

INFORMATICS TEACHING METHODS IN PEDAGOGICAL UNIVERSITIES: TRENDS AND PROSPECTS

Abdukarimov Sirojiddin Sayfiddin Ugli

Chief Specialist Of The Ministry Of Preschool And School Education Of The Republic Of
Uzbekistan, Tashkent, Uzbekistan

ABSTRACT: The problem of improving the methodology of teaching programming at university and school is being investigated. The necessity of new methods and forms of teaching related to students' teamwork, multimedia content, virtual spaces, etc. is substantiated. Programming teaching practices in leading foreign universities are analyzed and the main ways to improve programming teaching in Uzbek educational institutions are proposed. The author presents his own programming teaching experience and proposes to start transforming traditional programming teaching approaches and informatics teaching methods in pedagogical universities in order to spread progressive teaching practices from pedagogues to schools.

KEYWORDS: programming, teaching methods, project activity, teamwork, interactive technologies, internet platform, teacher training, robotics, mobile applications, algorithm, program, electronic educational resource.

INTRODUCTION

Modern informatics and programming education faces the challenges of accelerating renewal of content, forms and methods of learning, programming tools and methodologies. Changes in technology, operating systems, increasing complexity of application software and programming languages pose new challenges to the education system.

Constant complication of computer programs makes it necessary to change existing approaches to their development. Actual practice of software creation is regulated by many international standards and corporate norms. It is obvious that individual programming is not able to provide creation of complex software products. Teamwork on software packages is based on the principles of project organization: project life cycle, roles of participants (manager, designer, etc.), and stages. Each of the roles is related to the competences to be formed during school and university education.

At the same time in the conditions of development of demand on the specialists capable not only to develop faultless program code, but also to take part in joint project work on complex program complexes, it is necessary to form at programming training of students, along with technical knowledge and skills, the competences allowing to work in the socially-professional environment [1-3]. Therefore, educational training programs related to programming should include training content that ensures successful teamwork, leadership, team management.

The analysis of educational content of the Internet allows to assert that the widest spectrum of author's approaches to programming teaching, as well as high efficiency of teaching are represented by universities of the USA and Europe. Many of the leading Western universities are successfully collecting and developing methods from other regions of the world: Russia, USA, China, India, Asian and African countries.

Experience of using interactive technologies in teaching programming. We will present the key innovative directions in the field of teaching programming abroad and examples of implementation of these directions in leading universities.

The experience of collective programming education is quite diverse [3-5]. Different approaches are implemented in European universities. For example, in Spain (Complutense University of Madrid) a group of teachers conducts team learning of programming in the system e-Learning NUCLEO, which was developed on the basis of social-constructivist pedagogical approach for developing communication practice in Problem Based Learning. This computer system allows modeling interaction activity in group work, interpersonal communication, conflicts and their resolution. The principles of the NUCLEO system are based on the theory of activity and are implemented in a virtual environment that allows studying the processes of personal development. To solve this problem, the teacher needs to model the subject's behavior in a social environment. The researchers suggest using NUCLEO to improve team development of software products. In NUCLEO, social interaction is implemented through two different schemes: competition and cooperation, designed to increase motivation and develop group dynamics in different game contexts, scenarios that are prepared by teachers. The system implements a hierarchy of awards and various social ranks, which are achieved through the educational achievements of students [6].

The game concept of programming instruction, for example, involves guessing program sections by combining input and output data. Pex4Fun (<http://www.pex4fun.com>) is a browser game developed by Microsoft Research (MSR) specialists. It can be used on a variety of computer platforms and devices ranging from personal computers to smartphones. In competitive situations students can learn programming in C# and VisualBasic languages, achieving the goals set by the teacher. This game allows you to learn programming at different levels of education - from school to university. To advantages of the given game it is possible to carry possibility of group participation in the decision of problems and the feedback allowing the teacher to change training strategies. A didactic advantage is the possibility of unusual combinations of input data for algorithmic constructions created by students, which not only allow testing the solution of a problem, but also making them think about understanding of the created code fragment [5].

The European project Minerva CodeWitz (Finland) is connected with revealing innovative possibilities of productive programming training in interactive object-oriented environment. Visualization of basic algorithmic structures and hierarchical library of task examples allow developing individual educational routes for students. The advantages of this project (over traditional approaches to learning) include the continuous improvement, updating and expansion of collections of educational materials through participation in the project by leading European universities. The authors develop the concept of small, autonomous, transferable and

documented assignments, which can be combined in the learning process and applied without additional training of teachers and students. CodeWitz can be used for organization of teamwork of students on training tasks on programming and allows developing competitive qualities of students [8].

RobotC platform (<http://www.robotc.net/>), created in the USA, offers a wide range of opportunities for programmable robotics and allows programming robotic devices from different manufacturers (TETRIX, NXT, Cortex, RCX, PIC, VEX PIC, Arduino Diecimila, Duemilanove, Mega 2560, Mega 1280, Uno).

We have brought only individual, conceptual approaches, forms and methods of teaching programming, presented in the world educational practice, allowing to formulate modern tendencies in the field of teaching programming transformation of content, forms and methods. These trends can be summarized in the following provisions:

- 1) There is a need to use the project approach in teaching programming for students to master modern forms of software creation;
- 2) Teamwork on project tasks allows, in addition to technical competencies, to develop personal qualities and competences demanded by the modern labor market;
- 3) In the process of training, the result of students' activity may be a completed software product, which allows to significantly increase motivation for learning;
- 4) Graphic applications and virtual environments that simulate social interaction between students in the course of learning should be used in the learning process;
- 5) In the process of learning it is expedient to use the possibilities of open mass online courses and systems of distance learning (DLL) that provide openness, multimedia, interactivity and group forms of learning;
- 6) The applied component and interest of students can be ensured by involving elements of educational robotics and design in the classes;
- 7) The construction of a course on programming based on mobile application projects will increase the interest and performance of students, as well as provide the following the productive nature of learning.

CONCLUSION

In conclusion, it should be noted that it is too early to say that the experimental training has been completed. Every year, educational programs are updated and improved, and new interactive tools, new forms of classroom organization and buildings for practical work are included in the work programs. We consider the organization of pedagogical practice and students' understanding of interactive learning technologies as a tool for further professional activity to be an important direction for improving the effectiveness of training in programming future teachers of computer science. Despite the incompleteness of the experimental training, it can already be stated at this stage that the used complex of interactive forms and methods of teaching has significantly increased the interest of students in learning programming, provided an increase in absolute and qualitative performance in a number of complex disciplines of training, increased

the level of self-esteem of readiness for pedagogical activity and provided motivation of students to use interactive technologies in the process of pedagogical practice.

REFERENCES

1. Dann W., Copper S., Pausch, R. Learning to program with Alice. Upper Saddle River, NJ: Prentice Hall, 2006.
2. Kelleher C., Pausch, R. Lowering the barriers to programming: A taxonomy of programming environment and languages for novice programmers // ACM Computing Surveys. 2008. № 37 (2). P. 83–137.
3. Strijbos J.-W. The effect of roles on computer-supported collaborative learning: doctoral dissertation. Heerlen, The Netherlands: Open University of the Netherlands, 2014.
4. Daly T. Minimizing to maximize: An initial attempt at teaching introductory programming using Alice // Journal of Computer Science in Colleges. 2011. № 26 (5). P. 23–30.
5. Tillmann N., Halleux J.D., Xie T. Pex4Fun // Teaching and Learning Computer Science via Social Gaming, in 2012 IEEE 25th Conference on Software Engineering Education and Training (CSEE&T). Nanjing, 2012. P. 90–91.
6. Pilar S-T., Rubén F-F. Learning teamwork skills in university programming courses // Computers & Education. 2009. № 53. P. 517–531.
7. Liu M., Williams D., Pedersen, S. Alien rescue: A problem-based hypermedia learning environment for middle school science // Journal of Educational Technology Systems. 2002. № 30 (3). P. 255–270.
8. Kirsti Ala-Mutka. Problems in learning and teaching programming - a literature study for developing visualizations in the Codewitz-Minerva project // Institute of Software Systems, Tampere University of Technology. Finlandi, 2008.
9. William L. Honig Teaching and Assessing Programming Fundamentals for Non Majors with Visual Programming // Computer Science: Faculty Publications and Other Works Faculty Publications. Loyola University Chicago. 2013. № 7.
10. Jordine T., Liang Y., Ihler E. A mobile-device based serious gaming approach for teaching and learning Java programming // IEEE Frontiers in Education Conference (FIE). Madrid, 2014. P. 1–5.
11. Werner M. Teaching graphics programming on mobile devices // Journal of Computing Sciences in Colleges. pp. 2013. P. 125–131.