Gender differences in interacting with AnimalWatch

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Abstract

Little research has been carried out that examines how the two genders interact with software. This is of special importance in the case of educational software for mathematics, given the difficulties that girls and women have encountered while learning the subject (Eccles et al., 1993). We have observed the interactions of 350 elementary school students with a mathematics intelligent tutoring system, AnimalWatch (Beal et al., 2002). We found gender differences at two levels. At the coarse-grained level, there was a distinct impact of the amount of help on students' attitudes towards mathematics: girls decreased the value they attributed to math after working with a version of AnimalWatch providing the right answer when students made mistakes. At the fine-grained level, we observed the amount of time students paid attention to help: boys were less willing to be helped. This gender difference was larger for the best students in the class.

Gender differences in AnimalWatch

Three studies were carried out in urban and rural area schools in Massachusetts, with 350 children ranging from 9 to 11 years old. Boys and girls had similar cognitive abilities, as diagnosed with a cognitive development test. Students used the AnimalWatch tutoring system for about 2 hours, split into 3 different days. Students were provided a pre and posttest to assess the value attributed to mathematics, with an instrument that had produced gender differences in the past (Eccles et al., 1993). Different versions of AnimalWatch were provided to students, with different amounts of information provided when they entered incorrect answers. Three versions of AnimalWatch provided different kinds of highly interactive scaffolding. One version provided only the correct answer to the problem. Students' interactions with AnimalWatch were recorded, including mistakes, latency to attempt an answer, and time spent interacting with the help component.

In general, the provision of high amounts of help was beneficial for students, as they made more progress in the versions that provided more help. However, gender differences were found with respect to their attitudes towards mathematics and for the time they spent going through the provided help.

Girls spent 25% more time seeing help than boys, on average. This time difference was especially high for students who had higher than average score in the cognitive development test, i.e. the best students of the class. Girls of highest cognitive ability in the class spent almost double of the time in hints than boys of the same ability. Also, the latter boys were more likely to ignore help (spend less than 3 seconds within a hint) while girls barely displayed this behavior.

Students scored highly in the mathematics value pretest (4.3 in a scale of 1 to 5). Girls significantly reduced the value attributed to math by 10% when provided reduced help. At the same time, boys increased the value attributed to mathematics with this same version providing little help. We have found similar interaction effects in the past with respect to self-confidence in doing mathematics (Beck et al., 1999), where a version of the tutor providing little scaffolding provided highest self-confidence improvements for boys.

These results suggest that the level of scaffolding in educational software may affect changes in attitudes towards the subject being taught. Providing help and scaffolding can be more important for girls than for boys. Boys are more likely to reject high levels of scaffolding than girls. One possibility is that the provision of immediate help is too intrusive for boys, while it is not for girls. More details about this research can be found in (Arroyo, 2003).

Acknowledgments

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