

Educational Robot Research Trends Analysis

Ungyeol Jung, EunKyoung Lee, YoungJun Lee

Department of Computer Education, Korea National University of Education, Korea
 purnagi@gmail.com

Abstract: Robots are introduced as advanced teaching-learning media and there are many researches on educational robots recently. In this study, we reviewed thirty research papers and analyzed the findings from their researches. We identified the success factors and limitations of educational robot researches and suggested future research directions.

Keywords: Educational Robots, Research Trends, Success Factors, Limitations

1. Introduction

Many researchers and instructors have found robots are very attractive learning tools and there have been many researches about educational robots. They think that the environment with educational robots can support the 'learning by doing'. Educational robots give learners opportunities to improve their affective, cognitive, and psychomotor abilities without unnecessary cognitive loads. Robots are interesting media and tools for adults as well as children. Educational robots have been applied to K-12 student education, teacher training and handicapped student education[1][2][3]. We have analyzed 30 research papers on educational robots and identified success factors and limitations. Also, we proposed future research directions.

2 Trends of Educational Robotics Researches

Various classes are taught with educational robots. Educational robots are used in mathematics, artificial intelligence and programming classes[4][5][6]. While 25 researches are focused on single subject, five papers studied an integrated education. Integrated education improves learners' cognitive abilities based on learners' characteristics and development levels.

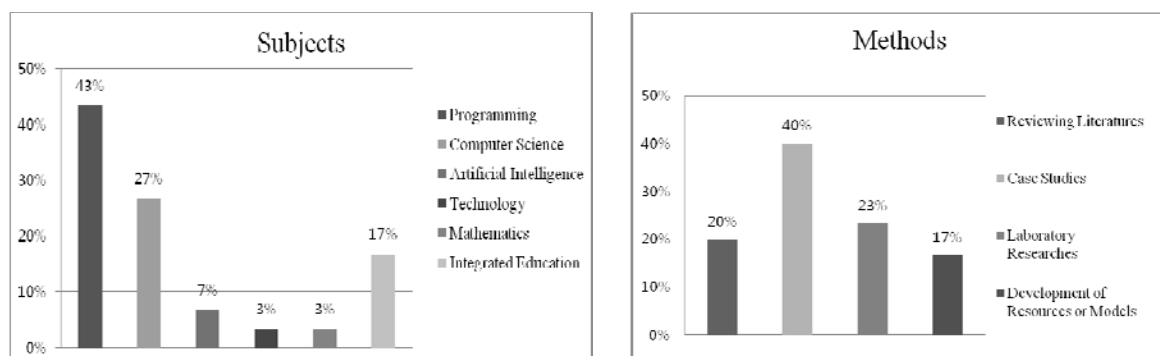


Figure 1: Subjects & Methods of Educational Robot Researches

The research methods of educational robot researches can be divided into four different types. One is to describe advantages or pedagogical possibilities through reviews of literatures. 20% of researches are in this category. Another is a case study to analyze effects of educational robots. 40% of researches are done with this methodology. There are 7 laboratory studies to verify effects of educational robotics with inferential statistics. In the remaining five researches, researchers developed teaching-learning strategies or cognitive tools to maximize effects of educational robots.

3. Discussion

Educational robots researches have reported various advantages of using robots. Some of the researches reported the improvement of a learner's interest, flow level, satisfaction and self-efficacy. Some researchers presented the results that activities with educational robots help students to have collaborative and democratic decision making attitude. Some reported the improvement of effectiveness and efficiency to learn because educational robots give immediate feedback and help learners' understanding and the degree to learn. There are some researches reporting the improvement of higher cognitive abilities such as creativity, problem solving ability and logical thinking ability.

There are few researches to identify important features to design a teaching-learning environment. Educational robots are attractive to many researchers and instructors. These may not be suitable for all subjects or learners. There are few studies that report students feel difficult with educational robots. Most of the current researches are for elementary school students and undergraduate students. Personal characteristics such as cognitive development and social development are quite different among various levels of students. Therefore, the findings from the elementary school students may not be applied to high school students.

4. Conclusion

This research analyzed the trends of educational robot researches. We, then, discussed the success factors and the limitations. The future educational robot researches should include researches to develop teaching-learning strategies to support the various pedagogical potentialities of educational robots and to consider various classes of learners.

References

- [1] Goldweber, M., Congdon, C., Fagin, B., Hwang, D., & Klassner, F.(2001). The use of robots in the undergraduate curriculum: experience reports. *The thirty-second SIGCSE technical symposium on Computer Science Education*, 2001.
- [2] Kang, J-P.(2003). A Study on the Education of Robot in Elementary School. *Journal of Society of Korean Practical Arts Education*, 16(4), 97-113.
- [3] Kim, Y., & Choi, J.(1996). Effectiveness of a Robot Assisted Instruction (RAI) system for severely cerebral-palseyed children. *Journal of Educational Technology*, 12(2), 211-228.
- [4] Hussain, S., Lindh, J., & Shukur, G. (2006). The effect of LEGO Training on Pupils' School Performance in Mathematics, Problem Solving Ability and Attitude: Swedish Data. *Educational Technology & Society*, 9(3), 182-194.
- [5] Lee, E., & Lee Y.(2007). The Effect of a Robot Programming Learning on Problem Solving Ability. *The Journal of Korean Association of Computer Education*, 10(6), 1-9.
- [6] Kumar, A. N.(2004). Three years of using robots in an artificial intelligence course: lessons learned. *Journal on Educational Resources in Computing*, 4(3), 1-16.