

Application platforms used for teaching of ICT subjects

Malvina Halilaj¹, Erisa Bekteshi¹

¹ University of Tirana, Department of Informatics, Boulevard “Zogu I”, Tirana, 1001, Albania

Abstract

During the last decade, educational institutions have made many steps forward, not only in the teaching of technology, but also using it, mainly in the development of new information systems, which are increasingly required in all sectors of life, including natural sciences.

Nowadays ICT is becoming key elements on teaching of the new generation.

In the study are presented different platforms that can be used for teaching purposes in pre-university cycles. Platforms are discussed for their accessibility, how they work, how user-friendly are, the benefits of using them, and comparing them.

Keywords

ICT, Platform, teaching, technology, educational institution.

1. Introduction

ICT stands for “Information and communication technology”. It refers to technologies that provide access to information through telecommunication. It is similar to Information Technology (IT) but focuses primarily on communication technologies. ICT can be used in in teacher training programmes nowadays and can help teacher to improve quality of teaching. Teachers are the most important part of the educational system in our society. The system of teacher preparation in our country has changed over the time with the main purpose to consolidate their preparation, giving them skills to prepare creative students. Teachers can play a friendly role with the learner.

The rapid development in technology has made creatively changes in the way we live, as well as the demands of the society. Recognizing the impact of new technologies on the workplace and everyday

life, today’s teacher education institutions try to restructure their education programs and classroom facilities, in order to minimize the teaching and learning technology gap between today and the future. Students and teachers must have sufficient access to digital technologies, platforms and the Internet in their classrooms, schools, and teacher education institutions. Teachers must have the knowledge and skills to use the new digital platforms and resources to help all students achieve high academic standards. For teacher education programmes, this daunting task requires the acquisition of new resources, expertise, and careful planning to insert them in teaching. [1]

Recently many digital platforms are a must in relationship between teacher and student and both need to collaborate to use effectively these platforms. Doing this, it is necessary to understand the needs and help them to find the best way and platform for a better education process. One of the most commonly cited reasons for using ICTs in the classroom has been to better prepare the current generation of students for a workplace where ICTs,



particularly computers, the Internet and related technologies, are becoming more and more ubiquitous.[2]

The criteria to consider a genuine platform were:

- Programming languages that the platform can support (preferred languages: C, C++, Java, C#, Python)
- Where it resides (Cloud or On – Premise)
- The cost of the platform (Free or Fee)
- User – friendliness (is it easy to use these platforms or does it need a support from a professional).

2. How these platforms were considered?

There are a lot of platforms that were considered. For research purposes we chosen two of them that fits better the needs and fulfil criteria we chosen to considered.

During the analysis phase, it was searched for all digital platforms that offer an opportunity for student-teacher cooperation. The platforms that will be studied before they were offered to the teachers and students must be one that are accessible from anyone who can access internet in desktop computers, laptops and tablets. During study of the platforms the attention was concentrated mainly in the platforms that are free, this because using free platform for our teachers and students is more comfortable.

For each of these platforms an analysis was made based on the above established criteria, if they met the conditions to be considered as a possible platform to be used in the educational institutions.

For the programming language criterion, a test was performed to identify which platform had the most supportive, diversity and trending programming languages.

For the second criterion, where it resides, all the platforms were hosted in cloud and fill the requirement.

Many of the platforms have a gap on the third criterion that was cost, almost all of them cannot be handled by the educational institutions due to the high prices.

The last criterion related to user friendliness, most of these digital’s platforms were for professional users and difficult to adapt on the pre – university cycle and only a part of them met this criterion.

3. Selected Platforms

Different types of digital platforms are available online and everyone can create their own account and use them for different purposes depending on their needs. The list of the most popular tools was: GitHub Classroom, Codecademy, Codeaid, Coderpad, Codility, Codeboard and Codesignal.

During the study was perform testing with the students and teachers for the selection of the platform. The platforms were valued from 1-5, where the value 5 is for the most helpful platform which is easy to use for the students and the teachers and the value 1 is for the least helpful platform.

Results of testing are presented in the figure 1.

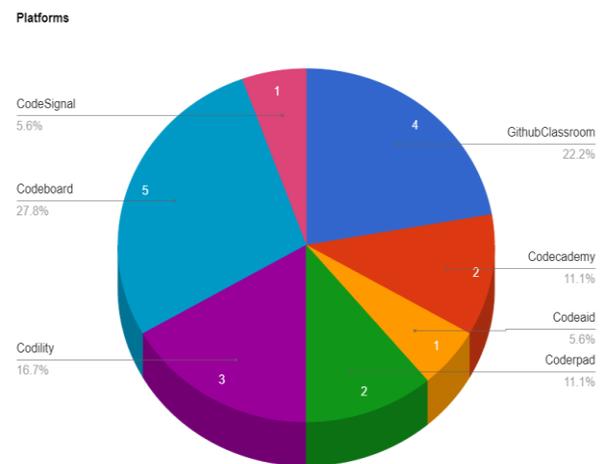


Figure 1: Results of testing for best platform using in teaching.

From figure 1, the platforms that received the highest rating were: GitHub Classroom and Codeboard and the platform that receive lowest rating were: Codesignal and Codeaid.

A. GitHub Classroom

GitHub classroom is one the first platforms that was selected from testing as the best platform to meet the established criteria. GitHub Classroom automates repository creation and access control, making it easy to distribute starter code and collect

assignments on GitHub. Track and manage assignments in teacher's dashboard, grade work automatically, and help students when they get stuck—all while using GitHub, save time by using automated testing to grade assignments. Tests run with every push, letting students see results immediately and make changes as necessary. Catch when students get stuck and help them rewind with version control. In group assignments, see each student's individual contribution in GitHub.

GitHub Classroom is free to use. To authorize GitHub Classroom to access your personal account on GitHub you just need to create an account and sign in into the platform. This platform is easy to use for beginners.

Repositories can be private or public whatever teacher need to configure, but it must have template repository set. After the repository creation teacher can set up the team members. Around 1.13 million students belong to GitHub Education programs.[3]

B. Codeboard

Codeboard is the second platform that was selected. Codeboard is a web-based IDE to teach programming in the classroom. Easily create and share exercises with students. It analyses and inspect students' submissions with a single click. In order to create a new project, Codeboard needs an account. This platform supports different programming languages and different types of projects. All compilers, programs, and tools are executed on a 64-bit Ubuntu Linux system. Each teacher and student can select the programming language of the project from a list of languages supported by the platform.

Codeboard is a free platform that can be used by anyone that have a valid account, a public project can be accessed by anyone visiting the URL of the project. A private project can only be accessed by users with a Codeboard account who are either listed under "Project owners" or "Project users".

This platform is very easy to access since is hosted in cloud and user will need just an internet connection to start working on it. Each Codeboard project comes with a special configuration file named "codeboard.json". This file defines for each programming language how the project gets compiled and/or executed.

Furthermore, this file may contain information about which files of a project are source code files, which files are used to test a program, and which

files are used during a submission to grade a program.

Codeboard sandboxes all compilations and executions of projects. A number of limits are put in place to prevent the overuse of Codeboard resources.[4]

C. Codecademy

Codecademy was the third platform selected. Codecademy is an online learning platform that teaches coding skills in an accessible, flexible, and engaging way. Codecademy offers growing catalogue of courses, skill paths and career paths so students and teachers can dive into the latest technology skills and prepare for the future.

The interactive learning environment that codecademy allows students to learn, student will code and receive feedback in real-time, at their own place. In addition to the coding exercises, students will be exposed to articles, videos, quizzes and projects to round out their learning experience.

Codecademy offer free courses while the student explores skill paths and build code foundations.

Code Academy offers projects, quizzes, and other features that can help to make the learning process immersive and addictive to keep students coming back for more. Lots of the training is laid out in sections titled by career path, so students can literally pick a job goal and then follow the courses to build to that.

Code Academy allows to sign up and get started right away and can even try a sample on the homepage that shows code on the left and output on the right for an instant taster.

If the student does not know where to start, there is a quiz that can be taken to help find the right course or career to suit their interests and abilities.

Get into the lesson and the screen breaks down into code on the left and output on the right so you can text what you write as you go, immediately. This is both rewarding and useful for guidance to check if you're doing it correctly as you progress.[5]

D. CoderPad

CoderPad was the fourth platform selected. CoderPad is a technical interview platform ideally used by development teams to enable a quick, accurate read on a candidate's skills through the hiring process. CoderPad works like an IDE to help

candidates share their skills and ensure the interviewer understands how the candidate works. The platform supports collaborative coding sessions and take-home assignments.

CoderPad's platform works like an online IDE where both interviewers and candidates can code live - together. This interactive coding platform allows to write, execute, and debug code - all in a performant, browser-based environment. CoderPad also offers asynchronous take-home projects via our best-in-class IDEs the size of the internet grows; it becomes difficult to retrieve the entire or a major portion of the web employing a single method.

E. Codeaid

Codeaid was the fifth platform selected. Codeaid is designed to simulate realistic coding challenges that allow you to assess a student's ability to think critically and solve problems.

Platform mission is simple, to offer a robust testing platform that gives a true, in-depth view of your candidates' capabilities – without an exorbitant price tag. Codeaid tool is available to everyone and that's why it is completely free.

Codeaid's Git-based system replicates the same workflow that developers and engineers would use in real-life projects, simulating an environment that is as close to an actual work environment as possible. By using a Git-based system, Codeaid can also measure the developer's Git knowledge and understanding – which is a mandatory skill itself for most development roles.

For sure this is a great platform that can support and offer many features, but is more as a recruitment tool that can be used for genuine developers.

That's why Codeaid was marked as a platform that doesn't fit the criteria for the educational institution that this paper is considering.

F. Codility

Codility was the sixth platform selected. Codility is an online coding platform that is used for online assessment. It is an automated coding test, that is later reviewed by professionals. Codility is a comprehensive suite of products that will help test programming skills, and keep them engaged with robust coding tests, interactive pair-programming sessions, and gamified coding events. This platform support 90 programming languages. Codility makes testing developers fast

and efficient. Students are evaluated based on technical skills.

This platform has a pricing list for each licence. Your code will be graded automatically depending on its efficiency with all possible inputs. When reviewed, your code will be assessed based on how optimal it is, and on your understanding of the solution. Codility creates and maintains a curated library of programming tasks. Codility automatically assesses the resulting code to filter the student with the best coding skills.

G. CodeSignal

CodeSignal initially called CodeFights, was the seventh platform selected. CodeSignal is a technical assessment platform operated by American company BrainFights, Inc.

Users select from a bank of coding tasks, create custom coding questions, or use a skills assessment framework like the General Coding Assessment (GCA). CodeSignal is a cloud-based software as a service (SaaS) product that integrates with applicant tracking system. Based on the licences CodeSignal has different prices.

It can support many programming languages. On CodeSignal, programmers compete against one another by writing code that solve a set of problems. They can also challenge bots that are programmed to code like engineers.[6]

4. Research pathways and results

Finding the most convenient platform for teachers and students was done testing teachers and students. The purposes of testing were:

- To know the methodology of how chosen platforms work
- To know if they will give the wanted results for teachers and students.

The result of testing for the best platform that can be used by teachers and students in ICT subjects are shown in figure 1. From figure 1 we decided that the most valued platform was Codeboard.

According to Maruni, 2014, Codeboard, is a fully functional online programming platform for introductory courses has been developed which includes instrumentation capable of capturing data that addresses questions on student performance and behavior.

Table 1.
Advantages and limitations of the platforms.

Platforms	Advantages	Limitations
Github Classroom	The platform is user – friendly, free, cloud based	Auto grading needs some extra configuration in order to implement it, support only Java and C.
Codeaid	Supporting different languages, free, suitable for recruiters to choose the best candidates.	Needs advance knowledge to use it as a professional developer
Codecademy	The platform is user – friendly, support different languages, cloud based.	The platform offers a limited number of users for free. You have to pay a fee for extra users.
CoderPad	Support different languages, user – friendly, cloud based.	Needs advance knowledge to use it as a professional developer and has a fee.
Codeboard	Support different languages, is user – friendly, cloud based and is free without limitation of users.	Auto grading needs to make an extra step for the teacher.
Codility	Support different languages, is user – friendly, cloud based.	Needs advance knowledge to use it as a professional developer and has a fee.
CodeSignal	Support different languages, user – friendly, cloud based.	Needs advance knowledge to use it as a professional developer and has a fee.

The platforms which according to the analysis met the criteria are: Github Classroom and Codeboard. The tests consisted of creating profile on these two platforms and using their functionalities to fulfil the desired requirements mentioned above.

i. CodeBoard

It starts with a new account creation on the web page of the platform. After the creation of the account a new project needs to be created by the teacher specifying the programming language desired and the exercise that is necessary develop by the students. The teacher can choose of the project is public or private. If the project is public the link should be shared to the student and they can open the IDE, compile, run, and submit their own solution.

For each project the teacher can apply a deadline for submissions, can specify the access control list, can clone the existing project, after a specific period teacher can trigger the deletion of the project.

Meanwhile the project is shared with the students, teacher can monitor all the submission for each student and the results of their solution.

ii. Github Classroom

It starts with a new account creation on the web page of the platform. After the creation of the account a new organization needs to be created by the teacher. After the creation of the organization a new classroom was created with the students added one by one or with bulk upload.

Following the creation of the classroom a new assignment is required to be set up. The teacher can specify if the assignment will be an individual or a group one. Based on environment configuration teacher can specify test cases related to the new assignment. For each assignment the teacher can apply a deadline for submissions.

The new assignment should be shared with the students with a link. The student needs to accept the assignment then they will start working on the repository, creating pull request for they solution.

On the assignment profile the teacher can validate every student submission.

5. Conclusions

The benefits of using such digital platforms will effectively increase the teaching process. A user-oriented platform is essential to meet the demand of today's teachers who want to learn how to use these platforms effectively for their ICT subjects. So, if use digital platforms in classrooms by the educational institutions our teaching learning process will be too smooth and able to understand for every type of students of our country. More attention should be paid to specific needs in offering interactions with teacher-student relationship.

In this paper have been introduced different type of digital platforms for educational purposes. In conclusion, Codeboard according to the criteria established for this paper is the most suitable platform comparing with the other platforms studied during this article. This platform will be suggested to be included in our educational institutions of Albania for teaching ICT programs.

6. References

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- [6] Simons, John (2016). New Site Helps Outsiders Land Tech Jobs, November 2016.

Notes:

For more information regarding to all the platforms on this article follow URLs below.

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<https://codeboard.io/>

<https://www.codecademy.com/>

<https://www.codility.com/>

<https://coderpad.io/>

<https://codesignal.com/>

<https://codeaid.io/>