

Future Academy®'s Multidisciplinary Conference

Developing technological knowledge and programming skills of secondary schools students through the educational robotics projects

Daniel Tocháček^{a*}, Jakub Lapeš^a, Viktor Fuglík^a

^a Department of Information Technology and Education, Faculty of Education,
Charles University in Prague, M. Rettigové 4, 116 39 Praha 1, Czech Republic

Abstract

Many pedagogical approaches that are mainly used in order to develop technological knowledge and programming skills of students at schools are mostly theoretically-oriented. They are based on the traditional model of transfer of finished knowledge between a teacher and a student. Exploitation of educational robotics project into the education at schools has the potential to change the students' access to the knowledge and skills through their own work and experiments under the supervision of teachers and tutors. The paper describes study that was aimed at identify the potential and aspects of exploitation of educational robotics project in education at secondary schools and training teachers in order to develop technological knowledge and programming skills of secondary school students in practically-oriented ways of education.

© 2016 Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of Future Academy® Cognitive Trading

Keywords: educational robotics; education; ICT

1. Introduction

At most schools participated at study, the traditional concept of the educational process has been based on passing more or less ready-made know-how to students by their teacher - most probably, this concept still prevails over other arrangements (Rambousek, Štípek, Procházka & Wildová, 2014). Certainly, many series of examples exist, where such a principle is well-founded and there is no need to look for another alternative. Nonetheless, there also subsist situations where it is suitable to carry out a modification of the relation between the educator and his students. Such

* Daniel Tocháček. Tel.: +420 221 900 239
E-mail address: daniel.tochacek@pedf.cuni.cz

situations allow to alter the view at the role of the both participants of such a relation, especially with respect to their activities during the educational process.

The up-to-now unilaterally oriented relation among the teacher and his students has been based on the traditional principle of supremacy and subordination; the new alternative introduces a balanced, collegial way of partnership. The role of the participants of the educational process changes and so does also the extent of activities which they embody. Especially the initiative of students grows. The students themselves work up towards knowledge, while the teachers act as their attendants, advisors and activities organizers. Such a change of conditions is typical, among other things, for an education arising from the theory of constructivism. In the agreement with this theory, students actively construct their proficiency on grounds of information and experience, which they are gradually acquiring throughout their life. This opinion has been deeper developed by the theory of constructionism, which identifies the most effective way for constructing students' knowledge - by the series of consecutive practical activities that lead to the creation of a realistic product, attractive for a student.

Theories of constructivism and constructionism are particularly bearing for the field of educational exploitation of technologies. Students' activities get oriented on the realization of various practical doings specifically in this sphere - with the result, that they themselves start creating new pieces of knowledge. The condition for a successful running of the constructivist education is a high-quality organizational securing of it from the side of teachers which must commence from a good understanding of all aspects of such a concept (Aliminis (Ed.), 2009). Hence it is understandable, that we pay an appropriate attention to the preparation of the future teachers of the technical and informational education. In connection with the practical exploitation at school, we consider as extraordinary useful the interconnection to the theory of constructivism and constructionism with the sphere of robotics.

2. The basic information of the study

During the year 2014 our Department of Information Technology and Education successfully joined the faculty grant project of Charles University in Prague. This project has intended to deepen the educational process of the secondary school students, educators and trainee teachers by showing them, how to implement robotics in the constructivist education.

The study consisted of several phases: The first phase was associated with the preparation of the educational robotics course curriculum by building the theoretical bases starting from the works of J. Piaget, S. Papert and others (Vaňková, Lapeš, 2013) and also from previous similar projects (Frangou, 2008; Tocháček, 2009; Tocháček, Lapeš, 2012), by selecting the technological support (taking into consideration especially the field of robotics; the LEGO Mindstorms NXT and WeDo systems were picked out), and by creating an extensive database of supporting electronic materials. During the second phase, a system of courses for the secondary school students, educators and trainee teachers was realized at all working units participating in the study; an evaluation and a detailed analysis of the courses were completed. The content of the third stage was preparation complex - printed and electronic manuals of the course, as well as development educational materials, didactic tools and curriculum for educational robotics courses.

Focus of the work in research was based on the empirical qualitative methods. It was primarily action-oriented research, verifying the examined strategies, based on the analysis of the experimental learning model, associated with the observations and interviews with the research participants. These methods were supplemented by proper quantitative approaches – by exploratory investigations and by an analysis of the recorded resources. The empirical part of the research consists of the analysis of experimental educational robotics courses. The realization of the study included searching for answers to research questions, especially: Could educational robotics projects fulfil the role of the tool that develops technological knowledge and programming skills of students at secondary schools? Are we able to prepare universal common scenarios of educational robotics projects that have potential to be used for the support of developing technological knowledge and programming skills?

Download English Version:

<https://daneshyari.com/en/article/1108603>

Download Persian Version:

<https://daneshyari.com/article/1108603>

[Daneshyari.com](https://daneshyari.com)