Application of Electronic Platforms to Increase the Knowledge of Learners

Daniela Mirtcheva-Ivanova
Bulgarian Defense Institute
"Professor Tsvetan Lazarov"
Sofia, Bulgaria
mirchevadany@gmail.come

Abstract. The article examines the use of online platforms and the possibilities they offer for supplementary and complementary learning. Some commonly used platforms among learners are presented and various studies have been conducted. The results were analyzed and a comparative assessment was made for the effectiveness of digital platforms in learning through described results of real tests. An increase in the knowledge of learners when using online platforms has been reported.

Keywords: electronic platforms, e-learning, test, learner

I. INTRODUCTION

The world in the 21st century is developing too fast, thanks to new digital technologies. The changes are reflected in every sphere of society – finance, healthcare, business, transport, electrical appliances. New technologies are an invariable part of public life, they are constantly present and used in modern education. Education is an important and basic activity of society, in its quality of education, training and building a fully developed personality. To achieve higher results in education, it is necessary to use new pedagogical approaches using digital technologies. Learning technologies include virtual reality, use of mobile devices, interactive multimedia technologies, online materials and videos.

In educational institutions, the use of digital technologies as a means of teaching and learning is increasing, which supports teachers and trainers to achieve higher results [6]. The education development strategies of the Ministry of Education and Culture in the Republic of Bulgaria are also aimed at full and fruitful use of digital technologies [7], [8].

In the program of educational institutions in technical specialties, the subject of informatics is studied. It involves algorithms and programming by learning a specific computer language in a programming environment with many practical tasks [1], [2], [3], [4]. The study of computer science begins at school, in the elementary stage to reach the compilation of computer programs in the 11th and 12th grade in the profiled classes and continue in the universities in the technical specialties [5].

Тест по информатика

Номер в клас: Клас:

1.От какъв тип е условието в структурата на оператотора if:

if (<условие>) <оператор_true>
else <оператор_false>

а)реален тип; б)целочислен тип;
в)булев тип; г)стринг.

2.Как се присвоява стойност на променлива:

а)a==5; б)a=5;
в)a< >5; г)a!=5;

3.Какво ще бъде изведено на конзолата след изпълнението на показания код?

```
static void Main(string[] args)
{
int a = 12, b = 6;
bool flag;
flag = a > b;
Console.WriteLine("flag = {0}", flag);
}
```

а)flag = False; б)True;

в)flag = True; г)False;

Fig. 1. Test questions.

Some of the schools in Bulgaria have a software and hardware profile. One of the schools with computer science in Sofia is 44 Secondary School "Neofit Bozveli" [22], [23]. Students in the 11th grade study the computer language C#, according to the program of the Ministry of Education and Culture [20], [21]. The results of the tests in the first academic term of the 2022/2023 academic year are not high. The studied material includes basic constructions of the C# language. Achieving high results leads to better

Print ISSN 1691-5402
Online ISSN 2256-070X
https://doi.org/10.17770/etr2024vol2.8090

assimilation and learning of the computer language in the next stage using materials and videos from electronic platforms from part by the students after one month of training. Here are some of the questions included in the test trial shown in Fig.1:

Some of the test questions include C# program fragments and a requirement to indicate a correct answer to the task result shown in Fig. 2.

5.Какво ще бъде изведено на конзолата след изпълнението на показания код?

```
static void Main(string[] args)
{
    int x=2;
    if(x>3)
    { Console.WriteLine("x е по-голямо от 3"); }
    else
    { Console.WriteLine("x не е по-голямо от 3"); }
```

а)x е по-голямо от 3; б)0;

в)програмата дава грешка; г)x не е по-голямо от 3;

6.Кой израз има стойност 1?

а)2 % 1; б)5 % 3;
в)12 % 2; г)29 % 4;

Fig. 2. Test questions include C# program.

The test includes questions about calculating the value of an expression depending on the value of variables, implemented by a program in the computer language C#, shown in Fig. 3.

9.Какво ще бъде изведено на конзолата след изпълнението на показания код?

```
static void Main(string[] args)
{
    int a, b;
    a = -10;
    b = 5;
    if (a>0)
    { Console.WriteLine(a = a + b); }
    else
    { Console.WriteLine(a = a * 2);
    Console.WriteLine(a = a - 2);
    }
}
```

а)-20 -22; б)-12 -5;
в)10 -8; г)-20 -8;

10.Какво ще бъде изведено на конзолата след изпълнението на показания код?

```
static void Main(string[] args)
{
    int a;
    a = 10;
    if (a>0)
    { Console.WriteLine(a + 2); }
    else
    { Console.WriteLine(a - 2); }
}
```

а)-12; б)12;
в)8; г)-8;

Fig. 3. Test questions about calculating.

Although teachers and students use digital technologies at school, good results were achieved from the tests done in 44 Secondary schools, during the first academic term of the 2022/2023 academic year, in computer science education, in the Object-Oriented Programming Module, Topics: "C# Programming". 16 students participated in the test assessment. The average score on the test is Good 4.19. The scores and scores obtained can be seen in Table 1.

TABLE 1. SCORES OBTAINED BY STUDENTS.

Learner number	Number of points received	Max points	Assessment	Assessment in words
1	15	30	4	Good
2	18	30	4.4	Good
3	15	30	4	Good
4	21	30	4.8	Very Good
5	9	30	3.2	Acceptable
6	27	30	5.6	Excellent
7	24	30	5.2	Very Good
8	9	30	3.2	Acceptable
9	24	30	5.2	Very Good
10	18	30	4.4	Good
11	15	30	4	Good
12	15	30	4	Good
13	9	30	3.2	Acceptable
14	9	30	3.2	Acceptable
15	30	30	6	Excellent
16	12	30	3.6	Good

The average success rate of students is Good 4.19. A total of 4 students have shown an average result, 7 students have a good result, 3 students have a very good result and 2 students have an excellent result. Everyone has a desire to succeed in the educational process Fig. 4. Student Scores on the Scoring Test

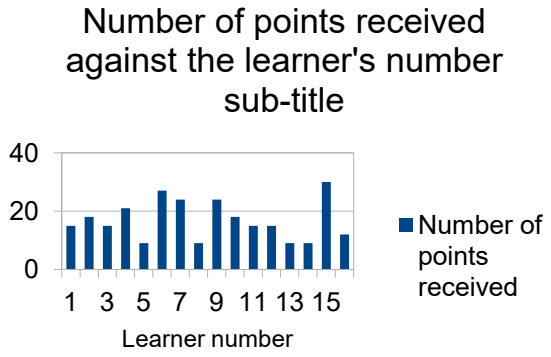

Fig. 4. Student Scores on the Scoring Test.

According to the previously prepared formula for converting points into grades, a diagram was made that illustrates the number of students in relation to their grades Table 2

TABLE 2. STUDENTS IN RELATION TO THEIR GRADES .

Total number of students 16	
Assessments	Number of students
3	4
4	7
5	3
6	2
Average	4.19

Looking at the chart Fig. 5 of the percentages of the learners' test scores, the overall performance is clearly visible.

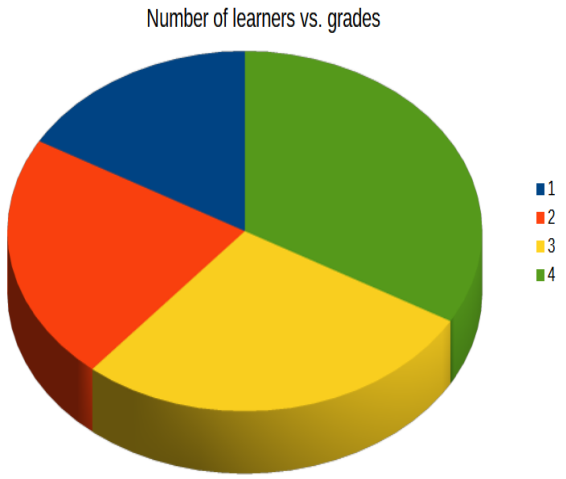

Fig. 5. Percentage ratio of students by test scores in grades

Here is the detailed information in Table 3, for each student by points received on each of the questions in the e-test. Each correctly solved task is evaluated with 3 points.

TABLE 3. STUDENT ACHIEVEMENT SCORES.

Learner number	Task number from the test										Number of points received
	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Task 9	Task 10	
1	3	0	3	3	0	3	3	0	0	0	15
2	3	3	3	0	3	3	0	0	0	3	18
3	3	0	3	0	3	0	0	0	3	3	15
4	3	3	3	3	3	3	0	3	0	0	21
5	3	0	0	0	0	0	3	0	3	0	9
6	3	3	3	3	0	3	3	3	3	3	27
7	0	3	3	3	3	3	3	3	3	0	24
8	3	0	3	0	3	0	0	0	0	0	9
9	0	3	3	3	3	3	0	3	3	3	24
10	0	3	3	3	3	0	3	0	0	3	18
11	3	0	3	3	3	0	0	3	0	0	15
12	3	0	3	0	3	3	0	0	0	0	12
13	3	0	3	0	0	0	0	0	3	0	9
14	0	3	0	0	0	0	3	3	0	0	9
15	3	3	3	3	3	3	3	3	3	3	30
16	3	3	3	0	3	0	0	0	0	0	12

The results were analyzed and a recommendation was made to the learners to use electronic platforms to eliminate the gaps and absorb more knowledge [9], [10].

There are 52 students in the 11th grade, divided into 2 classes. Only 16 of them wished to receive additional training to eliminate gaps and gain new knowledge.

Teachers and students who have expressed a desire to learn further have considered the possibility of e-learning and have chosen appropriate platforms for the subject of computer science.

Skillshare offers a variety of courses in design, entrepreneurship, business, programming and more. The training is conducted by experts in the respective fields and the user interface is easy to use. Many of the courses are a few hours long and can be completed quickly. The training includes video tutorials and many practical tasks. The payment for the courses is low, quite acceptable and is based on a monthly or annual fee, and unlimited brief courses can be studied during the paid period [9], [10], [11]. Fig. 6

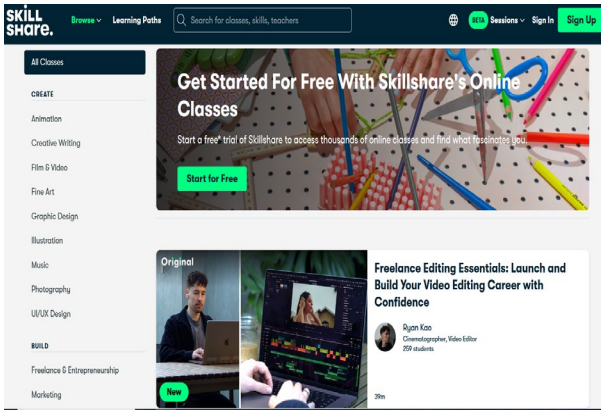

Fig. 6. . Site Skillshare

Udemy is one of the largest online learning platforms, with 60,000 instructors, 62 million students, and a huge database of courses Fig. 7. Training is available in business, programming, design, finance, teaching and more. Courses vary in length, but usually cover a large amount of information and take up a longer period of time. There is no monthly or annual fee, but an individual price per course, which is affordable and in most cases – low. Those who sign up for a course receive a certificate upon completion and lifelong access to the course, and in case of refusal of training within 30 days, the amount paid is returned to the learner [12], [13], [14].

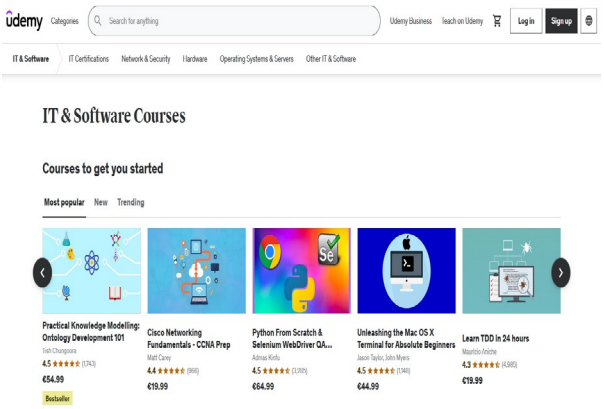

Fig. 7. Site Udemy

After a month of training, using the Skillshare and Udemy platforms to eliminate the gaps in the knowledge of the learners, a test was made to all the learners and a higher score was reported for the 16 students who worked extra Table 4.

TABLE 4. STUDENT SCORES ON THE TEST SCORES AND GRADES .

Learner number	Number of points received	Max points	Assessment	Assessment in words
1	21	30	4.8	Very Good
2	24	30	5.2	Very Good
3	21	30	4.8	Very Good
4	21	30	4.8	Very Good
5	24	30	5.2	Very Good
6	27	30	5.6	Excellent
7	24	30	5.2	Very Good
8	24	30	5.2	Very Good
9	21	30	4.8	Very Good
10	24	30	5.2	Very Good
11	27	30	5.6	Excellent
12	18	30	4.4	Good
13	21	30	4.8	Very Good
14	18	30	4.4	Good
15	30	30	6	Excellent
16	21	30	4.8	Very Good

The average success rate of the learners is Very good 5.06. A total of 2 students have shown a good result, 11 students have a very good result and 3 students have an excellent result. The result is shown in Fig. 8.

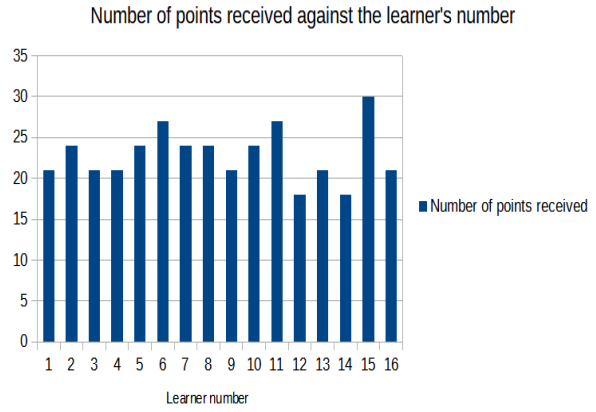

Fig. 8. Student scores on the point test.

The results achieved by learners after using the Skillshare and Udemy platforms have significantly improved. Here are the summary scores in Table 5.

TABLE 5. SUMMARY SCORES.

Total number of students 16	
Assessments	Number of students
4	2
5	11
6	3
Average	5.06

Learners who showed interest and took additional training, a total of 16, increased their success by one unit when given a second test of the same material after one month of additional training. The other 11th graders showed an identical level of knowledge on the second test, similar to the initial test trial.

The report examines digital platforms as a means of supplementary and complementary learning. Additional training of a group of computer science trainees through materials and videos on electronic platforms on studied topics has been set and requested. Some of the platforms have been implemented among some of the trainees for working at home and tests have been carried out. A test was conducted on all students from one graduating class before and after using materials and videos from educational online platforms with a difference of one month on the same material. The results were analyzed and an assessment was made of the effectiveness of their use in training. An increase in the knowledge of learners who used digital platforms for computer science training was reported.

New technologies and innovations complement and support traditional learning methods. The use of cloud technologies [17] has been increasingly used recently, and the widespread use in educational institutions of modern information models and resources gives a new impetus to learning [15, 16, 18, 19]. New technological tools such as online platforms, mobile applications and e-books can fundamentally contribute to higher learning efficiency. In order for education to be complete, effective and modern, digital technologies must be used to increase the effectiveness of learning and teaching.

ACKNOWLEDGEMENTS

This work was supported by the National Science Program “Security and Defence” program, which has received funding from the Ministry of Education and Science of the Republic of Bulgaria under the grant agreement no. Д01-74/19.05.2022.

REFERENCES

[1] Programs, Faculty of Mathematics and Informatics, SU "St. Kliment Ohridski". [Online]. Available: https://www.fmi.uni-sofia.bg/bg/programi [Accessed Jan 15, 2024].

[2] Plovdiv University "Paisii Hilendarski", Faculty of Mathematics and Informatics. [Online]. Available: https://fmi-plovdiv.org/index.jsp?id=4416&ln=1 .[Accessed Jan 15, 2024].

[3] OKS "Bachelor", Specialty "Computer Systems and Technologies".[Online]. Available: https://www.nvu.bg/bg/%D1%81%D0%BF%D0%B5%D1%86%D0%B8%D0%B0%D0%BB%D0%BD%D0%BE%D1%81%D1%82/%D0%B1%D0%B0%D0%BA%D0%B0%D0%BB%D0%B0%D0%B2%D1%80%D0%B8/grazhdanska-specialnost-kompyutarni-sistemi-i-tehnologii .[Accessed Jan 17, 2024]. (in Bulgarian)

[4] OKS "Bachelor", Computer systems and cyber security. [Online]. Available:https://www.nvu.bg/bg/%D1%81%D0%BF%D0%B5%D1%86%D0%B8%D0%B0%D0%BB%D0%BD%D0%BE%D1%81%D1%82/%D0%B1%D0%B0%D0%BA%D0%B0%D0%BB%D0%B0%D0%B2%D1%80%D0%B8/grazhdanska-specialnost-kompyutarni-sistemi-i-kibersigurnost .[Accessed Jan 17, 2024]. (in Bulgarian)

[5] Training programs for profiled preparation, Ministry of Education and Science.[Online]. Available: https://www.mon.bg/obshto-obrazovanie/uchebni-planove-i-programi-2/uchebni-programi-za-profilirana-podgotovka/ [Accessed Jan 19, 2024].

[6] Mariyana Nikolova, Tanya Evtimova , Digital Educational Tools – Potential, Application, and Perspectives ; Journal of Mathematics, Computer Science and Education Vol. 5, No. 1, 2022, DOI: 10.54664/MALF1684

[7] Ministry of Education and Science, Strategic documents, Strategy for the development of higher education in the Republic of Bulgaria for the period 2021-2030. [Online]. Available: https://www.mon.bg/mon/strategii-i-politiki/strategicheski-dokumenti-2/ [Accessed Jan 19, 2024].

[8] Strategic documents for the development of education of the Ministry of Education and Culture.. [Online]. Available: https://www.navet.government.bg/bg/media/strategicheska-ramka_obrobuuchene_110321-1.pdf [Accessed Jan 19, 2024].

[9] Top 10 E-Learning Platforms for Effective Developmen.[Online]. Available: https://www.hurix.com/top-10-e-learning-platforms-for-effective-development/

[10] Digital skills as a way to access learning opportunities. [Online]. Available: https://epale.ec.europa.eu/bg/newsletters/digitalnite-umeniya-kato-nachin-za-dostp-do-vzmozhnosti-za-uchene. [Accessed Feb. 5, 2024].

[11] Skillshare Official Site.[Online]. Available: https://www.skillshare.com/. [Accessed Feb. 5, 2024].

[12] The Top 10 Online Learning Platforms for 2024.[Online]. Available: https://www.thinkific.com/blog/online-learning-platforms/. [Accessed Feb. 7, 2024].

[13] Official udemy site [Online]. Available: https://www.udemy.com/. [Accessed Feb. 11, 2024].

[14] Udemy Review: Is it The Right Platform for You?[Online]. Available: https://upskillwise.com/reviews/udemy/ . [Accessed Feb. 11, 2024].

[15] P. Boyanov, Educational exploiting the information resources and invading the security mechanisms of the operating system Windows 7 with the exploit Eternalblue and backdoor Doublepulsar, a refereed Journal Scientific and Applied Research (Licensed in EBSCO, USA), Konstantin Preslavsky University Press, ISSN 1314-6289, vol. 14, 2018, pp.34-41.

[16] P. Boyanov, Construction and simulation of optical local area computer networks for the needs of the academic institutions, International Scientific Online Journal, www.sociobrains.com , Publ.: Smart Ideas - Wise Decisions Ltd, ISSN 2367-5721 [online], Issue 54, February 2019, pp. 89-96..[Accessed Feb. 23, 2024].

[17] R. Iliev and K. Ignatova. Implementation of cloud technologies for building data centers in defence and security. Information & Security: An International Journal 43, no. 1 (2019): 89-97.[Online]. Available: https://doi.org/10.11610/isij.4308 ..[Accessed Feb. 27, 2024].

[18] S. Spasov, International academic programs and training models for combating corruption and their application in the UNSS. Scientific works of UNSS, pp. 69-95, 2022.

[19] S. Marinov, I. Ivanov and A. Kolev, Modeling of a controllable communication environment, Collection of reports from the Scientific Conference "Modern trends in aviation training", NSU "V. Levski", Faculty of "Aviation" - Dolna Mitropolia, 2017, ISBN

[20] Curriculum in Computer Science (Profiled Preparation).[Online]. Available: https://www.mon.bg/nfs/2018/12/profil-informatika.pdf .[Accessed Feb. 27, 2024]. (in Bulgarian)

[21] Ministry of Education and Science, Training programs for profiled preparation. https://www.mon.bg/obshto-obrazovanie/uchebni-planove-i-programi-2/uchebni-programi-za-profilirana-podgotovka/ [Accessed Feb. 28, 2024].

[22] 44 Neophyte Bozveli Secondary School, Sofia, Bulgaria.[Online]. Available: https://44sou.eu/. [Accessed Feb. 28,2024]

[23] Curriculum 11th grade.[Online]. Available: http://44sou.eu/staging/wp-content/uploads/2018/09/Ucheben-plan-11.-a-klas.pdf. [Accessed Feb. 28, 2024