Croatian Journal of Education
Vol.22; No.3/2020, pages: 965-981
Original research paper
Paper submitted: 19th February 2019
Paper accepted: 21th February 2020
https://doi.org/10.15516/cje.v22i3.3804

The Opinion of Elementary School Teachers about the Use of ICT in Biology Classes in Four European Countries

Borsos Eva[1], Banos-González Isabel[2], Boric Edita[3] and Patocskai Maria[4]
[1]*University of Novi Sad, Hungarian Language Teacher Training Faculty*
[2]*University of Murcia, Faculty of Education*
[3]*University of Osijek, Teacher Training*
[4]*Eötvös József College*

Abstract

In the 21st century pupils learn how to use technological devices from their early childhood. Therefore, the use of Information and Communications Technology (ICT) in teaching and learning processes seems obvious. For the purpose of this research, 305 class teachers from four European countries (Serbia, Spain, Croatia and Hungary) were asked about their experiences and opinions on the use of ICT in biology classes. The aim was to determine whether they consider that this way of teaching is effective and may motivate pupils for further learning. The results showed that the teachers from all four countries agree that pupils enjoy and are more motivated when learning with the use of the ICT, and it improves the quality of their lessons.

Keywords: *biology education; information and communications technology; primary school; teachers*

Introduction

The 21st century is being dominated by technical development. Therefore, everyday life cannot be imagined without computers, laptops, mobile phones, tablets, the Internet, etc. According to the data from the International Telecommunication Union, 40 % of the world's population has internet access at home nowadays (International Telecommunication Union, 2015). Between 1999 and 2013, the number of Internet users has increased tenfold. In 2018 the statistics said that more than 4 billion people

used the Internet. They spend approximately 6 hours on the net every day (Global Web Index, 2018). The majority of people use it to do the shopping, pay bills, stay in contact with their friends, for social networking, to read newspapers, etc.

Nowadays pupils are being born into contemporary digitalized world. Already in their early childhood they learn how to use mobile phones, computers and other interactive devices (Prensky, 2001). On the one hand, this has many advantages since a great amount of useful information is available to them and therefore they can learn a lot, widen their scope of interest, easily keep in touch with their friends living far away, etc. (Subrahmanyam, 2000). It can also help to assist communication, develop collaboration and creativity, as well as help language development in young children (Nikolopoulou, 2013). The Internet gives them many possibilities of bringing the world closer, both in time and space.

On the other hand, this might be very harmful, as some age-inappropriate contents may be available to them (Subrahmanyam, 2000). Without sufficient control children tend to spend too much time in front of these devices, thereby damaging their eyesight, as well as their psychological and physical development (Syed, 2014; Kardefelt-Winther, 2017; Canadian Paediatric Society, 2017). Using the Internet shortens their time spent in nature, in the "real world". Students have no real-life experience with animals and plants living around them, and consequently they are not able to discover the beauty of nature. They spend most of their life in an artificial, virtual environment instead of with their families and friends (Third, 2017). Spending so much time online and using digital devices may cause addiction as well (Subrahmanyam, 2000; Syed, 2014). According to Kevin (2010), American children spend an average of seven hours and thirty-eight minutes a day indoors in front of the television or playing computer games. This is approximately fifty-three hours a week. In the United Kingdom children spend around six and a half hours in front of the screens of digital devices (Childwise, 2017). In the long run their physical and psychological development might also suffer (Kardefelt-Winther, 2017; Canadian Paediatric Society, 2017). They will not reach the basic psychophysical maturity, and the characteristics of their generation are: they are not fit enough, they cannot concentrate on a certain task for longer time, they are less efficient in lessons (Syed, 2014).

The term 'ICT', an acronym for Information and Communications Technology, was created to describe this phenomenon: modern and rapid technical development. ICT also refers to information and communication devices, which include the Internet, computers, laptops, interactive boards, teaching programmes, etc.

All these factors have brought considerable changes into teaching methods too. Laptops, projectors, interactive boards and other tools were introduced to schools in the early 1990s (Wellington, 2005). Their use has become common at every teaching stage from nursery school to university (Syed, 2013). Online lexicons, e-books, websites and other on-line possibilities are available to pupils, students and teachers too. Using these devices during teaching and learning processes acquire a special name: ICT assisted instruction (Daniels, 2002). The main aim of this approach was to make the

syllabus more attractive for pupils, to make them curious about new knowledge, to motivate them to learn more and, last but not least, to activate them during teaching and learning processes (Flecknoe, 2002).

Some studies say that using devices has had negative effects on self-efficacy, such as isolation, disconnection, lower achievements and less critical thinking (Bauerlein, 2008; Bowden, 2011; Greenfield, 2009; Junco, 2012; Langford, 2016). Several studies have documented the potential of ICT to create innovative, engaging and substantive learning opportunities for young children (McKenney, 2010; Nikolopoulou, 2013).

With the advent of ICT, it is important to consider what Prestridge (2012) called teachers' "pedagogical beliefs" about the role of ICT as a teaching tool, in other words, the significance of ICT for students' learning outcomes. For this author, these beliefs mean the 'second-order' barrier to the integration of ICT in teaching and learning, when there is a lack of personal confidence and digital competence required for the effective implementation of ICT. The first-order barriers, extrinsic to the teacher, would include lack of resources, access and technical support; but, nowadays, these are considered overcome.

In case they wanted to increase the efficiency and possibilities of the use of ICT in their classrooms, teachers should increase their personal confidence and competences, by keeping up with modern methods and devices. Some teachers, mainly the older generation, intend to use ICT devices during their classes (Ertmer, 2005). In many countries the national curricula and the teaching programmes prescribe the use of the ICT devices in teaching and learning. Moreover, the majority of these national curricula encourage pupils to reach elementary digital competence before the end of their compulsory education.

Some studies report that teachers with less experience have problems using these devices and they tend to avoid using them in various ways (Tondeur, 2017; Gudmundsdottir, 2018). They think it is an effective method, but they say that their university education was not sufficient when it comes to usage and methodology of ICT (Gudmundsdottir, 2018).

Considering that teachers' views are essential for ICT use and integration in childhood settings, it is important to investigate their perceptions regarding the use of ICT and the barriers with the aim of fostering the appropriate usage of these tools in such settings.

In the early 1990's, the use of the ICT method became very popular. Many papers were written about its efficacy, teachers and pupils were asked about their opinions, etc. Then, some new, more modern methods appeared, such as cooperative education, project education etc. Nowadays the use of ICT devices in teaching has become an everyday phenomenon, but still different opinions seem to exist among elementary teachers.

Research aim

The main aim of this paper was to examine the situation related to the use of ICT devices in biology classes in four countries (Serbia, Croatia, Spain and Hungary) and

to compare teachers' opinions about the efficacy of using ICT in the teaching process, as well as to find out whether they use these devices and how often.

Methods

The sample consisted of 305 elementary teachers who work with 6-11 year-old children in elementary schools in Serbia, Spain, Croatia and Hungary.

In Serbia there were 80 participants, 2 male and 78 female. Their working experience was 23.28±9.99 years. The maximum was 36 years and the minimum was 2 years. In Spain there were 70 participants, 12 male and 58 female. Their working experience was 13.1±10.45 years. The maximum was 36 years and the minimum was 1 year. In Croatia there were 75 participants, 1 male and 74 female. Their working experience was 17.57±9.28 years. The maximum was 34 years and the minimum was 1 year. In Hungary there were 80 participants, 11 male and 69 female. Their working experience was 18.41±10.65 years. The maximum was 38 years and the minimum was 2 years.

The teachers were kind and cooperative, and they filled out the questionnaire. The teachers participated voluntarily and anonymously.

The elementary schools were chosen based on their location. The educational institutions were chosen in towns surrounding the faculties.

A questionnaire [see Appendix] was compiled with the aim of analysing teachers' opinions on using ICT devices in biology teaching and it consisted of two sections. The first section involved statements regarding teachers' demographic and individual characteristics, such as sex and years of teaching experience. The second section contained ten questions related to their perceptions about the use of ICT in their classes. There were nine closed-form questions with four possible answers and one open question, in which the respondents could name the subject in which they most commonly use ICT.

The responses were analysed using the SPSS 20.00 program (Statistical Package for the Social Sciences). The analysis of the responses was performed using descriptive statistics and ANOVA to compare the responses from the four countries.

Results

Educational systems and biology teaching are very similar in the four countries analysed, so the opinions of teachers working in these countries could easily be compared. The term biology is used in this paper to facilitate understanding, but it refers to different subjects in different countries (science, natural sciences, etc.) (Serbian National Curriculum, 2013; Croatian National Curriculum, 2006).

Significant differences ($F_{(3,301)} = 12.25$; $p = 0.00$; $\eta^2 = 0.12$) were found in the answers to the first question comparing teachers' opinions in the four countries. They have different opinions about the importance of using ICT devices during teaching. A statistically significant difference in the frequency of using these devices in their classes was also found ($F_{(3,301)} = 13.23$; $p = 0.00$; $\eta^2 = 0.13$) with regards to the country.

Teachers tend to teach using laptops, projectors and interactive boards every week. In Croatia, 33 people use these devices in each subject they teach. The most common subjects beside biology where one or more of these devices are used are maths and mother tongue. In Hungary and in Serbia ICT devices seem to exist in every school that took part in the research, according to their teachers' responses. Conversely, in Croatia and in Spain, in two and in one school, respectively, there were no laptops nor projectors or interactive boards. In Croatia and in Serbia the majority of teachers use laptops for teaching. In Spain and Hungary most teachers use all three devices (laptop, projector and interactive board).

When it comes to perceived effectiveness, statistical significance ($F_{(3,301)} = 2.89$; $p = 0.00$; $\eta^2 = 0.03$) was found when comparing the teachers' opinions of the four countries. They have different opinions about the effectiveness of using ICT devices during teaching. Teachers' opinions did not significantly differ regarding the question in which grade children enjoy lessons with ICT devices most ($F_{(3,301)} = 0.683$; $p = 0.56$; $\eta^2 = 0.00$). Most teachers who attended ICT courses were found in Spain (80 %). Croatia was in the second place with 76%, Serbia in the third place with 72.5 %, and Hungary in the fourth place with 70 %. In Spain, the majority of the teachers attended four ICT courses, in Serbia two courses and in Croatia one course. In Hungary, the majority of the teachers attended no courses at all. In Croatia, 96% of teachers questioned planned to attend an ICT course. Spain was in the second place regarding this question with 92.86 % of positive responses, Hungary was in the third place with 75 % of positive responses, and Serbia in the fourth place with 65% of positive responses.

Discussion and conclusions

The aim of this study was to investigate the perceptions of teachers in Serbia, Spain, Croatia and Hungary about the importance of using ICT devices during biology classes and the extent of its realisation. A further aim was to determine whether the teachers thought that using laptops, projectors, mobile phones, etc. was an efficient way to make the education more effective and to motivate pupils for further learning.

With regard to the impact of teachers' individual characteristics (years of teaching experience, training level) on teachers' perceived barriers, Nikolopoulou (2013) found out that the less the years of teaching experience (a characteristic which is typically related to younger teachers), the more the years of computer experience and the higher the confidence with technology, which results in teachers' perceiving the "lack of support" as a minor barrier (in our case, we can refer to 'sufficient devices'). Interestingly, the "level of training" (technical training) was not significant in the study of Nikolopoulou (2013), where it was not linked to teachers' perceptions of barriers and it had a minor impact on teachers' confidence with technology.

Having compared the data collected in the four countries, it can be claimed that the participants found using ICT devices important, regardless of the country they worked in.

The curricula in Serbia, Spain, Croatia and Hungary give teachers the opportunities to use ICT devices (Serbian National Curriculum, 2013; Spanish National Curriculum, 2013; Croatian National Curriculum, 2014; Hungarian National Curriculum, 2014) and many of them do so, but to a varying degree. These results are better than in Turkey where pre-service teachers use only basic ICT applications (Tezci, 2011). In Spain, most of the teachers (65.7 %) use this method daily; in Serbia (45%), Hungary (47.5 %) and Croatia (52.0 %) the majority of them use it weekly.

The teachers gave different responses to the question in which subject they use ICT most commonly. Most teachers who used it in every subject were from Croatia. Other teachers use it only in some subjects. The most popular were mother tongue, science, maths and music. Only three schools do not have any kind of ICT devices (two in Croatia and one school in Spain), so the teachers are of the opinion they do not work in appropriate conditions. The situation related to technical equipment and ICT courses is better than in Turkey, where teachers complain about these circumstances (Gulbahar, 2008).

The most popular ICT devices are laptops and projectors. Teachers also like to use interactive boards, but many of them complain that their schools do not own this ICT device. Some of the teachers are very creative and use tablets and mobile phones in teaching and learning processes as well. Some of them have the possibility to use classrooms with personal computers too.

It was somewhat surprising that in all four countries the most of the teachers said that using ICT devices during education is only "effective". Among the possible responses, "it is very effective" was offered, but the majority of them did not choose it.

All the teachers who participated in the research agreed on the fact that pupils enjoy lessons taught using ICT devices. It makes them happy to gain knowledge in an active way, that they can be active participants in the learning process. It is more exciting for them than the frontal method when they only sit in the classroom for 45 minutes. With regards to ICT courses, the most of the teachers attended at least one, but there are many of them who took part in more than three.

The data highlights teachers in Croatia and Spain being more open to taking a professional development course than in Serbia and Hungary. The differences are highly significant. The result was disappointing because lifelong education gives teachers opportunities to learn and use most recent methods and approaches. Taking part in an ICT course does not mean that they are competent, but it seems that their willingness to learn new methods, get new ideas and be up-to-date contributes to them being more creative and effective in their work. According to Ghavifekr (2015) and Aslan (2016), these professional developing courses play a key role in enhancing the efficacy of ICT device usage.

The main factors influencing teacher ICT usage are: their attitude, ICT competence, self-efficacy, gender, teaching experience, workload and institutions' characteristics (Baubeng-Andoh, 2012). Other data from Greece, Italy, Spain, Portugal and Netherlands

say that the lack of technical and pedagogical support is the main obstacle in using ICT devices during teaching (Peralta, 2007). Our pilot survey showed that in all four countries teachers use ICT devices for their work. They think it is effective in the teaching process, but they had different opinions on the extent of its effectiveness.

It can be concluded that it is important to use these devices, to incorporate the Internet into learning and teaching processes because it brings the world closer to pupils. They can observe things that are far from them in space and time. The other very important thing is that with the help of ICT devices they can gain knowledge in an active way and it can motivate them to be curious and learn more. It is very important not to make the mistake of teaching using only ICT devices. In the case of certain teaching units, some classical or new modern methods can be more effective. Sometimes the class with a PowerPoint presentation or a short film is not so exciting for them because it has become a daily, customary thing for pupils to make and watch such things. However, the usage of other teaching methods such as outdoor education is also very important (Borsos, 2018a; Borsos, 2018b; Borsos, 2018c).

In the future teachers will have the key role in choosing the proper combination of methods and school equipment in processing teaching units to make biology education more and more effective.

Acknowledgements

The Project is supported by the European Union and co-financed by the European Social Fund (code #: EFOP-3.4.3-16-2016-00003, project title: Developing the quality of strategic educational competences in higher education, adapting to changed economic and environmental conditions and improving the accessibility of training elements).

Appendix:

Place (city or village): _____ female male
Number of working years (experience): _____

1 How important do you think it is to use ICT devices during biology teaching?
1 it is not important 2 it is a little important 3 I am neutral
4 it is important 5 it is very important

2 How often do you use ICT devices in your lessons?
1 never 2 once in half a year 3 monthly 4 weekly 5 daily

3 In which subjects other than biology do you use ICT devices?

_____

4 Does your school have ICT devices?
yes no

5 What kind of ICT devices do you use?
a) laptop b) projector c) interactive board d) other_____

6 How effective do you think is the use of ICT devices?

1 it is not effective 2 it is a little effective 3 I am neutral
4 it is effective 5 it is very effective

7 To what extent do you think children enjoy biology lessons involving ICT devices?

1 they don't enjoy it 2 they enjoy it a little 3 they are neutral
4 they enjoy it 5 they enjoy it very much

8 Did you take any ICT courses?

yes no

9 If yes, how many courses did you take?

1 2 3 more _____

10 Do you want to take ICT courses?

yes no

Thank you for filling out the questionnaire 

References

Aslan, A., & Zhu, C. (2016). Influencing factors and integration of ICT into teaching practices of pre-service and starting teachers. *International Journal of Research in Education and Science.*2(*2*), 359-370. https://doi.org/10.21890/ijres.81048

Bauerlein, M. (2008). *The Dumbest Generation: How The Digital Age Stupefies Young Americans and Jeopardizes Our Future (or Don't Trust Anyone Under 30).* Jeremy P: Tarcher/Penguin.

Baubeng-Andoh, C. (2012). Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development using Information and Communication Technology*, *8*(1), 136-155.

Borsos, É. (2018). The gamification of elementary school biology: A case study on increasing understanding of plants. *Journal of Biological Education*, *52*(3), 1-11. https://doi.org/10.1080/00219266.2017.1420679

Borsos, É., Patocskai, M., & Borić, E. (2018). Teaching in nature? Naturally! *Journal of Biological Education*, *52*(1), 1-11. https://doi.org/10.1080/00219266.2017.1420679

Borsos, É., Borić, E., & Patocskai, M. (2018). Be in: teach outdoors! *Croatian Journal of Education, 20*(3), 843-866. https://doi.org/10.15516/cje.v20i3.2978

Bowden, J. L. H. (2011). *Co-creating Value in Higher Education: The Role of Interactive Classroom Response Technologies. Asian Social Science, 7*, 35-49. https://doi.org/10.5539/ass.v7n11p35

Canadian Paediatric Society, Digital Health Task Force. (2017). Screen time and young children: Promoting health and development in a digital world. *Paediatrics & Child Health*, 461–468. https://doi.org/10.1093/pch/pxx123

Daniels, J. S. (2002). "Foreword" in Information and Communication Technology in education–A curriculum for schools and programme for teacher development. *UNESCO.*

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development, 53*(4), 25-39. https://doi.org/10.1007/BF02504683

Flecknoe, M. (2002). "How can ICT help us to improve education"? .*Innovations in Education & Teaching International, 39*(*4*), 271-280. https://doi.org/10.1080/13558000210161061

Ghavifekr, S., & Wan Rosdy, A. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science, 1*(*2*), 175-191. https://doi.org/10.21890/ijres.23596

GlobalWebIndex (2017). Daily time spent on social networks rises to over 2 hours. www.globalwebindex.com

Greenfield, P. (2009). Technology and informal education: What is taught, what is learned. *Science, 323*, 69-71. https://doi.org/10.1126/science.1167190

Gudmundsdottir, G. B., & Hatlevik, O. E. (2018). Newly qualified teachers' professional digital competence: Implications for teacher education. *European Journal of Teacher Education, 41*(*2*), 214-231. https://doi.org/10.1080/02619768.2017.1416085

Gulbahar, Y., & Guven, I. (2008). A survey on ICT usage and the perceptions of social studies teachers in Turkey. *Journal of Educational Technology and Society.* 11(3), 37-51.

International Telecommunication Union (2015). ICT facts and figures. https://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2015.pdf

Junco, R. (2012). Too much face and not enough book: The relationship between multiple indices of Facebook use and academic performance. *Computers in Human Behaviour*, *28*, 187-198. https://doi.org/10.1016/j.chb.2011.08.026

Kardefelt-Winther, D. (2017). How does the time children spend using digital technology impact their mental well-being, social relationships and physical activity? An evidence-focused literature review. *Innocenti Discussion Paper* 2017-02. www.unicef-irc.org

Kevin, J. C. (2010). Back to school: Back outside! *National Wildlife Federation.* https://www.nwf.org/~/media/PDFs/Be%20Out%20There/Back%20to%20School%20full%20report.ashx

Langford, S., Narayan, A., & von Glahn, N. (2016). Revisiting the technology and students learning debates: Critical issues and multiple perspectives. *Technology and Student Learning*, *9*(*2*), 1-15.

National Curriculum Spain (2013). Ley orgánica para la mejora de la calidad educativa 8/2013, de 9 de diciembre. Madrid: Ministerio de Educación, Cultura y Deporte (MECD). https://www.boe.es/buscar/act.php?id = BOE-A-2013-12886

National Curriculum Hungary (2014). Nemzeti Alaptanterv a Nemzeti alaptanterv kiadásáról, bevezetéséről és alkalmazásáról szóló 110/2012. (VI.4.) Kormány Rendelet módosításáról, *Magyar Közlöny*, Hungary.

Nikolopoulou, K., & Gialamas, V. (2013). Barriers to the integration of computers in early childhood settings: Teachers' perceptions. *Education and Information Technologies*. https://doi.org/10.1007/s10639-013-9281-9

McKenney, S., & Voogt, J. (2010). Technology and young children: How 4-7 years olds perceive their own use of computers. *Computersin human behaviour*, *26*(4), 656-664. https://doi.org/10.1016/j.chb.2010.01.002

Peralta, H., & Costa, F.A. (2007). Teachers' competence and confidence regarding the use of ICT. *Educational Sciences Journal*, *3*, 75-84.

Pravilnik o nastavnom planu za prvi, drugi, treći i četvrti razred osnovnog obrazovanja i vaspitanja i nastavnom program za treći razred osnovnog obrazovanja i vaspitanja ("Sl. glasnik RS – Prosvetniglasnik", br. 1/2005, 15/2006, 2/2008, 2/2010, 7/2010,3/2011 - dr. pravilnik, 7/2011 - dr. pravilnik 1/2013), Serbia. [National Curriculum Serbia]

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon, 9*(5), 1 – 6. https://doi.org/10.1108/10748120110424816

Prestridge, S. (2012). The beliefs behind the teacher that influences their ICT practices. *Computers & Education*, *58*(1), 449-458. https://doi.org/10.1016/j.compedu.2011.08.028

Subrahmanyam, K., Kraut, E. R., Greenfield, P. M., & Gross, E. F. (2000). The impact of home computer use on children's activities and development. *The Future of Children and computer technology, 2,* 123-144. https://doi.org/10.2307/1602692

Syed, N. A. (2013). An effective use of ICT for education and learning by drawing on worldwide knowledge, research and experience: ICT as a change agent for education (A Literature review). *Scholarly Journal of Education*, *2*(4), 38-45.

Syed, N. A., Nik, M., Maisarah, A., Che, A., Sallehuddin, M., & Nor, A. O. (2014). Negative and positive impact of internet addiction on young adults: Empericial study in Malaysia. *Intangible Capital*, *10*(3), 619-638. https://doi.org/10.3926/ic.452

Tezci, E. (2011). Factors that influence pre-service teachers' ICT usage in education. *European Journal of Teacher Education*, *34*(4), 483-499. https://doi.org/10.1080/02619768.2011.587116

Third, A., Bellerose, D. D. E., Oliviera, J. D., Lala, G., & Theakstone, G. (2017). Young and online: Children's perspectives on life in the digital age (The state of the world's children 2017 companion report). Western Sydney University. DOI: 10.4225/35/5a1b885f6d4db

Tondeur, J., Roblin, N. P., Braak, J., Voogt, J., & Prestridge, S. (2017). Preparing beginning teachers for technology integration in education: ready for take-off? *Technology, Pedagogy & Education*. *26*(2), 157-177. https://doi.org/10.1080/1475939X.2016.1193556

Zakon o odgoju i obrazovanju u osnovnoj i srednjoj školi, Article 11 paragraph 1, Article 12 paragraph 1, Article 26 paragraph 1, Article 30 [National Curriculum Croatia]

Wellington, J. (2005). Has ICT come of age? Recurring debates on the role of ICT in education, 1982–2004. *Research in Science & Technological Education, 23*(1), 25-39. https://doi.org/10.1080/02635140500068419

Childwise: Playground buzz – tracking report (2017). http://www.childwise.co.uk/reports.html

Borsos Eva
Hungarian Language Teacher Training Faculty
University of Novi Sad
Strosmajerova 11, 2400 Subotica, Serbia
bborsoseva@gmail.com

Banos-González Isabel
Faculty of Education
University of Murcia
30100, Espinardo, Murcia, Spain
ibbg1@um.es

Boric Edita
Teacher Training
University of Osijek
Trg Svetog Trojstva 3, 31000, Osijek, Croatia
editaboric@yahoo.com

Patocskai Maria
Eötvös József College
Szegedi út 2, 6500 Baja Hungary
patocskai.maria@ejf.hu

Mišljenja učitelja razredne nastave o uporabi IKT-a u nastavi Biologije

Sažetak

U 21. stoljeću učenici od ranoga djetinjstva uče kako se koristiti tehnološkim uređajima, stoga se primjena informacijske i komunikacijske tehnologije (IKT) u procesima poučavanja i učenja čini očitom. Za potrebe ovoga istraživanja 305 učitelja iz četiri europske zemlje (Srbije, Španjolske, Hrvatske i Mađarske) ispitano je o vlastitim iskustvima i mišljenjima o uporabi IKT-a u nastavi Biologije. Cilj je bio utvrditi smatraju li učitelji poučavanje pomoću IKT-a učinkovitim i može li se pomoću nje motivirati učenike za učenje. Rezultati su pokazali da se učitelji slažu kako učenici uživaju i više su motivirani za učenje pomoću IKT-a, što poboljšava kvalitetu nastave.

Ključne riječi: *biološko obrazovanje; informacijska i komunikacijska tehnologija; osnovna škola; učitelji*

Uvod

U 21. stoljeću dominira razvoj tehnologije. Svakodnevni život ne može se zamisliti bez računala, prijenosnih računala, mobilnih telefona, tableta, interneta itd. Prema podactima Međunarodne unije za telekomunikacije danas 40 % svjetskoga stanovništva ima pristup internetu (Međunarodna unija za telekomunikacije, 2015). Između 1999. i 2013. broj korisnika interneta povećao se desetostruko. U 2018. godini više od 4 milijarde ljudi koristilo je internet i dnevno provelo oko 6 sati *online* (Global Web Indeks, 2018). Većina ljudi koristi internet za kupovinu, plaćanje računa, održavanje kontakta s prijateljima, za društvene mreže, čitanje novina i sl.

Danas se učenici rađaju u suvremenom digitaliziranom svijetu. Već u ranom djetinjstvu uče kako koristiti mobilne telefone, računala i druge interaktivne uređaje (Prensky, 2001). To s jedne strane ima mnogo prednosti jer im je na raspolaganju velika količina korisnih informacija i stoga mogu puno naučiti, proširiti područje interesa, lako ostati u kontaktu sa svojim prijateljima koji žive daleko itd. (Subrahmanyam, 2000). Također, internet može pomoći u komunikaciji, razvoju suradnje i kreativnosti, kao i razvoju jezika u male djece (Nikolopoulou, 2013). Internet nam pruža mnogo mogućnosti za približavanje svijeta u vremenu i prostoru.

S druge strane, internet za djecu može biti štetan jer im mogu biti dostupni neki sadržaji koji nisu primjereni njihovoj dobi (Subrahmanyam, 2000). Bez dovoljne kontrole djeca su sklona previše vremena provoditi ispred ovih uređaja i tako oštetiti svoj vid, ali i psihički i fizički razvoj (Syed, 2014; Kardefelt-Winther, 2017; Canadian Pediatric Society, 2017). Korištenje interneta skraćuje vrijeme provedeno u prirodi, u „stvarnom svijetu". Djeca koja puno vremena provode na internetu nemaju iskustva iz stvarnoga života sa životinjama i biljkama koje žive oko njih te nisu u stanju otkriti ljepote prirode. Većinu svojega života provode u umjetnom, virtualnom okruženju, umjesto sa svojim obiteljima i prijateljima (Treća, 2017). Provoditi toliko vremena na internetu i koristiti digitalne uređaje može uzrokovati ovisnost (Subrahmanyam, 2000; Syed, 2014). Prema Kevinu (2010), američka djeca prosječno provodu sedam sati i trideset i osam minuta dnevno u zatvorenom prostoru ispred televizije ili igrajući računalne igre. To je otprilike pedeset i tri sata tjedno. U Ujedinjenom Kraljevstvu djeca provode oko šest i pol sati ispred ekrana digitalnih uređaja (www.childwise.co.uk). Dugoročno to bi moglo biti štetno za njihov fizički i psihički razvoj (Kardefelt-Winther, 2017; Kanadsko pedijatrijsko društvo, 2017). Djeca tako neće dostići osnovnu psihofizičku zrelost, a obilježje njihove generacije bit će nedostatak sposobnosti, koncentracije na određeni zadatak duži period i lošiji uspjeh u školi (Syed, 2014).

Izraz „IKT" je akronim za informacijsku i komunikacijsku tehnologiju, stvoren da opiše ovaj fenomen modernoga i brzoga tehničkog razvoja. IKT se također odnosi na informacijske i komunikacijske uređaje, koji uključuju internet, računala, prijenosna računala, interaktivne ploče, nastavne programe i sl.

Zbog tehnoloških promjena dolazi i do znatnih promjena u nastavnim metodama. Prijenosna računala, projektori, interaktivne ploče i drugi alati predstavljeni su školama ranih 1990-ih (Wellington, 2005). Njihova upotreba postala je uobičajena u svim odgojno-obazovnim fazama od vrtića do sveučilišta (Syed, 2013). Učenicima, studentima i nastavnicima dostupni su i *online* leksikoni, e-knjige, mrežne stranice i druge *online* mogućnosti. Korištenje ovih uređaja tijekom procesa poučavanja i učenja ima posebno ime - IKT potpora poučavanju (Daniels, 2002). Glavni je cilj ovoga pristupa učiniti nastavni plan atraktivnijim za učenike, pobuditi im znatiželju o novim saznanjima, motivirati ih za učenje i, posljednje, ali ne najmanje bitno aktivirati ih tijekom nastavnoga procesa i učenja (Flecknoe, 2002). Nekoliko istraživanja dokumentiralo je potencijal IKT-a za stvaranje inovativnih, zanimljivih i sadržajnih prilika za djecu (McKenney i Voogt, 2010; Nikolopoulou, 2013).

Neke studije utvrdile su da je upotreba tehnoloških uređaja negativno utjecala na samoefikasnost, potaknula izolaciju, nepovezanost, slabija obrazovna postignuća i dovela do manjka kritičkoga razmišljanja (Bauerlein, 2008; Bowden, 2011; Greenfield, 2009; Junco, 2012; Langford, 2016).

S pojavom IKT-a važno je razmotriti ono što je Prestridge (2012) nazvao učiteljskim „pedagoškim uvjerenjima" o ulozi IKT-a kao nastavnoga alata, drugim riječima o značaju IKT-a za ishode učenja učenika. Za navedenoga autora, ova uvjerenja znače prepreku „drugog reda" integraciji IKT-a u učenje, koja nastupa kada nedostaje osobnoga

samopouzdanja i digitalne kompetencije koja je potrebna za učinkovitu primjenu IKT-a. Prepreke „prvog reda", izvan kontrole učitelja, uključivale bi nedostatak resursa, pristupa i tehničke podrške, ali danas se to smatra prevladanim.

U slučaju da žele povećati učinkovitost i mogućnosti upotrebe IKT-a u svojim učionicama, učitelji bi trebali povećati svoje samopouzdanje i kompetencije, u skladu s modernim metodama i uređajima. Neki učitelji, uglavnom starije generacije, namjeravaju koristiti IKT uređaje tijekom nastave (Ertmer, 2005). U mnogim zemljama nacionalni kurikuli i nastavni programi propisuju upotrebu IKT uređaja u poučavanju i učenju. Štoviše, većina ovih nacionalnih kurikula potiče učenike da steknu elementarnu digitalnu kompetenciju prije završetka obveznoga obrazovanja.

Neka istraživanja navode da učitelji s manje iskustva imaju probleme s tim uređajima i skloni su izbjegavanju njihove upotrebe na različite načine (Tondeu,r 2017; Gudmundsdottir, 2018). Smatraju da je primjena IKT učinkovita u nastavi, ali izjavljuju da im njihovo sveučilišno obrazovanje nije pružilo dovoljno kada je u pitanju uporaba i metodologija IKT-a (Gudmundsdottir, 2018).

S obzirom na to da su stavovi učitelja od presudne važnosti za korištenje i integraciju IKT-a u nastavi, važno je istražiti njihovu percepciju o korištenju IKT-a i mogućim preprekama s ciljem poticanja odgovarajuće uporabe IKT alata u nastavi.

Početkom 1990-ih upotreba IKT metode postala je vrlo popularna. O njezinoj učinkovitosti napisano je mnogo radova, a učitelji i učenici pitani su o tome što misle o IKT-u. Tada su se pojavile neke nove, modernije metode, poput kooperativnoga obrazovanja, projektnoga obrazovanja i sl. Danas je upotreba IKT uređaja u nastavi postala svakodnevna pojava, ali čini se da i dalje postoje različita mišljenja o ovoj temi među učiteljima osnovnoškolskoga obrazovanja.

Cilj istraživanja

Glavni cilj ovoga rada bio je ispitati situaciju povezanu s upotrebom IKT uređaja u nastavi Biologije u četiri zemlje (Srbija, Hrvatska, Španjolska i Mađarska) i usporediti mišljenja učitelja o učinkovitosti korištenja IKT-a u nastavnom procesu, kao i otkriti koriste li te uređaje i koliko često.

Metode

Uzorak se sastojao od 305 učitelja koji rade s djecom od 6 do 11 godina u osnovnim školama u Srbiji, Španjolskoj, Hrvatskoj i Mađarskoj.

U Srbiji je sudjelovalo 80 sudionika, 2 muškarca i 78 žena. Njihovo radno iskustvo iznosilo je 23,28 ± 9,99 godina. Maksimalni radni staž iznosio je 36 godina, a minimalni 2 godine. U Španjolskoj je sudjelovalo 70 sudionika, 12 muškaraca i 58 žena. Njihovo radno iskustvo iznosilo je 13,1 ± 10,45 godina. Maksimalni radni staž iznosio je 36 godina, a minimalni 1 godinu. U Hrvatskoj je sudjelovalo 75 sudionika, 1 muškarac i 74 žene. Njihovo radno iskustvo iznosilo je 17,57 ± 9,28 godina. Maksimalni radni staž iznosio je 34 godina, a minimalni 1 godinu. U Mađarskoj je sudjelovalo 80 sudionika,

11 muškaraca i 69 žena. Njihovo radno iskustvo iznosilo je 18,41 ± 10,65 godina. Maksimalni radni staž iznosio je 38 godina, a minimalni 2 godine.

Učitelji su suradnički ispunili upitnik. Učitelji su sudjelovali dobrovoljno i anonimno.

Osnovne škole odabrane su na osnovi njihove lokacije. Obrazovne ustanove izabrane su u gradovima u blizini fakulteta.

S ciljem analize mišljenja učitelja o korištenju IKT uređaja u nastavi Biologije sastavljen je upitnik [Prilog] koji se sastojao od dva odjeljka. Prvi odjeljak sadržavao je izjave o demografskim i individualnim osobinama učitelja, poput spola i godina učiteljskoga iskustva. Drugi dio sadržavao je deset pitanja vezanih za njihovu percepciju o upotrebi IKT-a u nastavi. Bilo je devet pitanja zatvorenoga tipa s četiri moguća odgovora i jedno otvoreno pitanje u kojem su ispitanici mogli imenovati nastavnu temu u kojoj najčešće koriste IKT.

Odgovori su analizirani pomoću programa SPSS 20.00 (Statistički paket za društvene znanosti). Analiza odgovora izvedena je korištenjem deskriptivne statistike i analize varijance (ANOVA) radi usporedbe odgovora iz četiri države.

Rezultati

Obrazovni sustavi i nastava Biologije vrlo su slični u četiri analizirane zemlje pa se mišljenja učitelja koji rade u tim zemljama lako mogu usporediti. Izraz „Biologija" koristi se u ovom radu radi lakšega razumijevanja, ali odnosi se na različite predmete u različitim zemljama (Priroda i društvo, Prirodne znanosti itd.) (Srpski nacionalni kurikulum, 2013; Hrvatski nacionalni kurikulum, 2006).

Pronađene su značajne razlike ($F_{(3,301)} = 12,25$; $p = 0,00$; $\eta 2 = 0,12$) u odgovorima na prvo pitanje kojim se uspoređuju mišljenja učitelja u četiri zemlje. Učitelji imaju različita mišljenja o važnosti upotrebe IKT uređaja u nastavi Biologije. Što se tiče učestalosti korištenja IKT uređaja u razredima, pronađena je statistički značajna razlika ($F_{(3,301)} = 13,23$; $p = 0,00$; $\eta 2 = 0,13$) s obzirom na državu. Učitelji imaju tendenciju da poučavaju koristeći prijenosna računala, projektor i interaktivne ploče na tjednoj razini. U Hrvatskoj 33 sudionika koristi ove uređaje u svakom predmetu koji predaju. Najčešći predmeti osim Biologije u kojima se koristi jedan ili više IKT uređaja su Matematika i Materinski jezik. U Mađarskoj i Srbiji postoje IKT uređaji u svakoj školi koja je sudjelovala u istraživanju. S druge strane, u Hrvatskoj i Španjolskoj u dvije, odnosno u jednoj školi nije bilo prijenosnih računala, projektora ni interaktivnih ploča. U Hrvatskoj i Srbiji većina učitelja koristi prijenosna računala za poučavanje. U Španjolskoj i Mađarskoj većina učitelja koristi sva tri navedena uređaja (prijenosno računalo, projektor i interaktivna ploča).

Kada je u pitanju percipirana učinkovitost, postoji statistički značajna razlika ($F_{(3,301)} = 2,89$; $p = 0,00$; $\eta 2 = 0,03$) kada se uspoređuju mišljenja učitelja u četiri zemlje. Učitelji se razlikuju s obzirom na mišljenje o učinkovitosti IKT uređaja u poučavanju. Nema razlike u mišljenju učitelja o tome u kojem razredu djeca najviše uživaju u lekcijama s IKT uređajima ($F_{(3,301)} = 0,683$; $p = 0,56$; $\eta 2 = 0,00$). Većina učitelja koji su pohađali informatičke tečajeve dolazi iz Španjolske (80 %). Hrvatska je bila na

drugom mjestu sa 76 %, Srbija na trećem mjestu sa 72, 5%, a Mađarska na četvrtom mjestu sa 70 % učitelja. U Španjolskoj je većina učitelja pohađala četiri tečaja iz IKT-a, u Srbiji dva tečaja, a u Hrvatskoj jedan tečaj. U Mađarskoj većina učitelja uopće nije pohađala tečajeve. U Hrvatskoj je 96 % ispitanih učitelja planiralo pohađati tečaj IKT-a. Španjolska je na drugom mjestu s 92,86 % pozitivnih odgovora, Mađarska je na trećem mjestu sa 75 % pozitivnih odgovora, a Srbija je na četvrtom mjestu sa 65 % pozitivnih odgovora.

Rasprava i zaključci

Cilj ovoga istraživanja bio je ispitati percepciju učitelja u Srbiji, Španjolskoj, Hrvatskoj i Mađarskoj o važnosti korištenja i učestalosti korištenja IKT uređaja tijekom nastave Biologije. Cilj je bio utvrditi smatraju li učitelji da je korištenje prijenosnih računala, projektora, mobilnih telefona i sl. učinkovit način da se obrazovanje učini uspješnijim i motivira učenike za daljnje učenje.

S obzirom na utjecaj individualnih karakteristika učitelja (godine učiteljskoga iskustva, stupanj obrazovanja) na percipirane prepreke od strane učitelja, Nikolopoulou i Gialamas (2013) otkrili su da su učitelji s manje godina učiteljskoga iskustva (tipično mlađi učitelji) te oni s više godina iskustva rada na računalu i većim povjerenjem u tehnologiju, percipirali „nedostatak podrške" kao manju prepreku. Zanimljivo je da „razina osposobljenosti" (tehnička obuka) nije bila značajna u studiji Nikolopouloua i Gialamasa (2013) te da nije bila povezana s percepcijom prepreka i imala je vrlo mali utjecaj na povjerenje učitelja u tehnologiju. Usporedivši podatke prikupljene u četiri zemlje, može se reći da su sudionici ustanovili kako su IKT uređaji važni u nastavi, bez obzira na državu u kojoj je provedeno ispitivanje.

Nastavni programi u Srbiji, Španjolskoj, Hrvatskoj i Mađarskoj pružaju učiteljima mogućnost korištenja IKT uređaja (Srpski nacionalni kurikulum, 2013; Španjolski nacionalni kurikulum, 2013; Hrvatski nacionalni kurikulum, 2014; Mađarski nacionalni kurikulum, 2014;), a mnogi od njih to i čine, u različitom stupnju. Ovi su rezultati nešto bolji nego u Turskoj gdje učitelji koriste samo osnovne IKT aplikacije (Tezci, 2011). U Španjolskoj većina učitelja (65,7 %) koristi ovu metodu svakodnevno, a u Srbiji (45 %), Mađarskoj (47,5 %) i Hrvatskoj (52,0 %) većina ih koristi na tjednoj razini.

Učitelji su dali različite odgovore na pitanje u kojem predmetu najčešće koriste IKT. Većina učitelja koji su ga koristili u svakom predmetu bili su iz Hrvatske. Drugi učitelji ga koriste samo u nekim predmetima. Najpopularniji odgovori su bili Materinski jezik, Matematika i Glazbeni. Samo tri škole nemaju nikakvu vrstu IKT uređaja (dvije u Hrvatskoj i jedna škola u Španjolskoj), tako da učitelji smatraju da ne rade u odgovarajućim uvjetima. Stanje vezano za tehničku opremu i IKT tečajeve bolje je nego u Turskoj, gdje se učitelji žale na uvjete rada (Gulbahar, 2008).

Najpopularniji IKT uređaji su prijenosna računala i projektori. Učitelji također vole koristiti interaktivne ploče, ali mnogi od njih žale se da njihove škole ne posjeduju ovaj IKT uređaj. Neki od učitelja vrlo su kreativni i koriste tablete i mobilne telefone u nastavnim i izvannastavnim procesima. Neki od njih imaju mogućnost korištenja učionica s osobnim računalima.

Bilo je pomalo iznenađujuće da je u sve četiri zemlje većina učitelja rekla da je uporaba IKT uređaja tijekom obrazovanja samo „učinkovita". Među mogućim odgovorima ponuđen je i odgovor „vrlo je učinkovita", ali većina se nije odlučila za taj odgovor.

Svi učitelji koji su sudjelovali u istraživanju složili su se da učenici uživaju u nastavi koja je provedena koristeći IKT uređaje. Veseli ih što aktivno stječu znanje, što mogu biti aktivni sudionici u procesu učenja. Za njih je takva nastava uzbudljivija od frontalne nastave u kojoj samo pasivno sjede 45 minuta. Što se tiče IKT tečajeva, većina učitelja je pohađala najmanje jedan, ali ima ih mnogo koji su sudjelovali na više od tri takva tečaja.

Podatci ukazuju na to da su učitelji u Hrvatskoj i Španjolskoj otvoreniji za tečaj stručnoga usavršavanja, nego u Srbiji i Mađarskoj. Rezultat je bio razočaravajući jer cjeloživotno obrazovanje pruža učiteljima mogućnost učenja i korištenja najnovijih metoda i pristupa. Sudjelovanje u IKT tečaju ne znači veću kompetentnost, ali čini se da spremnost za učenje novih metoda i dobivanje novih ideja doprinosi tome da budu kreativniji i učinkovitiji u svojem radu. Prema Ghavifekru (2015) i Aslanu (2016) IKT tečajevi za profesionalno razvijanje igraju ključnu ulogu u povećanju učinkovitosti uporabe IKT uređaja.

Glavni čimbenici koji utječu na korištenje IKT-a kod učitelja su: njihov stav, IKT kompetencija, samoefikasnost, spol, iskustvo u nastavi, radno opterećenje i karakteristike institucija (Baubeng-Andoh, 2012). Ostali podatci iz Grčke, Italije, Španjolske, Portugala i Nizozemske govore da je nedostatak tehničke i pedagoške podrške glavna prepreka u korištenju IKT uređaja tijekom nastave (Peralta, 2007). Naše pilot-istraživanje pokazalo je da u sve četiri zemlje učitelji za svoj rad koriste IKT uređaje. Smatraju da je to učinkovito u nastavnom procesu, ali u različitoj mjeri.

Može se zaključiti kako je važno koristiti IKT uređaje, uključiti internet u procese učenja i poučavanja, jer tako svijet približavamo učenicima. Tako mogu promatrati stvari koje su im daleko u prostoru i vremenu. Druga vrlo važna činjenica je da pomoću IKT uređaja učenici mogu aktivno steći znanje i to ih može motivirati da budu znatiželjni i nauče više. Vrlo je važno ne pogriješiti u učenju koristeći samo IKT uređaje. U slučaju određenih nastavnih jedinica neke klasične ili nove moderne metode mogu biti učinkovitije. Ponekad nastava koja uključuje *PowerPoi*nt prezentaciju ili kratki film nije toliko uzbudljiva jer je učenicima postala nešto svakodnevno i uobičajeno. Vrlo je važna i upotreba drugih metoda poučavanja, poput učenja u prirodi.

U budućnosti će učitelji imati ključnu ulogu u odabiru ispravne kombinacije nastavnih metoda i školske opreme u obradi nastavnih jedinica kako bi nastava Biologije postala učinkovitija.

Zahvala

Projekt podržava Europska unija i sufinancira Europski socijalni fond (šifra #: EFOP-3.4.3-16-2016-00003, naziv projekta: Razvijanje kvalitete strateških obrazovnih kompetencija u visokom obrazovanju, prilagođavanje promijenjenim ekonomskim i okolišnim uvjetima i poboljšanje pristupačnosti elemenata obuke).