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Availability of implementation of standards of digital competence of secondary education teachers

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Abstract: the article deals with the availability of the implementation of digital competence standards in secondary education teachers. For this purpose, we analyzed data on the digital competence of secondary education teachers who teach in different locations (urban, rural), in schools with different types of ownership (public, private). The data of teachers of all ages and genders are also compared. Theoretical and empirical research methods were used to solve the problems of the study. The results show that the skills of using digital tools have significant differences among teachers of the different locality of teaching. Also, younger teachers have higher rates of digital competence than older teachers. Accordingly, younger teachers from urban areas have better access to implementing digital competency standards. To improve digital literacy and the ability to implement digital competency standards for secondary education teachers, it is necessary to create conditions for teachers from different locales with different levels of digital competency to gain the necessary experience. This requires effective professional development programs for teachers and conditions for continuous self-study.

Keywords: teachers, high school, digital tools, competence.

Introduction

Today's teachers need to have a wide range of digital skills, knowledge of working in a digital environment for quality work with children who actively use various digital technologies. At the same time, it is necessary to teach students not only to be digital users but also to have a high level of digital literacy and competence (Redecker & Punie, 2017). In order to do this, teachers themselves need to enrich their level of digital competence.

Lack of digital literacy creates conditions of inequality in a society where some people have more opportunities than others. Ignorance of the possibilities of technology implementation, its efficiency, and ineffective implementation of technologies limit people's ability to develop and learn. In turn, a high level of digital competence can significantly improve the quality of life of a modern citizen. The goal of digital literacy is to be able to use digital technology effectively and understand how it works. The digital competence skills of the teacher to some extent influence the skills of students, because the teacher is the benchmark of a highly intelligent person, an example that the younger generation should look up to (Icen, 2020; Sahin, 2019). Consequently, a teacher's level of digital competence can provide for the level of competence of students (INTEF, 2017). At the same time, the high level of digital competence of the teacher gives him/her the opportunity to teach students in a quality way. Regarding access to digital technologies, experts (Tsankov & Damyanov, 2019) have made many recommendations. However, experts noted a discrepancy between the requirements for the digital competence of the teacher and the training program for future teachers (Guitert et al., 2021), the lack of materials for training current teachers in the field of digital competence (Cigognin & Parigi, 2016). According to the report (Redecker & Punie, 2017), the Czech Republic has adopted a new framework for digital competencies for teachers. The development of teachers' digital competencies will be gradually integrated into teacher education programs.

This study plans to test the availability of the implementation of digital competence based on a study of its level in teachers of all ages, the area where they teach, and the type of school ownership. Reference guidelines have been developed by international organizations to determine the level of digital competence of teachers. Also, digital competency standards for teachers are noted in international standards (Redecker & Punie, 2017). There is a mismatch between the skills teachers have and those needed to develop those skills in students. Teachers cannot develop the necessary skills in students if they themselves do not possess them (Ramírez-Montoya et al., 2021; Arslan, 2019). To achieve a certain level or increase the level of digital competence, teachers take professional development courses or learn the knowledge they need for their profession (Taddeo et al., 2016). Self-assessment tools allow teachers to assess their level of knowledge in the context of digital competence, to highlight what they do not know, and to develop their knowledge and skills. At the European level, teacher self-assessment tools for digital competence have been developed to help teachers develop their knowledge and skills further (European Commission/EACEA/Eurydice, 2019; Guitert et al., 2021).

The digital education action plan recommends focusing on three aspects: 1. Internal and external school connectivity, school equipment, and management; 2. Digital competence of teachers and students; 3. Quality digital content, curriculum.

Digital competence is not only knowledge of tools, but also certain knowledge and skills integrated into a certain work context. The European Digital Competence Framework defines five areas that define the concept of digital literacy - information processing, communication, content creation, security, and

problem-solving (Tsankov & Damyanov, 2019). Digital literacy is the ability of people to generate new knowledge, access digital data, interpret and synthesize, evaluate, and rationally use digital tools (Dedebali, 2020). Some studies show that teachers have higher levels of digital competence than female teachers (Dedebali & Dasdemir, 2019). Whether or not a teacher learns according to the learning requirements of today is greatly influenced by the teacher's own level of curiosity (Aldan-Karademir, 2019). However, there is little research on how teachers of all ages, from different locations where they teach, can implement digital competency standards.

Research Problem

In this regard, the problem of the study is to investigate how the level of the digital literacy knowledge of teachers differs depending on age, gender, location of work (rural and urban schools), the form of ownership of the school (public or private). Based on the data obtained, a conclusion can be made about the availability of the implementation of the standards of digital competence of secondary education teachers.

Research Focus

Teachers' digital competence based on self-assessment of their digital tools skills.

Research Aim and Research Questions

The purpose of the study is to examine the level of digital competence of teachers and the implementation of standards of digital competence of teachers of secondary education institutions in the Czech Republic.

Objective:

1. To learn the level of digital competence of secondary education teachers
2. Explore the accessibility of digital competency standards through open-ended questions
3. Investigate the difference in the availability of digital competency standards between teachers of different gender, age, urban and rural schools.

Research Methodology

General Background

The study was conducted using a quantitative approach. Theoretical (analysis of scientific literature data, synthesis) and empirical research methods (questionnaires, methods of mathematical statistics) were used.

The research was conducted using an online survey of teachers using the tool Google Forms. The survey was anonymous.

Sample / Participants / Group

A total of 529 secondary school teachers participated in the study. Respondents were selected based on providing detailed answers to the questionnaire. A total of 755 invitations to complete the questionnaires were sent out, and 529 were fully completed. The detailed composition of the respondents' sample is presented below (Table 1).

Table 1

Composition of study participants

Sample characteristics	Type of school property	private		public		
Age of participants	Features of the area	Rural	Urban	Rural	Urban	
Age 20 - 35 years	Women	12	64	48	71	195
	men	10	12	15	18	55
Age 36 - 45 years	Women	22	52	32	65	171
	men	10	22	12	19	63
Total		54	150	107	173	529

Source: Author's own development.

Instrument and Procedures

The accessibility of the implementation of digital competency standards for secondary education teachers was assessed using a questionnaire developed by Tourón et al. (2018). This questionnaire contained 54 items grouped into five categories (information, communication, content creation, safety, and problem-solving). The original questionnaire examines the level of knowledge and the level of use of digital technologies, but in our study, we used only the level of use of certain technologies.

The level of use was assessed on a seven-point Likert scale (1 point meant “I don't use it” and 7 points meant “I use it a lot”). Teachers also noted the location where they teach at the school, the type of school ownership, their age, and their gender.

Data Analysis

The data obtained were processed using MS Excel. Differences between groups of teachers by age, gender, characteristics of school (private or public), and location where the teacher teaches (rural or urban) were investigated. The obtained data of the survey are depicted graphically, and the differences between the groups are calculated by Student's t-test. The mean square deviations in the groups were also checked using the normal distribution function.

Research Results

In order to determine the accessibility of the implementation of digital competency standards, a study of digital competency in teachers who teach in schools of different forms of ownership and in different locations was conducted. The results of the use of digital tools are taken into account because this is a measure of the accessibility of digital competence standards. The results are presented in Table 2.

Table 2

Levels of digital competence of teachers taught in private schools

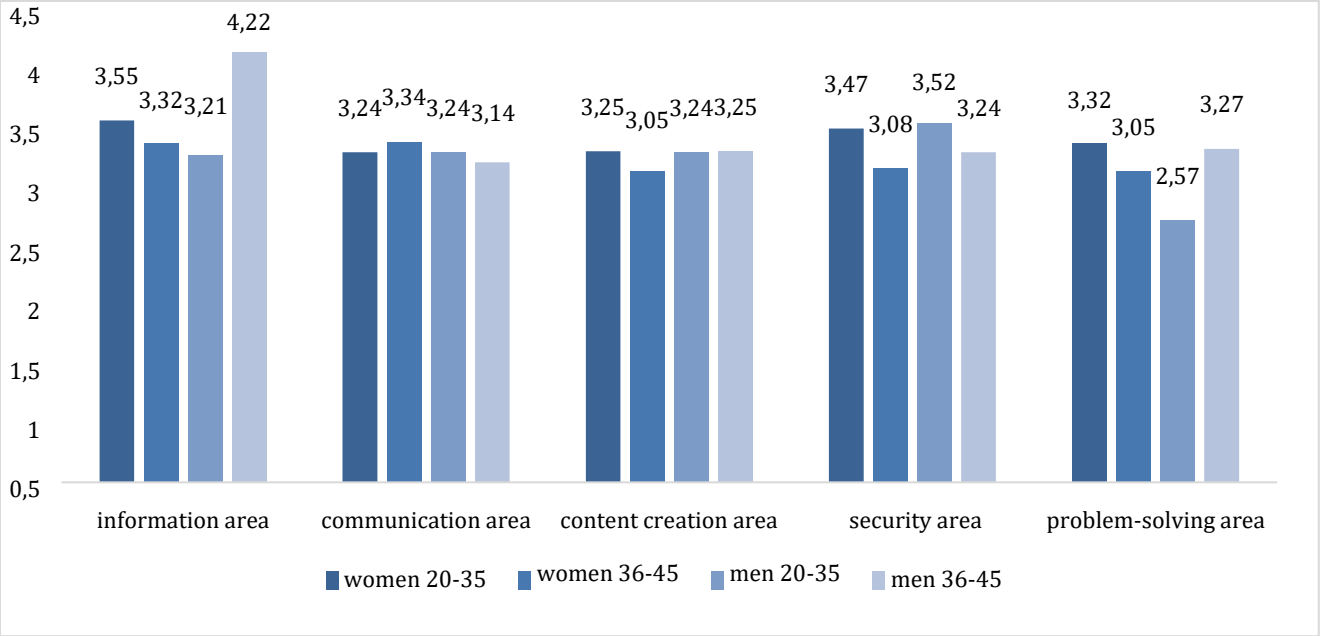
Characteristics of the sample	Type of school ownership	private schools	public schools

Age of participants	Areas of digital competence	Rural	Urban	p	Rural	Urban	p
	Women						
20 – 35 years old	information area	3,55	4,21	>0,05	3,55	3,85	>0,05
	communication area	3,24	4,98	>0,05	3,24	4,65	>0,05
	content creation area	3,25	4,08	>0,05	3,25	3,95	>0,05
	security area	3,47	4,18	>0,05	3,47	4,05	>0,05
	Problem-solving area	3,32	4,21	>0,05	2,45	4,15	>0,05
	Men						
	information area	3,21	4,74	>0,05	3,11	4,62	>0,05
	communication area	3,24	4,48	>0,05	3,55	4,32	>0,05
	content creation area	3,24	4,74	>0,05	3,15	4,64	>0,05
	security area	3,52	4,45	>0,05	3,32	4,57	>0,05
	Problem-solving area	2,57	4,68	>0,05	2,65	4,63	>0,05
36 – 45 years old	**Women**						
	information area	3,32	4,25	>0,05	3,25	4,18	>0,05
	communication area	3,34	4,33	>0,05	3,48	4,38	>0,05
	content creation area	3,05	3,47	>0,05	3,41	3,55	**<0,05**
	security area	3,08	3,55	>0,05	3,41	3,68	**<0,05**
	Problem-solving area	3,05	3,74	>0,05	3,07	3,72	>0,05
	Men						
	information area	4,22	4,43	**<0,05**	3,64	4,39	>0,05
	communication area	3,14	4,68	>0,05	3,14	4,88	>0,05
	content creation area	3,25	4,54	>0,05	3,25	4,28	>0,05
	security area	3,24	4,22	>0,05	3,2	4,19	>0,05
	Problem-solving area	3,27	4,53	>0,05	2,81	4,26	>0,05

As can be seen from the results of the survey on the use of different types of digital tools, teachers taught in private schools located in rural and urban areas have a statistically significant difference in almost all indicators of the use of digital tools (Table 1). Comparing the results between men and women of all ages, there are statistically significant differences in digital competency scores between men in the information ($p>0.05$) and problem-solving areas. In these areas, men who teach in private schools in rural areas, ages 36-45, have better rates of using digital tools than men ages 20-35. Also, in these areas, men have significantly higher rates of women of the same age and age 20-35 (Figure 1).

Figure 1

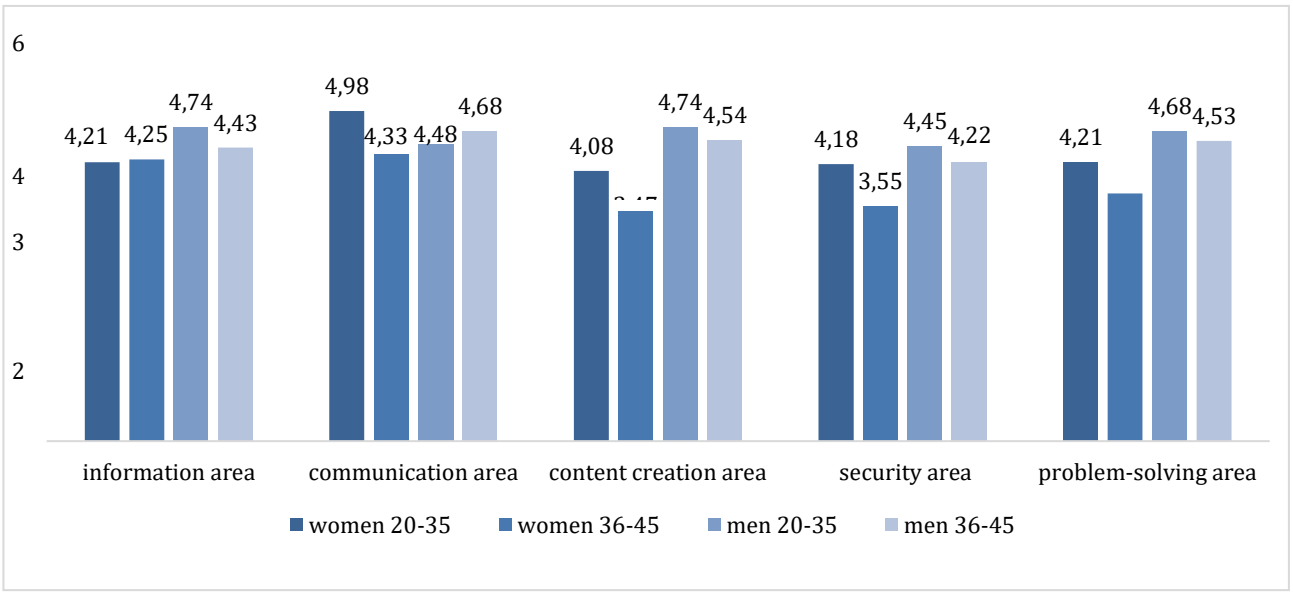
Indicators of digital competence of teachers who teach in private schools in rural areas



Analyzing the indicators of digital competence in private schools, which are located in cities, we note the following differences (Figure 2):

Figure 2

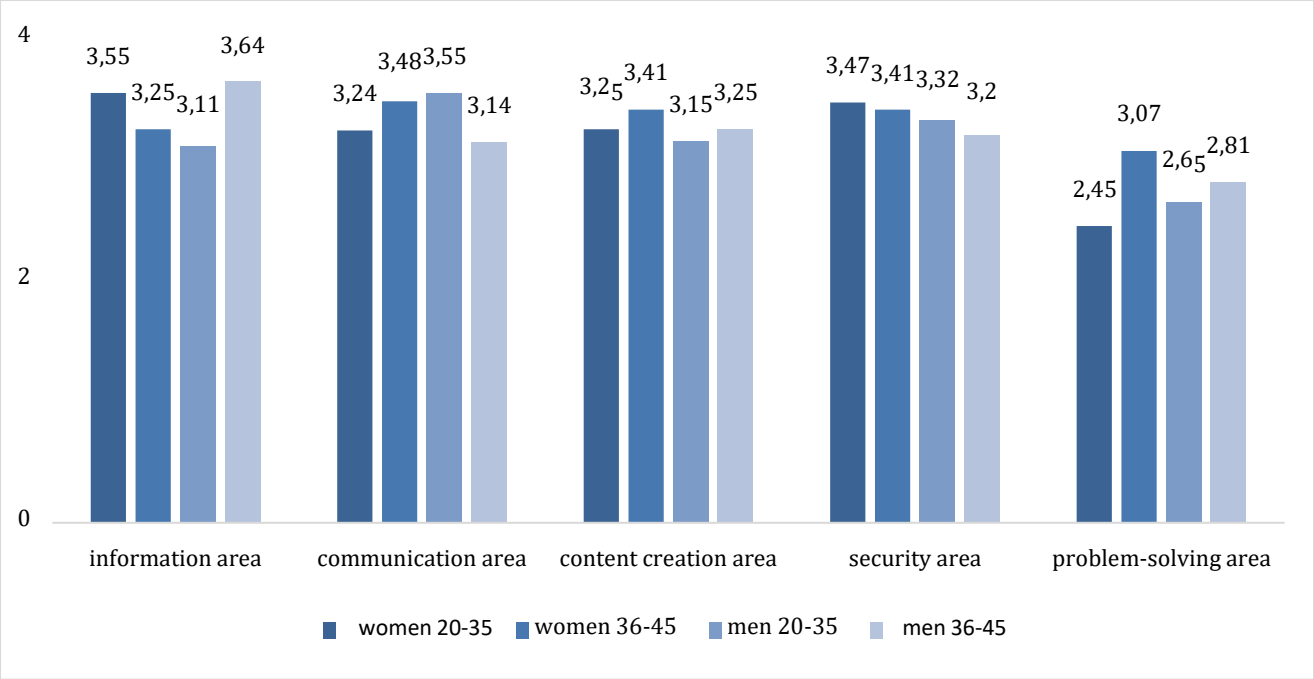
Digital competency indicators for teachers who teach in urban private schools



As can be seen from the results presented in Figure 2, there are quite significant and statistically significant differences between the indicators of teachers in the indicators of digital competence. Specifically, in the area of communication, a statistically significant difference is observed between the indicators of the use of digital tools in the area of communication, content creation, and security for women of all ages ($p>0.05$). There is no statistically significant difference between the scores of men of all ages ($p<0.05$). The results of men and women aged 20 - 35 years have significant differences in the area of information, communication, and content ($p>0.05$). Comparing the levels of digital competence of men and women aged 36 - 45 years, a statistically significant difference is not observed ($p<0.05$). Interesting results of the level of digital competence in teachers taught in public schools (Figure 3, 4):

Figure 3

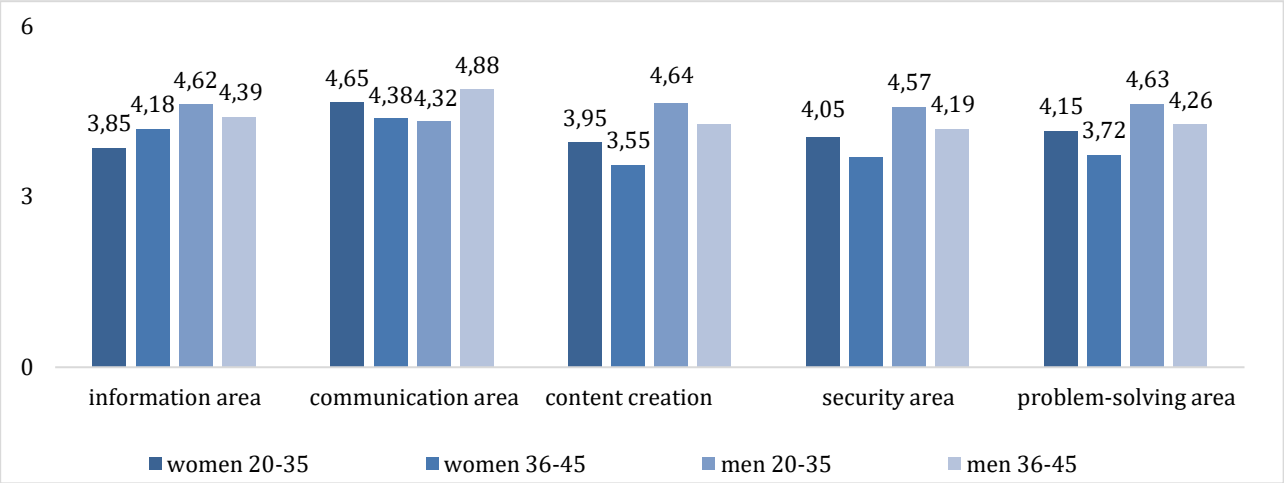
Indicators of digital competence of teachers who teach in public schools in rural areas



As the results show, for teachers teaching in public schools, there is a statistically significant difference between the rates of men aged 20 - 35 and 36 - 45 in the area of information ($p>0.05$), and between the rates of women of all ages in the area of problem-solving ($p>0.05$).

Figure 4

Digital competency indicators for teachers who teach in urban schools

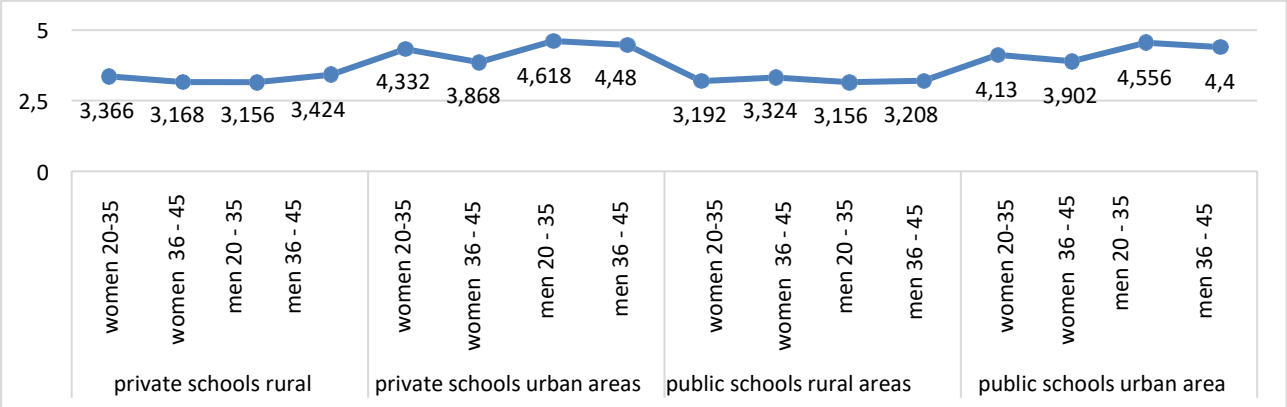


In urban public schools, there are significant differences in the digital competency scores of men and women ages 20 - 35 in information, men of all ages in communication, content creation scores of women and men ages 36 - 45 (men have higher scores), and scores of women ages 36 - 40 and men ages 20 - 35 in problem-solving ($p>0.05$).

Analyzing overall digital competency scores as an average of all competency domains, we can conclude that men aged 20 - 35 from urban private and public schools have the highest scores (Figure 5). Men aged 20 - 35 from private schools have significantly higher rates of digital competence than men of the same age who teach in public schools.

Figure 5

Generalized indicators of digital competence of teachers



The indicators of digital competence of teachers who teach in private and public schools in rural areas do not have statistically significant differences, as well as the indicators of teachers who teach in public and private schools in urban areas ($p<0.05$). Consequently, the impact on the level of digital competence of teachers is the location where they teach, but not the type of school ownership.

Discussion

The results of the study of the availability of the implementation of digital competency standards for teachers in schools of different forms of ownership, all ages, genders, in different locations show a significant advantage of urban teachers in the use of digital tools. These results can be explained by a number of factors - the use of digital competency training for teachers used by school administrators, the specifics of the students' curriculum and teacher knowledge requirements, or the characteristics of the students themselves in private and public schools. We believe that private schools have higher requirements for teachers' general competence, and this has implications for teachers' digital competence as well.

At the same time, teachers must have a certain level of knowledge and skills of working with digital tools for school work (García-Vandewalle García et al., 2021). This research confirms the findings of Dedebali (2020) that men have higher levels of digital skills than women. New data are studies on teacher qualifications in schools of different locations and in teachers of all ages.

Future research should test the use of digital technology and the varieties of devices teachers use for self-study and student learning. Interesting research on the reciprocal influence of digital competence of teachers and their students.

Conclusions and Implications

The study shows that the availability of the implementation of digital competency standards for secondary school teachers is statistically higher in urban areas than in rural areas. Neither does the type of school ownership have a reliable impact on the level of digital competence of teachers, and therefore on the availability of implementation of digital competence standards. It is more influenced by the locality and, therefore, by the teacher's ability to improve his/her level of proficiency on a certain issue. To level out the difference between the accessibility of the implementation of digital standards for teachers from different locations and for teachers of all ages, it is necessary to introduce various professional development courses, conferences, and discussions in the teaching staff to discuss the issues arising for teachers of all ages and with different levels of understanding and perception of technology. It is a matter of school administrators and a teacher's personal interest in professional development.

Many factors can influence these outcomes, such as rural and urban mentality, the level of digital literacy in the general public, and many others.

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