

Оригинални
научни радVera S. Županec,
Tihomir D. Lazarević¹,
Tijana Z. PribićevićUniversity of Novi Sad, Faculty of Sciences,
Department of Biology and Ecology, Novi Sad, Serbia

Classes Supported by Digital Technologies: the Application of the Blog as a Virtual Tool in Biology Teaching

Summary: Innovations in technology are rapid and workers' roles in the virtual environment have changed. Due to the great need to educate professionals who need to adapt quickly, the modernization of teaching is gaining momentum. Blog is one of the internet tools that can be effectively implemented in education. The aim of the research is to experimentally test the effects of the application of the blog Biosoikoslogos in biology teaching in relation to traditional teaching and to evaluate the attitudes of first-grade high school students (15-16 years of age) towards the characteristics of the blog. The theoretical method, descriptive method, experimental method with parallel groups, and methods with pedagogical statistics were applied in the research. The results of the study showed that the students who used the blog achieved statistically significantly better results than the students who did not use the blog. The results also showed that the most important features of the blog are those that are the most helpful for students to directly facilitate learning. The analysis of the results shows that blog-based biology teaching is significantly more effective than traditional teaching, should be applied more frequently in practice, and students should evaluate blog features differently.

Keywords: teaching biology, ICT in teaching, blog in teaching

¹ tihomir.lazarevic@dbe.uns.ac.rs

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Introduction

Teaching in schools continues to take place in a predominantly traditional way and generally does not follow the trends that information and communication technologies (ICT) have already largely found their place and taken a dominant role in many spheres from economics, through industry, to creating trends and responding to numerous global challenges through science, education, and many other social activities. The poor results of our students on PISA and TIMSS tests show that teaching in Serbia is not efficient enough. In order to break this trend, digital technologies that are effectively implemented in the industry need to be more widely represented in education. The emergence of the “Fourth Industrial Revolution” in the 21st century brought challenges, as well as opportunities, for the education sector to accelerate and modernize the learning process. Education is currently experiencing a rapid change due to the increase of technology-based networked communities. In order for the higher education sector to remain relevant and compatible with today’s challenging society, educational institutions must commit to a process of a continuous change or will become less and less important due to the emergence of various online courses (Van Wyk, 2018).

Many manufacturing processes in industry are controlled by software. In agriculture, mobile meteorological stations installed on drones are used; in medicine, the most modern tools are used, supported by complex software for diagnosis and treatment of diseases, so the application of ICT has become inevitable for modern man. In this regard, it is necessary to apply such technology in education, which is the basis for education and intellectual shaping of experts in various fields. On the other hand, there is a special question whether the application of technological support in teaching leads to a fundamentally different approach to teaching (Eraković and Lazović 2020).

Although innovations of any kind usually require certain material investments, given the avail-

ability of various software and platforms that can be used free of charge in education and science, there is no significant obstacle to their introduction and use in educational work. However, for the successful application of ICT in teaching, appropriate training of both teachers and students is necessary. From the perspective of social justice, an important question arises as to whether all teachers have equal opportunities to be trained and transfer ICT knowledge and skills learned in their courses to students in different school environments (Jita, 2018).

In scientific literature, various authors have tried to define the concept of digital competence. Ananiadou and Claro (2009) and Navarro et al. (Navarro et al. 2016) define digital competence as the integrated and functional use of knowledge, skills, and digital attitudes. Teachers’ digital competencies are dynamic and complex not only because of the dynamic development of ICT, but also because of the close connection with pedagogical, psychological, methodological, didactic, and subject competencies of teachers (Ristić and Blagdanić, 2017). Equally, digital competence implies the ability to apply the necessary knowledge, attitudes and skills for planning, application, and assessment in the process of teaching and learning, using ICT in teaching. Therefore, digital competence can be understood as pedagogical digital competence. Taking into account this definition, it can be stated that pedagogical digital competence has three components: attitude towards ICT, knowledge, and educational use of these technologies (Kihzoza et al, 2016; Navaro et al. 2016; Rivera-Laylle et al. 2017).

One of the information and communication technologies that can be used effectively in teaching is a blog. A blog is an internet platform that brings together textual, audio, and video content in one place. Although blogging platforms are intuitive, this job requires more activity than writing just a few articles (posts). In the arena of content marketing, the effective use of a blog (blogging) means that the user becomes a respected member of the online

community that leaves a recognizable mark in the virtual space. Blogging has become a „cheap publishing platform“, a potentially powerful and visible way, not only to build informative content, but also to 1) make a blog user a valuable member of the virtual community, and 2) raise the value of one's personal brand (Gilbert et al. 2016).

Although reminiscent of a classic website, the blog has certain characteristics that make it specific. The contents of the blog are arranged in reverse chronological order, from the most current to the oldest, which makes it extremely clear. This platform enables two-way (web 2.0) communication, so that users can exchange information almost synchronously. In addition to textual, audio and video content, links to other sources of knowledge can also be posted on the blog, which significantly expands the information base on it (Lazarević et al., 2018).

In an educational context, a blog can be effectively used as a tool that combines different possibilities. This platform can be used according to the combined model in the classroom, but also for online teaching. This approach gives the student the opportunity to independently master the teaching material that the teacher makes available through the learning support system, while the time in class can be devoted to problematic segments. The teaching process is thus more focused on the student and his needs, i.e., difficulties in mastering the material (Eraković and Lazović, 2020). The fact that a teacher at home can record a lesson and post a video with a certain teaching unit on a blog has a special significance in situations when, due to the corona virus pandemic, the school system completely switched to online teaching at one point.

There are several types of blogs used for educational purposes. These include the teachers' blog, the students' blog, and the teaching blog used in the classroom (Campbell, 2003). The teachers' blog is used to post learning materials so that students can download or read them. The students' blog is run by an individual or a small group of students. This

blog can be used for personal interests as well as for peer education. Finally, the classroom teaching blog is the result of the joint effort of the entire class. It is like a virtual classroom. On this blog, the teacher can post anything about the information from the lecture, such as an assignment or reading material, and students can solve or set assignments and give answers and comments about the work of other students (Vadia, 2018).

The classroom teaching blog offers a number of benefits for both students and teachers. One of them is that it can motivate students to be more efficient because it also promotes peer review. It also offers an authentic audience that makes students more aware of what they are doing. Through this blog, a limited time in the classroom is no longer a problem because teachers and students can maintain contact via the Internet, outside of school. Finally, a teacher can apply many different teaching strategies using a blog in the classroom or outside (Vadia, 2018).

The blog has a great potential to be used in teaching, at all levels of education (Aberšek, 2013; Aberšek et al., 2014). It can be used in different ways in teaching, so that it is fun and interesting and engages students in additional activities. It can also be used as an aid to students in the development of important skills related to communication in science or as a club of readers of precisely defined scientific content through the formation of groups (De Souza-Hart, 2010). According to the literature (Achtenann, 2006; Godwin-Jones, 2003; Ray, 2006), a blog has a potential to be used as a complementary means of communication, a shared virtual tool, or a teaching tool in educational systems.

Students can use the blog to replace paperwork, and feedback can be obtained in the form of comments from teachers or other students. Most studies on the application of blogs include writing texts in various courses (Tang & Lam, 2014; Yang & Chang, 2012) or teacher education programs (Chou, 2011; Pavo & Rodrigo, 2015), while several researchers have used audio and video blogs in lan-

guage learning (Hung, 2011; Shih, 2010; Sun, 2012). Finally, with the help of a blog, the teacher can create an environment in which students feel that they are important factors in the educational process (Churchill, 2009).

In education, the blog is most often used as an aid in learning the native language and a foreign language or in subjects related to computer science. However, the use of blogs in sciences such as biology or chemistry is still underrepresented, so research related to the use of blogs in these areas is very scarce (Lazarević et al., 2018).

The aim of the research is to experimentally check the effects of the application of the blog in biology teaching in relation to traditional teaching and to look at the attitudes of students about the characteristics of the blog.

In relation to the research goal, tasks have been formulated for its operationalization:

1. To determine whether there is a statistically significant difference in the achievement of biology students on the final test between students of the group that used the blog in processing the teaching topic Basics of Cytology in the first grade of high school and students of the group that covered the same teaching topic by means of traditional teaching.

2. Determine which features of the blog are most important to students.

Research methodology

Research design: The research is focused on the effects of using a blog as a web tool in teaching biology. The research was conducted in 2017 in biology classes within the teaching topic Cytology in the first grade of high school, according to the former, linear program of biology. Before the beginning of the research, a blog Biosoikoslogos was created on the internet address www.biosoikoslogos.wordpress.com, on which biology teaching units for high school students were integrated. The research

used an experimental model with parallel groups, an experimental (E group) that used a blog in teaching and a control (C group) that implemented teaching in the traditional way. Before teaching, students from the experimental and control groups were tested with a pre-test in order to equalize the groups. Since the students of the first grade of high school participated in the research, and the research was realized at the beginning of the school year, the pre-test included questions from the materials that the students studied in elementary school. These contents are related to the material processed in the teaching topic Fundamentals of Cytology, which was realized in pedagogical research. That is why the initial test mostly covers the contents that are processed in the 7th grade of primary school (cell biology and human anatomy). After the application of the pre-test, the students from the group E, with the help of the blog, realized the teaching units from the teaching topic Cytology. All lessons from this teaching topic integrated into the blog included a multimedia presentation, including images, videos of complex biological processes taking place in cells, as well as links to other related content that lead to the appropriate application or a web page.

In addition to using the blog in class, the students in the experimental group had the opportunity to communicate with the teacher from their homes by posting comments on the blog at the time of learning the material or immediately afterwards. Also, other students from the experimental group were able to respond to the comments, which created good conditions for online community communication on a particular topic.

For the students in group C teaching took place in the traditional way, where the teacher predominantly teaches the material (frontal form of work), without the use of a blog. Classes were taught in both groups by the same teacher. After the implementation of teaching in different ways, both groups did a post-test to check their knowledge after applying different teaching models.

Research sample: Random sampling was applied in the research. The sample consisted of 180 students, divided into two groups, but after equalizing the groups, the results of 171 students were included in the analysis, with 85 students in the experimental group and 86 students in the control group. In order to fully ensure the objectivity of the experiment, the remaining 9 students participated until the end in the research, but their results were not taken into account and were not statistically processed.

The experimental group consisted of students from three classes of the first grade of the high school in Šabac, and the control group consisted of students from three classes of the first grade of the high school "Isidora Sekulic" in Novi Sad. All students are between the ages of 15 and 16. This choice of experimental and control groups ensured that students were not in contact and could not exchange experiences related to the different teaching models applied in these two groups. The number of students at the class level was uniform, so the classes in group E had between 27 and 30 students, and in C group between 28 and 30 students.

Research instruments: The instruments used in the research are: pre-test (applied at the beginning of the research, before the introduction of the innovative teaching model, which equalizes the E and C groups), post-test (applied for both groups after the introduction of the innovative teaching model in E groups), and an assessment scale by means of which students evaluated different characteristics of the blog. The reliability coefficient (Cronbach's Alpha) for the pre-test is $\alpha = .801$, and for the post-test $\alpha = .808$, which indicates a high degree of consistency of the questions within the tests. The reliability coefficient for the assessment scale is $\alpha = .824$.

Data analysis: For data processing on the pre-test, a t-test with a significance threshold of $p < .05$

was used. Data on the progress of E and C group students from the pre-test to the post-test were processed by a combined analysis of variance (ANOVA). When processing the data on the characteristics of the blog, the arithmetic mean of the points on a scale of 1 - 4 was calculated. All analyzes were performed in SPSS and Microsoft Excel.

Research results and discussions

After processing and the statistical analysis of the data on the effects of the application of the blog in biology teaching in high school, the results were obtained which are an indicator of the achievement of students in groups E and C by applying different teaching models. They include:

- E and C group pre-test results;
- post-test results of E and C groups
- The results of an evaluation scale about the values of different blog features.

The obtained results were analyzed and compared with the results of the research by other authors related to the application of ICT, and especially the application of the blog in teaching at school and university level of education.

Pre-test results: In order to equalize the students of E and C groups according to their knowledge of biology, a pre-test was applied at the beginning of the research. To look at the measures of central tendency, skewness (Skewness) and kurtosis (Kurtosis), arithmetic mean (M), standard deviation (SD), minimum (Min), maximum (Max), mod (Mode), median (Median), a descriptive statistic for the pre-test was done (Table 1). According to Tabachnick & Fidell, (2013), the range of acceptability for skewness and kurtosis is -1.5 to +1.5.

Table 1. Descriptive pre-test statistics.

N=171	Min.	Max.	M	SD	Mode	Median	Skewness	Kurtosis
In total	22	93	55.54	15.26	57	55	0.07	-0.38

In the pre-test as a whole, the students of Group E achieved an average of 55.52 points, and the students of Group C 55.56 points. The results of the pre-test were processed by t-test and shown in Table 2. On the pre-test there was no statistically significant difference in the achievement of students in groups E and C ($p > .05$).

The Leven test ($F = 4.36$, $p > .05$) was also used in the analysis of the pre-test data. And its result indicates that the E and C groups are uniform in terms of to their prior knowledge of biology.

Post-test results: After the realization of the content of the teaching topic Basics of Cytology, students of both groups did a post-test. Descriptive statistics was also performed for this test, the results of which are shown in Table 3. The range of acceptability for skewness and kurtosis ranges between -1.5 and + 1.5 (Tabachnick & Fidell, 2013).

In the post-test as a whole, the students of Group E achieved an average of 78.15 points, and the students of Group C 69.20 points. The data obtained in the post-test were processed by t-test, which examined the statistical significance of the differences in the achievement of students in groups E and C after the application of the two teaching models. The students in group E achieved a statistically significantly better result in the post-test compared to the students in group C ($p < .001$). The statistical significance of differences in achievement in biology on the final test is shown in Table 4.

The efficiency of the two teaching models was analyzed by a combined analysis of variance (ANOVA). This analysis showed that there is a statistically significant main effect of the non-repeated factor Group as well as the repeated factor Testing. Also, the interaction of these two factors proved to be statistically significant (Table 5).

Table 2. Statistical significance of the difference in achievement in biology on the pre-test between students of E and C groups (t-test)

Group	N	M	SD	t (df)	p	d _{Cohen}
E	85	55.52	13.85	0.02 (169)	>.05	0.003
C	86	55.56	16.62			

Table 3. Descriptive statistics for post-test.

N=171	Min.	Max.	M	SD	Mode	Median	Skewness	Kurtosis
In total	27	100	73.65	17.32	72	78	-0.69	-0.22

Table 4. Statistical significance of the difference in achievement in biology on the post-test between students of E and C groups (t-test).

Group	N	M	SD	t (df)	p	d _{Cohen}
E	85	78.15	15.01	3.49 (169)	<.001	0.533
C	86	69.20	18.36			

Table 5. Statistical significance of the difference in achievement in biology between students of E and C groups measured on the initial and final knowledge test.

	F	df1	df2	p	η^2_p
Group	15.10	1	169	<.001	0.08
Testing	125.84	2	338	<.001	0.43
Group x Testing Interaction	24.61	2	338	<.001	0.13

Students in both groups (Group factor; $p < .001$) made a statistically significant progress on the post-test compared to the pre-test (Testing factor; $p < .001$). This progress is expected, given that the contents of the post-test were realized immediately before the final testing. However, it was observed that the students of the group E progressed statistically significantly more compared to the students of the group C (interaction Group x Testing). Since the working conditions in the groups E and C were the same, with the only difference in the teaching model applied in these two groups, it can be concluded that the application of the blog in biology teaching statistically significantly contributes to the improvement of biology achievement.

A blog is an application that makes it easier for students to master the material and allows them to respond to complex challenges in teaching. The challenges of displaying cell characteristics are multiple. Molecules undergo a wide range of conformational changes at different levels, from atomic level vibrations to conformational changes at the level of the domain of random motion of molecular entities. Understanding the concept of spatial and temporal scaling in the cellular environment is one of the main challenges related to the study of cytology and molecular biology (Duncan, 2007; Tibell & Rundgren, 2010).

The presentation of abstract concepts can take any form (static, dynamic, two-dimensional, three-dimensional) and will often combine multiple modalities. Moreover, visualizations can fulfill specific learning goals or even put teachers in the role of designers (Jenkinson, 2018). That is why blogs

have the potential of an individual reflective journal (Zabalza, 2004) and enable the interaction of readers, with the possibility of adapting to metacognitive processes in a common way of acquiring knowledge, thus directly influencing learning.

Teaching with the help of a blog is more efficient than traditional teaching, and students are more motivated for teaching that includes digital technologies, which is in line with the previous research on the application of the blog in teaching (Churchill, 2009). Many authors have proven that blogs have the effect of improving learning performance (Ching, 2012; Chou, 2011; De Andrés Martínez, 2012; Goktas and Demirel, 2012; Halic, et al, 2010; Hramiak et al, 2009; Mansor, 2011; Tang and Lam, 2014). For example, Halic et al. (2010) state that the interaction of teaching materials in class with combining teaching with the help of a blog significantly contributes to a better understanding of the material. Previous research (Norrby et al., 2015) has also shown that students who use computer animations or videos understand the material better, compared to students who only read about it from textbooks.

The results of the scale of assessment of the importance of certain characteristics of the blog: The blog provides many opportunities when it comes to its application in education. As a platform that integrates image, sound, video, comments and links to specific content, the blog facilitates learning and provides an opportunity for further research within a specific topic (Lazarević, 2019). Each student has the opportunity to use the blog in different ways.

One of the tasks of the research was to determine which characteristics of the blog are the most important ones for students in the E group. The different characteristics of the blog and their evaluation by students within the assessment scale are shown in Table 6. Each characteristic could be evaluated on a scale from 1 to 4 (1-it is not important, 2-it is a little important, 3- important and 4-extremely important to me).

When processing the data, the arithmetic mean of the estimates was calculated for each characteristic individually. The obtained results showed that the most important characteristic for students is no. 10 (The blog allows me to see complex bio-

logical processes on video). In addition to this, the blog feature that allows students to see pictures and diagrams is also very important (feature no. 9). This finding is consistent with the findings of other researchers (Cavanagh et al., 2014; Hourigan & Murray, 2010; Jensen et al., 2012). Visualizations can be a powerful tool of intuition, playing a key role in transforming the way students think about the scientific sphere. However, if we want to provide pedagogically effective experiences, we need a better understanding of how the design and capabilities of different visualization modalities support learning (Jenkinson, 2018).

Table 6. Evaluation of different characteristics of the blog by E group students.

Blog features	N	M	SD
1. A blog helps me learn material more easily at home.	85	3.55	0.699
2. A blog allows me to study at a time that suits me.	85	3.44	0.715
3. The blog allows me to follow the material regularly, even when i miss classes for a long time.	85	2.75	0.770
4. The blog allows me to ask a teacher a question from home.	85	2.25	0.925
5. The blog encourages me to express my opinion through comments, without fear that other students will make fun of me.	85	1.92	0.889
6. The blog allows me to check my knowledge from home, through comments with other students.	85	1.91	0.921
7. With the help of a blog, I become a more active participant in teaching.	85	2.71	0.753
8. The blog directs me via links to websites with additional content.	85	2.41	0.955
9. With the help of a blog, I learn more easily, because the pictures, sketches and schemes on the blog are clearer than on the classic board.	85	3.62	0.654
10. The blog allows me to see complex biological processes on video.	85	3.67	0.625

The characteristics that with the help of a blog they can effectively learn the material at home (characteristic no. 1), or at a time when it suits them (characteristic no. 2), are also highly valued. Similar conclusions have been reached by other researchers (Luehmann & Tinelli, 2008) who point out the advantage of blog communication, which is reflected in the fact that students are not geographically or temporally limited.

The least important feature of a blog, according to students, is that the blog allows them to check their knowledge from home, through comments with other students, and then the feature by which the blog encourages them to express their opinions through comments, without fear of other students ridiculing them. Although least valued by students, these characteristics must be viewed in the context of other characteristics listed. Previous research has shown that a blog can be a source for increasing students' self-confidence, motivation and trust in writing (Pinkman, 2005; Zhang, 2009). Also, previous research has confirmed that students are important features of the blog that facilitate learning in that they, in cooperation with other students, check their knowledge through comments and learn new material (Churchill, 2009).

Conclusion

Despite numerous efforts to change the trend dominated by traditional teaching, the problem of an insufficient application of information and communication technologies in teaching is still present, even in many developed countries (Johnson et al., 2019). Students growing up in the era of internet technology do not have the patience to listen to the teacher teach the material for an entire hour. They are used to finding information that interests them

at the moment on the Internet. That is why teaching must be adapted to the new needs of students and one of the approaches to solving this problem is the application of ICT in teaching. The multimedia and ICT stimulate learning motivation and provide different strategies to improve learning skills (Guan et al., 2018).

The results obtained in this and other research indicate that various educational applications, online programs, social networks and blogs significantly contribute to the improvement of achievement in students who use them in teaching. Therefore, their application should be much more represented in teaching practice in Serbia. By applying the blog and other ICT in teaching, chronic problems of education in our country could be successfully solved, such as: poor motivation and lack of interest of students, teaching that is lecturer-centered (traditional) and does not require much activity from students in class other than memorizing facts, poor results on independent external tests due to misunderstanding the material, etc. Also, the results indicate that different characteristics of the blog are important to students, but that the characteristics that directly facilitate their mastering of the material (pictures, schemes, videos, comfort of learning from home...) and when creating content on the blog should be given special attention.

The use of the blog in teaching brings with it several questions. How to use the available technology? How to communicate with the "outside world" through digital technology? Is there a will to share information with others (Bâldea et al., 2015)? We hope that some future research will provide answers to these questions in order to complete the picture of the use of digital technologies in teaching and give a more detailed insight into the advantages and disadvantages of their use in teaching.

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Вера С. Жупанец

Тихомир Д. Лазаревић

Тијана З. Прибићевић

Универзитет у Новом Саду, Природно-математички факултет,
Департман за биологију и екологију, Нови Сад, Србија

НАСТАВА ПОДРЖАНА ДИГИТАЛНИМ ТЕХНОЛОГИЈАМА: ПРИМЕНА БЛОГА КАО ВИРТУЕЛНОГ НАСТАВНОГ СРЕДСТВА У НАСТАВИ БИОЛОГИЈЕ

Иновације на пољу технологије су брзе, а улоге радника у виртуелном амбијенту измењене. Због велике потребе за образовањем стручњака, који се морају брзо прилагодити, модернизација наставе је веома актуелна. Образовање тренутно доживљава брзе промене услед повећања умрежених заједница заснованих на технологији. Један од интернет алата који се ефикасно може применити у образовању је блог. Блог је интернет платформа која обједињује текстовне, аудио и видео садржаје на једном месту. На блогу су садржани поређани обрнутим хронолошким редоследом, од најактуелније, према старијим, што га чини изузетно прегледним. Ова платформа омогућује двосмерну (Web 2.0) комуникацију, иако да корисници могу синхронно да размењују информације.

Циљ овог истраживања била је експериментална провера ефеката примене блога у настави биологије на постојећа ученика у односу на традиционалну наставу, као и следеће ставове ученика првог разреда гимназије (15–16 година) о карактеристикама блога. У односу на циљ истраживања формулисани су задаци за оптимизацију циља: 1. Утврдити да ли постоји статистички значајна разлика у постојећу ученика из биологије на финалном тесту између ученика који су користили блог у обради наставне теме Основи цитологије у првом разреду гимназије и ученика који су имали наставну тему реализовали традиционалном наставом; 2. Утврдити које карактеристике блога су ученицима најважније.

У истраживању је коришћен експериментални модел са паралелним групама, експерименталном Е групом, у којој су ученици користили блог за учење биолошких садржаја и контролном (К) групом, у којој је настава реализована на традиционалан начин.

Узорак истраживања је чинио укупно 171 ученик, при чему је у експерименталној групи било 85 ученика из гимназије у Шајку, а у контролној 86 ученика из гимназије у Новом Саду.

Инструменти коришћени у истраживању су: иницијални тест (примењен је на почетку истраживања, пре увођења иновативног модела наставе, којим су Е и К група уједначене према претходном знању из биологије), финални тест (примењен је у обе групе након увођења иновативног модела наставе у Е групу) и скала процене, којом су ученици вредновали различите карактеристике блога.

За обраду података на иницијалном и финалном тесту коришћен је χ^2 -тест уз праг значајности $p < .05$. Подаци о напредовању ученика Е и К групе од иницијалног до финалног тестирања обрађени су комбинованом анализом варијансе (АНОВА). При обради података

о карактеристикама блога рачунаћа је аритметичка средина бодова на скали од 1 (није ми важно) до 4 (веома ми је важно).

Резултати испитивања: Анализа добијених резултата показала је да постоји статистички значајна разлика у постигнућима ученика Е и К на финалном тесту знања у корисћ експерименталне групе. Ученици Е групе су постигли више поена на финалном тесту, у просеку 78,15 поена (од максималних 100 поена), у односу на испитанике К групе, који су освојили у просеку 69,20 поена. Резултати су, такође, показали и да су ученицима најважније карактеристике блога које им директно олакшавају учење. Испитивање је показало да је ученицима најважнија карактеристика блога према којој „имају могућност да виде сложене биолошке процесе на видео запису”. Осим ове, врло је значајна и карактеристика „која ученицима омогућује да виде слике и шеме”, јер визуализација може бити моћно средство интуиције, истражући кључну улогу у трансформацији начина на који ученици размишљају о научној сфери. Карактеристике да „уз помоћ блога ученици могу ефикасно да уче трајиво код куће”, као и она „да могу да уче у време када њима највише одговара” такође су високо вредноване. Најмање важна карактеристика блога, према мишљењу ученика, јесте она „да им блог омогућује да од куће, кроз коментаре са другим ученицима, провере своје знање”, а затим карактеристика према којој их „блог подстиче да изразе своје мишљење кроз коментаре, без бојазни да ће их други ученици исмејавати”. Иако су најмање вредноване од стране ученика, ове карактеристике се морају посматрати у контексту других наведених карактеристика.

Закључци и педагошке импликације: Резултати до којих се дошло у овом испитивању указују на то да блог значајно доприноси побољшању постигнућа из биологије код ученика који га користе у настави. Због тога би његова примена требало да буде много више заступљена у наставној пракси у Србији. Такође, резултати указују и на то да су ученицима важне различите карактеристике блога, али да се посебно истичу карактеристике које им директно олакшавају савладавање трајива (слике, шеме, видео-записи, комфор учења од куће...), те би при креирању садржаја на блогу посебну пажњу требало посветити овим сејменима.

Упоредба блога у настави са собом доноси и неколико питања. Како користити технологију која је на располагању у настави? Да ли постоји воља наставника да размењује информације са другим наставницима из истој или других наставних подручја, образовно-настаним установама, родитељима и праћећим друштвеним организацијама? Надамо се да ће будућа испитивања дати одговоре на ова питања, како би се слика о упореди дигиталних технологија у настави уопшћунила и дала детаљнији увид о предностима и недостацима њихове употребе у настави.

Кључне речи: настава биологије, ИКТ у настави, блог у настави