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THE IMPACT OF E-LEARNING ON STUDENT SELF-RESPONSIBILITY IN DOING THEIR HOMEWORK

Summary: *Following the global social changes, the center of the educational process should be reserved for a student who is active and self-responsible, both in classroom and while carrying out her/his individual extracurricular tasks. Precisely the contemporary student, who is expected to be active and responsible, is surrounded by technological advances that enable her/him to quickly obtain information, communicate, carry out the given tasks and get feedback, therefore she/he becomes a frequent user of information and communication technology. Despite the wide range of ICT applications, this technology is more commonly used for social interactions on various social networks, and rarely for educational purposes, i.e. only if students had been previously referred to a specific digital content. Therefore, it is necessary to implement information and communication technology and e-learning not only in the teaching process in schools, but to use them in designing different tasks which students will receive, complete, send for correction, and receive feedback electronically. In order to determine the impact of the application of e-learning on student self-responsibility in general, and in particular in completing homework assignments in Science and Biology classes, a study was conducted on a sample of eight primary school classes divided into two groups: the experimental, using fully online e-learning resources, and the control group, using modern forms of active learning. The homework assignments for the students of both groups were the same, while the way of receiving homework assignments, carrying them out and submitting them was different, either in e-surrounding or traditionally. Although the analysis of the results of the homework assignments done by the students of both groups shows equal student success, the study registers a complete self-responsibility of the students involved in e-learning via Moodle platform. The research findings presented in this paper indicate that Moodle e-learning has a greater impact on student self-responsibility in doing their homework, and can therefore serve as a stimulus for teachers practitioners to apply e-learning systems in the teaching process in general, and in particular for independent student activities such as homework assignments.*

Keywords*: active learning, homework, e-learning, ICT, Science and Biology classes*

INTRODUCTION

It is not possible to build a system of knowledge, skills and attitudes within the competence of learning how to learn unless students become systematic and regular in their learning (Ristić-Dedić et al., 2017), and unless teachers allow them to use adequate learning strategies to help them achieve the necessary educational outcomes (Bulić, 2018) and, finally, unless teachers teach students how to control their progress and adjust learning approaches if necessary. That is why it is extremely important to plan and organize the learning process well in order to create a learning habit that is a prerequisite for success. Although educational theorists and practitioners agree that students need to be taught how to learn, and that it is necessary to train a self-responsible student for the future to come, still there are different views on educational approaches. On the one hand, some advocate maximum involvement of students in curricular and extracurricular activities with the use of modern information and communications technology (ICT), and on the other hand, some believe that students should have enough free time to freely choose learning content and activities. Because of such different attitudes, for decades we have wrestled with the question whether to give students homework assignments or not. One of the opponents of homework is Glasser (1994), who sees it as a coercion against the student, burdened in her/his free time. In contrast, Painter (2003) believes that homework is an extension of the classroom learning that allows students to process the information they receive in class, while Cooper (1989) believes that students can do homework when they want in their free time outside of school. Parents, teachers and students view homework from different perspectives. Teachers emphasize the educational component of homework, such as independent work outside of the classroom, developing self-responsibility and acquiring student work habits during this form of exercise and repetition of teaching content, while parents and students consider homework an obligation which takes too much time, and which sometimes because of its extensiveness (Mattes, 2007), complexity or inappropriateness requires someone else's help (Sokol, 2005).

Teacher should check the homework to indicate the need to correct possible inaccuracies and to provide feedback to the students themselves as well as their parents (Kyriacou, 1997). If the student is not informed about inaccuracies in the assignment, then the basic purpose of homework, i.e. conceptual understanding of the teaching content, is lost, the student's misconception deepens and the misunderstanding of the matter increases.

Habits of learning and writing homework are very different, and according to research by Ristić-Dedić and Jokić (2014), two-thirds of eighth graders study only before a written or an oral knowledge assessment, which certainly does not provide the necessary educational outcomes. In addition, respondents do their homework, required reading, and similar independent homework assignments often or almost always at the last minute or they copy from their classmates. In addition to the attitude towards homework, it is necessary to highlight the results of a research on student

self-responsibility while learning and doing homework in terms of student sex (Rakaš-Drljan and Mašić, 2013 and Ristić-Dedić et al, 2017). Namely, the researches showed that girls are more self-responsible because they learn on a daily basis, they take notes in classroom and repeat the previously processed material, learn out loud, regularly do their homework, actively participate in classes, and silently respond to the questions addressed to their classmates.

Although homework is associated with a commitment and time consuming tasks, Muhnenbruck et al. (2000) find that homework does not have to be obligatory for all students, but that students could choose the assignments independently. In addition, homework assignments can also vary in the length and difficulty of the tasks, the frequency with which they are assigned, their purpose, their being obligatory or facultative, the deadline and the degree of individualization (Cooper, 2007). That is why teachers need to carefully devise assignments, taking into account the intended outcomes by selecting one of the three forms of homework. If their objective is for students to apply new knowledge or to review and identify new skills, they will design homework with a practice exercise. To collect additional information on the topic covered, or for the purpose of preparing for future teaching content, they will choose the so-called preparatory homework, and if they want to train students how to find information for homework on their own, they will choose the so-called extension assignments.

Kohn (2006, p. 185) points to the need for individualization when assigning homework, emphasizing that "the same task can cause boredom in one student and frustration in another". In order to avoid unnecessary frustration and unnecessary burden, as indicated by the results of a comprehensive PISA research (Program for International Student Assessment) (2014) conducted in 38 OECD member states (Organization for Economic Cooperation and Development), according to which students should spend 4.9 hour a week doing their homework, it is necessary to rationally and purposefully assign homework, with a prior obligatory arrangement and planning done together by all teachers of one class unit.

For any form of homework, students can use a variety of available sources of information, from classic print sources (textbooks, encyclopedias, popular or scientific journals, etc.) to contemporary digital content. Of course that contemporary students, the so-called digital natives (Prensky, 2001), first look for information on the Internet. With the exception of digital educational content (eBooks, interactive websites, pdf files, photos, videos, etc.) created for specific age groups of students, other online resources are often inadequate to student age and needs or incomplete and unverified. The wide range of non-educational online resources is one of the reasons why there is a reluctance to apply e-learning, especially among teachers who prefer traditional forms of learning during face-to-face teacher education. To use the benefits of ICT in teaching (Bulić et al. 2017), avoiding wandering in the sea of online resources or burdening students with unnecessary information, teachers have a great responsibility in selecting online content and designing independent assignments for students to be applied using ICTs, enabling them to act independently and responsibly, which is indispensable for their future life.

This paper presents the results of a study on the primary school student self-responsibility in doing their homework assignments in Science and Biology classes, through applying e-learning systems (hereinafter: e-learning) as well as through active learning in classroom. The results indicate that homework assignments were equally successfully completed, but also confirm a complete self-responsibility at the students who applied e-learning. The results of the research confirm the views of advocates of the use of ICT in the educational process, but also point to the need for the right choice of activities for students using e-learning resources.

RESEARCH METHODOLOGY

RESEARCH OBJECTIVE AND HYPOTHESES

Considering the complexity and factors of the application of ICT in education, the research objective was to determine whether the students of the experimental group using fully online e-learning courses would be more responsible while writing and doing homework assignments compared to the control group using modern active learning methods.

For the purpose of operationalizing and achieving the established objective, the following tasks have been set:

Z1 - to determine if there is a statistically significant difference in doing homework assignments between the experimental and the control group in terms of student age.

Z2 - to determine if there is a statistically significant difference in doing homework assignments between the experimental and the control group in terms of student sex.

Z3 - to determine if there is a statistically significant difference in doing homework assignments by the same students in terms of their learning methods, i.e. modern classroom learning or e-learning.

In the context of the set research objective, the following hypotheses were made:

Hg – the use of the Moodle system is a sufficiently motivating factor that encourages students to be self-responsible, to write and do their homework practically, as much as modern learning methods do.

H1 - there is no statistically significant difference in doing homework between the experimental and the control group in terms of student age.

H2 - there is no statistically significant difference in doing homework between the experimental and the control group in terms of student gender.

H3 - there is no statistically significant difference in doing homework between the same students when included in the experimental or in the control group.

SAMPLE OF RESPONDENTS

The study (Table 1) involved grades 5 and 6 students within the framework of the school subject of Science, and grades 7 and 8 students within the framework of the school subject of Biology, N = 162.

Table 1. Sample of respondents

grade	experimental group	control group	total
5	20	18	38
6	23	19	42
7	21	23	44
8	18	20	38
total	82	80	162

Figure 1 shows a sample of respondents in terms of their gender, whereby we can see a slightly higher percentage of boys in grade 5 (60.5%), grade 6 (66%), and grade 7 (59.09%), while in grade 8 there is no difference.

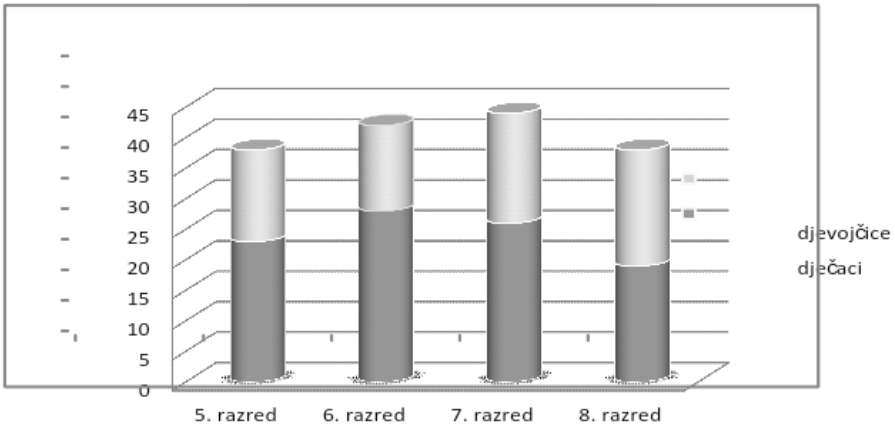

Figure 1. Structure of the student sample in terms of their sex

THE COURSE OF THE EXPERIMENTAL PROCEDURE

After obtaining the approval of the School Board for the conduct of the research along with the parent consent for student participation, we made a schedule for the use of our IT classroom for students to be involved in e-learning during Science and Biology classes. Before starting the research, the necessary teaching content was designed for the students of the experimental group and uploaded on the Moodle platform (server of the Faculty PMF, znani.pmfst.hr). We designed the research instruments and lesson plans for each lesson of all classes for two teaching units during the research. Four different exams testing prior knowledge were created, based on which students were divided into control and experimental groups. The experimental group students were additionally instructed on working in Moodle as they would spend the following two months in IT classroom without having a direct contact with their Biology teacher, but communicating with her daily via e-mail, forum, and chat.

Students of the experimental group, using a password, could access electronic teaching content outside of the school as well, depending on their personal preference and needs. The teacher monitored their access to the teaching content and regularly gave them feedback. The course of the experimental procedure is shown in Figure 2.

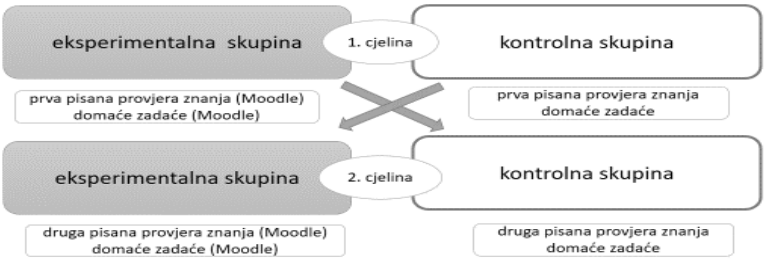

Figure 2. The course of the experimental procedure (according to Bulić, 2018)

The control group students were studying in their Biology classroom using active learning methods. Two teaching units were uploaded on Moodle, making each student a member of the experimental group in one unit and a member of the control group in the other. Student individual work thus could be observed depending on the group, i.e. whether she/he was involved in e-learning or using active learning methods in Biology classroom.

Both groups of each class unit had identical homework (Table 2) with various questions and tasks. For the most part, to accomplish these tasks, they needed to look for additional information in print or electronic media or make a practical work.

Table 2. Homework assignments for students of all grades

grade	unit	homework assignment	topic
5	1	Z1E	Make a healthy eating pyramid model
		P1E	Food nutrients
	2	Z2K	Make a PPT on the topic *Puberty and diseases of addiction*
		P2K	Hygiene in puberty
6	1	Z1E	Make a PPT on the topic *Sea and inland water benefits*
		P1E	Impact of detergents on watercourse
	2	Z2K	Make a mini planet scheme (water circulation in nature)
		P2K	Eco-friendly forms of energy

7	1	Z1E	Make a PPT on the topic *The comparison between flatworms and roundworms*
		P1E	Why are roundworms more developed than flatworms?
	2	Z2K	Effects of probiotic bacteria on the body
		P2K	Kingdoms of living beings and viruses
8	1	Z1E	Make a respiratory system model
		P1E	Brain teaser (decompression sickness)
	2	Z2K	Make a PPT on the topic *Healthy eating*
		P2K	Nobel Prize

For a clearer and easier tracking of results in tables and histograms, the following tags were used: Z1E-first experimental group task, Z2E-second experimental group task, P1E-first experimental group question, P2E-second experimental group question, Z1K-first control group task, Z2K-second control group task, P1K-first control group question, P2K-second control group question. The homework included assignments of varying level of difficulty and time duration with a well-defined deadline. The students of the experimental group had to submit their homework electronically (under the activity "assignment" in the Moodle system) by the specified deadline (hour, date), as outside this deadline the system did not allow the submission of homework. After reviewing and grading the homework, the experimental group students received feedback on Moodle. In addition to written homework assignments, students were required to create specific models, such as healthy eating pyramid in grade 5, models of water circulating in nature in grade 6, or lung model in grade 8. The students of the experimental group photographed the models they made, e-mailed it to the teacher, and then attached them to the works done by the control group exposed in the classroom.

DATA COLLECTION AND DATA PROCESSING METHODOLOGY

In order to test the hypotheses, students were assigned homework tasks (N = 648) that were evaluated on a nominal scale either as a pass or a fail. The hypothesis was tested by testing the significance of differences between proportions. Data were considered significant if $p < 0.05$. All results were calculated using Statistica 12.0 software (StatSoft, Tulsa, Oklah., USA).

RESULTS AND DISCUSSION

The results in histograms are presented in the same way for easier tracking: the black and dark gray columns show how successfully the homework was done by the students from the experimental group in the first test unit (Z1E and P1E). As those in the second test unit were the control group, their results are shown in black and gray columns (Z2K and P2K). The results of the students who in the first test unit were the control group (Z1K and P1K) and in the second test unit the experimental group (Z2E and P2E) are shown in a multicolored gray and white column. Such presentation of student results was approached with the aim of monitoring the same students in

completing their homework assignments both as members of the experimental group and as members of the control group.

The results of homework assignments done by grade 5 and 6 students (Figure 3) show that all students completed all homework assignments and thus confirmed their self-responsibility. They did their homework completely, regardless of whether they belonged to the experimental or control group, or whether they were involved in fully online courses (e-learning) or in modern active learning.

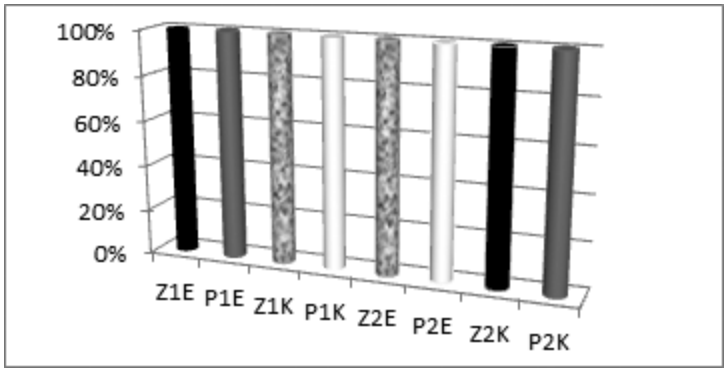

Figure 3. Histogram of homework performance by grade 5 and 6 students11

The trend of regular homework, seen in grades 5 and 6, does not continue in the higher grades, therefore Figure 4 shows how the students in grade 7a, when they were members of the experimental group and when they used e-learning resources, in both test units did their homework completely. However, the same students, as members of the control group, were clearly not sufficiently motivated during learning, although they were involved in active forms of learning, and did not complete their homework.

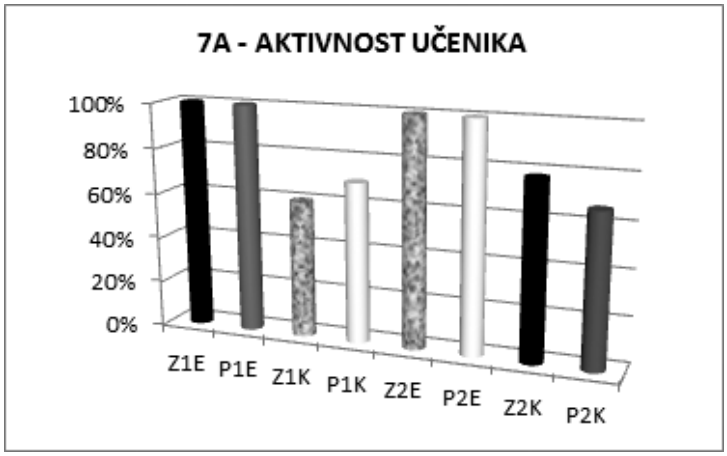

Figure 4. Histogram of homework performance by grade 7 students

11 Z1E-first experimental group task, Z2E-second experimental group task, P1E-first experimental group question, P2E-second experimental group question, Z1K-first control group task, Z2K-second control group task, P1K-first control group question, P2K-second control group question.

The situation was almost identical in the grade 7b (Figure 5), in which the students used e-learning as members of the experimental group and completely did the first homework task (Z1E) and answered the first question (P1E). However, they also did not do their tasks completely (Z2K and P2K) when in the second test unit they were members of a control group having lessons in the Biology classroom using active learning methods. The results of the seventh grade students confirm the fact that their self-responsibility in doing their homework is not complete when involved in modern learning while they are completely self-responsible when using e-learning system.

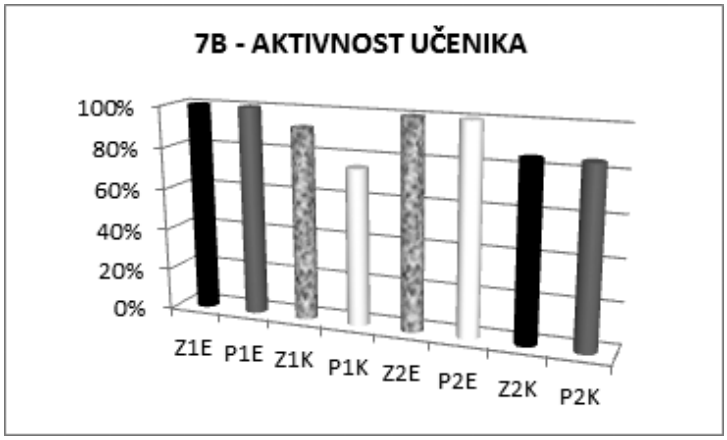

Figure 5. Histogram of homework performance by grade 7b students

A very similar behavioral modality was observed in the eighth grade students, with the exception of the grade 8a students, who were the only ones who did not completely do their homework when answering the P1E question, with only 90% of them doing so (Figure 6). The same students, as members of the control group, in the second test unit, almost equally successfully did homework tasks (Z2K-100% and P2K-80%), indicating that few students did not write homework neither when they were members of experimental nor control group. Students who were the control group in the first test unit carried out the first task (Z1K) with 92% success, and the first question (P1K) was answered by 82% of the respondents, but when they became the experimental group, they showed higher homework performance in the second test unit carrying out the second task (Z2E) and answering the second question (P2E) with 100% success.

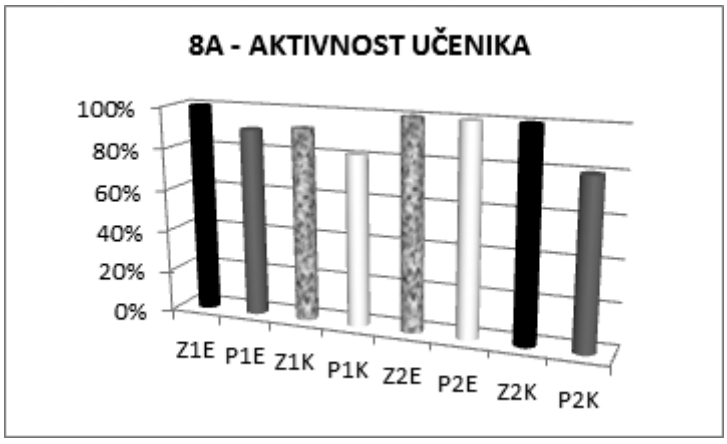

Figure 6. Histogram of homework performance by grade 8 students

From Figure 7 it is evident that the grade 8 students show the same behavior as their peers, since in the first test unit as members of the control group they solved the first task (Z1K) with 88% success, the first question (P1K) was answered by only 57% of them, and while working in the experimental group, the P1E question was answered by everyone.

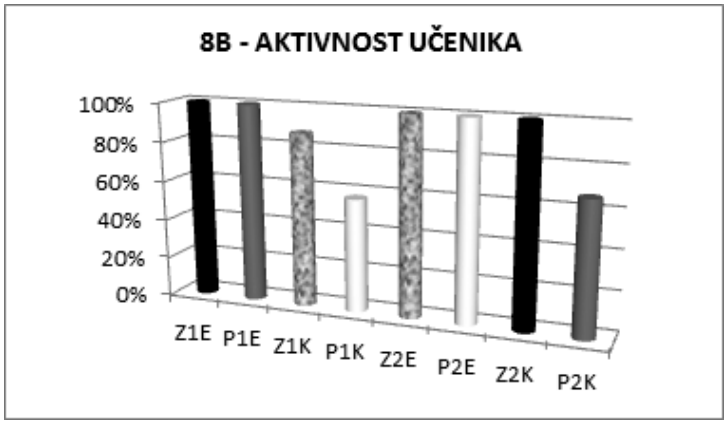

Figure 7. Histogram of homework performance by grade 8 students

The students in the control group in the first test unit were not completely self-responsible when doing their homework, but when they became members of experimental group in the second test unit, they showed a complete self-responsibility and solved the second task (Z2E) and answered the second question (P2E) with a 100% success rate. The aforementioned research results indicate that grade 7 and 8 students are more active and do homework with a greater percentage when they are members of experimental group and when using e-learning system.

Due to the observed differences in student work and work results, depending on the way of learning, and for the purpose of determining statistically significant difference between the groups, a discriminant analysis was done (Table 3).

Table 3. Discriminant analysis of results of homework performance

grade	grade unit	group	Z1 %	Z2 %	P1 %	P2 %
5	A	E	100	100	100	100
		K	100	100	100	100
	B	E	100	100	100	100
		K	100	100	100	100
6	A	E	100	100	100	100
		K	100	100	100	100
	B	E	100	100	100	100
		K	100	100	100	100
7	A	E	100	100	100	100
		K	60	78	70	67
	B	E	100	100	100	100
		K	92	85	75	85
8	A	E	100	100	90	100
		K	92	100	82	80
	B	E	100	100	100	100
		K	88	100	57	67
		P	>0,05	>0,05	0,03	>0,05

All reference values of p refer to the sub-sample of grade 8b, respectively, for Z1, Z2 and P2 is > 0.05 and for P1 p = 0.03. Therefore, it is clear that in the first two tasks (Z1 and Z2) and question 2 (P2), the threshold value p is boundary, while only in question 1 (P1) there is the statistical significance of distinguishing between the control and experimental group of the grade 8b.

Although the research results show higher activity of students in grades 7 and 8 as members of the experimental group compared to the activity of the same students as members of the control group, nevertheless a statistically significant difference between the proportions is visible only for students of grade 8b in the variable P1K / P2E, where p = 0.03.

Considering the results of the research as a whole, it can be said that the general hypothesis was confirmed because working in the Moodle system was a sufficiently motivating factor that encouraged students to be responsible, to write homework as well as to actively learn using modern teaching strategies. The difference in self-responsibility of grade 5 and 6 students versus grade 7 and 8 students in doing homework was not statistically significant. That is why it is possible to confirm hypothesis H1 and to state that student age was not a crucial factor in self-responsibility while doing their homework (p> 0.05).

Thus, no differences were found in homework performance with respect to student age, similarly no differences were found in terms of student sex, whereupon

the hypothesis H2 was confirmed ($p > 0.05$). As boys and girls did their homework equally successfully in this study, student sex did not play a role in their self-responsibility, which is in contrast to the results of Rakaš-Drljan and Mašić (2013) and Ristić-Dedić et al (2017), who identified greater self-responsibility of girls. This result can be interpreted in terms of the use of e-learning system motivating all students to learn and do their homework.

The study found no statistically significant difference in homework performance between the same students when working as experimental and as control group members, and therefore hypothesis H3 was confirmed ($p > 0.05$). Although there is a difference in self-responsibility and doing homework in grades 7 and 8, it is not statistically significant except for one variable P1K / P2E, and only in grade 8b. The results of homework performance do not show statistical significance between groups, yet any shift in student activity and increased self-responsibility is welcome in teaching. Therefore it may be advisable to introduce this mode of work, especially in situations where students are unable to attend regular classes.

In order to avoid overloading students with homework, cited by Sokol (2005), in the study presented here, students were assigned a variety of homework assignments that did not require too much time since individual tasks could be completed in less than 5 minutes, and only rare ones, such as model making or PPT presentation, took them up to two hours. According to the students, the time required to do their homework was not an aggravating circumstance, but more important was how interesting the given topic was and the challenge they felt in completing the tasks. Certainly an important segment of student motivation was creative and practical homework, as they emphasized that tasks with diverse activities inspire their curiosity for research and motivate them to work, as opposed to uninteresting and non-motivating tasks in workbooks and textbooks. The student statements about the importance of creative intriguing tasks are also confirmed by Cooper (2007), who emphasizes the importance of designing different tasks for students.

In order to avoid the most common mistakes done in assigning homework, as described by Mattes (2007), the homework in this study was not assigned after each lesson, was well designed, included only one question and one task, was regularly and carefully reviewed, and students received feedback in a short period of time with the appropriate grade (through the Moodle system, for members of the experimental group, and in the classroom, for members of the control group).

Careful qualitative analysis revealed that even less active students regularly did their homework while working in the experimental group. At the same time, no cases of copying from other students were recorded, which contradicts the claims of Ristić-Dedić and Jokić (2014), and most of the students did their homework immediately upon returning home, thus developing their working habits.

The results of the research showed a high degree of student self-responsibility in doing their homework, especially when working in the Moodle system. The exception were the grade 5 and 6 students who, regardless of the group to which they belonged, did their homework completely, which can be explained by the age of the

students, whose priority is still learning. Considering the results of the student homework performance when using the Moodle system or active learning in traditional classroom, it is obvious that students achieve greater success and greater satisfaction during the use of the Moodle system, and this fact can be an incentive for applying e-learning systems in Science and Biology classes as well as other classes.

CONCLUSION

The implementation of ICT in the teaching process is a reality, such technology being already used in Science and Biology classes, while the application of fully online e-courses in primary school is still in its infancy. This is why the question may be raised as to how well the education system is prepared for learning in a multimedia environment and how competent teachers are to implement e-learning using e-learning systems as a new challenge. While there are real problems for the implementation of such learning, such as technical equipment of schools, computer skills of teachers and students themselves, there are also benefits of applying e-learning (fully online) in cases of student illness or other justifiable class absences when students cannot attend regular classes.

The use of e-learning in the teaching process implies, first of all, the quality design of teaching content uploaded on the e-platform as well as the design of various and creative activities that will be stimulating for the accomplishment of the set tasks. During the learning process, it is extremely important to regularly monitor student activities, provide feedback on their work, suggest activities for further progress, and evaluate the achievement of the required learning outcomes. For every applied form of learning, and especially when applying e-learning systems, it is essential a timely evaluation of student activities, and thus the completion of homework assignments, which are designed to help students repeat, identify and supplement the teaching content important for their conceptual understanding.

The results of this research confirm that the application of e-learning systems and ICT in Science and Biology classes affects student self-responsibility and homework performance. Although the results indicate the benefit of e-learning, it alone does not necessarily guarantee a higher quality of the teaching process, nor can it replace the quality work of teachers.

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