Capstone Project Importance in Early Childhood Robotics (Poster)

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Abstract

In this novel empirical study, the authors investigate capstone projects in early childhood robotics program and try to answer the following questions: How children at such a young age managed to identify the problem for the capstone project or who helped them? How does it impact their future desire to continue to study robotics? Are there any gender or aged related differences between participants?

This study is based on a unique Early Age Robotics (EAR) program running since 2016 involving over 2500 children. The program uses project-based learning and promotes inquiry-based science education. In this study a sample of 189 children (aged 5–7) answered one-on-one or team interviews, among them 51 children (61% first-graders and 39% kindergarteners; 53% boys and 47% girls), who studied robotics as a compulsory component of their curriculum and completed a capstone project, 28 team interviews with 81 children (17 teams were at elementary school and 11 in kindergarten; 48% boys and 51% girls) and a control group of 57 children (46% first-graders and 54% kindergarteners; 53% boys and 47% girls), who did not complete the capstone project.

Analysis of the answers to the statement "The project idea came from …" showed that majority of participants managed to find project idea without external help, but it was more difficult for kindergarteners. In experiment group school partcipants worked better together and didn't need the help of somebody else, like teacher or another figure. However, according to the Chi-Square test for independence this

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difference was not age significant $\chi 2(3) = 5.974$, $p = 0.113$ and not gender significant $\chi 2(3) = 0.667$, $p = 0.881$. Group interviews showed that in both cohorts similar percent of students (about a third) saw themselves as the deciders, however first-graders felt much more the team spirit of deciding "together". These results show that in kindergarten the scaffolding provider (like teacher, instructor, mentor) is very important and third of the students see this "somebody else" as source of the project idea.

The results of analysis of future desire to study robotics statement showed that integrating capstone project challenge in robotics program positively influences child's desire to continue to study robotics. Also encouraging is the gender equality found in this area.

These significant results prove that EAR stakeholders should intensify project-based learning in early childhood and motivate children to take upon themselves greater challenges than was seen as age appropriate in the past.

Keywords: robotics in education (RE), project-based learning (PBL), early childhood, constructivism, inquiry-based science education (IBSE).