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Role of Multimedia in the Teaching of Science and Social Studies

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KLJUČNE BESEDE: učitelji, multimedij, poučevanje, učne vsebine, učilnica

POVZETEK – Uporaba multimedijske tehnologije pri predmetu narava in družba omogoča učencem, da v okviru procesa pridobivanja novega znanja vključijo več čutil. Multimedijske vsebine se zato lahko uporabljajo ne le kot pripomoček pri poučevanju, temveč tudi kot dodaten vir spoznanj. Pospešeni razvoj sodobne tehnologije je zagotovil potrebne predpogoje za ustvarjanje, uporabo in distribucijo multimedijskih vsebin, ki vplivajo na izboljšanje procesa poučevanja narave in družbe. V okviru naše raziskave smo ugotavljali vpliv multimedija na realizacijo učnih ciljev pri predmetu narava in družba, pri čemer smo upoštevali že znane lastnosti multimedijske tehnologije, da omogoča animacijo in vizualizacijo, kar prispeva k večji nazornosti učnega procesa. Rezultati nas usmerjajo k implementaciji medijev v učni proces in spodbujanje učiteljev v nadaljnje usposabljanje za uporabo sodobnih učnih tehnologij ter za ustvarjanje takih pogojev v šolah, ki bodo omogočali učencem sodoben didaktični pristop.

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ABSTRACT – Application of multimedia during the implementation of teaching Science and Social Studies provides the preconditions for the involvement of all student's senses in the process of acquiring new knowledge. Hence, the multimedia content can be used not only as an aid in teaching but also as an additional source of information. The rapid development of modern technology has provided the necessary preconditions for the development, implementation and distribution of multimedia content that affects the improvement of the implementation process of teaching about nature and society. The focus of our research concerns the assessment of impacts during the implementation of multimedia in the teaching process of the subject, and is selected according to the opinion that multimedia offers animation and visualization at the same time. This paper was written as a contribution to the implementation of multimedia in the teaching process as well as support for the necessity of teaching staff training for the application of modern teaching aids.

1 Introduction

The development of information and communication technologies has caused certain changes in the traditional teaching methodology. The synergy of text, graphics, videos and various animations led to a significant benifit for the target user in relation to the effects that can be achieved by the individual application of the aforementioned components. The integration of multiple monomedia content inevitably leads to the creation of multimedia content that enables a simultaneous activation and visual perception and auditory effects. The choice and the usage of multimedia in teaching Science and Social Studies is a relatively recent problem area of research, which was one of the reasons for choosing this study.

It is known that the traditional teaching is characterized by a frontal form of work and, often, one-way communication between teachers and students. The introduction of

innovations in the learning process not only involves equipping classrooms with modern teaching aids but also their functional use. The very use of media and multimedia in teaching involves an extensive flow of new information that will be useful to students. Thus, in the process of multimedia interaction, the teacher is no longer the only source of knowledge because his role is taken by technology. The emergence of new communication technologies or media caused changes in education and, as a result, the learning process is supported by them. A rational application of multimedia technology in a well-organized educational process provides not only the engagement of the learner's cognitive areas, but also affects the willing, i.e. psychomotor, ones.

New technologies have become the integral part of many human activities, which is inevitably reflected in the field of education. The application of multimedia in teaching Science and Social Studies offers the possibility of achieving numerous improvements, encouraging, at the same time, the modernization of the teaching process, which means not just equipping classrooms but also an adequate training of teachers for their proper implementation.

1.1 Definition and basic features of multimedia

Improvements in information technology and numerous possibilities for its application in various fields result in creating the conditions for a new, more modern way of acquiring knowledge. A more intensive usage of computer engineering and information technology points to the need of increasing and broadening knowledge by using computer systems. The application and development of information technology was influenced by technological breakthroughs of other complex systems previously discovered and applied, as well as the available technical means, methods and techniques.

"Therefore, it is often said that information technology, although very complex, has achieved a high degree of development in a shorter period of time than many other technologies that are far less complex." (Milosevic, 2007, p. 249) Technology is rapidly changing the world we live in and its academic aspect is no exception. "Students and teachers everywhere are discovering exciting and innovative ways to make learning more dynamic, longer lasting and more applicable to the world outside the classroom." (Almarabeh, Amer & Sulieman, 2016, p. 763)

On the road to the development of information technology, the search for the application of visual and audio information caused the emergence of multimedia communication, which includes transmitting various types of information (text, drawings, speech, images and sound) in large quantities through a unified computer network. This way of communicating simultaneously engages multiple senses through audio and video resources. The resources of multimedia technology provide students with access to various learning materials "so as to elevate teaching efficiency and classroom instruction effectiveness" (Li & Kang, 2014, p. 243). The very concept of multimedia implies any combination of text, graphic art, sound, animation and video, which comes with a computer or in any other electronic mode (Mijic, 2009). Also, it could be defined as "the development of computer-based hardware and software packages produced on a mass scale and yet individualize use and learning" (Hilal, Amer & Sulieman, 2016, p. 761). Thus, multimedia implies the possibility of integration in the transmission of

different forms of information, linking technical and software dimensions and providing resources management, interaction, creation and communication (Ratković & Bajac, 2009, p. 822). The expedient multimedia system is actually formed by linking a series of compatible electronic means and applications. "An interactive multimedia is digitally integrated, organized information that includes text, graphics display, but also images, such as photographs, audio and video content, on a user-friendly computer interface. It allows the user to navigate, if desired, to find and look at the information." (Dyrli & Kinnaman, 1995; Galbreath, 1994) Multimedia applications were created by establishing a network formed by connecting nodes (as basic information units), facilities and links that are not anything other than a homogenous structure of intertwined relationships that operate between the set of information objects (Mijanovic, 2002, p. 259). The elementary condition for the occurrence of multimedia applications is satisfied by successfully establishing independent information units.

The integration of audio and visual components provides a more efficient presentation of programmes, enhancing learning and at the same time making the adoption of new information interesting. So, they are based on multimedia compatible and functionally related electronic resources and adequate software-information applications, which are used simultaneously in order to mobilize different senses of students or their users.

"It is indisputable that interactive media and hypermedia allow the teacher to relatively quickly and easily increase the effectiveness of teaching and learning." (Mijanovic, 2002, p. 259) New technologies, as an integral part of many human activities, have a strong impact on the educational activity, starting from pre-school through to higher education institutions. Multimedia also offers the possibility of accessing educational content for learning from home, where one should see "an opportunity with the potential to improve student learning" (Mukherjee, 2018, p. 245). Learning through multimedia results in encouraging students to work, since new technologies create a wider choice of various sources of knowledge and effectively provide feedback, objectively evaluate the learning results, with a special emphasis on adjusting the pace and rhythm of work to the capabilities of each individual student. Hence, "multimedia devices have quality to improve early education" (Shilpa & Sunita, 2016, p. 180). In terms of contemporary organized teaching (using multimedia technology), students are provided with a variety of databases that they can, according to their own interests, consult and use for the purpose of analyzing and testing knowledge, given that, according to the authors, "there are differences in individual learning style" (Lauc, Kišiček & Bago, 2013, p. 157).

As was already noted, each multimedia includes a combination of two or more networked media. If the multimedia is a computer, its structure will be composed of two or more different sensory areas of the media. The multimedia can be a computer then or composed of two or more media of the same or different sensory areas. The structure of the multimedia is always reflected in its complexities and multiplicities. The multimedia of one sensory field provides various information on the different media from the same sensory area, while the multimedia of two different sensory areas usually includes teaching audiovisual multimedia.

The term intermediality implies the interpenetration of all media information in a multimedia synthesis. The ready-made recipes for their synthesis do not exist for the class needs to combine multimedia which are a precondition for the realization of a

quality student achievement. The diversity and degree of learning activities is always greater when different sources are used, while communication is successful if different sources are used in the transfer of content, information and messages that complement each other. Considering the wide range of areas, including the content of the study programmes and the subject of Science and Social Studies, the teacher needs to be informed about many things that cannot be implemented in the immediate environment. Multimedia provides easy access to numerous facilities, which should be hierarchically sorted. The teacher should therefore be focused on the priorities of the individual source in order to avoid the so-called "teaching kitsch". Modern technological achievements offer easy access to information, but should not be allowed to overshadow the wealth of information that are a priority, a source. Inappropriate networking of various media creates a sort of "glitter" in the classroom, which raises the question of the credibility of the information presented to students. Theoretically, a multimedia system offers a variety of combinations, but when it comes to applying it in the classroom, it should not result in a saturation of information. An inappropriate choice of media and multimedia, as well as inappropriately chosen and designed content, will inevitably cause the opposite effect, i.e. students will not be able to adopt any information due to the fact that any unacceptable content will give the wrong impression about the presented contents.

1.2 Multimedia in the teaching of Science and Social Studies

After a successful implementation in the economy, technical and technological process will find its place in the classroom. However, these changes happened rather late in the process of education, and the reason for that can be found in insufficient training of teachers relative to the application of modern information technology in the teaching process. "Based on the reality, the use of interactive multimedia in primary school is still rare" (Saputri, Rukayah & Indriayu, 2018, p. 1). "Most teachers have a moderate attitude towards innovation, i.e. implementation of modern information technologies in the teaching process." (http://www.rc-cacak.co.rs)

The reasons for the opposition of teachers to introducing innovations in the teaching process can be found in their unreadiness for the flow of new ideas, as well as their tendency to evade responsibilities and obligations imposed by the changes. In fact, by carrying out the teaching of Science and Social Studies, the teachers have to play multiple roles, which means that they are expected to be the leaders of the process of learning and development, educators, experts in the programme, planners, organizers, faciliators, teaching media implementers, innovators, partners of students, parents, employers, colleagues, external collaborators and members of various teams, all at the same time. Hence, a permanent teacher training is extremely important, during which the teacher is taught to meet all of their students' expectations. The goal of professional development is to acquire new knowledge, skills and habits, as well as to upgrade the acquired knowledge (http://bib.irb.hr).

The multimedia environment provided for the Science and Social Studies students is one in which students can receive a patiently, carefully, thoroughly and easily digestible content, because they are objectively in a better position to independently observe, analyze and reveal causal connections and relationships between the studied objects,

processes and phenomena. Here, we would like to point out that the mentioned segments are of particular relevance to the teaching of Science and Social Studies, since the curriculum is characterized by interdisciplinarity. "No other school subject or area in a class includes such a variety of facts." (Lazarevic & Banđur, 2001, p. 57) The subject of Science and Social Studies is complex, because its contents are chosen from the field of Natural Sciences (Physics, Chemistry, Biology, etc.), Social Science (History, Sociology, etc.), as well as from certain specific content (Traffic, Environmental Protection, etc.) (De Zan, 2005, p. 18). "Benefits of the multimedia teaching, both in education and business, include interactivity through the user interface and flexibility in acquiring training with regard to planning, self-stimulation, memorizing, usage, and the type of the learning environment."(Cheen, 1994) It can be said that multimedia enables students to approach the presented multimedia content, offering at the same time a much broader and better ability to stage their identification, understanding and adoption. Through multimedia technology, students' cognitive capacities are successfully extended, while the teaching quality in Science and Social Studies reaches a higher level, developing and encouraging a more effective individual potential of students.

A wide choice of media, contents and methodological approaches contributes to students' maturity and independence. The possibility of monitoring and studying different phenomena, events and processes enables students to acquire a quality and comprehensive knowledge about their environment, while also giving them a complete insight into a reality that is directly unfathomable to our senses. The implementation of multimedia in the teaching of Science and Social Studies affectsstudents' involvement of multiple senses, which allow them to uncover different findings, while encouraging their mental, psychomotor and other engagement. These options inevitably affect the launch of complex thinking processes with the aim of finding new and sometimes original approaches in solving the assigned tasks. In task solving, not only students' skills relative to analysis, synthesis, abstraction and generalization are activated, but very often, certain motor skills as well, such as performing certain operations.

The previously mentioned items related to the implementation of multimedia in the teaching of Science and Social Studies certainly should not lead to the conclusion that its modernization is ensured merely by including multimedia. Moreover, it is necessary to make a selection of the programme material that will affect the maximum commitment and cooperation of each student. Thus, the application of modern multimedia systems in the teaching process of Science and Social Studies stipulates a more favourable pedagogical environment that will allow a more efficient development of individual cognitive, affective and psychomotor skills of each student.

2 Research objective and methodology

The aim of our study was to investigate teachers' opinions about the role of multimedia in the teaching of Science and Social Studies. The assumption, as the basis of this study, is that teachers are under-utilized during the implementation of the multimedia teaching for Science and Social Studies, therefore we examined the usage of multime-

dia and its impact on the teaching process in Science and Social Studies in relation to the location of the school where the respondents teach.

For the realization of the objective, it was necessary to look into:

- Frequency of use of modern media during the implementation of the teaching of Science and Social Studies;
- Existence of statistically significant differences in the use of modern media in relation to the city in which the educational institution is located;
- Obstacles to presenting content through multimedia;
- Existence of a statistical difference in the training of teachers for the implementation of multimedia in the school where they teach.

This research was carried out in September 2015 on a sample consisting of 122 Science and Social Studies teachers in the territory of three Montenegro municipalities. The cooperation in this study was preceded by consultations with school managements as well as the teachers as the direct implementers of the teaching process. Prior to the research, the teachers were informed about the problem and the objective of the research, and then they were given questionnaires in which they could express their opinion. The obtained data was processed using a statistical programme for Windows 7 as well as descriptive statistical parameters. We have reduced the statistical analysis to the description, while the processing of the obtained information was performed by means of the statistical methods, with the consequent inference.

3 The obtained results and the discussion

In the first section of the paper, it was emphasized, among other things, that multimedia was defined as a combination of several compatible media providing easy access to numerous facilities. As the content of Science and Social Studies is characterized by complexity and sprawl, it goes without saying that by using multimedia, the teaching itself becomes more modern, and with valid outcomes. One of the research objectives was to obtain information about the degree to which multimedia is used during the implementation of Science and Social Studies. We started from the hypothesis that multimedia was underused in the teaching of Science and Social Studies, and the results presented in the next section of this paper show whether the hypothesis is true or false.

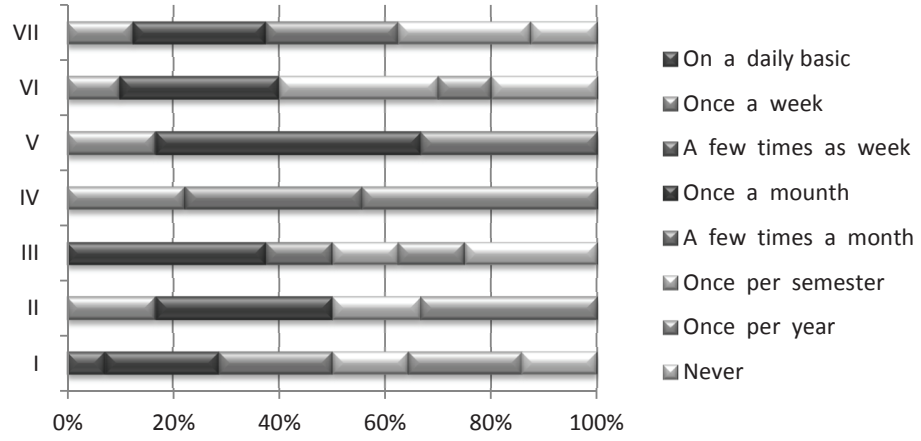
The question answered by the respondents teaching in the first cycle of primary school was related to *how often during the implementation of the teaching of Science and Social Studies contemporary media (computer, projector ...) are being applied*. Having processed the information, we came up with the following data:

Table 1. The frequency of application of modern media in the lessons of Science and Social Studies

Answers	*The schools*							*F*	*%*
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*		
On a daily basis	2	0	0	0	0	0	0	2	1.64
Once a week	0	2	0	4	2	2	2	12	9.84
Several times a week	0	0	0	0	0	0	0	0	0
Once a month	6	4	6	0	6	6	4	32	26.23
Several times a month	6	0	2	6	4	0	4	22	18.03
Once per semester	4	2	2	0	0	6	4	18	14.76
Once per year	6	4	2	8	0	2	0	22	18.03
Never	4	0	4	0	0	4	2	14	11.47
Σ	28	12	16	18	12	20	16	122	100

The frequency of application of multimedia during the implementation of the teaching of Science and Social Studies was presented graphically as well.

Graph 1. The presence of modern media in the lessons of Science and Social Studies



The analysis of the data presented in Table 1 and Graph 1 show that 1.64% of the respondents stated that they have been using modern media in the teaching process. In addition, 12 respondents (9.84%) said that modern media were used in the lessons of Science and Social Studies once a week, while none of the teachers confirmed that they use modern media multiple times a week. 32 teachers use modern media in Science and Social Studies once a month, which makes 26.23% of the total number of the

respondents. Modern media is used in Science and Social Studies lessons several times a month by 22 respondents, i.e. 18.03 % of the total number of the surveyed teachers. 18 respondents (14.76 %) claimed to use multimedia once per month, and 22 participants, 18.03 % of our sample, only once a year. It is interesting to point out that modern media was never used, during the process of its implementation in the teaching process of this subject, by 11.47 % of the total number of the teachers included in this study, especially as the survey was conducted in schools located in urban centres.

For the purpose of a detailed study, we considered it interesting to examine whether there is any statistically significant difference in the application of modern media in relation to the city where the primary school is located. Keeping in mind that our survey covered five schools in the municipality of Niksic and one school in the municipality of Podgorica and Berane, we wanted to examine whether there is a statistically significant difference in the application of modern media, as the mentioned cities are situated in a central, southern and northern part of Montenegro. The obtained results are presented in the following section of the paper:

Table 2. Statistically significant difference in the application of modern media

Answers	*Aunicipality*		
	NK	*PG*	*BA*
On a daily basis	2	0	0
Once a week	8	2	2
Several times a week	0	0	0
Once a month	22	6	4
Several times a month	18	0	4
Once per semester	8	6	4
Once per year	20	2	0
Never	8	4	2
χ^2	18.056		

The analysis of the data presented in Table 2 showed that among the respondents who are employed in educational institutions, there is no statistically significant difference in the application of multimedia (χ^2 = 18,056). Thus, the research results showed no connection between the city where organized training takes place and the application of modern media, that is to say, there are no differences in the application of modern media by the teachers with respect to the city or region in which the institution where they are employed is located.

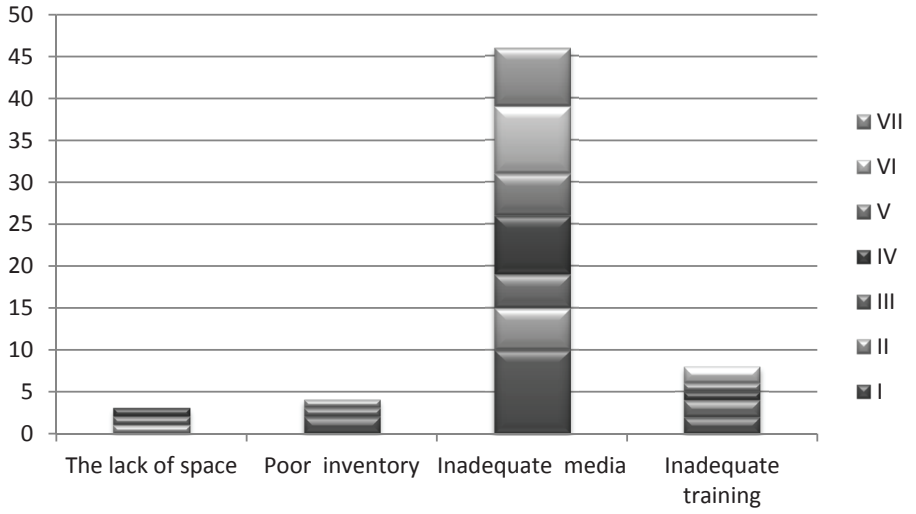
The most common obstacles to presenting the provided content (for the subject of Science) through multimedia are given in Table 3.

Table 3. Obstacles to presenting the content through multimedia

Answers	*School*							*F*	*%*
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*		
Lack of space	0	2	2	2	0	0	0	6	4.92
Lack of useful technical support	4	0	2	0	0	0	2	8	6.56
Lack of adequate media	20	10	8	14	10	16	14	92	75.41
Lack of training	4	0	4	2	2	4	0	16	13.11
Σ	28	12	16	18	12	20	16	122	100

Graphic data representing the obstacles to using multimedia in the lessons of Science and Social Studies.

Graph 2. Obstacles to presenting the content through multimedia in Science and Social Studies



The data shown in the Table 2 and Graph 2. proved that most of the respondents (92, or 75.41%) said that their biggest obstacle in presenting multimedia content was inadequate classroom equipment necessary for implementing modern media in the teaching process. A rather significant percentage of the respondents (13.11%) emphasised as an important obstacle inadequate training for presenting the content through multimedia. 6.56% mentioned poor classroom equipment as the main reason for not presenting multimedia content in the lessons of Science and Social Studies, while 4.92% gave as reason lack of classroom space. According to this data, the main obstacles for presenting the programmes provided through the multimedia content are inadequate classrooms and the lack of modern media, which was highlighted as the segment that must be cor-

rected in order to enable the teacher and students to teach and study in line with the modern trends.

It can be concluded that teachers do not use multimedia efficiently during the teaching process, which confirmed our hypothesis. One of the objectives of the study was to examine the possible association between the use of modern media and the city or region in which the institution is located. It turns out that there is no statistically significant difference in the application of modern media and the city where the institution is located (in which the respondents are employed).

The objective of our research was to examine, among other things, if there is a statistical difference in the qualification of teachers for the implementation of multimedia regarding the school where classes are realized.

Table 4. Statistical differences in the qualification of teachers

Answers	*School*							χ^2
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*	
Not at all	0	2	0	0	0	4	0	27.97
Partially	26	6	12	12	10	14	10	
Absolutely	2	4	4	6	2	2	6	
Σ	28	12	16	18	12	20	16	

The data presented in Table 4 proves that there is a statistically significant difference ($\chi^2 = 27.97$) in the training of teachers for the implementation of multimedia regarding the school where classes are realized. This information appears to be essential due to the fact that the research was carried out in schools located in different regions, which inevitably leads to the conclusion that teachers are trained to apply various multimedia in relation to the school and the region where the school is located.

4 Conclusions

The purpose of the research about the role of multimedia in the process of realizing the teaching of Science and Social Studies was to look at various aspects of the given problem with the objective of identifying concisely the items that monitor their implementation, while the topic of the research was stimulated by the growing influence of information technology both in the everyday living environment and the school system. Our intention was to make a modest contribution to the idea of implementing multimedia in the teaching of Science and Social Studies and define the issues that are in the way.

The obtained results lead to the following conclusions:

- The survey started from the hypothesis of insufficient use of multimedia during the implementation of the teaching of Science and Social Studies, which turned out to be accurate. The conclusion was based on the data collected, which reveal

that 11.47% of the surveyed teachers have never used modern media during the implementation of Science and Social Studies. The survey was conducted in schools located in urban areas, and we are left with only hope that the situation is better in rural areas, which would be an interesting topic for some future research.

- In terms of evaluating the stability of statistically significant differences in the application of multimedia, considering the location of the educational institution and the teachers who use them, it turned out that the differences do not exist ($\chi^2 = 18.056$). This fact seemed interesting, because we wanted to look at the possible existence of differences in the modernization of the teaching process, since the survey was conducted in schools located in the northern, central and southern part of Montenegro. It was found that, in terms of multimedia applications in the abovementioned regions, the teaching is carried out in the same way.
- In identifying the obstacles to presenting the content provided by the curriculum (Science and Social Studies) by means of multimedia, inadequate equipment was the dominant. As many as 75.41% of the teachers chose this option, while other obstacles included inadequate training of teachers for the application of multimedia, poorly equipped classrooms with inadequate inventory and lack of space in the classrooms.
- Relative to the existence of a statistical difference in the qualification of teachers for the implementation of multimedia regarding the school where classes are realized, its existence proved to be palpable. This leads us to the conclusion that the teaching of Science and Social Studies is not performed in a similar manner, bearing in mind the level of qualification of teachers for the application of multimedia in the teaching process.

We also believe that one should not overlook the fact that the obtained results represent only current thinking about the role of the teacher in the implementation of multimedia in the teaching of Science and Social Studies. This research, with a series of interesting conclusions, indicates the direction of some possible, future research endeavors for researchers to deal with, whose realization could contribute to the improvement of the teaching process.

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Uloga multimedija u nastavi prirode i društva

Uspješna primjena i neposredna implementacija informatičko-tehnoloških dostignuća u svakodnevnu ljudsku zbilju, omogućila je i uslovila, između ostalog, i efikasniju organizaciju nastave podržavane novim medijskim i multimedijskim sistemima. Riječ je o gotovo neiscrpnim izvorima znanja koji simultano kod njihovih korisnika (učenika) animiraju više saznajnih čula. Međutim, tradicionalno rezervisan stav prema inovacijama, naročito iskusnijih nastavnika, dodatno osnažen sviješću o vlastitoj upitnoj informatičkoj pismenosti, samo su neki od ozbiljnijih razloga zbog kojih je primjena savremene tehnologije u našim školama gotovo marginalizovana. Štaviše, rekli bismo da je upotreba interaktivnih multimedija u osnovnoj školi još uvijek rijetkost, a

ne obaveza (Saputri, Rukayah i Indriayu, 2018). Izvjesno je da formalna participacija medija i multimedija u nastavi po automatizmu ne jemči njen visok kvalitet i zapaženije vaspitno-obrazovno postignuće. Koliko će ona zaista biti u funkciji efikasnog poučavanja i učenja ponajviše zavisi od stručne, didaktičko-metodičke i obrazovno-tehnološke kompetentnosti učitelja. To zapravo znači da je racionalnom primjenom multimedija u nastavi prirode i društva moguće kreirati optimalno pedagoško okruženje koje će dodatno motivisati svakog učenika na aktivnost i saznajnu znatiželju. U vezi s tim, realizujući ovo istraživanje pokušali smo da sagledamo uticaj multimedija na efikasnost nastave prirode i društva (čineći je očiglednijom), s jedne, i istovremeno skrenuti pažnju nastavnicima i njihovim pretpostavljenim, kako bi shvatili neophodnost njihovog dodatnog osposobljavanja za funkcionalniju medijsku primjenu u procesu poučavanja i učenja, s druge strane.

Naime, neslućeni razvoj informaciono-komunikacioih tehnologija uslovio je potiskivanje iz škola predavačke nastave tradicionalnog tipa, uz primjenu frontalnog oblika rada i dominantno uspostavljanje jednosmjerne komunikacije na relaciji nastavnik – učenik. Za razliku od te, u osnovi, retrogradne nastave, fleksibilno organizovana nastava uz primjenu savremenih tehnoloških rješenja omogućuje funkcionalno i sinhronizovano povezivanje niza kompatibilnih medija i njihovih komponenata koje sačinjavaju jedinstven multimedijski sistem, prikladan za korištenje različitih izvora znanja; uspostavljanje konvergentnih komunikacija, istovremeno angažujući više saznajnih učeničkih receptora. Na taj način, kreira se znatno povoljniji vaspitno-obrazovni ambijent, nudeći svakom pojedincu širi izbor didaktičkog materijala i drugih saznajnih izvora, čime se osnažuje njihova motivacija, istraživačka aktivnost i doprinosi većoj trajnosti i samostalnosti prilikom sticanja dragocjenih znanja i vještina. (Li i Kang, 2014). Multimedijske mreže i sistemi nude učenicima i drugim korisnicima gotovo neograničene mogućnosti pretraživanja, razmjene i korištenja stručnih informacija, nezavisno od vremenskih i prostornih uslova. Ovakav način učenja u školi najčešće podstiče, kontroliše i usmjerava nastavnik. Ta kontrola je poželjna, zavisno od uzrasta, sazrijevanja i informatičke pismenosti učenika, i onda kada pojedinac radi i koristi multimedije bez posrednika – nastavnika ili roditelja. Osim toga, organizacija nastave uz podršku multimedija nudi svakom učeniku da napreduje shodno vlastitim sposobnostima, motivima i aspiracijama. Pored toga, tehnologija ovog tipa omogućuje učenicima i nastavnicima da znatno objektivnije prate i vrednuju vlastita, pojedinačna i zajednička, školska postignuća. Budući da nastavni program prirode i društva obuhvata bogat spektar sadržaja i tematskih cjelina, nastavnik je u prilici da posredstvom multimedija učenicima prezentuje sadržaje, predmete, objekte, procese i fenomene bez obzira na prostorna, vremenska, bezbjedonosna i svaka druga ograničenja. Međutim, obilje ponuđenih informacija ne smije uticati na pravilnu selekciju i izbor onih najkvalitetnijih i saznajno najcjelishodnijih sadržaja. Nesporno je da multimediji nude brzo i lako korištenje različitih informacija, tim je posebno naglašena briga i odgovornost nastavnika da selektivno i racionalno biraju one didaktički najsvrsishodnije. Od njih se očekuje da ukazuju na moguća neugodna iznenađenja, probleme i izazove koje neiskusne korisnike vrebaju na elektronskim mrežama. Stoga učenici moraju biti blagovremeno upozoreni, da ih lakomisleno preuzimanje nepouzdanih informacija može odvesti u stranputice sa nesagledivim posljedicama.

Izvjesno je da fenomenološka interdisciplinarnost programa prirode i društva učiteljima nameću obavezu kreiranja primjerenog multimedijalnog miljea, kako bi učenici što efikasnije ovladali predviđenim sadržajima. U takvom medijskom okruženju svaki pojedinac je u poziciji da sam posmatra, analizira i pronalazi uzročno posledične veze među proučavanim predmetima, pojavama i procesima. Tako se animiraju i obogaćuju saznajni kapacitet, podstiče svekoliki razvoj učeničkog individualnog potencijala, a istovremeno podiže kvalitet nastave prirode i društva. Sve to dodatno ohrabruje i osamostaljuje učenika i osposobljava ga da nastavničko poučavanje postepeno supstituiše učenjem bez posrednika, odnosno uvodi ga u tajne samoučenja.

Istraživanjem organizacije, suštine i funkcije multimedija u nastavi prirode i društva, pokušali smo da damo skroman doprinos i ukažemo na njihove gotovo neiscrpne mogućnosti i očigledne prednosti nad verbalno-predavačkom nastavom tradicionalnog tipa. Ovom prilikom identifikovali smo niz problema i barijera koje usporavaju ili onemogućavaju efikasniju implementaciju ove tehnologije u nastavni proces. Dobijeni rezultati nedvosmisleno upozoravaju da se medijska i multimedijska tehnologija nedovoljno koriste u bilo kojoj nastavi, pa i onoj iz prirode i društva. Zabrinjavajuća je činjenica da se izvjestan procenat ispitanika otvoreno izjašnjava da medije ovog tipa nikada ne koriste u nastavi. Ovom prilikom ispitivali smo, između ostalog, da li postoje statistički značajne razlike u učestalosti primjene multimedija s obzirom na regionalnu pripadnost škola u kojima se nastava prirode i društva realizuje. Tom prilikom je dobijen $\chi^2 = 18,056$, što upućuje na zaključak da ne postoji statistički značajne razlike u pogledu primjene multimedija u nastavi prirode i društva, s obzirom na regionalnu disperziju škola. To zapravo ukazuje na saznanje da je multimedijska nastava egalitarno zanemarena u svim regionima iz kojih je odabran naš istraživački uzorak. Pokušavajući da otkrijemo koji su najozbiljniji uzroci i prepreke efikasnijoj participaciji i neposrednijoj primjeni multimedija u nastavi, više od dvije trećine (75,41%) ispitanika istakli su neadekvatnu materijalno-tehnološku opremljenost škola. Pored toga, apostrofirana je: neadekvatna informatička osposobljenost nastavnka (mada je po tom pitanju zapažena pozitivna distinkcija između starijih i mlađih kolega, u korist ovih drugih). Zatim se kao ozbiljne barijere navode neprikladne učionice i njihovi interijer, te nezadovoljavajuća motivisanost nastavnika.

Prema tome, dobijeni rezultati su indikativni, zabrinjavajući, ali istovremeno i upozoravajući. Oni mogu biti inspirativni za buduće istraživače, koji pretenduju da se studioznije bave ovom sve aktuelnijom problematikom. Zabrinjavajuće i upozoravajuće bi oni trebalo da budu za kreatore obrazovne politike, zakonodavce, finansijere, organizatore škole i neposredne realizatore nastave.

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