

Single- and Mixed-Gender Pairs' Help-Seeking and Domain-Knowledge Gains in Collaborative Inquiry-Learning Classroom

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Abstract: This study explored single- vs. mixed-gender pairs' ($N = 35$ dyads) help-seeking processes and domain-knowledge gains in secondary science education. The results of the quantitative analyses show that the gender composition of the group had no substantial effect on the pattern of student help-seeking processes and domain-knowledge gains in the classroom. To explore this further, qualitative analysis of single- and mixed-gender pairs and their ways of working will be conducted.

Introduction

It has been indicated that inquiry learning process can be highly demanding for students and that students often refrain from seeking help from the resources (e.g. teacher, peer learners, computer) available in a classroom when they are stuck which may further hinder learning (van Joolingen et al., 2005). Not asking for help when it is needed is a phenomenon which is widespread across a variety of educational settings (Aleven et al., 2003). There are indications that help-seeking behaviour is influenced by gender (Newman & Goldin, 1990; Ryan et al., 1998). Females have been found to be more willing than males to seek help in the classroom when they need it (Ryan et al., 1998). Moreover, gender differences in help-seeking may depend on the domain; females have been found to be more worried about their displayed competence in the mathematic classes than the reading classes when asking for help (Newman & Goldin, 1990). However, studies exploring gender implications in collaborative inquiry learning situations regarding help-seeking process and domain-knowledge gains are relatively rare. It has been argued, too, that collaborative working, working with computers and science learning may involve gender factors (Harskamp et al., 2008; Scanlon, 2000). The literature indicates that students behave differently when working in single-gender and mixed-gender groups and that this can have some effects on students' learning outcomes. Overall, several studies have shown that students' achievements in single-gender conditions are superior to those in mixed-gender conditions (Harskamp et al., 2008; Light et al., 2000). At least in studies in the past, males had more positive attitudes towards computers and science, felt more competent in computer-supported tasks, and felt themselves to be entitled to use technology - all factors that might enhance their performance (Greenfield, 1997; Underwood et al., 2000; Whitley, 1997). As regards collaboration and gender, it has been argued that females prefer to work together, whereas males would rather work independently; consequently it has been thought that collaborative learning may favor females (e.g. Harskamp et al., 2008). It should be noted, however, that these earlier studies on students' help-seeking behavior mostly investigated student-teacher interaction in teacher-centered classrooms – locations where students are expected to ask help from the teacher, and where the teacher is assumed to be the only reasonable source of help. In classrooms focusing on computer-supported collaborative inquiry-learning, a number of help sources are available to students; however, up to now, we know little about how these sources will be utilized in a real classroom situation. Despite the increased use of computer-supported collaborative inquiry-learning in education, there are hardly any studies on the help-seeking behavior and learning of gender groups in the collaborative inquiry-learning classroom.

In this study, we investigated how computer-supported collaboration in single-gender vs. mixed-gender pairs might affect both help-seeking processes and domain-knowledge gains in science classrooms. Moreover, we will explore qualitatively if there are differences between single-gender and mixed-gender pairs' ways of working.

Methods

In three secondary-school classes, female and male students were randomly assigned to single- and mixed-gender groups ($N = 35$ pairs; $n = 17$ single-gender pairs: $n = 7$ female-female pairs, $n = 10$ male-male pairs; $n = 18$ mixed-gender pairs). The students in each dyad used a shared laptop computer and worked on a module of the Web-based Inquiry Science Environment (WISE; Slotta & Linn, 2000).

Nelson-Le Gall's (1981) model of the help-seeking process was applied in a quantitative analysis of 35 screen- and audio-capturing videos of the first lessons (four five-minute intervals/90-minute videos). Interrater agreement between two coders ranged between 74% - 98%. Identical pre- and post-tests were used to measure students' knowledge of physics. Domain-knowledge gain was calculated by reducing the pair's mean post-test score by its mean pre-test score and therefore, it could be either positive or negative. Cronbach's alpha was .74

in the pre-test and .80 in the post-test. Further, qualitative approach will be used in order to explore differences between single- and mixed-gender pairs' ways of working (task-relevant/task-irrelevant behavior; Hijzen et al., 2007). We also explore if there are any indications in the data, that females have more problems with computers than males or if there are any differences in interests towards computers and science or collaboration.

Results and Discussion

In this study, we investigated single- vs. mixed-gender pairs' help-seeking processes and domain-knowledge gains in collaborative inquiry-learning environments. The results of the quantitative analyses show that the gender composition of the group had no substantial effect on the pattern of student help-seeking processes in the classroom. Overall, the amount of help sought was rather low ($M = 3.88$, $SD = 2.76$; range from 0 to 10 times) across the four 5-min time samples. The female-female pairs ($Mdn = 20.79$) scored little better in the domain-knowledge gains than the male-male pairs ($Mdn = 16.60$) or the mixed-gender pairs ($Mdn = 17.69$), but there was no statistically significant difference found between the groups, $H(2) = 0.78$, *ns*. Further, qualitative analysis of the single- and mixed-gender groups will be conducted in order to investigate if there are differences between the different gender pairs and their ways of working in computer-supported collaborative inquiry-learning environment.

Taken together, our findings indicate hardly any differences that could be attributed to the gender composition of the pairs. Help was rarely sought by the single-gender or mixed-gender pairs; nor did the pairs differ substantially in the frequency of help-seeking, in the type and content of help sought or in the help source approached. The domain-knowledge gains were generally fairly modest, but the differences that were found between the students could not be adequately explained by whether they had learned with a same-gender or a different-gender learning partner. Of course, the results of this study have to be cautiously interpreted because of the relatively small sample size and hence the relatively small power to identify existing differences.

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