

ATTITUDES OF HIGH SCHOOL MATHEMATICS TEACHERS ABOUT LIFELONG LEARNING

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Abstract

The aim of this study is to examine the attitudes of high school mathematics teachers towards lifelong learning in the Republic of Croatia. This research was conducted as part of the project "Digitalna.hr" funded within the call "Thematic Networks for Socio-Economic Development and promotion of social dialogue in the context of improving working conditions". There were 443 high school teachers from various high schools who participated in the research. The chosen data collection technique was online survey via LimeSurvey service. The results of the research confirmed the hypothesis: mathematics teachers have a positive attitude towards the concept of lifelong learning. The study found that most teachers participated in at least one form of lifelong learning, with the most common reasons for non-participation being lack of time, ignorance, and a lack of interest. Also, mathematics teachers were found to be the most interested in those programs that offer further development of digital and communication skills and work with students with special needs. This study is a good starting point for future research on the topic, it highlights aspects of lifelong learning that are of great importance for teachers and topics that, when planning and organizing, should be implemented in lifelong learning programs.

Keywords: attitudes towards lifelong learning, lifelong learning, mathematics teachers

1 INTRODUCTION

Lifelong development, which includes lifelong education and learning, assumes that teachers and other educators want to continuously learn and develop their knowledge and skills through their careers and that their development needs will change according to experience and changes in the environment in which they work (OECD, 2005). That is, lifelong learning is primarily a pedagogical concept that starts from the realization that a person formally and/or informally learns throughout his or hers life (Horvat, 2019). Lifelong learning is included in the UN Sustainable Development Goals (United Nations, 2015), which testifies to its importance as well as the fact that in some European countries, such as Lithuania, participation in such programs is required for professional advancement. At the same time, it means that it is extremely important to research how teachers perceive such programs, what are their attitudes towards them, which skills they want them to include, and how to organize and make them available to teachers.

According to the Strategy of Science, Education and Technology (2014) (hereinafter the Strategy), lifelong learning refers to all activities of acquiring knowledge, skills, attitudes and values throughout life with the aim of their adoption or expansion. It can be carried out within the personal, social or professional development and as an action of an individual. Additionally, the Strategy clarifies how such a comprehensive concept encompasses learning at all stages of life and in all performance forms – it includes programs of formal education (early and pre-school, primary, secondary and higher education, as well as education, adult education and training), non-formal education, but also unintentional, disorganized and spontaneous acquisition of knowledge, skills, attitudes and values on informal and informal ways.

Some of the activities that fall into the spectrum of lifelong learning are: attending lectures, seminars, courses and conferences (in person and online), exchanges of good practice between educational institutions and colleagues, networking with other colleagues, reading professional literature, research and writing of scientific papers and etc. (OECD, 2019). Although a large number of one-day and short lifelong learning activities provide an opportunity for teachers in professional development that does not take too much time and does not represent a great financial burden, at the same time, such activities may seem "intellectually superficial, separate from the deeper curriculum problems and learning, fragmented and non-cumulative" (Ball and Cohen, 1999: 3-4). Still, lifelong learning cannot be considered as a synonym for lifelong education. Lifelong education is linked to formal, compulsory schooling and includes organized learning, whereas lifelong learning, on the other hand, can take place unintentionally, and it can be disorganized and spontaneous (Čupić, 2015).

Mišurac (2007) says that mathematics is a school subject that develops the logical thinking of pupils and students, and is the basis for any scientific, technical, information technology, but also many other areas of human activity. She describes how the way in which mathematics is taught is extremely important, as well as the importance of quality of the staff performing the task. The author believes that the education of teachers and professors of mathematics is the first and the most important foundation on which successful teaching of mathematics is built.

Considering what has been said, it is necessary to emphasize that mathematics is the basis for the development of the so-called pupils' STEM (Science, Technology, Engineering and Mathematics) knowledge and skills. Mathematical concepts like numbers, geometry, measurements, symbols and problem-solving form a basis for the development of science and logical thinking (Hasanah, 2020).

Vizek Vidović (2005) states that there is an increase in attention being paid in most European countries to the issue of retaining good teachers and professors in the profession, especially considering the needs of mathematics, science and IT subjects. Keeping teachers in their professions and enabling professional development can be achieved through the implementation of different measures in three broad directions: ensuring good social and material working conditions, creating a stimulating work environment and the possibility of lifelong learning and education. Also, teacher education is a fundamental prerequisite for a quality educational system and raising the quality of their education is an imperative in the process of lifelong learning (Horvat, 2019).

Teachers of all subjects, including mathematics, are faced with the challenges of sudden and comprehensive changes in today's society, from changes fuelled by globalization processes, changes in demography and the labour market, and increasingly rapid development and growing influence of various information and communication technologies (ICT) on everyday life, but also teaching and learning (OECD, 2005). Teachers are adapting teaching to these changes, in order to match the knowledge and skills that their students will need to continue education and find employment, but there is also a need to develop STEM skills and to monitor the use of new technologies, for which participation in lifelong learning and education is important (Beswick and Fraser, 2019).

An initiative called the National Coalition for Digital Skills and Jobs in Croatia, published a document called the Charter on Digital Jobs (2020). The Charter, among other things, states that due to numerous rapid changes in the economy and economic environment of Croatia, in the next ten years it is necessary to educate, recruit and hire an additional 6,000 technology professionals in order to reach the average in the European Union of 3.7% share of IT professionals in the workforce, who have the necessary STEM knowledge and skills, and thus be able to more equally match the offer of companies from other EU countries.

Mathematics teachers significantly contribute to the mastery of pupils' STEM knowledge and skills so that in the future they will be ready to perform jobs in the technology sector, but also in other sectors. We can say that timely mastering of new knowledge enables individuals, in this case mathematics teachers, for timely adoption of new knowledge for the purpose of creating modern and purposeful teaching of mathematics.

1.1. Previous research: External and internal drivers of lifelong learning mathematics teachers

Research on teacher participation in lifelong learning programs shows that in many countries of the world most teachers participate in some form of the activities and that on average, 94% of teachers in OECD countries participated in at least one such activity within one year (OECD, 2019). OECD research has shown that the participation in programs is not tied just to specific places, types of schools, subjects, or most sociodemographic characteristics, although it has been observed that women and persons with longer years of professional service are more inclined to participate in these activities, compared to their male counterparts and those who have just been employed (ibid.). The situation in the Republic of Croatia differs significantly, as less than 3% of adult Croats participate in one of the programs of adult education, that is, as many as 73% of the adult population has no desire to get involved in them. At the same time, as much as 75% of all learning takes place outside the institutional framework (Koludrović and Vučić, 2018).

The most important aspects of lifelong development for teachers is that it allows them to apply new knowledge and ideas in their classrooms, opportunities for active and collaborative learning and focus on the introduction of innovation in teaching (OECD, 2019). Professional development and lifelong learning, in addition to increasing teachers' self-confidence and satisfaction, also affects the latter student success: new knowledge and skills that teachers gain through activities and programs of lifelong

learning enables the integration of improved and innovative teaching practices, which can lead to better student outcomes and knowledge (Yoon et al., 2007). However, research shows mixed results in terms of the impact of lifelong learning on later student achievements, that is, although research shows that lifelong learning increases mathematical and pedagogical knowledge, this does not necessarily lead to later better results of students (Gareth et al. 2006).

Tovkanets (2018) found that more than 50% of European teachers are interested in various forms of lifelong learning in the field of information and communication technologies, especially in the field of innovative teaching methods. 65% of participants stated that they prefer different courses and trainings as forms of learning, along with conferences and seminars (32.4%). Mobility programs have significantly influenced forms of non-formal learning and teaching in the European Union, but as a conclusion it is stated that lifelong learning should be interpreted as a form of managing the development of an institution.

The study by Torres et al. (2020) showed how organized and effective lifelong learning activities and additional training reduce stress for mathematics teachers, especially when they were supported in the field of digital literacy, technical support and promoting the active participation in the work of the institution. According to Aykaç, Aslandağ and Köğce (2020) it has been observed that the participation in the lifelong learning of mathematics teachers is associated with their professional satisfaction and the way of working in a certain institution.

Additionally, Koludrović and Vučić (2018: 90), list the following motivational factors related to adults participating in the process of lifelong learning and teaching:

1. "Intrinsic, internal motivation that depends on natural, intrinsic stimuli that spring from the person himself. Learning is motivated by the desire for new knowledge, skills and cognitions, and results in a sense of self-worth and satisfaction.
2. Extrinsic, external motivation that depends on external stimuli that determines the intensity and duration of a person's behaviour in order to achieve possible goals that satisfy economic and social motives. Learning is motivated by acquisition of certain competencies in order to receive an award: good grades, money, advancement, recognition, promotion and etc.
3. Achievement-oriented motivation: depends on a personal challenge while fulfilling educational tasks and on strategic approach to learning. Learning is organized in order to achieve a good balance between investment of effort, achievement of results and expected learning outcomes."

In addition, it should be emphasized that research (Radeka and Sorić, 2006) shows that 70% of teachers in Croatia are not satisfied with their working conditions: teachers and educators are utmost burdened, have low incomes and perceive their social reputation low compared to other higher education occupations, which indicates that in addition to high intrinsic motivation for performance of work, systematic support and changes within the system are necessary.

2 METHODOLOGY

Many scientific papers and international research point to the important role that lifelong education and learning have on teachers and their students. The main objective of this paper is to determine the attitudes of high school mathematics teachers towards lifelong learning. The research was conducted within the project "Digitalna.hr" funded under the call "Thematic networks for socio-economic development and the promotion of social dialogue in the context of improving working conditions" UP.04.2.1.06, whose coordinator is the Telecentar association.

The hypotheses are set as follows:

- H1) Teachers have a positive attitude towards the concept of lifelong learning.
- H2) Internal and external factors influence the motivation of teachers when choosing lifelong learning.
- H3) The system of professional development in the Republic of Croatia has room for improvement.

In order to test the hypotheses, a study was conducted using a specially designed survey questionnaire. Therefore, we take the definition of the questionnaire in the narrow sense - "as a standardized (methodologically defined) procedure by which the statements of selected participants are collected and analysed with the intention to gain insight into the attitudes, opinions, preferences, motives or forms of behaviour of certain social groups or to learn about their demographic, social and other characteristics" (Lamza Posavec, 2011: 13).

The questionnaire consisted of nine groups of questions and begins with a series of questions on sociodemographic characteristics of the participants: age, place of employment, education and years of work experience. This is followed by a series of closed questions about teachers' attitudes towards the concept of lifelong learning, then multiple choice questions about the state of support of the institution where the teachers work. Next a group of questions examines the participation of teachers in various lifelong learning programs, attitudes towards lifelong learning activities and two open-ended questions examine the impact of these activities on work with students, and then examine the reasons for non-participation in lifelong learning.

The last three groups of questions examine the application of technologies, the future and the institutionalization of lifelong learning and the possible connection between lifelong learning and the success of teachers' students at the state graduation exam in a combination of open and closed questions.

The data was collected from November 20th to December 22nd 2021 via the LimeSurvey service, and teachers were able to access it online during the data collection. Participation in the study was voluntary and anonymous, and the results were analysed exclusively in groups. Prior to data collection, Association of Croatian High School Principals was contacted by a short message sent via e-mail. They were asked to forward the call for participation to mathematics teachers working in their schools.

The study involved 443 high school mathematics teachers – 250 of which answered all questions fully, and 193 partially. During the analysis of data, those participants who did not respond to the required questions were eliminated, therefore the final number of participants involved in the data analysis is 308. According to the data obtained in the correspondence with the Ministry of Science and Education, in the Republic of Croatia in 2021 were a total of 1420 secondary (high) school mathematics teachers.

Men comprise 17.2% of the sample (F = 53), while women comprise 82,8% of the sample (F = 255). Average age of the participants is 43,7, ranging from 23 to 64 years. The questionnaire was completed by at least one participant from each county in the Republic of Croatia, and most participants were from the City of Zagreb (15.6%) and the Split-Dalmatia County (10.4%), while the least from Lika-Senj (0.3%) and Međimurje County (1.3%).

It is important to note that most (77.3%) participants have completed teacher training at the faculty, 18.5% completed their university studies after which they passed the pedagogical-psychological education (PPE) for obtaining pedagogical-psychological-didactic-methodological competencies, and a smaller number of participants passed pedagogical-psychological education (PPE) after completing undergraduate studies (1%) or professional studies (1.6%), while 5 the participant declined to comment.

Table 1 - Sample structure according to the level of acquired qualification

Acquired qualification level	F	X
Completed teaching studies at the faculty	238	77,3%
Completed undergraduate studies and then passed PPE	3	1,0%
Completed professional study and then passed PPE	5	1,6%
Completed university studies and then passed PPE	57	18,5%
I do not want to answer	5	1,6%
TOTAL	308	100,0%

Most of the participants (40.6%) have more than 20 years of work experience as a mathematics teacher, more than a quarter have between 11 and 20 years of experience, and 16.9% have 4 up to 10 years of experience, while the smallest part of the participants (16.2%) have up to 3 years of work experience.

3 RESULTS

The vast majority (86%) of participants indicated that they have a positive attitude towards the application of lifelong learning in order to improve the teaching of mathematics and work with students. A smaller number (12%) stated that they abstain on this issue, while only 6 participants (1.9%) stated that they have a negative attitude. More than half (54.9%) of participants think that lifelong learning is important and that it substantially improves the quality of teaching mathematics and work with students,

less than a third (27.3%) thinks that it contributes, but not significantly. A slightly smaller number (14.9%) thinks that lifelong learning is crucial for the quality of teaching, and the smallest number (N = 9, 2.9%) thinks that it is not important.

According to the results shown in Table 2, it is noted that the participants mostly (87.3%) agree that lifelong learning helps improve education components and 58.4% of them claim that it helps improve work processes in the institution, but most (59.7%) do not think that lifelong learning helps in cooperation and communication with students' parents.

Table 2 - The impact of lifelong learning on certain aspects of work in teaching mathematics

Lifelong learning affects:	YES		NO	
	F	%	F	%
Improvement of the educational component	269	87,3%	39	12,7%
Improvement of cooperation and communication with parents of students	124	40,3%	184	59,7%
Improvement of work processes in the institution	180	58,4%	128	41,6%

In Table 3, it can be noted that most participants think that lifelong learning contributes to teaching that is tailored to the needs of today's students, provides continuous informing about educational trends in Croatia and the world, enriches education processes with new content and enables better achievement of learning outcomes and the acquisition of knowledge. Although some teachers (40.9%) agree with the statement that lifelong learning creates more work for teachers, the majority still disagrees with this statement (59.1%).

Table 3 - What is affected by lifelong learning?

What impact, potential or realized, do you think lifelong learning on the teaching and learning of mathematics?	YES		NO	
	F	%	F	%
It enables continuous informing about educational trends in Croatia and the world	192	62,3%	116	37,7%
Contributes to teaching tailored to the needs of today's students	226	73,4%	82	26,6%
It enables better achievement of learning outcomes and the acquisition of knowledge	179	58,1%	129	41,9%
It enriches the educational process with new content	193	62,7%	115	37,3%
It creates more work for teachers	126	40,9%	182	59,1%
It has no impact	8	2,6%	300	97,4

In Tables 4 and 5 it can be noticed that, although the teachers are generally exceptionally satisfied and satisfied (68.2%) with the situation in their institutions regarding the application and implementation of lifelong learning, a slightly smaller number of participants (62%) believe that the physical and technological conditions are exceptionally good and good.

Table 4 - Situation in one's own institution regarding the application and implementation of lifelong learning

How would you assess the situation at your institution regarding the application and implementation of lifelong learning	F	%
Exceptionally favourable	48	15,6%
Approving	162	52,6%
Neutral	76	24,7%
Unfavourable	7	2,3%
Exceptionally unfavourable	4	1,3%
No response	11	3,6%

Table 5 - Assessment of conditions in one's own institution for participation in lifelong learning

How would you assess the conditions (computer equipment, availability of teaching cabinets / classrooms for teachers, Internet, general support) for teachers in your institution for participation in lifelong learning?	F	%
Exceptionally good	82	26,6%
Good	109	35,4%
Satisfactory	60	19,5%
Insufficient	36	11,7%
Exceptionally insufficient	10	3,2%
No response	11	3,6%

A quarter (25.6%) of participants participated in lifelong learning programs more than 10 times and up to 10 times in the last three years, while the largest number (27.9%) of participants participated in the programs less than 5 times, and 50 participants (16.2%) never participated in the programs.

Table 6 - Participation in lifelong learning programs

How many times have you participated in lifelong learning programs in the last three years?	F	%
More than 10 times	79	25,6%
Up to 10 times	79	25,6%
Less than 5 times	86	27,9%
I did not participate	50	16,2%
I do not know / I do not want to answer	18	5,8%

Table 7 shows the reasons why are teachers engaging in lifelong learning programs. The most common reason for engagement is the development of innovative ways of teaching (33.8%), a personal need for training (25.3%) and improving the quality of education (18.2%). The least number of participants is motivated by pressures from other teachers (1%) and the requirements of the institution in which they work at (0.6%).

Table 7 - Reasons for participation in lifelong learning programs

What do you think is the reason why mathematics teachers participate in lifelearning programs?	F	%
Due to the development of innovative ways of teaching	104	33,8%
Personal training needs	78	25,3%
Improving the quality of education	56	18,2%
Improving teacher competencies	43	14,0%
Career advancement	8	2,6%
Pressure from other teachers	3	1,0%
Recommendations / requirements of the institution where I work	2	0,6 %
Other	3	1,0%
No response	11	3,6%

Lack of time and other reasons were cited as the most common reasons for not participating in lifelong learning programs (participants pointed out that this was mainly because they had just been employed and were not familiar with the possibilities of joining the programs), and a smaller number of participants pointed out the lack of their interest. The results show that 56.25% of participants who have not participated in any lifelong learning programs so far, would be involved if they were convinced through

examples of good practice, 47.9% of them would be encouraged by available and systematic support, 34.2% are motivated by the feeling of responsibility towards their work and profession, a quarter would only get involved if it was compulsory, and 18.7% if participation in programs would be evaluated in the process of election to teaching and scientific-teaching titles. Further on, 12.5% would be included due to the possibility of using different institutional resources, and only 2% of participants said that nothing would motivate them, because they do not want to be included in such programs.

43.8% of participants said that they might be interested in joining institutional lifelong learning programs, 36% would join, 16.9% do not know if they would decide on such a program, and only 10 participants would not be interested in joining.

Table 8 - Interest in attending an institutionalized lifelong learning program

If an institutional lifelong learning program for secondary mathematics teachers were established, would you be interested in attending?	F	%
Yes of course	111	36,0%
Maybe	135	43,8%
No, I don't think such an educational program is needed	6	1,9%
No, I'm not interested	4	1,3%
I don't know	52	16,9%

Most participants pointed out that they highly value communication (84%), pedagogical (81.8%), organizational (72.1%) and digital competencies (75.3%). On the open type question on which contents should be included in an institutionalized lifelong learning program, most participants wrote digital skills, communication skills, and teaching methods for children with special needs. The final data showed the participants' self-assessment of their knowledge of the application of technology and e-learning: it can be noticed that the largest number of participants (45.5%) consider their knowledge good, while 22.7% consider their knowledge satisfactory and 21.8% extremely good.

Table 9 - Assessment of one's own knowledge of different technologies and e-learning in mathematics teaching

How would you assess your knowledge in the field of application of different technologies and methods of e-learning in teaching mathematics?	F	%
Especially good	67	21,8%
Good	140	45,5%
Satisfactory	70	22,7%
Insufficient	15	4,9%
Especially insufficient	0	0,0%
No response	16	5,2%

Most participants think that they would acquire new knowledge and skills through lifelong learning programs which would enable them to better teach their students, which could lead to better prepared and interested students, and consequently to better results at the state graduation exam, ie:

"A teacher who follows trends and works on his lifelong learning will easier convey his knowledge to their students and make it easier for them to solve certain problems, and thus improve the results at the state graduation exam."

and

"If the teacher keeps up with the educational and other trends, students experience such teaching differently – they are more motivated, it is easier to follow the flow of the teacher's thoughts, student-teacher communication is better, teaching contents are presented to the student in several ways, which makes them more understandable to students, the teacher reaches students more easily if he is familiar with different teaching methods and connects mathematics with things that are close to students with ease. Because of all the above, students should have more interest in mathematics, and it should be easier for them to learn".

However, it should be noted that the participants pointed out that lifelong learning programs are not necessarily related to the subsequent success of students at the state graduation exam, nor that the

success of students at the state graduation exam is a crucial criterion to assess the quality of their work or students' knowledge, ie:

"The interest of students and their readiness to work is crucial for success at the state graduation exam. Lifelong learning of teachers gives them additional competencies for work, but it is not crucial for the success at the state graduation exam."

4 CONCLUSIONS

Interpretation of the results indicates that we can accept the first hypothesis, ie that the research has shown that the vast majority (86%) of teachers have a positive attitude towards the concept of lifelong learning. Also, research has shown that teachers positively evaluate the impact that participation in lifelong learning programs has on teaching mathematics and the improvement of the educational component, but do not consider that it helps in the cooperation and communication with parents of students.

Most of the participants participated at least once in some form of lifelong learning, which is a surprisingly good result, given the general non-participation and disinterest of Croats in such programs (Koludrović and Vučić, 2018). At the same time, it is noted that Croatia still lags behind other OECD countries. TALIS survey found that 90% of teachers and principals approached some form of lifelong learning within a period of one year, and the most common type of lifelong learning in which they participated (70% of the participants) are seminars and courses, while learning from their own peers and networking within the school was significantly underrepresented (40%) (OECD, 2019). Also, it should be noted that in this study only a quarter of the participants participated in lifelong learning activities in the last 3 years more than 10 times, and the largest number of participants (27.9%) less than 5 times.

The most common reason for not participating in lifelong learning programs is lack of time and insufficient knowledge about the possibilities of accessing such programs, and a smaller number of participants noted a lack of interest. Also, several participants pointed out that they have not had the opportunity or enough information to get involved in such programs because they had only recently been hired. Results of this survey are in line with the results of other studies which also show that the main obstacles to participating in lifelong learning are lack of time and inability to organize participation in activities due to other obligations, and that engagement in such programs is insufficiently encouraged (OECD, 2019). Youngs (2001) points out that it is extremely important that during the development of lifelong learning programs, sufficient time is planned and allowed (eg a pre-planned number of hours that teachers can dedicate to such programs), as well as financial support for teachers.

Hypothesis 2 can be partially accepted, but further research is needed on the importance and the strength of the influence of each group of examined factors. It was pointed out that the following are the most important reasons for involvement in lifelong learning activities: the desire to develop innovative ways of teaching, improving the competencies of teachers and the quality of education and personal needs for training. On the other hand, only a few participants pointed out that they would participate due to pressures of colleagues or requests of the institution. Koludrović and Vučić (2018), note that engagement in lifelong learning is most influenced by motivational factors directed towards achievement, intrinsic motivation, while external factors are less represented. Also, most participants would engage in lifelong learning activities through examples of good practices, available and systematic support, while significantly fewer would be motivated by extrinsic factors such as the evaluation of participation in programs in the selection process in the teaching and scientific and teaching titles.

The study found that 36% of participants would certainly join the institutionalized lifelong learning programs, while more than half of the participants might or don't know if they would join. Most participants think their knowledge of digital skills is good, while interestingly the TALIS study (OECD, 2019), shows that 40% of teachers emphasize the need for additional education in the field of developing their knowledge related to information and communication technologies, as well as for new teaching methods dedicated to work in multicultural environments and with students with special needs.

Participants pointed out that they recognize the positive impacts that additional knowledge and skills have on teaching students and potentially better their performance at the state graduation exam, but research also highlighted the view that the state graduation state exam is not a crucial criterion for assessing student knowledge or that the role of a teacher should be emphasized exclusively for success at the state graduation exam. Since other studies have shown mixed results in terms of connectivity of lifelong learning and student success (Yoon et al., 2007), we do not believe this should be the crucial criterion for evaluating lifelong learning activities or a key motivating factor for engagement in programs.

Hypothesis 3 can be partially accepted and considered as a starting point for further research. Although the study found that more than two-thirds of teachers are satisfied with the situation and opportunities in their institutions for the application and implementation of lifelong learning and technological conditions for accessing some of the lifelong learning activities, there is room for progress. Also, the above results which indicate that the number of teachers in Croatia who are involved in lifelong learning programs lag behind those in OECD countries and that some teachers do not have sufficient opportunities or interests for participation in these activities, suggest the need for further research and work on this topic.

The purpose of this paper was to determine the attitudes of high school mathematics teachers towards lifelong learning. The study represents a good example of basic research on the topic and points to areas that require further research, but also the elements that need to be kept in mind when planning and designing lifelong learning programs.

Since this study, as well as others, found lack of time and lack of information of teachers about the programs to be the main obstacle for participation in lifelong learning programs, we believe that these are the aspects that it is necessary to further research as well as keep in mind when designing a lifelong learning program. Also, it was emphasized that examples of good practice and systematic support to teachers are important elements for their active involvement in such programs. It was also pointed out that recently hired teachers are not sufficiently familiar with the possibilities and ways on accessing lifelong learning programs. Such results suggest that more research is needed on how the opportunities and importance of access to lifelong learning stand out during education of the teachers.

Additionally, the study found that a lack of interest in the programs of lifelong learning is a common reason for teacher non-participation, but also that teachers are not sure whether they would have engaged in an institutionalized form of lifelong learning. Such findings indicate the need for further research on the possibilities, motivations and needs of teachers to participate in lifelong learning programs, and that the establishment of such programs should take into account ways of performing and contents that teachers would consider useful for professional development and teaching. Also, it is necessary to further investigate what type of lifelong learning programs is most popular in Croatia and whether there are differences between participants.

The biggest limitation of this study is that not all participants who approached the survey responded to all questions, and that the number of female teachers in the sample is overrepresented, as well as those who have more than 10 years of professional service. Also, it was not possible to obtain more details on what forms and types of activities the participants attended, as well as their satisfaction and influence that those activities had on their teaching.

5 REFERENCES

1. Aykaç, Murtaza, Aslandağ, Buket i Köğce, Davut. (2020). The Examination of Prospective Mathematics Teachers' Perceptions of Lifelong Learning Competencies. *Journal of Computer and Education Research*. 10.18009/jcer.751476.
2. Ball, D. L., & Cohen, D. K. (1999). Developing practices, developing practitioners: Toward a practice-based theory of professional development. U G. Sykes and L. Darling-Hammonds (ed.), *Teaching as the learning profession: Handbook of policy and practice* (30–32). San Francisco, CA: Jossey-Bass.
3. Beswick, K. & Fraser, S. (2019). Developing mathematics teachers' 21st Century Competence for teaching in STEM contexts. *ZDM*, 51(6), 955-965. <http://doi.org/10.1007/s11858-019-01084-2>
4. Čupić, R. (2015). *Pedagogija cjeloživotnog obrazovanja – teaching material*. URL: https://www.ufri.uniri.hr/files/nastava/nastavni_materijali/141117_Renata_Cepic_Nastavni_materijal_PCO_LOCK.pdf (Accessed 2022-02-07)
5. Hasanah, U. (2020). Key definitions of STEM education: Literature review. *Interdisciplinary Journal of Environmental and Science Education*, 16(3), e2217. <https://doi.org/10.29333/ijese/8336>

6. Horvat, Z. (2019) Didaktičko-metodičke kompetencije nastavnika matematike, Doctoral disertation, The Faculty of Humanities and Social Sciences, Zagreb
7. Koludrović, M. & Vučić, M. (2018) Učimo cjeloživotno učiti i poučavati. Priručnik za nastavnike u obrazovanju odraslih. Zagreb: Agencija za strukovno obrazovanje i obrazovanje odraslih. Zagreb: OG Grafika d.o.o., 2018.
8. Kvantitativne metode istraživanja: anketa i analiza sadržaja, Lamza Posavec, Vesna, Zagreb, 2011., p. 13
9. Mijatović, A. (2000), Leksikon temeljnih pedagoških pojmova. Zagreb: Edip.
10. Mišurac Zorica, I. (2007) Stavovi studenta učiteljskih studija o matematici. In: Pavleković, M. (ur.) Proceeding of the International Scientific Colloquium MATHEMATICS AND CHILDREN (How to teach and learn mathematics). Osijek Faculty of Education; Osijek: Grafika d.o.o., p. 263-273.
11. Nacionalna koalicija za digitalne vještine i radna mjesta. URL: <https://digitalnakoalicija.hup.hr/povelja-o-digitalnim-radnim-mjestima/> (Accessed 2022-02-15) Povelja o digitalnim radnim mjestima
12. OECD (2005), Teachers Matter: Attracting, Developing and Retaining Effective Teachers, Education and Training Policy, OECD Publishing, Paris, <https://dx.doi.org/10.1787/9789264018044-en>.
13. OECD (2019), TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners, TALIS. OECD Publishing: Paris.
14. Radeka, I., Sorić, I. (2006). Zadovoljstvo poslom i profesionalni status nastavnika, Napredak 2(1), 161-177.
15. Strategija obrazovanja, znanosti i tehnologije. URL: <http://www.kvalifikacije.hr/sites/default/files/news/2018-01/Nacrt-prijedloga-strategijeobrazovanjaznanosti-i-tehnologije.pdf> (Accessed 2021-12-17)
16. TORRES, Juan Manuel & Hossein Mohand, Hossein & Gómez, Melchor & Hossein Mohand, Hassan & Cáceres- Reche, M^a. P. (2020). Mathematics Teachers' Perceptions of the Introduction of ICT: The Relationship between Motivation and Use in the Teaching Function. Mathematics. 8. 2158. 10.3390/math8122158.
17. Tovkanets, Hanna. (2018). Lifelong Learning in Enhancing Professional Teacher Training in the European Countries. Comparative Professional Pedagogy. 8. 23-27. 10.2478/rpp-2018- 0015.
18. United Nations (2015), Transforming our World: The 2030 Agenda for Sustainable Development, United Nations, New York, NY,
19. Vizek-Vidović, V. i sur. (2005). Cjeloživotno obrazovanje učitelja i nastavnika. Zagreb: Institut za društvena istraživanja
20. Yoon, K. S., Duncan, T., Lee, S. W.-Y., Scarloss, B. i Shapley, K. (2007). Reviewing the evidence on how teacher professional development affects student achievement (Issues & Answers Report, REL 2007–No. 033). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southwest.
21. Youngs, P. (2001). District and State Policy Influences on Professional Development and School Capacity. Educational Policy, 15(2), 278–301.