

ICT in the Primary School: Practice and Attitudes of Informatics Teachers

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Abstract: The aim of the study was to explore various issues related to the introduction and use of ICT in primary schools in eastern and central Croatia from the viewpoint of informatics teachers. A total of 232 respondents participated in the survey. Both descriptive and inferential statistics were applied in data analysis. The results indicate that the equipment in computer classrooms is only partially satisfactory. LCD projectors and multimedia computers are mostly used in teaching informatics. The research also revealed that teachers are aware of the importance of ICT implementation in classrooms. However, they are less satisfied with the professional development opportunities. Their responses also suggest that they are ready to participate in the curriculum development process, undertake continuing education, and focus on pupils and their learning. In addition, the analysis showed that teachers, regardless of their background characteristics, share similar views. So far, the issues discussed in this paper have only been superficially examined. The present study expands previous research by providing insight into the practice and attitudes of informatics teachers in Croatian primary schools.

Keywords: equipment; ICT; informatics teachers; practice and attitudes; primary school; professional development

1 INTRODUCTION

Information and communication technology (ICT) has become essential in all aspects of modern life, including education. Today, the process of teaching and learning is inconceivable without technology. The use of ICT contributes greatly to the improvement of quality and efficiency of education at all levels, from primary school to university. There are many reasons why ICT is an important teaching and learning tool, and according to Meadows and Leask [1] they can be divided into five groups: political, personal/professional, professional/pupils' needs, professional/curriculum, and professional/pedagogic theory. Political reasons are related to the government's wish to provide pupils with skills needed for life and work in the information society. Furthermore, teachers also have to use ICT in their personal and professional lives. In addition, pupils need to master modern technologies that surround them, not only in school, but also at home. A curriculum must keep pace with such changes, and preparation and revision of curriculum require the use of ICT. Finally, one must not forget the development of pedagogical theories that are necessary to establish the best possible framework for acquisition of knowledge and skills in the technology dominated world.

ICT may contribute to creating high-quality teaching and learning environments in many ways. In this context, Smeets [2] points out that ICT provides access to a wide range of information from a variety of sources and allows viewing information from multiple perspectives. According to Dančević [3], the use of ICT in primary schools does not only help pupils to find and select information, but also to recognize patterns and behaviors, to model, predict and hypothesize, to test the authenticity and correctness, to evaluate and modify the work in order to improve its quality, to communicate and present ideas, to assess achievements, to increase the efficiency, and to build self-confidence and independence. Moreover, ICT helps pupils to be more creative and take risks. The insufficient use of ICT in the teaching process and neglecting its potential is unacceptable today, since pupils are

deprived of the opportunity to acquire the necessary competencies, which greatly diminishes their chances of success in the future. However, it is not enough just to bring the new technology in the classroom. Summarizing several previous studies, Lim and Oakley [4] concluded that having ICT in the primary school curriculum and classroom does not guarantee improved learning. It is also important to support the implementation of ICT in education by appropriate policies and provide professional development for teachers. In order to be successful, the integration of ICT in the education system should be carefully designed and implemented. Kler [5] distinguished three main phases in this process. The first is the establishment of an institution-wide technological infrastructure. In the second phase, emphasis is placed on the pedagogical use of ICT and its effective integration into teaching and learning activities. The third phase is characterized by the strategic use of ICT with a focus on different target groups.

ICT integration into the educational setting is not an easy task. On the contrary, there are many factors that must be taken into account when introducing a new technology. Prior research has identified a number of different barriers to ICT adoption and integration into teaching practices. Lawrence and Tar [6] classified these barriers into groups of teacher-level barriers (lack of ICT knowledge, lack of time, resistance to change, and complexity of integrating ICT) and institutional-level barriers (limitation of infrastructure, lack of training, lack of access, and lack of technical support). In their analysis, Almaki and Williams [7] made the distinction between teacher factor (lack of self-confidence, lack of competencies, and negative attitudes towards ICT), school/institution factor (lack of time, lack of efficient training, lack of local technical support, and leadership barrier), and extrinsic factor (local culture, lack of financial support, and inadequate planning). According to Goktas, Gedik, and Baydas [8], external barriers include hardware and software inadequacies, and lack of time and technical support, while internal barriers encompass attitudes and beliefs towards the uses of technology in education, and the approaches that are used in teaching.

Teachers use ICT in their classrooms and organize technology-supported teaching and learning activities. In addition to playing a pivotal role in implementing educational innovations, they are directly responsible for curriculum realization [9]. Therefore, teachers are the most important and essential factor influencing ICT adoption and use in education [10]. The integration of ICT in the teaching process cannot be successful if it is not accepted by teachers. Among them, informatics teachers have a special role and responsibility as people who equip pupils with ICT knowledge and skills. Thus, it is of the utmost importance to gain insight into their experiences, beliefs, and perceptions. With this in mind, the present study aimed to explore the practice and attitudes of informatics teachers regarding the introduction and use of ICT in primary schools located in eastern and central Croatia.

2 PREVIOUS RESEARCH

The development of ICT and its application to education has attracted the attention of scholars and practitioners worldwide. This has resulted in the publication of papers dealing with different aspects of ICT implementation in teaching and learning at all levels of education, including primary schools. However, research focused on the attitudes and experiences of primary school teachers of informatics is still relatively rare. Given the subject of this paper, the most important findings and conclusions of such studies, published over the last ten years or so, are presented in chronological order below.

Deryakulu et al. [11] conducted a study aimed at determining the most satisfying and frustrating aspects of ICT teaching in Turkish schools and examining whether there were differences in these aspects between two groups of teachers with respect to their self-efficacy. The sample was overwhelmingly comprised of primary school ICT teachers. The analysis revealed that for teachers with high self-efficacy the most satisfying aspects of ICT teaching were the dynamic nature of ICT subject, highly motivated students, the opportunity to help other teachers, and lecturing in well-equipped classrooms, whereas the most frustrating aspects were extra jobs and duties, shortage of computers and technical problems, indifferent students, insufficient time for teaching, lack of appreciation from colleagues, and the status of ICT subject in curriculum. Teachers with low self-efficacy listed the same most satisfying aspects of ICT teaching as their high self-efficacy colleagues. The most frequently cited frustrating aspects of ICT teaching by teachers with low self-efficacy were extra jobs and duties, shortage of computers and technical problems, insufficient time for teaching, the status of ICT subject in curriculum, lack of appreciation from colleagues, and the attitude of other teachers and school administrators that ICT subject is not needed. Based on the results, the authors concluded that both groups share similar views on the most satisfying and frustrating aspects of ICT teaching.

Özer, Uğurlu, and Beycioglu [12] examined the attitudes and awareness of ICT teachers in Turkish primary schools regarding the ethical use of computers in classrooms. Most

of the teachers surveyed stated that they did not have computer ethics courses during their higher education and professional careers. Respondents cited print and/or visual media as the most popular source of information on the ethical use of computers, followed by the Internet and workshops. The results suggest that women were more concerned with the ethical use of computers than men. The study also found that teachers who have taken computer ethics courses were more aware of ethical issues than those who did not. In addition, it has been confirmed that beliefs about ethical use tend to decrease as the teaching experience increases.

In order to determine how ICT is taught in primary schools, Akbiyik and Seferoğlu [13] investigated the opinions of Turkish computer teachers. Analysis of their responses showed that demonstration and practice, questions and answers, and lecturing methods were most frequently used in teaching pupils. Problem solving, group discussions, and teamwork were also popular teaching methods, while the project-based approach was not preferred by teachers. The study further revealed that computer teachers most often use course books and written instructions as their teaching materials. Other sources, such as websites, animations, and videos were significantly less preferred. Akbiyik and Seferoğlu also found that teachers face difficulties in implementing the curriculum. A limited amount of time for lessons was identified as the main problem.

The aim of the study by Cakir and Yildirim [14] was to explore the professional growth of ICT teachers in the Turkish primary education system in terms of their perception of teaching and their own pedagogical and subject matter competencies. The results showed that the respondents assessed their own competencies positively and that they experienced difficulties in teaching, such as classroom management, number of students, and problems associated with the efficient use of the latest technology. According to the teachers surveyed, the integration of technology in the classroom was negatively affected by time constraints, poor ICT classroom design, lack of flexibility, and overcrowded classrooms. The findings of the study suggest that the effective use of technology in primary education is highly dependent on the active involvement of ICT teachers in the process of technology integration. Thus, training programs should be provided to ensure their professional development. Cakir and Yildirim concluded that salaries and employment opportunities also influence teachers' performance.

In their study, Konstantinos, Andreas, and Karakiza [15] examined the views and attitudes of informatics teachers about the introduction of ICT in Greek primary schools. The results revealed that there was considerable confusion among teachers regarding their role in a changing learning environment. Respondents pointed out several external and internal barriers to effective teaching and factors that hinder the successful integration of ICT into the classroom. The research indicated that although ICT teachers have a positive attitude towards interdisciplinary practice, they rarely collaborate with other teachers.

The acquisition of ICT literacy has become a mandatory part of the primary and secondary school curriculum in developed countries. In order to determine the current state and trends in the Czech education system, Rambousek et al. [16] conducted a survey on a sample of ICT teachers. Based on the answers received, the authors concluded that ICT-related educational activities were mainly carried out within a compulsory subject. Respondents identified the following key ICT topics: searching and retrieving information on the Internet, word processing, Internet security, copyright and ethical principles, the use of an operating system and file management, working with presentations, and communication and collaboration in the digital environment. On the other hand, they cited the creation and publication of websites, the use and design of databases, and programming and development of algorithmic thinking as less important topics in the context of ICT literacy development. The study also showed that the structure and level of teachers' ICT skills significantly influenced the conception and orientation of their classes.

Zovkić and Vrbanec [17] pointed out that informatics teachers in Croatian primary schools in addition to teaching often have the role of ICT administrators in computer classrooms. Their work is further complicated by the different hardware configurations and the fact that computers are relatively old. The average age of computers was eight years, indicating that many of them were not meeting the needs of the educational process. The problem is also that classrooms had on average 19 computers, and usually there were more pupils than available computers. Furthermore, informatics teachers are often tasked with maintaining all other computers in the school and helping colleagues. In their paper, the authors particularly highlighted the issues related to ICT security in Croatian primary schools, which should be improved at all levels. In this context, the professional development of informatics teachers is of utmost importance.

Aziz and Rahman [18] investigated the use of ICT in Malaysian rural primary schools attended by Indigenous children from the ethnic group known as 'Orang Asli'. The researchers explored the expectations and experiences of their teachers who are responsible for the maintenance of ICT equipment. The findings suggest that the technological infrastructure in Indigenous primary schools is inadequate and that pupils have limited ICT knowledge. Since Indigenous children usually have low-level ICT facilities at home or do not have ICT at all, they need the steady guidance and support of their teachers. However, continuous ICT training is necessary not only for pupils, but also for teachers. The results of the study confirmed that there is a huge gap between primary schools attended by Indigenous children and other primary schools in Malaysia in terms of ICT availability and use.

The purpose of the study by Nordlöf, Höst, and Hallström [19] was to examine the attitudes of Swedish technology teachers, who teach at levels ranging from pre-school to ninth grade, towards their subject and to determine how these attitudes were related to background variables. The analysis revealed four dimensions of attitudes. Three clusters of teachers were identified and interpreted in terms

of the underlying dimensions. The clusters were characterized as positive, negative, and mixed with respect to attitudes towards the subject and its teaching. The results lead to conclusion that efforts to increase teachers' qualifications and to establish a fixed number of teaching hours, as well as overall teaching plan for the subject, contribute to more positive attitudes of teachers.

Panselinas et al. [20] sought to identify and describe the competencies and knowledge required of computer teachers in Greek primary and secondary schools. According to the results, teachers showed a great interest for programming and robotics, which was in line with the changes in educational policy. Respondents also believed that they needed more training in the area of website design, advanced collaboration tools, and e-learning and learning management systems. Teaching and pedagogical competencies were also considered important by teachers who participated in the survey.

3 PURPOSE OF THE STUDY AND RESEARCH QUESTIONS

Today's world is profoundly affected by ICT. Therefore, ICT education should be started as early as possible. Recent studies have confirmed that the application of new technologies in the classroom is essential for the development of students who are ready and prepared for the information society [21]. In order to improve their knowledge and skills, the integration of ICT in learning and teaching is becoming a major task for primary schools worldwide [22]. Thereby, it should be kept in mind that ICT has a strong impact on all aspects of school life, from altering teaching practices and providing opportunities for teacher development to the improvement of the learning environment [23].

Taking into account the importance of the elementary level of education in acquiring ICT competencies, the purpose of this study was to investigate the adequacy of technological infrastructure and the use of ICT in Croatian primary schools. Conclusions were drawn from the attitudes and experiences of the surveyed informatics teachers. In addition, the aim of the research was to find out teachers' opinions on particular issues of interest to this study and to determine their willingness for improving the teaching process and professional development. Some of these issues were explored by Pinjušić [24]. However, the present study goes further by examining in more detail the factors that influence teaching practices in computer classrooms. For this reason, the current research included questionnaire items that were not previously analyzed.

Specifically, the study sought to answer five research questions:

- What are the conditions for teaching informatics, i.e. how appropriately are computer classrooms equipped?
- What devices and tools do informatics teachers use in teaching?
- What are the attitudes of informatics teachers towards the introduction and use of ICT, adjustment of the curriculum to technological changes, and professional development opportunities?

- To what extent are informatics teachers willing to participate in curriculum development, acquire new competencies, inspire and help pupils, and adapt to their needs?
- Are there statistically significant differences in the attitudes and motivations of informatics teachers with respect to age, gender, type of study completed, type of employment contract, and length of service?

4 SAMPLE AND METHODS

The study was conducted on the sample of 232 primary school informatics teachers from eight eastern and central Croatian counties. The survey took place in 2015. The data were collected using self-administered structured questionnaires that were distributed to participants of teachers' workshops. Despite efforts, it was not possible to repeat the survey with a sample large enough to be representative and yield statistically reliable results. Due to this limitation, statistical analysis was performed on the available data. An additional survey was conducted in November 2019 to verify their relevance. The latter sample consisted of 21 teachers who had also participated in the first survey. The results of both surveys were very similar, suggesting that the previously collected data are still applicable and can be employed in the analysis.

Among the respondents, 50% were between 24 and 37 years of age, 38.8% were between the ages of 38 and 50, and 11.2% were between 51 and 65 years old. The sample

consisted of 44.8% men and 55.2% women. Out of all respondents, 69% had a degree in education, while 31% of those surveyed had a background in engineering or computer science. There were 73.3% participants with a permanent contract and 26.7% with a fixed-term contract. Most of the respondents (53%) had less than 10 years of experience, followed by 28.4% teachers with 10 to 20 years of service. Those with more than 20 years of experience accounted for 18.5% of respondents.

Statistical methods were used to answer the research questions. Both measures of central tendency and dispersion were calculated to summarize and describe the data collected. Nonparametric statistical tests (Mann-Whitney test, Kruskal-Wallis test, and multiple pairwise comparisons) were applied to analyze the differences between the studied groups. Statistical significance was set at $p < 0.05$.

5 RESULTS AND DISCUSSION

Respondents were first asked to rate the equipment of their classrooms and conditions for teaching informatics on a scale from 1 (completely dissatisfied) to 5 (completely satisfied). Descriptive statistics (mean, median, mode, standard deviation, and interquartile range) were calculated for each item. The results obtained are shown in Tab. 1.

Table 1 Descriptive statistics for satisfaction ratings

Item	Mean	Median	Mode	Standard deviation	Interquartile range
Satisfaction with the equipment of classrooms with up-to-date devices	3.31	3.00	4.00	1.12	1.00
Satisfaction with the ratio of pupils to computers	3.67	4.00	4.00	1.00	1.00
Satisfaction with Internet speed and reliability	3.60	4.00	4.00	1.01	1.00
Satisfaction with the reliability of computers	3.31	3.00	3.00	0.98	1.00
Satisfaction with the availability of software applications	3.80	4.00	4.00	0.98	2.00

The responses of the surveyed informatics teachers suggested that they were only somewhat satisfied with the equipment provided. According to the means, the availability of software applications was rated most positively. However, even in this case, the mean was less than 4. The ratio of pupils to computers and Internet speed and reliability were similarly assessed by the teachers. The means indicated that respondents were least satisfied with the equipment of classrooms with up-to-date devices and reliability of computers. In the case of these items, the median was less than the mean. Standard deviation and interquartile range are measures of dispersion or variability. The largest standard deviation was obtained for the first item (satisfaction with the equipment of classrooms with up-to-date devices), while the largest interquartile range was found for the last item (satisfaction with the availability of software applications).

Therefore, according to the teachers who participated in the study, computer classrooms in primary schools in eastern and central Croatia were not adequately equipped, which implies that conditions for teaching informatics were not optimal. Since 3 is the midpoint of the scale and indicates a neutral attitude, it can be concluded that respondents were

inclined to agree that the teaching process was not sufficiently supported with technology. This result was expected, given that Croatian primary schools are not able to keep pace with technological developments and acquire modern equipment due to the lack of funds. In such circumstances, the question is to what extent schools can provide pupils with the required ICT-related knowledge and skills. Education has been neglected in Croatian society for many years. As a result, Croatian education system is lagging far behind world leaders in teaching and learning. Such trends must be reversed. The recently initiated educational reform is an important step forward, but without a substantial increase in funding for equipment and staff, it will not produce desirable outcomes.

In the next part of the survey, respondents were asked to rate on a scale of 1 (never) to 5 (always) how often they use each type of devices and tools in the classroom. Descriptive statistics calculated to summarize the data are shown in Tab. 2.

According to the mean, median, and mode, primary school informatics teachers from eastern and central Croatia regularly use a LCD projector and multimedia computer in

teaching, while other devices and tools are used much less frequently. The results indicate that interactive whiteboards are the least used in working with pupils. More than 70% of respondents said they never used them, and only slightly more than 8% stated that they used them regularly. According to the findings, learning management systems, such as CARNet's Moodle-based platform named Loomen, and digital video cameras are used to a somewhat greater extent than interactive whiteboards. However, the majority

of teachers use neither the learning management system nor the digital video camera. It can be concluded that informatics teaching in eastern and central Croatia is mostly supported by presentation tools and multimedia computers. This is certainly a reflection of inappropriate position of informatics courses in the curriculum and insufficient investment in people and infrastructure. The findings on the teachers' use of devices and tools are consistent with the results from Tab. 1.

Table 2 Descriptive statistics on the frequency of use

Device / tool	Mean	Median	Mode	Standard deviation	Interquartile range
Multimedia computer	4.50	5.00	5.00	0.78	1.00
Interactive whiteboard	1.76	1.00	1.00	1.32	1.00
Learning management system	2.23	2.00	1.00	1.28	2.00
LCD projector	4.69	5.00	5.00	0.68	0.00
Digital video camera	2.28	2.00	1.00	1.16	2.00
Digital camera	2.77	3.00	3.00	1.16	1.00

Table 3 Descriptive statistics of the surveyed teachers' attitudes

Item	Mean	Median	Mode	Standard deviation	Interquartile range
ICT should be used in teaching to improve its effectiveness	4.42	5.00	5.00	0.72	1.00
Integration of ICT into the curriculum is necessary	4.55	5.00	5.00	0.74	1.00
ICT needs to be implemented more systematically into primary school education	4.31	4.00	5.00	0.70	1.00
The curriculum must respond to the rapid technological development	4.30	4.00	4.00	0.71	1.00
Introduction of ICT in teaching has to be planned more carefully	4.16	4.00	4.00	0.82	1.00
Teachers should be better prepared for ICT integration in their classrooms	4.22	4.00	4.00	0.71	1.00
ICT training is appropriate and beneficial	3.47	4.00	4.00	0.96	1.00
Education authorities provide ICT training for teachers at all levels	3.51	4.00	4.00	1.13	1.00

Tab. 3 provides the descriptive statistics of respondents' attitudes towards the introduction and use of ICT in schools, necessity of curriculum adaptation to technology innovations, and training opportunities. Responses were made on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The results suggest that informatics teachers are aware of the importance of ICT implementation in classrooms. The respondents mostly agreed that the integration of ICT into the curriculum was necessary and that technology should be used in teaching to improve its effectiveness. The highest means were found for these two items. For both of them the median and mode were 5. The participants also largely agree that ICT needs to be implemented more systematically into primary school education, that curriculum must respond to the rapid technological development, that teachers should be better prepared for ICT integration in their classrooms, and that the introduction of ICT in teaching has to be planned more carefully. For all the above items, the mean values were

greater than 4, indicating a high level of agreement. The surveyed teachers were significantly less likely to agree that ICT training was appropriate and beneficial, and that education authorities provided ICT training for teachers at all levels. The means of these items were 3.47 and 3.51, respectively. The largest standard deviations were associated with these variables, while the interquartile ranges were 1 in all cases. Therefore, the teachers who participated in the survey have a high level of awareness of the role that ICT has to play in education, but they are less satisfied with the support and opportunities for professional development.

In the questionnaire, respondents were also asked to evaluate their willingness to participate in the curriculum development process, acquire new ICT skills, adapt instruction to pupils' needs, and help them to learn more effectively. Teachers' responses were again measured on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Table 4 Descriptive statistics of motivation items

Item	Mean	Median	Mode	Standard deviation	Interquartile range
I am willing to actively engage in the curriculum development process	4.34	5.00	5.00	0.79	1.00
I am willing to participate in ICT training	4.32	5.00	5.00	0.82	1.00
I find myself motivated to acquire new ICT skills	4.37	4.00	5.00	0.74	1.00
I am ready to respond to pupils' needs and interests	4.52	5.00	5.00	0.64	1.00
I am willing to help and motivate pupils to acquire digital skills	4.44	5.00	5.00	0.61	1.00

Based on all three measures of central tendency, it can be concluded that primary school informatics teachers from eastern and central Croatia are motivated to improve their practice and acquire ICT competencies that are necessary for

successful teaching. As indicated by the means in Tab. 4, the participants mostly agreed that they were ready to respond to pupils' needs and to help and motivate them to acquire digital skills. Thus, the surveyed teachers are aware of the need to

focus on pupils and their success in learning. In addition, the respondents indicated that they were willing to participate in ICT training and found themselves motivated to acquire new ICT skills. A mean value of 4.34 suggests that they were also willing to actively engage in the curriculum development process. Overall, the measures of dispersion show that there was some variability in the responses.

Educational institutions cannot fulfil their mission and cope with a rapidly changing environment without well-trained, dedicated, and enthusiastic teachers. In this context, the results of this study are encouraging and promising. Although a self-report instrument was used to assess participants' motivation towards educational activities, it is believed that their answers are honest and straightforward. Many teachers are dissatisfied with various aspects of their

jobs, such as salaries, workload, amount of paperwork and record keeping, working conditions, school's administration, social status, future career prospects, and professional support, but it seems that these issues do not significantly affect their motivation. Nevertheless, even highly skilled and motivated informatics teachers will not be able to accomplish their tasks without proper equipment, continuing professional development, a well-defined curriculum, and support of authorities at all levels of the education system.

In order to answer the fifth research question, differences in the attitudes and motivation of informatics teachers with respect to age, gender, type of study completed, type of employment contract, and length of service were examined. The results of the difference analysis are summarized in Tab. 5.

Table 5 Analysis of differences in the attitudes and motivation of informatics teachers

Item	Statistics	Age group			Gender		Type of study completed		Type of employment contract		Length of service		
		24–37	38–50	51–65	Male	Female	Degree in education	Degree in engineering or computer science	Permanent contract	Fixed-term contract	Less than 10 years	10–20 years	More than 20 years
Attitude													
ICT should be used in teaching to improve its effectiveness	Mean rank <i>p</i>	116.38 <i>p</i> = 0.245	111.61	133.96	115.22 <i>p</i> = 0.769	117.54	121.13 <i>p</i> = 0.080	106.22	114.13 <i>p</i> = 0.319	123.00	115.63 <i>p</i> = 0.945	116.38	119.19
Integration of ICT into the curriculum is necessary	Mean rank <i>p</i>	112.04 <i>p</i> = 0.417	119.48	126.10	113.33 <i>p</i> = 0.438	119.08	118.61 <i>p</i> = 0.393	111.81	114.24 <i>p</i> = 0.310	122.69	110.46 <i>p</i> = 0.216	122.64	124.37
ICT needs to be implemented more systematically into primary school education	Mean rank <i>p</i>	118.70 <i>p</i> = 0.556	111.45	124.15	118.00 <i>p</i> = 0.736	115.28	116.24 <i>p</i> = 0.924	117.08	115.16 <i>p</i> = 0.582	120.16	119.45 <i>p</i> = 0.723	112.23	114.63
The curriculum must respond to the rapid technological development	Mean rank <i>p</i>	115.23 <i>p</i> = 0.946	117.46	118.85	120.03 <i>p</i> = 0.429	113.63	113.58 <i>p</i> = 0.279	122.99	111.39 <i>p</i> = 0.035*	130.52	118.73 <i>p</i> = 0.835	113.42	114.85
Introduction of ICT in teaching has to be planned more carefully	Mean rank <i>p</i>	121.92 <i>p</i> = 0.409	110.92	111.63	117.89 <i>p</i> = 0.757	115.37	118.44 <i>p</i> = 0.476	112.19	114.88 <i>p</i> = 0.508	120.95	120.36 <i>p</i> = 0.552	114.09	109.15
Teachers should be better prepared for ICT integration in their classrooms	Mean rank <i>p</i>	122.13 <i>p</i> = 0.357	110.14	113.38	113.05 <i>p</i> = 0.435	119.30	119.72 <i>p</i> = 0.228	109.35	113.80 <i>p</i> = 0.262	123.90	119.36 <i>p</i> = 0.699	114.98	110.65
ICT training is appropriate and beneficial	Mean rank <i>p</i>	109.80 <i>p</i> = 0.159	126.28	112.52	112.99 <i>p</i> = 0.438	119.36	122.94 <i>p</i> = 0.019*	102.18	113.32 <i>p</i> = 0.197	125.23	111.11 <i>p</i> = 0.166	116.46	131.98
Education authorities provide ICT training for teachers at all levels	Mean rank <i>p</i>	119.68 <i>p</i> = 0.502	110.42	123.37	108.10 <i>p</i> = 0.073	123.33	119.53 <i>p</i> = 0.286	109.76	117.09 <i>p</i> = 0.819	114.89	120.04 <i>p</i> = 0.142	103.71	125.99
Motivation													
I am willing to actively engage in the curriculum development process	Mean rank <i>p</i>	114.38 <i>p</i> = 0.534	115.61	129.02	105.27 <i>p</i> = 0.012*	125.62	116.26 <i>p</i> = 0.930	117.03	110.74 <i>p</i> = 0.017*	132.30	116.49 <i>p</i> = 0.272	108.90	128.19
I am willing to participate in ICT training	Mean rank <i>p</i>	118.41 <i>p</i> = 0.732	112.67	121.23	116.34 <i>p</i> = 0.972	116.63	117.32 <i>p</i> = 0.761	114.68	116.54 <i>p</i> = 0.987	116.39	117.14 <i>p</i> = 0.970	114.93	117.07
I find myself motivated to acquire new ICT skills	Mean rank <i>p</i>	117.12 <i>p</i> = 0.498	112.34	128.13	116.57 <i>p</i> = 0.988	116.44	118.08 <i>p</i> = 0.554	112.98	113.54 <i>p</i> = 0.219	124.61	119.28 <i>p</i> = 0.112	104.20	127.41
I am ready to respond to pupils' needs and interests	Mean rank <i>p</i>	115.41 <i>p</i> = 0.250	112.84	134.06	111.39 <i>p</i> = 0.228	120.65	116.17 <i>p</i> = 0.897	117.24	116.07 <i>p</i> = 0.853	117.68	115.87 <i>p</i> = 0.751	113.91	122.29
I am willing to help and motivate pupils to acquire digital skills	Mean rank <i>p</i>	126.64 <i>p</i> = 0.021**	103.33	116.85	112.78 <i>p</i> = 0.393	119.52	119.79 <i>p</i> = 0.211	109.19	114.59 <i>p</i> = 0.420	121.74	124.01 <i>p</i> = 0.075	103.34	115.21

* Statistically significant at $p < 0.05$ (Mann-Whitney test); ** Statistically significant at $p < 0.05$ (Kruskal-Wallis test)

The analysis shows that groups of teachers with different background characteristics have similar views regarding the issues discussed in the paper. Only a few statistically significant differences were identified by the Mann-Whitney and Kruskal-Wallis tests. The results of the Kruskal-Wallis test indicate that at least two age groups differ from each other in their willingness to help and motivate pupils to

acquire digital skills. The pairwise comparisons confirmed that younger teachers are more willing to do so than their middle-aged counterparts, while differences between other age groups were not significant. According to the Mann-Whitney test, women are significantly more willing than men to actively engage in the curriculum development process. Also, fixed-term contract teachers are more willing to

participate in such activities than those with a permanent contract. In addition, it was found that informatics teachers with a degree in education tended to agree significantly more than their engineering or computer science counterparts that ICT training they had received was appropriate and beneficial. The analysis also reveals that fixed-term contract teachers are significantly more likely than those having a permanent contract to agree that the curriculum must respond to the rapid technological development. In all other cases, the differences between the studied groups were not statistically significant.

6 CONCLUSION

Teachers are a key pillar and component of any education system. The quality of education and students' achievements depend heavily on them. The responsibility of informatics teachers in the ICT era is particularly pronounced. Their main task is to provide students with knowledge and skills related to modern technologies and thus prepare them for active participation in the information society. Due to the very important role that informatics teachers play, educational policy makers need to know their views, attitudes, expectations, and problems. Such information is necessary to make meaningful and valid decisions at all levels of education.

The first years of education are crucial in a child's development and have a huge impact on personal and academic success in life. Primary school informatics teachers are expected to equip pupils with the basic ICT competencies. They should discuss with pupils the advantages and disadvantages of various technologies and stimulate their interest in ICT. Informatics teachers are certainly the most qualified to evaluate the school's technology resources, teaching conditions, and the subject curriculum. It is therefore surprising that the use and integration of ICT in primary schools has been poorly explored from the perspective of informatics teachers. The present paper aims to fill this gap by focusing on the practice and attitudes of Croatian informatics teachers.

The results of the study reveal that the equipment of computer classrooms in primary schools in eastern and central Croatia is only partially satisfactory. Teachers need to have at their disposal modern devices and tools in order to effectively teach their pupils. They will not be able to fulfil their role without adequate ICT infrastructure, which includes hardware, software, network resources, services, protocols, and procedures. The study further finds that informatics teachers regularly use LCD projectors and multimedia computers in their classrooms. Other devices are used much less frequently, which is largely a consequence of the poor classroom facilities. According to the results of the analysis, the surveyed teachers are aware of the importance of ICT implementation in the teaching process, but they do not find the professional development opportunities very positive. Despite the problems, informatics teachers are willing to actively participate in the development of the curriculum, educate themselves in order to keep their knowledge and skills up-to-date, and respond to pupils' needs

and help them achieve learning outcomes. Finally, it was found that groups of teachers with different background characteristics shared similar attitudes towards the issues examined in this study.

At the time of the development and implementation of the new informatics curriculum, the present study provides valuable insight and useful information for education authorities and policy makers. Based on the results, it can be concluded that there is a lot of room for improvement of informatics teaching in Croatian primary schools. Education reform will not achieve the desired outcomes if schools are not equipped with adequate ICT infrastructure. It is also important to provide informatics teachers with a wide variety of professional development opportunities. These are just some of the issues that have to be addressed and resolved. Given the role of education as a vehicle for growth and prosperity, radical and fundamental changes in this system are urgently needed in order to foster social and economic development in Croatia.

The issues discussed in this study gain further importance due to the coronavirus (COVID-19) pandemic. Primary and secondary schools around the world, as well as higher education institutions, have been closed to stop the virus' spread. In such circumstances, online learning has become central to the education of students since it represents the most efficient way to continue with classes. As in other countries worldwide, primary schools in Croatia have also shifted to delivering online lessons to their pupils. It is too early to conclude how effective Croatian schools are in implementing online learning, but introducing virtual instruction has been very challenging. Many participants have experienced various difficulties, especially in the first days of distance education classes, which was to be expected. Such problems need to be solved on the fly and it seems to be succeeding. In the current situation, informatics teachers have a particular professional interest in supporting the transition from traditional to technology-based teaching practices. Their knowledge, skills, and experience can be of great value and assistance in achieving the learning objectives and outcomes through the online platforms. Today, more than ever before, informatics teachers have an opportunity to point out the relevance of their subject and to show that they are an important part of the educational process.

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