Tripled Learning: Conception and First Steps

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Abstract. In the article, the concept of tripled learning is considered. There are provided advantages of tripled learning and first results. We ty to combine the blended learning with team work for the first year students of specialty "Computer sciences".

Keywords: tripled learning, education process, team work.

1 Introduction

Recently, there is a tendency for students to lose interest in research and learning in general. The main reason for this development is lack of motivation. Students do not have the opportunity to concentrate on their studies, they more like games or research [1]. Thanks to the rapid development of information technology, people do not have the time or the desire to read books, record lectures and perform traditional laboratory work. First of all, this applies to students from areas related to information technology. The scope of IT is innovative, and it is natural that traditional teaching methods such as lectures and books are not always effective. It is very important to encourage such students to study and research. For this purpose, it is necessary to update the traditional system, making it more interesting and relevant.

2 The Tripled Learning Approach

Nowadays the learning process have different implementations. Next to traditional or "classic" methods [2] such as lectures and practical works there is also its online version as e-learning and their combination - blended learning [3]. Also the gamification of learning process is popular [9].

Our proposal is a new kind of learning – **tripled learning**. This is combination of three different approaches:

1. Offline or "classic" learning process with lectures, individual practical tasks and individual laboratories.
2. Online learning at one or more preselected MOOC according to main case of studies.
3. Teamwork on own projects.

All three cases are strongly connected and passed inside time framework. The final mark: 35% exam, 10% practical tasks, 20% laboratories, 10% success online learning, 25% project. Finally, students must show their results in three forms to:

1. Examination with dialog of lecturer.
2. Set of passed tasks with revised reports.
3. Public presentations of projects with grade from third part persons.

According to the proposed structure of tripled learning we expect the growth of learning and creative work efficiency. The conception of tripled learning made first steps in real teaching process at university.

During last months we made successfully implementation of proposed tripled learning into real learning process within course “Algorithmic and Programming. Part One” for the first year students of specialty “Computer sciences at the department “AI Systems”. This course created around the learning of procedural programming using C language with examples of using different algorithms and basic overview of operating systems like Linux, GitHub, networking, Internet, client-server technologies, modern web development, project management process and different up to date IT conceptions such as Cloud computing, Internet of Things, Artificial Intelligence, Robotics etc. with several practical applications. To cover the whole list of topics, 25 lectures with additional visualization and a detailed extended text description were developed. In this case, the main emphasis and most of the time is devoted to the study of programming using C language in various aspects.

By creating a training program by a group of experts, a number of different MOOCs were analyzed for the best possible compliance with the requirements of this course. As a result, the online course "Introduction to Computer Science. CS50" [4,5] from Harvard university as the main MOOC and "Design Thinking for Innovation" [6] from Darden School of Business, University of Virginia as an auxiliary for creativity training during the development of team projects was selected.

The next step was to develop a set of practical tasks for work in computer laboratories that would be coordinated, supplemented, and expanded the corresponding tasks from “CS50”. As a result, detailed step-by-step guidelines were developed for 15 practical programming works in accordance with the length of the academic semester at the university, which were in harmony with the tasks from “CS50”.

A separate task was to organize teamwork on various projects during the semester. As a result, from all 124 first-year students, 32 original authoring projects with a team size of up to 5-6 people were formed. The results of the projects were successfully presented to the jury from the invited top managers of various IT companies. The subject of the completed projects was very diverse, namely:

- Applied tasks of AI, computer vision and neuro networks;
- Augmented Reality (AR) applications;
- Different Internet of Things (IoT) prototypes using Arduino and elementary AI;
- Robotics tasks using original author’s platform T-Bot;
- Mobile applications;
- 3D learning games;

- Web sites and web applications.

All the results of the **tripled learning** process were reflected on a dedicated web site named “AI Students” created by our students. It contains a list of all projects with their presentations, videos and links for downloading whenever possible. On a separate web page there is a list of all students with their Certificates from Harvard University and University of Virginia on the successful completion on the relevant MOOC and links on their team projects. A fragment of the project description site is shown in Fig. 1 (http://ai.lpnu.ua/).

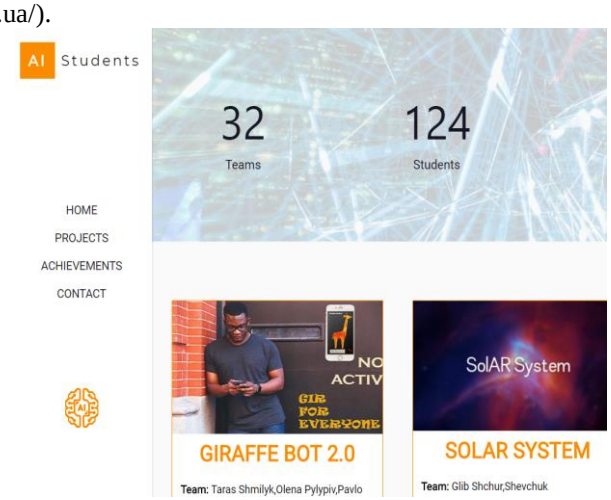

Fig. 1. Part of web site with results of the first implementation of tripled learning

For the robotics projects, a specially designed educational T-Bot platform was created. The created T-Bot robot consists of an Arduino board, motor shild, an ultrasonic range-finder, color sensors to follow along the route, two motors with wheels and position sensors and a gyroscope. The Arduino platform was chosen for next reasons:

1. Programming language is very similar to ANSI C.
2. Easy study with a low entry threshold.
3. Availability and prevalence of all components.

For tasks like tracking along the route, searching for an exit and avoiding obstacles, a specialized simulator was created. The T-Bots robots in a real project are shown in Fig. 2.

To ensure even higher quality of the learning process, it is advisable to use within tripled learning a specialized web-oriented e-learning system of third generation with the ability to remotely communicate using telepresence robot and specialized visual programming language as described in [7,8]. Especially promising is the using AI capabilities for personalized of learning process with permanent feedback and the next-generation of T-Bots robots with auto-balancing, but this goes beyond the scope of this article.

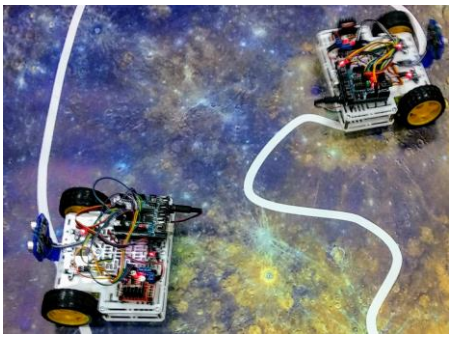

Fig. 2. Robots T-Bots during presentation of the one of projects.

3 Conclusions

Thanks to the proposed approach of tripled learning, the students not only studied the traditional university course but also attended distance learning at other universities, learned to use the benefits of MOOC, received the Certificates of origin and mastered teamwork skills with public presentation of their achievements.

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