CASE STUDY OF TEACHING METHODS FOR STUDENTS WITH LEARNING DIFFICULTIES SUPPORTED BY INFORMATION AND COMMUNICATION TECHNOLOGY

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ABSTRACT

The development of information and communication technology has significantly changed the field of education and is used daily in various forms of teaching, especially to adapt educational processes for students with special learning difficulties. This paper reveals the results of a case study which involved teachers employed in two elementary schools in Croatia, and deals with the application of information and communication technology in work with students with specific learning difficulties. The focus of this research was to investigate the relationship between four research variables: a) the perceived level of usefulness of utilizing ICT in the context of working with students with specific learning difficulties, b) the frequency of use of such tools, c) implementation of teaching methods and d) the need for additional ICT training for work with students with specific learning difficulties. A measuring instrument was developed, and an online survey was used as the main method of data collection. In total, 59 teachers (N=59) completed the survey. This case study reveals a statistically significant yet weak correlation between the perceived usefulness of Information and Communication Technology (ICT) and three key factors: a) implementation of teaching methods, b) frequency of ICT use and c) ICT training. The multiple regression analysis has shown that the implementation of teaching methods is a statistically significant predictor for the dependent variable in the model. Most elementary school teachers involved in this case study seldom use ICT tools like Modmath, OmoType or OmoReader. In addition, the teachers mentioned various challenges in connection with the use of ICT in the classroom. Despite the statistically significant correlation, the conclusion of this case study

highlights the need for more ICT training programs, institutional technical support and activities to improve teachers' motivation in such a context.

Keywords: *information and communication technology, learning difficulties, students, case study*

1. INTRODUCTION

The use of information and communication technology (ICT) in education is becoming an important part of education. This includes various tools and resources used to transmit, store, create, share or exchange information (UNESCO Statistic, 2009). The use of information and communication technology (ICT) facilitates adaptation of the teaching and learning content to the specific needs of students with various learning difficulties. The usage of the ICT has a positive impact on students' motivation and additionally promotes their autonomy, stimulates the development of their communication skills and helps them to achieve better results than with traditional teaching methods (Benmarrakchi *et al.*, 2017). The benefits of inclusion for students with learning difficulties are related to students' perceptions of their abilities, attributes and self-esteem (Ntshangase, 2008). Common learning difficulties include dyslexia, dysgraphia, dyscalculia, non-verbal learning disability (NVLD), attention deficit hyperactivity disorder (ADHD), developmental coordination disorder (DCD) and developmental language disorder (DLD).

All the learning difficulties mentioned above are an opportunity for the introduction of appropriate ICT tools that could help students in learning process if they are properly implemented by teachers in the classroom. However, a major challenge, and often the cause of various problems, are a lack of teacher motivation and insufficient ICT skills for successful implementation of teaching methods. Consequently, students with learning difficulties in such a setting may derive less academic benefit from the use of appropriate ICT tools. Exploring teachers' perspectives on using ICT are important as they are enablers of an inclusive learning environment for students with learning difficulties throughout their educational journey.

This paper presents the results of a case study that explores the views of elementary school teachers on the use of ICT tools and implementation of teaching methods for teaching students with learning difficulties. The aim is to identify the potential benefits as well as the barriers and challenges of using these types of tools. The paper is organized as follows: the introduction briefly describes the research problem, followed by the literature review section discussing teaching methods and the specific use of ICT for students with learning difficulties. In the third section, research questions are stated. The fourth section discusses the methodological components and the context of this case study. Research results related to the research questions are presented and discussed in the fifth section of the paper. The research paper concludes by highlighting scientific contributions, suggesting further directions, and addressing this case study's limitations.

2. LITERATURE REVIEW

The term "specific learning difficulties" has been present in research and educational work for many years, and there is also growing interest in this topic among researchers and practitioners (Vouglanis, 2023). Students with learning difficulties face many challenges during the educational process and are those who need extra assistance with schooling related to various cognitive and physical difficulties (Tas and Tatnall, 2017). A large number of different definitions make it difficult to understand the core of the problem and what this term should imply (Pesova *et al.*, 2014). According to the Individuals with Disabilities Education Act (IDEA), a specific learning difficulty is a condition that impairs one or more psychological processes related to the use and understanding of language, whether spoken or written (Yell *et al.*, 2006). In addition, this disorder can manifest itself as difficulties in listening, thinking, speaking, reading, writing, spelling or mathematical calculation. Typically it is diagnosed during early school years, though recognition may not occur until adulthood (Latoya and Schaepper, 2021). Generally speaking, a "*Specific Learning Difficulty (SpLDs) is an umbrella category that includes dyslexia (reading difficulties), dyspraxia (motor difficulties), dysgraphia (writing difficulties) and dyscalculia (mathematical difficulties)*" (Rowlands *et al.*, 2013:200)

Teaching students with such difficulties requires the use of different teaching methods and is often supported by the use of information and communication technology (ICT). According to students and teachers' feedback, the main benefits of ICT use are related to any time information access at different times. On the other hand, students identify insufficient investment in education as the main disadvantage, while teachers highlight a lack of awareness regarding the possibilities of ICT use (Pejić Papak and Grubišić Krmpotić, 2016).

Kaltsidou (2022) compared the school performance of students with learning difficulties using traditional learning methods and learning supported by new technologies. The results showed that children with special learning difficulties can easily adapt to the new learning environment supported by digital technologies and achieve better school performance compared to children using traditional learning methods. Students with learning difficulties that have developed good computer skills enable teachers to use modern teaching methods in elementary school. Students have a positive attitude towards modern teaching methods supported by digital technology (Lepičnik Vodopivec and Bagon, 2016). The impact of the use of ICT for children with disabilities in relation to the PISA test is analyzed in the 2015 OECD report. The results show that the use of ICT improves children's motivation and attitudes towards learning and further education and prepares them for the labor market (Tas and Tatnall, 2017).

The role of the teacher is an important factor in the implementation of technological resources in the learning process of all students, especially students with disabilities (Martínez, 2011). In addition, the quantitative and qualitative research of 777 questionnaires and 723 interviews completed by competent teachers show that there is a lack of adequate training in the use of ICT for students with special needs (Fernández-Batanero *et al.*, 2022).

The conceptual model of teachers' ICT skills, based on a literature review using the partial least squares (PLS) method, showed that teachers are positively motivated to use ICT. Teachers in primary and early childhood education have a lower motivation for using ICT in teaching and learning and a higher knowledge of disabilities. The results emphasize the need for ICT skills training and knowledge about disabilities within educational policy (Medina-García *et al.*, 2021). Future university teachers have a sufficient level of ICT literacy, media literacy and skills that have developed as part of the information culture and informatization of society (Chen *et al.*, 2017).

In the past, there was a lack of research on the usability of various ICT tools for students with learning difficulties (Williams *et al.*, 2006). Today's research (Vouglanis and Driga, 2023) shows that ICT tools supported by collaborative learning, communication and methods to develop critical thinking are helpful for students with dysgraphia. Educational software, appropriate pedagogical methods and specialized frameworks change can improve the learning process for students with dyscalculia and other learning disabilities (Vouglanis and Raftopoulos, 2023). Children with learning difficulties use different types of assistive technology to solve problems in the areas of written language, reading, listening, memory and math. Different types of assistive technology are used by children with learning difficulties to solve written language, reading, listening, memory and mathematic problems. The challenge for teachers and students is to choose the right assistive technology that will be helpful for specific needs (Adebisi *et al.*, 2015). Students with learning disorders such as dyslexia, dyscalculia, dysgraphia and dysorthographia need more time for written tasks. It is helpful if they can use ICT tools based on audio, video, text programs for writing, games, quizzes and maps (Leto, 2018). ICT tools such as virtual reality, that incorporates entertainment into the educational process, support students' reading efforts and the learning process in general. Virtual reality in reading and learning is positively evaluated by students, teachers and parents (Maskati *et al.*, 2021). Students with dyscalculia often have difficulty acquiring mathematical skills, understanding number concepts or relationships between numbers, and learning procedures related to numbers (Reid *et al.*, 2015:4).

Dyslexia, a specific learning difficulty, affects approximately 7-10% of the population. Students with dyslexia prefer different learning styles supported by the adaptive game based mobile learning platforms which can help students to improve their skills in reading, writing, comprehension, Arabic spelling short-term memory, and concentration (Benmarrakchi *et al.*, 2017). Research conducted by Muin *et al.* (2020) shows that 64.8% teachers who have good teaching competences improved by additional training, have expertise to handle students with dyslexia. Experts, professionals and medical doctors could provide information and develop training that can have effect to the dyslexia awareness (Shaw *et al.*, 2019).

Children with autism, ADHD and dyslexia use digital and assistive technologies to facilitate the processes of comprehension, assimilation and consolidation of cognitive functions (Anagnostopoulou *et al.*, 2021). A study conducted by Sahin *et al.* (2018) confirmed that the use of assistive technology, such as smart glasses with socio-emotional coaching, can improve communication, motivation and cognitive functioning in students with autism (Sahin *et al.*,

2018). There are some additional adaptations that are helpful for inclusion and ICT use, such as the multisensory approach (Obradović *et al.*, 2015).

The effective use of communication processes and ICT plays a crucial role in fostering inclusion for students with disabilities. There are cross-institutional and inter-institutional differences concerning generally reasonable adjustments and reluctance to address equality issues for students with disabilities, particularly dyslexia (Ryder and Norwich, 2019). Students with learning difficulties or anxiety included in pre-registration physiotherapy education reported experiences related to communication staff, dialogue issues and dealing with ambiguity concerning disclosure and amplification (Norris *et al.*, 2020) and may face discrimination, less favorable treatment and disclosure (Sanderson-Mann *et al.*, 2005). Students with dyslexia in higher education require reasonable adjustments, that are governed by the Disability Discrimination Act (DDA). The DDA document aims to archive agreements between students, lecturers, and academic institutions about the diagnosis, support, and assessment of students with disabilities (Riddell and Weedon, 2006). There is a major ethical issue that is accompanied by many professional and practical considerations about privacy and disclosure policy for students with disabilities for staff and faculty (Tso, 2018).

In summary on this literature review, current research emphasizes the central role of teachers in the implementation of various ICT tools for students with learning difficulties. Nevertheless, there is a gap between teachers' ICT skills and knowledge for the implementation of such activities in elementary school.

3. RESEARCH QUESTIONS

To address the research problem highlighted in the introductory section and literature review in connection with the use of ICT and implementation of teaching methods for students with learning difficulties, three research questions were formulated in this case study:

RQ1 What is the relationship between: a) the perceived level of usefulness of utilizing ICT in the context of working with students with specific learning difficulties, b) the frequency of use of such tools, c) implementation of teaching methods and d) additional ICT training for working with students with specific learning difficulties?

RQ2 What are the most frequently used applications and tools by teachers in their interactions with students experiencing specific learning difficulties?

RQ3 What barriers and challenges do teachers encounter while using information and communication technology in the educational context for students with specific learning difficulties?

The main research objective of this case study and its novelty is the specific focus on a) ICT tools and their different aspects of use and b) the perspective of elementary school teachers involved in this case study. These two factors are the most important prerequisites for the inclusion of students with difficulties in the learning process in the first years of school. For

this reason, the second aim of this case study is to pre-test the application of the developed questionnaire for specific research purposes and data collection.

Answering the three research questions is important because it will reveal the most common pedagogical practices of elementary school teachers when working with students with learning difficulties. New findings in this area may lead to the development of more effective teaching methods and optimization of ICT use to improve learning experiences for students with specific learning difficulties. Nevertheless, identifying difficulties and challenges that teachers face when working with students with specific learning difficulties is the first step towards overcoming them and providing institutional support or additional professional development for teachers involved in this process.

4. METHODOLOGY

As the data collection was conducted in a specially observed environment (teachers from two elementary schools were included in this case study), this case study is an appropriate research method within which to interpret the research results and draw conclusions.

Case studies are widely use in social science research (Priya, 2021) and enable a researcher to examine the data in specific context, including the limited number of individuals as the subjects of this case study. A case study was chosen for this research as the data collection was conducted using an online survey in only two elementary schools and the sample was small, but it considered a specific problem – the use of ICT tools and teaching methods for students with learning difficulties. According to (Entwistle, 2012) a case study is an appropriate method when the central topic/subject is an individual community rather than a large sample, when the research is conducted in a specific context and the researcher is investigating real-life situations that focus on factors that are important to the specific context. A case study is therefore an appropriate research method for interpreting the research results and drawing conclusions as the data collection was conducted in a specially observed environment.

The rest of this section briefly describes the data collection and the means used for data analysis as well as the measuring instrument used in study. The sociodemographic characteristics of the respondents in this case study are presented.

4. 1 Data Collection and Analysis

The questionnaire for this case study was created using the Google Forms tool. The questionnaire was sent by email to the teachers of selected elementary schools, who could complete it in the period in July 2023. The survey was completely voluntary and anonymous. All questions in the survey were mandatory, so respondents had to answer every question, which reduced the possibility of incomplete answers and the possible exclusion of incomplete surveys. To conduct this case study prior consent was obtained from the two elementary schools where the online survey was distributed.

As the data collection was conducted in a specially observed environment (two elementary schools were included in this case study), a case study is an appropriate research method within which to interpret the research results and draw conclusions.

Descriptive statistical analysis methods were employed to describe the sociodemographic characteristics of the respondents and to present the results regarding the frequency of using various ICT tools and the barriers to their use. In addition, Cronbach's alpha coefficients were calculated to assess the reliability of the measurement scales of this case study instrument and are reported in this section. Correlation analysis was used to investigate the relationship between the four variables concerning the first research question, and Spearman's rho coefficient was applied for interpretation. A multiple regression analysis (R^2) and a calculation of the effect size (f^2) were carried out. IBM SPSS Statistics Version 29.01 and MS Excel were used for the statistical analysis and data visualization.

4. 2 Measuring Instrument

The ICTSD questionnaire was developed for data collection and consisted of questions related to the a) a general part dealing with the demographic characteristics of the respondents, b) the respondents' knowledge of ICT tools for students with specific learning difficulties and teaching methods, c) the extent and level of use of ICT tools and d) the challenges and barriers related to ICT use. There are 40 items in the questionnaire ICTSD created for the purpose of this research.

The most important constructs in this case study were the perceived usefulness of ICT and the implementation of teaching methods. In this research, construct *perceived usefulness of ICT* relates to the benefits teachers perceive while using various information and communication technology to support students with specific learning difficulties. It also encompasses customized teaching methods, enhanced motivation and independence of student and communication skills development. Construct *implementation of teaching methods* in this research emphasizes the accessibility of teaching materials and the suitability of teaching methods for students with special learning difficulties. Specifically, it is about avoiding information overload, using appropriate fonts and colors, using concise texts and different types of stimuli (auditory, visual, tactile) when presenting new content.

Respondents answered each of the items in the rating scales related to the key constructs on the following 1–5 Likert scale: '1—I strongly disagree'; '2—I disagree'; '3—I neither agree nor strongly disagree'; '4—I agree'; '5—I strongly agree'. The names of the main research constructs, the number of items for each construct and a sample item are shown in Table 1. In addition, Cronbach alpha coefficients were calculated to assess the internal consistency of the scales used in the research and are listed as part of Table 1. The values of the Cronbach alpha coefficient as a measure of internal consistency indicate that the internal reliabilities of the scales in our study are very acceptable (Taber, 2018), as their values lie in the range between (0.73–0.95).

Table 1. Key constructs, number of items, exemplary item, and internal consistency, N=59

Key Construct	Number of Items	Example of Items	Internal Consistency (Cronbach Alpha Coefficient)
Perceived usefulness of ICT	6	The use of information and communication technology in working with students with specific learning difficulties helps students achieve better results than with the traditional approach. Information and communication technology makes possible to adapt teaching and content to the specific needs of students with special learning difficulties.	0.926
Implementation of teaching methods	4	I use fonts and colors that are suitable for students with specific learning difficulties. I use different types of stimuli (auditory, visual, tactile) when I process new content.	0.855

Source: Authors

Two additional key variables relevant to the research questions in this case study are the *Frequency of ICT* use and *ICT training*. These variables were assessed using a single-item measurement approach.

4. 3 Respondents

Out of the 72 teachers employed at the selected two primary level schools in the Republic of Croatia, 59 participated in this case study by completing the online questionnaire (N=59). The sociodemographic characteristics of respondents from the sample are listed in Table 1, including gender, age, respondents' level of education and respondents' work experience in the field of education.

Table 2. Demographic characteristics of the respondents, N=59

Sociodemographic Characteristics of Respondents		Frequency	%
Gender	Male	7	11.9
	Female	52	88.1
Age	23 – 30	7	11.9
	31 – 38	9	15.3
	39 – 46	21	35.6
	47 – 54	13	22.0
	55 – 62	9	15.3
	63 +	7	11.9

Level of education	Undergraduate studies	6	10.2
	Graduate studies	48	81.4
	Postgraduate studies	5	8.5
Work experience	Up to 10 years	15	25.4
	From 11 to 20 years	25	42.4
	From 21 to 30 years	12	20.3
	31 years and over	7	11.9

Source: Authors

From the results in Table 2, N=52 female respondents (88.1%) and N=7 male respondents (11.9%) took part in the survey. Majority of the respondents are between 39 and 46 years old, with 22% of them aged between 55 and 62 years. The dominant level of education among respondents was a graduate study, with 81 indicating this category. Regarding working experience in the field of education, 25 respondents, more precisely 43.4%, had 11-20 years of experience, while 25.4% of the respondents in this case study had less than 10 years of experience working in education. In total, 19 respondents had at least 21 or more years of working experience in the education system. In the last question about sociodemographic characteristics, respondents had to indicate whether they were currently working in class organization by classes of students or subject classes – classes organized by subjects and grouped by educational fields. Forty-one respondents from the sample (69.5% of them) were employed as subject teachers, while 30.5% of respondents were employed as classroom teachers.

5. RESULTS AND DISCUSSION

This section presents the results in relation to the three research questions (RQ1-RQ3) in accordance with the statistical analyses performed. In addition, for each research question, a brief discussion highlights the main results of this case study and links to findings from similar studies on the use of ICT tools by teachers working with students with learning difficulties.

5. 1 Interpretation of the Correlation of Key Research Variables

The first research question of this case study was to examine correlation between four key variables: perceived usefulness of ICT, implementation of teaching methods, frequency of ICT use and ICT training. To answer the stated question RQ1, a correlation analysis was conducted, the results of which, or more precisely the values of the Spearman-rho coefficient (r_s), are shown in Table 3 below. The Spearman-rho coefficient (r_s) or rank correlation is appropriate when one of the variables is measured on an ordinal scale or when the condition for normal data distribution is not met, and can be used with small samples (N < 35) (Udovičić *et al.*, 2007, p. 11)

Table 3. Results of Correlation Analysis, N=59

	Perceived Usefulness of ICT	Implementation of Teaching Methods	Frequency of ICT Use	ICT Training
Perceived Usefulness of ICT	1.000			
Implementation of Teaching Methods	0.399**	1.000		
Frequency of ICT Use	0.297*	0.165	1.000	
ICT Training	0.269*	0.233	–0.003	1.000

Source: Authors

The guidelines provided by the authors (Udovičić *et al.*, 2007)most often by Pearson's or Spearman's coefficient, while the significance of the coefficient is expressed by P value. The coefficient of correlation shows the extent to which changes in the value of one variable are correlated to changes in the value of the other. A sign preceding the coefficient of correlation (+ or – were employed to describe the correlation among the variables. The results of correlation analysis indicate following:

- There is a weak positive, statistically significant relationship between variables *perceived usefulness of ICT* and *implementation of teaching methods*, (r_s = 0.399, N = 59, p = 0.01).
- There is a weak positive, statistically significant relationship between variables *perceived usefulness of ICT* and *frequency of ICT* use, (r_s = 0.297, N = 59, p = 0.05).
- There is a weak positive, statistically significant relationship between variables *perceived usefulness of ICT* and *ICT training* (r_s = 0.269, N = 59, p = 0.05).

No statistically significant correlations were discovered for other combinations of variables by calculating the Spearman-rho coefficient.

5. 2 Regression Analysis and Effect Size

In this research, a multiple regression was performed to investigate the relationships between the dependent (criterion) variable, *perceived usefulness of ICT*, and the predictor (explanatory) variables: *implementation of teaching methods*, *frequency of ICT use* and *ICT training*. The coefficient of determination (R^2) was calculated to explain the proportion of the variance in the dependent variable of a regression model that can be explained by the predictor variables. The results of the multiple regression analysis and p values are shown in Figure 1. The interpretation of the R^2 coefficient of 0.267 leads to the conclusion that 26.7% of the variance of the dependent variable (*perceived usefulness of ICT*) is explained by the predictor variables (*implementation of teaching methods*, *frequency of ICT use* and *ICT training*). Results indicate that in the research model, only the variable *implementation of teaching methods* is a statistically significant predictor of criterion variable *perceived usefulness of ICT* since p<0.01.

Figure 1. Results of the Regression Analysis, R^2 = Coefficient of Determination; $β$ = Standardized Coefficient Beta, N = 59
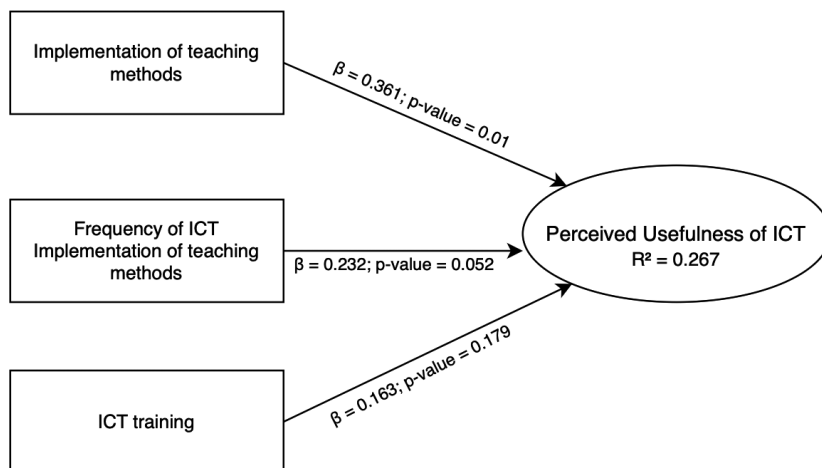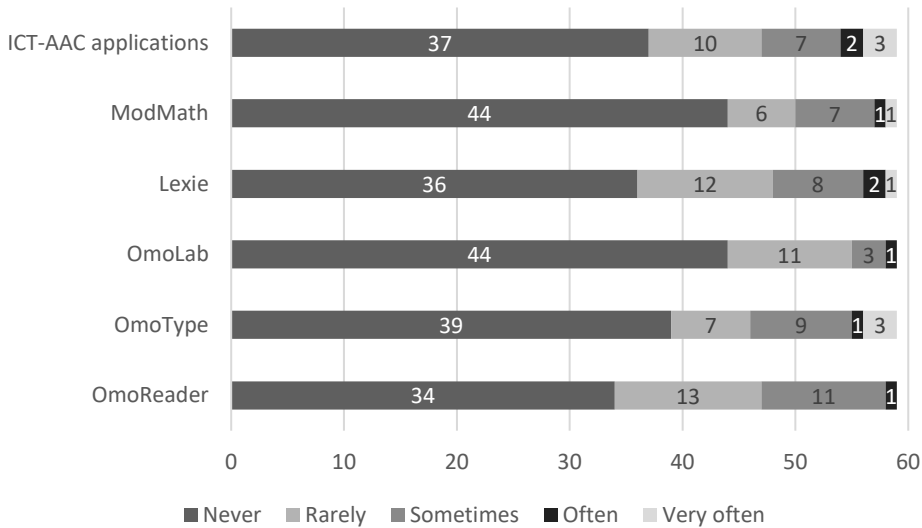

Source: Authors

This result suggests that additional predictor variables should be included in future studies to explain the variance of the dependent variable (apart from the one included in the case study). As the sample in this case study was relatively small, the effect size was examined to determine whether the results of this case study and the associated conclusions were meaningful in the context of this case study.

Cohen's f effect size was calculated as a measure of effect size suitable for multiple regression. The results show that, based on the R^2 value, the effect size (f^2) = 0.36. According to the literature (Cohen, 1992), this value indicates a large effect size, as f^2 is above the critical value of 0.35. These results suggest that the observed effect within this case study focusing on teachers' perspectives on the use of ICT while working with students with learning difficulties is substantial and meaningful, indicating that the results are significant and robust in terms of the relationship between the variables despite the small number of participants in this case study.

5. 3 ICT Application and Tool Usage for Students with Specific Learning Difficulties

Regarding the second research question, frequency of usage of various specific tools and application is shown in Graph 1.

Graph 1. Frequency of Use of Applications and Tools Suitable for Working with Students with Specific Learning Difficulties, N=59
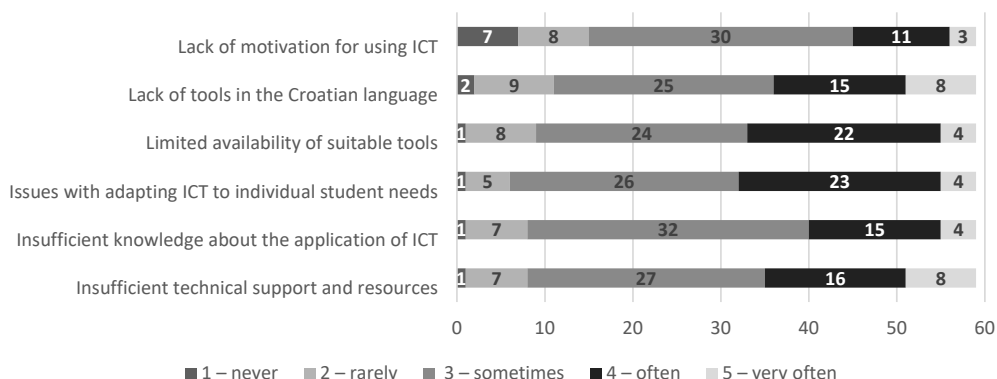

Source: Authors

It can be seen from the Graph 1 that the answers of the respondents predominantly indicate that more than half of them have never used the tools mentioned, which can make teaching easier for students with specific learning difficulties. On the other hand, if we look at the answers of the teachers who state that they use the tools in class, we find that 11 of them sometimes use OmoReader and 9 of them use OmoType. OmoLab is sometimes used by three teachers. Seven teachers stated that they sometimes use the ModMath and ICT-AAC applications. On average, 1-5 teachers reported that they use the tools shown in Graph 1 often or very often. The results suggest that teachers generally do not use these types of tools in the classroom, which could mean that they do not often encounter students with learning difficulties in their work. On the other hand, it should be noted that, after years of professional experience, these are mostly experienced teachers with generations of students behind them in the school desks. The authors want to emphasize that the advanced technology is recommended by Croatian Academic and Research Network (CARNET) and is available to both students and teachers to facilitate the teaching process for students with learning difficulties (Vrdoljak, 2020).

5. 4 Barriers and Challenges Regarding ICT Use

Concerning the third research question, which aims to identify the most common barriers and challenges teachers encounter while using various ICT tools and applications for students with specific learning difficulties, responses are displayed in Graph 2 and are interpreted in the following paragraphs.

Graph 2. Frequency of Barriers and Challenges in the Use of ICT for Students with Specific Learning Difficulties, N=59

Source: Authors

As can be seen from the results of Graph 2, relatively small number of teachers stated that they "*never*" or "*rarely*" encounter any of the above obstacles when working with students who need help with learning and that the teaching process is supported by ICT. The predominant response from teachers in relation to all barriers and challenges covered by the research was "*sometimes*", which can be clearly seen in Graph 2.

Thirty respondents reported that sometimes they are not motivated for ICT use, and 32 indicated that insufficient knowledge regarding ICT use is a barrier to applying it successfully in classrooms. Twenty-seven respondents sometimes deal with limited technical support and resources provided by the educational institution, and for 25 of them, not having the requisite tools in the Croatian language presents a barrier. It should be noted that all applications and tools included in the research are available in the Croatian language and their use is recommended to teachers by CARNET (Vrdoljak, 2020). Therefore, the results of the research indicate that the teachers who participated in the research do not have enough knowledge about the available tools and the possibilities of their use in the teaching process for students with different learning difficulties.

In relation to the negative perception regarding the frequency of obstacles and challenges, 27 teachers reported that they often or very often have to deal with various problems in adapting ICT to the needs of individual students (e.g. students with dysgraphia or dyslexia).

6.   CONCLUSION

The results of this case study show a statistically significant but weak correlation between the variable *perceived usefulness of ICT* and a) *implementation of teaching methods*, b) *frequency of ICT use* and c) *ICT training*. The results also show that most elementary school teachers from our case study never or rarely use ICT tools such as Modmath, OmoType or OmoReader in the classroom when working with students with learning difficulties. The main reasons they

gave for this were insufficient knowledge about the use of such tools, insufficient technical support and their own lack of motivation to use these tools when working with students with learning difficulties.

The results obtained from the research carried out can be used for different purposes. Much can be learned from the results about teachers' attitudes to the use of information and communication technologies, the frequency and nature of their use and the prevalence of barriers and challenges when working with students with specific learning difficulties. The findings of this research can greatly benefit schools aiming to enhance teacher training in ICT for students with specific learning difficulties. This could be achieved through additional subject sessions, workshops and practical training. The insights gained from this case study can also serve as a reference for similar research in different educational settings. Since this research is focused on smaller research sample, a comparative study with a larger sample size could offer valuable insights into teachers' skills, knowledge, motivation, and institutional readiness for implementing these adaptations in the teaching process at regional or national level.

The main limitation of this case study is the relatively small sample size. This case study's findings suggest that, despite the relatively small sample size, the observed effect size (f^2) based on the value of coefficient of determination (R^2) indicates a strong and meaningful relationship between variables in the research model, supporting the significance and robustness of the case study results. Regression analysis results showed that only the variable *implementation of teaching methods* is a statistically significant predictor of criterion variable *perceived usefulness of ICT*.

Secondly, this case study looked at specific tools that can be used in lessons with students with learning difficulties. However, due to the strong development of computer science and artificial intelligence in particular, not all important tools could be listed, which is due to the feasibility of this case study and the length of the online questionnaire. The research's scientific contribution and limitations offer insights for future studies in this domain. The first recommendation is to include a larger number of available tools that can be used specifically for dysgraphia, dyslexia or dyscalculia as examples, to study in depth their application in the teaching process of students with learning difficulties. In this approach, the authors recommend interview as a data collection method to gain detail insights for specific category. Given the validity and reliability of the measuring instrument developed in this case study, its application in elementary schools can be valuable for identifying both opportunities and barriers to the utilization of these tools by teachers.

The novelty and scientific value of this work lies in the fact that the problem of the use of ICT tools in the context of students with learning difficulties has been analyzed from the teacher's perspective. In previous research, the student's perspective is more often included, for example, university students as a target population (Pavin Ivanec, 2022). Even though this topic has been studied in Croatia partly from the general aspect of inclusion of students (see for example Stančić *et al.*, 2015), the value of this case study lies in the fact that ICT

tools and their specific application are included from teacher's perspective. The authors of this paper also emphasize that the case study was an appropriate method to pre-test the application of the developed Questionnaire ICTSD, but for future research it is suggested to use methods such as interviews or focus groups with teachers. As these are specific tools that only some teachers use in the teaching process (taking into account the needs and number of the students with learning difficulties), the authors of this paper suggest that, although the preliminary reliability and validity of the questionnaire used has been confirmed, qualitative methods such as interviews or focus groups would be more appropriate methods for data collection.

The results also suggest that a smaller percentage of teachers have experience with these types of ICT tools. In order to investigate the way of use, barriers and motivation in more detail, the interview method would allow a real insight into the situation related to the research problem. Nonetheless, a questionnaire that is valid and reliable could be received by a larger number of subjects in the future with random selection of the participating schools.

To summarize, even though teachers tend to use appropriate adaptation strategies for such students, they rarely use the appropriate applications and tools. For the future, it is crucial to find effective methods to motivate teachers to use ICT and to provide them with the necessary institutional support and technical training. Removing the barriers identified in this case study is an imperative for a supportive learning environment and long-term positive outcomes for students with specific learning difficulties.

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STUDIJA SLUČAJA NASTAVNIH METODA ZA STUDENTE S POTEŠKOĆAMA U UČENJU UZ PODRŠKU INFORMACIJSKE I KOMUNIKACIJSKE TEHNOLOGIJE

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SAŽETAK

Razvoj informacijske i komunikacijske tehnologije značajno je promijenio područje obrazovanja i svakodnevno se koristi u različitim oblicima poučavanja, posebno kako bi se prilagodio obrazovni proces učenicima s posebnim teškoćama u učenju. Ovaj rad otkriva rezultate istraživanja provedenog među učiteljima zaposlenima u dvije osnovne škole u Hrvatskoj u vezi s primjenom informacijske i komunikacijske tehnologije u radu s učenicima s određenim teškoćama u učenju. Glavno istraživačko pitanje bilo je istražiti odnos između četiri istraživačke varijable: a) percipiranog stupnja korisnosti korištenja IKT-a u kontekstu rada s učenicima s određenim teškoćama u učenju, b) učestalosti korištenja takvih alata, c) primjene metoda poučavanja i d) dodatne IKT obuke za rad s učenicima s određenim teškoćama u učenju. Razvijen je mjerni instrument razvijen za potrebe istraživanja, a online anketa kao glavna metoda prikupljanja podataka. Ukupno je 59 učitelja (N = 59) ispunilo anketu. Studija otkriva statistički značajnu, ali slabu korelaciju između percipirane korisnosti informacijske i komunikacijske tehnologije (IKT) i tri ključna faktora: a) primjene metoda poučavanja, b) učestalosti korištenja IKT-a i c) ICT obuke. Višestrukom regresijskom analizom utvrđeno je da je primjena metoda poučavanja statistički značajan prediktor za zavisnu varijablu u modelu. Većina učitelja osnovnih škola u istraživanju rijetko koristi IKT alate poput Modmatha, OmoTypa i OmoReadera. Osim toga, učitelji su naveli različite izazove u vezi s upotrebom IKT-a u učionici. Unatoč statistički značajnoj korelaciji, zaključak studije ističe potrebu za dodatnim programima obuke o IKT-u, tehničkom institucionalnom podrškom i aktivnostima koje će poboljšati motivaciju učitelja u takvom kontekstu.

Ključne riječi: *informacijska i komunikacijska tehnologija, teškoće u učenju, učenici*