opción

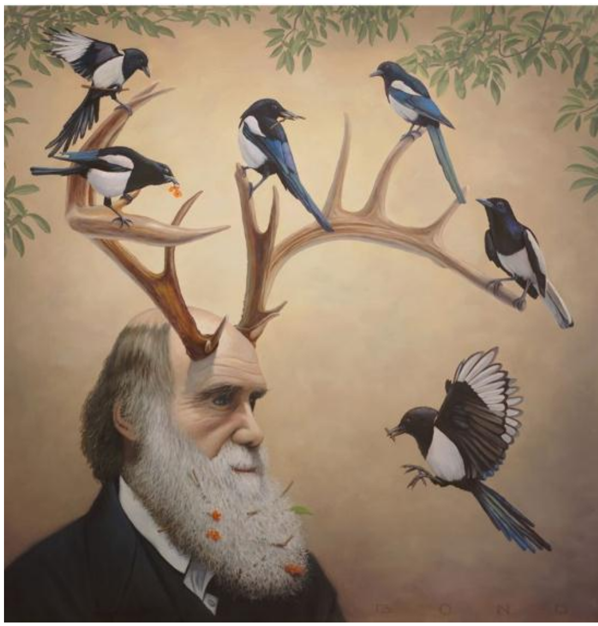
Revista de Antropología, Ciencias de la Comunicación y de la Información, Filosofía, Lingüística y Semiótica, Problemas del Desarrollo, la Ciencia y la Tecnología

Año 35, 2019, Especial N° 22

Revista de Ciencias Humanas y Sociales

ISSN 1012-1587/ ISSNe: 2477-9385

Depósito Legal pp 198402ZU45



Universidad del Zulia

Facultad Experimental de Ciencias

Departamento de Ciencias Humanas

Maracaibo - Venezuela

Opción, Año 35, Especial No.22 (2019): 292-307
ISSN 1012-1587/ISSNe: 2477-9385

Project-oriented training experience in micro-robot programming in college and its features

Ainash Haliullinovna Davletova[1]
[1]L. N. Gumilyov Eurasian National University, Astana, Kazakhstan
ainash.davletova@yandex.ru

Talant Tolganbaiuly[2]
[2]L. N. Gumilyov Eurasian National University, Astana, Kazakhstan
talant.tolganbaiuly@yandex.ru

Almira Izbasarovna Tazhigulova[3]
[3]JSC National Center for Informatization
almira.tazhigulova@yandex.ru

Laura Amangeldievna Smagulova[4]
[4]Zhetysu State University Named After I. Zhansugurov
laura.smagulova@yandex.ru

Akmaral Hamzievna Kasymova[5]
[5]Zhangir Khan WKATU, Uralsk, Kazakhstan
akmaral.kasymova@yandex.ru

Dametken Sagidullaevna Baigozhanova[6]
[6]L.N. Gumilyov Eurasian National University, Astana, Kazakhstan
dametken.baigozhanova@yandex.ru

Abstract

In this article, a pedagogical experiment was conducted using a project-oriented training methodology to study about micro-robot programming at the Faculty of Information Technologies in college and its features. The research results show that the considered project-oriented teaching method allows one to fulfill teaching tasks through the example of various applied tasks, is effective in teaching micro-robot programming, and contributes to the development of creative abilities and communication skills in students. In conclusion, the participants have formed a holistic view of the project, while awareness of the completeness and significance of their activities increased the students' self-esteem.

Keywords: Information technologies, Digital, educational, Micro-robot.

Recibido: 10-12-2018 •Aceptado: 15-03-2018

Experiencia de capacitación orientada a proyectos en la programación de micro-robots en la universidad y sus características

Resumen

En este artículo, se realizó un experimento pedagógico utilizando una metodología de capacitación orientada a proyectos para estudiar sobre la programación de micro-robots en la Facultad de Tecnologías de la Información en la universidad y sus características. Los resultados de la investigación muestran que el método de enseñanza orientado a proyectos considerado permite realizar tareas de enseñanza a través del ejemplo de varias tareas aplicadas, es eficaz en la enseñanza de la programación de micro robots y contribuye al desarrollo de habilidades creativas y habilidades de comunicación en los estudiantes. En conclusión, los participantes han formado una visión holística del proyecto, mientras que la conciencia de la integridad y el significado de sus actividades aumentó la autoestima de los estudiantes.

Palabras clave: Tecnologías de la información, digitales, educativas, micro-robot.

1. INTRODUCTION

Today, the educational system in the Republic of Kazakhstan requires modifications, as their traditional specialist training is lagging behind the current requirements. Today, employers, as well as a majority of companies, have an increasing demand for professionals who think laterally and creatively, people with the ability to analyze and adapt to changing market demands in a short time. Therefore, the acquisition of the above skills mainly depends on the form and methodology of teaching young students in college. In modern scientific literature, the use of active learning methods in all training

and education areas when training future professionals has received particular attention. Besides, we need to review the practical and theoretical aspects of the content of education, teaching and learning aids, methods of teacher education and training (ALTAN, OZTURK, & TURKOGLU, 2018: BARRETO & ALTURAS, 2018).

Today, entering the top thirty countries in the world is one of the high-priority tasks. In this regard, it is necessary to develop core capital, that is, a human resource, by increasing the competitiveness of national universities. Accordingly, the national educational system should introduce some changes. These changes should have the impact of increasing the standard of knowledge and the acquisition of relevant competencies. During the solution of these problems, the main deterrent is a significant gap between the knowledge and practical skills students acquire at domestic universities. Foreign universities efficiently solve this problem based on educational technology known as learning by doing within the framework of project-oriented learning. American philosopher and educator, John Dewey, is the founder of this method; he set its framework in his article Project Method (RASOOLI & ABEDINI, 2017: SEMA, DEMIRKAN & EMRE, 2018).

2. METHODS

The authors have developed a project-oriented syllabus in micro-robot programming and a training course for students of the Robotics Lyceum and tested them as a part of practical training for

both the undergraduate students of Gumilyov Eurasian National University and the Lyceum students in Astana. The main objective of this workshop was to promote the development of students' engineering, physic technical, and creative abilities and the formation of their professional self-identity in the process of designing, engineering, and programming. The workshop duration was four hours. The main objectives of the workshop were:

– To teach students the basics of electrical device design and engineering on the Arduino platform;

– To develop programming skills and increase motivation to learn; and

– To heighten students' interest in the research area.

The syllabus selected key topics for studying micro-robot programming and design on the Arduino platform. During the workshop, working groups were created as teams consisting of Lyceum students. The fact that each student has the opportunity to analyze the problem, to offer their own solutions, and to perform certain functions is one of the main features of teamwork. At the end of the workshop, each working group had to develop a project based on the knowledge gained. The teaching staff comprised a tutor and three assistants. The project work of the workshop participants was organized at the laboratory premises of the American Makerspace

corner club, which provided 15 Arduino sets and laptops. Figure 1 presents the students' project work.

Figure 1: Students' project work

Table 1. Experimental study phases

Groups	Experimental study phases			
	Initial assessment	Learning process, auxiliary control	Summative assessment	Feedback
Experimental group (project-oriented teaching method)	Pre-test E1	Workshop	Post-test E2	Questionnaire survey
Control group (conventional teaching method)	Pre-test C1	Workshop	Post-test C2	Questionnaire survey

Based on the analysis of scientific, methodological, and regulatory documents, the training activities in teaching micro-robot

programming were systematized, which determined the need to structure training activities in the design of technical systems in accordance with the project activities (Table 2).

Table 2. Project-oriented micro-robot programming training organization

Phases	Stages	Stages
Training project organization	Conceptual stage	Formation of a project team
		Choice of a training project
		Problem statement
		Defining the research objectives
		Project hypothesis
	Team building with allocation of functional responsibilities in the project	Definition of research objectives and the distribution of tasks among project team members
		Resource exploration
Training project implementation	Micro-robot development	Designing a micro-robot
		Programming micro-robot
	Testing and debugging the micro-robot software/hardware	Micro-robot software/hardware testing
		Micro-robot software/hardware debugging
Training project assessment	Training project presentation	Preparation of the training project charter
		Preparation of the training project presentations for public defense

		Public defense of the training project
	Analysis of the work performed	Discussion of the project, critical scrutiny
		Analysis of the goal achievement

Depending on the specifics of a project, the structure of the project group is defined as follows: a project manager, an engineer, and a programmer. The group is formed based on related interests and interpersonal relationships. The developed Digital Educational Resource (DER) in the English language for students in the e-learning system consists of 15 topics. When viewing each new topic, one can view audio, animation, and text on this topic. Each topic is classified in the Listening, Reading, Test Assignments, and Interactive Tasks sections. Listening, reading and writing the parts that introduce each topic are questions and tasks that introduce the whole text. A student can make a self-assessment after the assignments and consolidate their communication skills in the next test section. A large amount of audio and video content can help learners understand and master the topics.

Such a differentiated step gives a positive result, allowing each student to work consistently, which enhances their motivation to study. Interactive models are available to use at any time. For example, in the first lecture, the topic is called the Role of ICT in the Key Sectors of Social Development. ICT Standards. Below is an audio recording of this topic, texts to read, interactive exercises and tests to assess the

knowledge gained. A DER subject and an illustrated multimedia topic are shown in Figure 2.

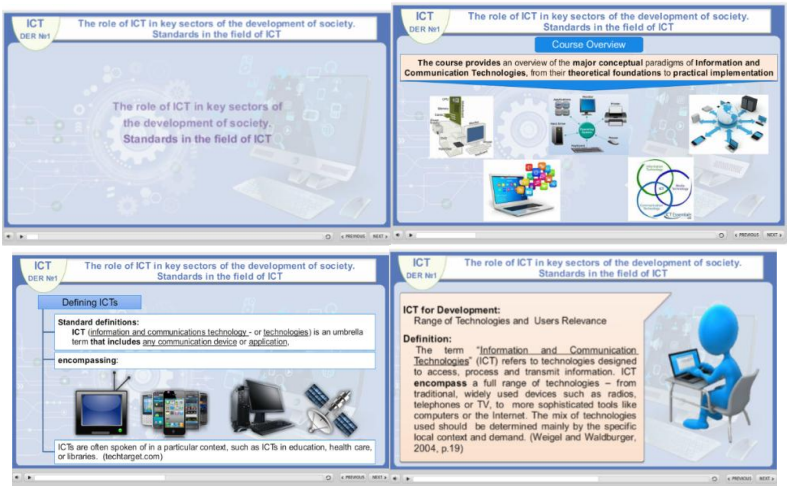


Figure 2: The Role of ICT in the Key Sectors of Social Development. Excerpts from the ICT Standards Digital Education Fund

The demonstration of various physical projects increased students' understanding of how to integrate a variety of logical expressions into a program, how to correctly use loops in arrays to operate robots for various programming techniques. While working with a sound sensor, the students composed popular musical melodies for the signal of automated micro-robots. This approach helped students to understand in detail the process of array concatenation and the difference between the position and the value of an array element. Therefore, we can say that project-oriented learning is the main bridge between theory and practice. Figure 3 shows fragments of work at the

workshop fundamentals of micro-robot design and engineering (on the Arduino platform).

Figure 3: Micro-robot design and engineering on the Arduino platform
Currently, modern teaching at the university that involves

teaching designers is unique. This concerns the modernization of scientific and technological progress and the complexity of its development momentum. Due to high demand, innovative educational technologies are a modern didactic mechanism. Therefore, teaching designers at the university will adapt to modern didactics during the training process. Modern bachelors should be highly demanded in society. Therefore, it is important to take into account education in the field of communication technology integration when training teaching designers at the university.

This is done using these lines to develop students' skills in algorithmic and logical thinking, to build up their intellectual abilities and to create necessary symbols for better learning in the training process. In the course of mastering the algorithmic area in school practice, the algorithmic basis, the start of programming, algorithmization and programming has shown that students are not

interested in studying these sections. The reason is that in studying these sections, student performance declines. This lesson shows that there is no intermediate connection and that mathematics should be used to solve problems when creating a program. Figure 4 shows the student's work with robots (TROFIMENKO, 2014).

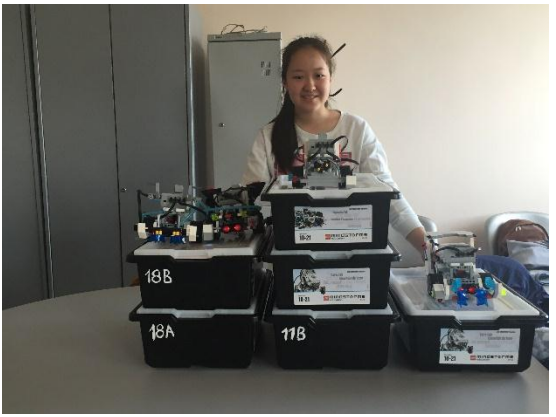


Figure 4: Working with robots

To date, robotics has been the most advanced type of programming. Robotics is an applied science involved in the creation of automated technical systems. With robotics used in education, a student can gain universal learning experience, since the robot technique uses different areas to accomplish the same task. Involving teaching designers in education, one can increase students' motivation to learn and ensure collective thinking and autonomy. The didactic

features of the Robotics course that leads to achievements in education are:

– Robots with robotic elements allow students to manage subjects objectively rather than only virtually. Students setting up and editing using data CDs allows them to take control over the entire computerized system;

– Robotics Development Studio Environment for robots, ecologically friendly robots like Parallax Boe-Bot and Lego Mindstorm, are available in C# and Visual Basic programming languages. Having mastered these programs, students will use robots in the future (GANSEUER, NERETINA & KOROKOSHKO, 2015).

– Virtual environments allow one to control programmed robots. All of this will allow students to share their duties. For example, one programmer is a robot, another one is an environment. During teamwork, students acquire team work skills when designing, and this is currently one of the most important issues. Figure 5 shows students in the Robotics training course and the result of their work.

Figure 5: Robotics training course

4. RESULTS

The experiment involved six groups in three specialties. The statistics show a significant difference in the post-test assignment results between the experimental and control groups. The experimental group has assimilated knowledge on average by 21.6% better than the control group. One of the main factors influencing the results was the number of students. Therefore, the groups with a small number of students scored the highest (Computer science (education)-13–75% (8 people); Computing hardware and software_19–91% (9 people)). Table 3 presents the results of our experiment.

Table 3: The results of our experiment are presented below.

No.	Group	Pre-test	Post-test	Project-oriented learning efficiency	Number of students
1	Computer science (education) – 13 (exp. group)	38%	61%	+ 20%	14
2	Computer science (education)– 11 (control group)	36%	41%		15
3	Computer science (natural sciences)-13(exp. group)	58%	75%	+ 12%	8
4	Computer science (natural sciences)– 11 (control group)	65%	67%		18
5	Computing hardware and software–19 (exp. group)	39%	91%	+ 33%	9
6	Computing hardware and software–17 (control group)	53%	58%		14
Average / Total				**+ 21.6%**	**78**

Figure 6 shows the experimental research results in the control and experimental groups.

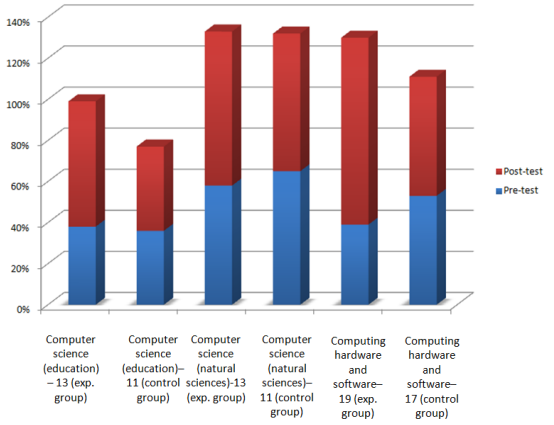


Figure 6: The experimental research results in the control and experimental groups

6. CONCLUSIONS

After the project-based training in micro-robot programming, the participants have formed a holistic view of the project, while awareness of the completeness and significance of their activities increased the students' self-esteem. Also, the participants received an unforgettable experience of working with a team and practically applied their theoretical knowledge to solve real-life problems. Thus, the conducted research shows that the considered project-oriented training method allows one to fulfill teaching tasks using

the example of various applied tasks, is effective for teaching micro-robot programming, and contributes to the development of creative and communicative skills in students.

REFERENCES

ALTAN, E.B., OZTURK, N., & TURKOGLU, A.Y. 2018. "Socio-Scientific Issues as a Context for STEM Education: A Case Study Research with Pre-Service Science Teachers". **European Journal of Educational Research**, Vol. 7, N° 4: 805-812. USA.

BARRETO, D. M., & ALTURAS, B. 2018. "Quality-in-use app evaluation: case of a recruitment app for Portuguese SMEs". **Journal of Information Systems Engineering and Management**, Vol. 1. Netherlands.

GANSEUER, C., NERETINA, E., & KOROKOSHKO, Y. 2015. **"**Experience of project-oriented learning and organization of teamwork among university students". **Integration of Education**. Vol. 19, N° 2: 22-30. DOI: 10.15507/Inted.079.019.201502.022. Russia.

RASOOLI, M., & ABEDINI, M. 2017. "The Relationship between Organizational Support and Job Satisfaction of Experts and Managers of Islamic Azad University of Qeshm and Subsidiaries (International Units, Medical, Sama, Hormuz and Khamir)". **Dutch Journal of Finance and Management**, Vol. 1, N° 2: 42. Netherlands.

SEMA, C. A. N., DEMIRKAN, E., & EMRE, A. V. C. I. 2018. "The Effect of Exercise on Serum Homocysteine, Adma, Neopterin and Oxidative Stress Levels in Young Male

Athletes". **International Journal of Applied Exercise Physiology**, Vol. 7, N° 4: 17-29. Iran.

TROFIMENKO, A. 2014. "Innovative teaching methods in higher education". **SCI-ARTICLE**. N° 13. Canada.

UNIVERSIDAD
DEL ZULIA

opción
Revista de Ciencias Humanas y Sociales

Año 35, N° 22, (2019)

Esta revista fue editada en formato digital por el personal de la Oficina de Publicaciones Científicas de la Facultad Experimental de Ciencias, Universidad del Zulia.
Maracaibo - Venezuela

www.luz.edu.ve

www.serbi.luz.edu.ve

produccioncientifica.luz.edu.ve