considered proactive help (e.g., decision-theoretic), dissuading unnecessary help requests while providing proactive help will be a step towards changing students' use of ITS help. Currently, help requests are usually the main way for students to get an ITS to respond, but these help requests are often either over- or under-utilized, resulting in sub-optimal learning. If students are dissuaded from requesting help when they don't need it, and provided with proactive help when they do need it, students may begin to request help from ITSs more like they request help from human tutors: when they really need it and the tutor has failed to anticipate their need.

Since our intervention involved mainly a simple help delay, it can be used by tutors in diverse domains with a variety of help content. The delay was only for reactive help and so it may prove useful even for tutors that do not provide proactive help.

References

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