A PRELIMINARY STUDY OF GENDER DIFFERENCES IN PROGRAMMING LEARNING

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Abstract - Many existing studies have found gender differences in computer science learning. Previous research documented that female students have less confidence in their computing abilities than male students [1]-[3]. With respect to programming learning, gender differences were also observed. Female students tend to view themselves as less competent in programming [4]. Researchers examined log file data from children in a CSCL environment [5]. They found that girls spend more time than boys on communicating with others in the CSCL environment. Boys are more likely to have prior programming experience than girls, and spend more time on programming. However, gender does not affect programming performance. While several studies as mentioned above have been carried out to explore the gender differences in programming learning, most mainly focus on exploring traditional programming learning methods. Few research focus on comparing the learning outcome or attitudes towards using microcontrollers as programming learning tools. Microcontrollers have been more prevailing in recent years. Many scholars have started to research on using Microcontrollers as learning tools in teaching programming. When learning programming, it helps learn the concepts, or read the hardware data as an information resource. Learners can observe the programming results immediately, which also facilitates the learning of connecting experience and abstract programming concepts. Such method is also more motivating and results in better learning efficiency [6]-[7]. In early times, robots were the major learning tools for learning and teaching programming. It was shown that it had a positive effect on motivating learners. Considering that robots are more costly, it is also a financial burden to the school. On the contrary, Arduino is cheaper and can be expanded in use with its many different input sensors and actuators. What’s more, Arduino can be used with visual programming, such as Scratch, to operate the hardware panel; this tool is suitable for novice programmers to use.

With its cheap price, Arduino has been applied widely to programming learning in recent years. Many research began to explore the learning outcomes when using Arduino as a learning tool, but they put less attention on the effect of gender factors. Thus, the present study aims to explore the influences of gender on programming learning when using Arduino as a learning tool. Thirty-three students including 16 females and 16 males from one class of a senior high school participated in the experiment. Students used Arduino in programming hands-on practices to learn programming concepts of Boolean statements, if statements and loop statements. The data, including programming achievement test and questionnaire results, were collected and examined. The research results indicate that the females and males have similar scores on the achievement test. However, males have much more positive attitudes than females toward using Arduino in programming learning.

Index Terms - programming, gender, computer science education, Arduino

REFERENCES