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Teachers' Perspectives on Using Information and Communication Technology in the Secondary School Practice: A Case Study

Gulzhana Kuzembayeva[1], Aru M. Taganova[2], Diana Spulber[3] & Zhumagul Maydangalieva[4*]

Abstract

Information and communication technology (ICT) is used in all spheres of life, including education. Educators are encouraged to use ICT in the classroom, and their technology is constantly improving. The relevance of the study lies in the fact that ICT has become an essential issue and a powerful tool in the educational process. The ICT is applied from the preschool to the university level, facilitating the educational process, changes, and reforms in the field, especially under the influence of the COVID-19 pandemic. The ICT use causes crucial changes in education, visible in the very structure of the educational process and the roles of its stakeholders – students and teachers. The importance of specific requirements for ICT use is proved by the necessity to adapt to a changing reality in secondary education according to modern requirements, especially for elderly educators. This fact is also critical for the school administration concerning the professional development of teachers. Our study aims to explore teachers' perspectives on using ICT in secondary school education and the relationship between teachers' age, education, work experience and the aptitude for using ICT in teaching practice. The primary research approach is an exploratory-descriptive research based on qualitative and quantitative methods for collecting information from secondary school teachers using a survey and on-site observations. The study's results depict that the technology used in the educational process affects the growth of teachers' professional competence and contributes to high motivation of students, valuable results in teaching, and a substantial improvement in the quality of education. However, it causes particular challenges for teachers and the school's administration. The research data provide possible solutions for refining the ICT use in education and offer insights into effective teaching using technology in secondary schools.

Keywords: *Information and communication technology, ICT, technology, secondary education, school, teachers' perspectives*

Introduction

Information and communication technology (ICT) has become one of the most critical parts of curricula in the world education system (Chubakumzuk & Moameren, 2021). The active use of

[1] *Ph.D. in Philology, Associate Professor, K. Zhubanov Aktobe Regional University, kuzembayeva@mail.ru*
[2] *Candidate of Education, Associate Professor, K. Zhubanov Aktobe Regional University, aru73@mail.ru*
[3] *Ph.D., Professor of the Department of Theory and History of Journalism, Peoples' Friendship University of Russia (RUDN University); Professor of the Department of Education, University of Genoa, 22spulber@gmail.com*
[4] *Ph.D. in Education, Associate Professor, Baishev University, maydangalieva@mail.ru*

ICT in teaching is associated with the process of informatization, and it is the most crucial factor in updating the education system following the requirements of modern society (Nazarova, 2016). The emergence of ICT in education changes the precise structure of the educational process, and the roles of its stakeholders (students and teachers) are changing substantially (Yamaletdinova, 2016). In line with the theory of generations people aged up to 25 years perceive the digitalization of education in a natural way, as most of them were born in the period of rapid development of gadgets (Papadakis, 2018). The emergence of new technologies is fraught with the need for continuous advanced professional training of teachers. This forces them to adjust themselves and rebuild their methodologies and approaches to the new learning paradigms (Bates & Bates, 2015). As reported by previous researchers (ul Haq & Akhtar, 2013; Moalosi, 2013), there is a disparity between teachers' age, experience, and teacher effectiveness.

In view of the dynamic introduction of digital educational environments and e-learning (Kalimullina et al., 2020), as already mentioned, the issue of using ICT in secondary school education, and teachers' perception of its integration into teaching process related to their age, level of education and work experience is raised. This article provides the analysis of teachers' perspectives on using ICT in secondary school teaching practice. The study results offer insights into effective teachers' practices using technology in a secondary school.

Research Questions

The present research aims to explore the following research questions:

RQ1: What is the teachers' perception about the effect of using ICT in the classroom on students learning process? This research question investigates what secondary school teachers feel about using ICT during classes.

RQ2: What is the correlation between teachers' age, level of education and experience and the aptitude for using ICT during the classes? This research question comprises the correlation analysis between teachers' age, education, work experience, and their predisposition to use ICT during the teaching process.

Hypothesis

There is no statistically significant relationship between the secondary school teachers' age, level of education, and work experience in relation to their ICT skills, integration of ICT into the teaching practice, and their barriers to using ICT.

Literature Review

The use of ICT has a long history, and one can state that ICT has changed traditional approaches to learning and led to reforms in the education system. Historically the use of ICT in education was introduced in 1924 by Sidney L. Pressey, a professor at Ohio University, who invented a "rote-and-drill" learning machine; later, this experiment was performed by Skinner in 1954 (Spulber, 2021). Technical and scientific progress has created various tools and resources for teaching and learning through ICT. Therefore, almost all educational institutions use very effective ICT tools for teachers and students (Davis & Ellison, 2003; Tadeu et al., 2019) to raise their digital literacy at all educational levels (Chigisheva et al., 2021; Soltovets et al., 2020).

Using ICT in education is understood as "the organization and management of the educational process and cognitive activity of students using computer technology, software and methodological support, communication educational environment to obtain certain, obviously expected results" (Kiselyov, 2014). It is considered from the position of the educational process representing specific goals and objectives, in which the process of informatization or the development of ICT is connected with the development of "information epochs" (Manako & Voronkin, 2014).

Technology has grown concerning quality and efficiency perspectives. The need for technological innovation has led to a communication revolution and the rapid development of technology use in teaching. ICT is a potentially powerful tool for educational changes and reforms (Davis & Ellison, 2003). Teachers are encouraged to use ICT in the classroom, and the applications they use in the classroom, are constantly improving (Badaru & Adu, 2022; Hartoyo, 2008).

Technology plays a crucial role in learning. It seems especially relevant in situations of forced isolation (Kuzembayeva et al., 2022; Soltovets et al., 2021) or geographic remoteness. It is "a tool and environment that makes it easier for people to learn, but the effectiveness of learning depends entirely on the users" (Hartoyo, 2008). Therefore, one of the main goals of using ICT in education is to increase motivation to learn (Shoimqulova, 2020).

Three factors influence the profitable use of technology in teaching. Two of them are connected directly with teacher feelings on the ICT use, and mainly:

1) the pedagogical approach of teachers that can contribute to the appropriate ICT use – the plurality of tools and resources, especially online, present in the didactic scenario makes it possible to meet a plurality of learning needs. The teacher must assess their technical characteristics, degree of accessibility, and relevance to the established didactic path;

2) the knowledge of technology and skill in its use – the ICT devices and the web programs are in a vertiginous change, contributing to the continuous and indefinite multiplication of content available to users. Teachers must continuously update and improve their skills in ICT use in teaching. The school administration must provide advanced training in the use of technology during the teaching process to avoid the teacher facing a demanding challenge;

3) the third factor relates to the student's motivation and competencies. The student's motivation can be endorsed through a relationship of trust with the teacher and the content of a different variety, meeting the students' interests (Caon, 2012). The student's competencies can be increased through methodologies activating the learners' cognitive processes through materials and environments (physical and virtual) offering enjoyable stimuli: content methodologies, materials, and environments through ICT (Ghafur, 2021).

Experts and educational practitioners recommend using ICT in secondary school practice to increase learning effectiveness and improve the quality of understanding and assimilation of the topic under study. ICT can form interaction and improve communicative competence by offering original material for the class or engaging in self-education (Hartoyo, 2008).

Each lesson in a secondary school setting should be aimed at practical results (Mashbitz, 1986). ICT has tools for teaching, learning, research, information and interaction for pupils and educators (Cener et al., 2015). For ICT-assisted learning to be as effective as possible, the physical and psychological environment, didactic materials, and teaching methods should be considered (Chapelle, 1998). The peculiarity of the lesson using modern ICT is that the student finds himself in the center of the activity. In such a situation, the teacher activates the student's activity and becomes a motivator. Most students agree that ICT use in the classroom changes the overall atmosphere and fosters learning (Bogdanova, 2015). It diversifies the learning process and presents the educational material in a visual and accessible way to students. Any diagram, illustration, animation, or sound recording used in the organization of the educational process becomes beyond

a decoration of the lesson, making it more meaningful (Mashbitz, 1986). Moreover, ICT provides diverse options for encompassing and processing information, making sense of ideas, and expressing learning for students with different learning styles. Over 87% of students learn best through visual and tactile modalities, and ICT can help them "experience" the information instead of just reading and hearing it (Kenney, 2011; Tileston, 2003).

It is one of the most critical aspects in preparing students for work and life according to modern requirements. Informatization in school education ensures the students' computer literacy and information culture (Zagainov & Blinova, 2014). Therefore, ICT can impact student learning when teachers are digitally literate and understand how to integrate it into the curriculum (Information, 2021). Bogdanova (2015) highlights the vitality of specific requirements for ICT use and support from the school administration per professional development, contributing to high motivation of students and good results.

The increasing growth of ICT in education has prompted studies on "the impact of technology on learners' motivation, performance, and engagement" (Christopoulos et al., 2018), "the need to help school principals and teachers orchestrate available digital learning resources" (Mayer, 2019; Zhu & Urhahne, 2018). Moreover, it deals with the integration of ICT into the classroom, stating its challenges (Christopoulos, 2021) as "an inability of teacher education programs to build technical knowledge and skills" (Fishman & Davis, 2006). It also covers "a lack of funding and resources" (Nikolopoulou & Gialamas, 2015), "an absence of direction related to e-course design and delivery" (Vongkulluksn et al., 2018), and "limited motivational incentives" (Scherer et al., 2019).

Methodology

Research Design

Research questions and a hypothesis guided the study. The study used an exploratory-descriptive research design to connect with the research problem and the research questions. The research design included data collection, measurement, and analysis. Data collection was conducted through an online questionnaire. The questionnaire was constructed ad hoc considering the regional peculiarities and historical period. The latter is implicit in the COVID-19 pandemic period, during which the educational process had to be modified, and the role of ICT in teaching was accentuated. Teachers faced the challenge of changing teaching methodology, whereas students had to respond to increasing their responsibility for self-management in the learning

process (Spulber, 2021). The sampling was accomplished using the snowball method. The data analysis utilized descriptive statistics and correlation analysis.

Sample

The snowball sampling was conducted by considering the possibility of mathematically formalizing the sample construction process based on social ties as a Markovian chain. Most social networks have been found to have a giant component, covering most populations. From the perspective of state inference, the generalization of the results will have to be limited to the giant component in case a massive distortion is reduced (Vitalini, 2010). The giant component, in this case, was the matter of teaching at secondary school. The sample was designed through the WhatsApp social media platform.

The participants were 104 teachers from 40 secondary schools in Aktobe city, the Republic of Kazakhstan. Table 1 depicts the demographic information of the survey respondents.

Table 1

The Participants' Demographics

Gender	**N**	**%**
Male	5	4.8
Female	99	95.2
Place of work	**N**	**%**
Primary school	-	-
Secondary school	40	100
High school	-	-
Experience	**N**	**%**
0-3 years	21	20.2
3-5 years	7	6.7
5-10 years	21	20.2
10-20 years	30	28.8
20< years	25	24
Education	**N**	**%**
College	2	1.9
Specialist degree	49	47.1
Bachelor's degree	41	39.4
Master's degree	12	11.5
Ph.D.	-	-

Source: author's elaboration based on statistical analysis

Research Instrument

The research aims to investigate the teachers' perspectives on using ICT in secondary school education. The primary research method is surveying the teachers in secondary schools.

The survey was administered through an online questionnaire in Google Forms. The developed questionnaire included participants' demographics (gender, place of work, work experience, and

education), benefits and barriers to using ICT at school, specifics, and perspectives on integrating ICT into secondary school education.

The research instrument's reliability was established using Cronbach's Alpha in SPSS Statistics. The overall Cronbach's Alpha coefficient for the questionnaire was .722, proving that the scale employed in this study is a reliable measurement of the secondary school teachers' perspectives on using ICT (Table 2).

Table 2

Reliability Results of Secondary Schools' EFL Teachers' Perspectives on Using ICT

Item	Scale mean if item deleted	Scale variance if item deleted	SD if item deleted	Corrected item-total correlation	Cronbach's alpha if an item deleted
Q1	30.76923	36.50444	6.041890	-0.060658	0.727362
Q2	29.57692	34.32101	5.858413	0.061966	0.743318
Q3	30.03846	35.55621	5.962903	0.030672	0.733765
Q4	29.20192	36.27653	6.023000	-0.098536	0.772116
Q5	30.66346	36.26174	6.021772	0.000085	0.727586
Q6	30.10577	34.24843	5.852216	0.196881	0.719093
Q7	29.18269	30.53393	5.525752	0.534537	0.684744
Q8	29.33654	29.99251	5.476542	0.623080	0.675967
Q9	29.32692	30.66235	5.537360	0.507360	0.687368
Q10	29.41346	29.87712	5.465997	0.589359	0.677728
Q11	29.50000	30.23077	5.498251	0.588098	0.679526
Q12	29.46154	29.99852	5.477090	0.595083	0.677892
Q13	29.59615	30.14460	5.490410	0.670810	0.674120
Q14	29.41346	29.93482	5.471272	0.601643	0.677110
Q15	29.86539	34.36649	5.862294	0.056573	0.744352
Q16	30.36539	32.36650	5.689156	0.418607	0.699632

Source: author's elaboration based on statistical analysis

The validity of measurement was estimated based on the criterion type of evidence showing the extent to which the result of a measure corresponds to other valid measures of the same concept. The survey findings predicted the results of the on-site observation indicating the research instrument's high criterion validity.

For the validity of the scale, we performed Kaiser–Meyer–Olkin measure of sampling adequacy (KMO) (Table 3).

Table 3

The Results of the Kaiser–Meyer–Olkin Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.752
Bartlett's Test of Sphericity	Approx. Chi-Square	812,124
	Df	210
	Sig.	.000

Source: author's elaboration based on statistical analysis

The Kaiser–Meyer–Olkin test measures the proportion of variance in the variables that might be caused by underlying factors. The results showed that KMO was 0.752, which is good (Cerny & Kaiser, 1977; Gravetter & Wallnau, 2008). All the coefficient values are above 0.722, which indicate that the items have relatively high internal consistency.

Data Collection

The quantitative data were obtained by sending the invitation to participate in the survey and the link to the questionnaire in Google Forms to secondary school teachers through the WhatsApp social media platform. For obtaining qualitative data on the research topic, on-site observation of the ICT integrated lesson was conducted at Sh. Ualikhanov No. 62 Secondary School (Aktobe, the Republic of Kazakhstan). Descriptive data and inferential data are both important to describe the setting and the mood in a detailed manner.

Data Analysis

The data collected from the questionnaires were processed using the Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics and correlation analysis were employed to analyze the survey data. Descriptive statistics of the major variables under study were used to display their frequencies and percentages in tables and figures to answer RQ 1. Spearman's Rank Correlation Coefficient investigated the possible relationship between secondary school teachers' age, level of education, work experience, ICT skills, ICT integration into the teaching practice, and their barriers to using ICT to answer RQ 2.

Results and Discussion

The Perception of Teachers about the Effect of Using ICT in the Classroom on Students' Learning Process

The study results revealed that most teachers (92.3%) consider using ICT in secondary school education to foster students' critical thinking and increase their interest in a lesson. Regarding the frequency of using ICT in the classroom, some teachers (5.77%) refer to the technology-integrated methodology only while introducing a new topic due to a lack of computer equipment or the unavailability of the Internet at school. Other responses (0.96%) suggest that using technology depends on the topic and the lesson plan. However, it is overall rare.

Figure 1 demonstrates teachers' proficiency in using ICT.

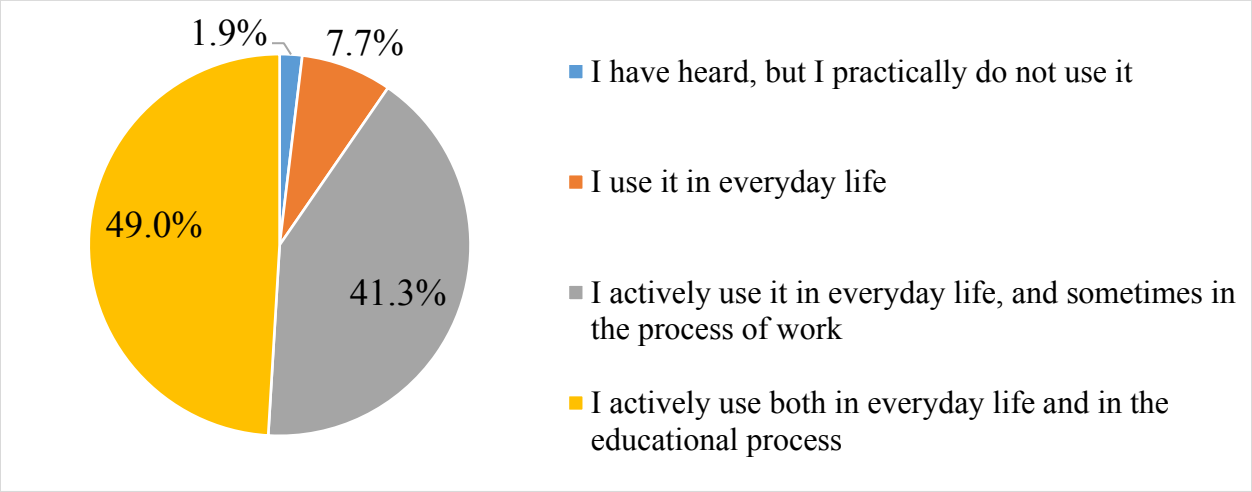

Figure 1. Teachers Using ICT

More than 90% of the respondents actively use ICT daily, and nearly half (49%) state that they also use technology in the educational process. The rapid development of modern technology creates challenges for elderly teachers, and integrating ICT into the lesson can be challenging because of their health status.

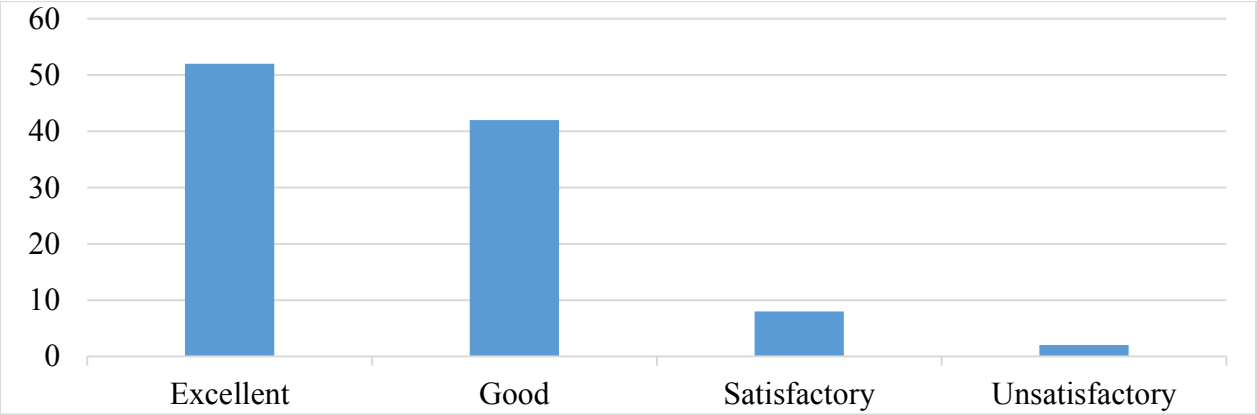

Figure 2. Teachers' ICT Skills

More than 90% of the teacher-respondents evaluate their ICT skills as excellent and good. At the same time, less than 2% state unsatisfactory competency in technology use.

Figure 3 presents the stages of the technology-integrated lessons and the benefits of using ICT.

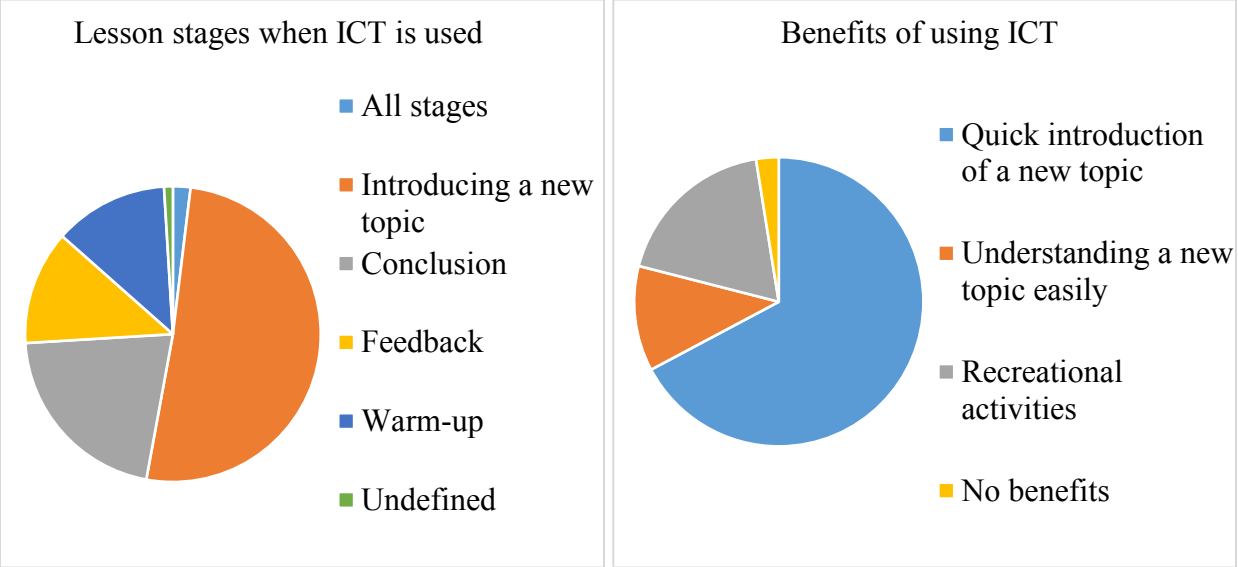

Figure 3. Benefits of Using ICT

According to the teachers, ICT is mainly used when introducing a new topic (51%) as it makes the process quick (76.9%) and easy (13.5%).

The barriers to using ICT in lessons at school can be traced from Table 4. A four-point Likert scale was offered for the response where the following values of strongly disagree – 1, disagree – 2, agree – 3, and strongly agree – 4 were assigned to each response.

Table 4

Barriers to ICT Integration at School

Item	Mean	Min	Max	Std. Dev.
ICT in the learning process is not a priority.	2.538462	1.000000	4.000000	0.869361
My school does not have enough computer equipment.	2.384615	1.000000	4.000000	0.839645
Not enough electronic educational resources exist in my school.	2.394231	1.000000	4.000000	0.885901
My school has limited internet access (slow or unstable connection).	2.307692	1.000000	4.000000	0.893090
In our school, the computer equipment is outdated.	2.221154	1.000000	4.000000	0.847117
Not enough time exists to prepare for technology-integrated classes.	2.259615	1.000000	4.000000	0.870166
I do not have enough opportunities/conditions to develop professional skills in the use of ICT.	2.125000	1.000000	4.000000	0.771929
It is not enough to provide technical assistance to ensure the means of ICT in the working environment.	2.307692	1.000000	4.000000	0.871077

Source: author's elaboration based on statistical analysis

These results indicate that the barriers to ICT integration into secondary school teachers' classroom practices include insufficient electronic educational resources, computer equipment, and slow or unstable Internet connection. Currently, innovative technologies are renewing exceedingly quickly, and the functional literacy of some teachers is low or inadequately developed. Thus, ICT in the learning process is not a priority for them.

On-site observation of the ICT integrated lesson was conducted in the 5th grade of the Sh. Ualikhanov No. 62 Secondary School (Aktobe, the Republic of Kazakhstan). Observation field notes included descriptive as well as inferential data for describing the setting and the mood in a detailed manner. A new topic was introduced during the lesson, and its overview was conducted via a multimedia presentation. The teacher explained the topic, and the students took notes. This finding aligns with the survey results indicating that ICT is mainly used when introducing a new topic making the process quick and easy.

The teacher used the WordWall platform to practice the lesson and took the feedback through the Mentimeter.com platform. Analyzing the data obtained, we noted a high level of student learning activity. Thus, introducing ICT in the educational process contributes to students' motivation. This observation was predicted by the survey that most teachers consider using ICT in secondary school education to foster students' critical thinking and increase their interest in a lesson. It indicates the research design's high criterion validity.

The Relationship between the Teachers' Age, Level of Education, Work Experience, and the Aptitude for Using ICT during Classes at School

Spearman's rank correlation coefficient was used as a hypothesis test to study the relationship between secondary school teachers' age, level of education, work experience, and their ICT skills, integration of ICT into the teaching practice, their barriers to using ICT. Tables 5–6 present correlations based on the collected data.

Table 5

Correlation of the Teachers' Age, Level of Education, Work Experience and the Aptitude for Using ICT during Teaching Process

Items	Age		Level of Education		Work experience	
	r	*p*-value	*r*	*p*-value	*r*	*p*-value
Need for ICT integration into the teaching practice	-.1363	.168	-.1086	.272	-.0856	.388
ICT skills	-.0389	.695	-.0665	.502	.0187	.850
Barriers to Using ICT	-.049	.621	-.157	.110	**-.184**	**.050**

Correlation is significant at $p < 0.05$ level (2-tailed)

Source: author's elaboration based on statistical analysis

No significant correlation exists between the secondary school teachers' age, level of education, work experience and their ICT skills, need for integration of ICT into teaching practice as a result of the correlation analysis. However, an almost negligible relationship exists between the teachers' work experience and the barriers of using ICT in secondary school education. The weak negative relationship indicates that experienced teachers face less barriers in integration of ICT into teaching practice.

Table 6 presents the correlation between the teachers' age, level of education, work experience, and the barriers to using ICT in their teaching practice.

Table 6

Correlation of the Teachers' Age, Level of Education, Work Experience, and Barriers to Using ICT during Teaching Process

Items	Age		Level of Education		Work experience	
	r	*p*-value	*r*	*p*-value	*r*	*p*-value
ICT in the learning process is not a priority.	-.048	.632	.065	.512	.025	.803
My school does not have enough computer equipment.	-.029	.772	-.087	.380	**-.203**	**.038**
Not enough electronic educational resources exist in my school.	-.052	.598	-.151	.126	**-.226**	**.021**
My school has limited internet access (slow or unstable connection).	-.003	.978	-.130	.187	-.166	.093
In our school, the computer equipment is outdated.	-.055	.582	-.171	.083	**-.201**	**.041**
Not enough time exists to prepare for technology-integrated classes.	-.150	.128	-.138	.161	-.143	.148
I do not have enough opportunities/conditions to develop professional skills in the use of ICT.	-.079	.428	-.184	.061	-.157	.111
It is not enough to provide technical assistance to ensure the means of ICT in the working environment.	-.120	.225	-.116	.241	-.187	.058

Correlation is significant at $p < 0.05$ level (2-tailed)

Source: author's elaboration based on statistical analysis

The Spearman's rank correlation test resulted in a weak negative relationship between the secondary school teachers' work experience and the lack of computer equipment, the lack of electronic educational resources, and the outdated computer equipment at school (Table 6). This implies that experienced teachers do not perceive the outdated computer equipment, the lack of computer equipment and electronic educational resources at school as barriers to using ICT in their teaching practice.

The research aimed to investigate the teachers' perspectives on using ICT in secondary school education.

As in any research, some limitations also exist in this research. Because the teachers of secondary schools are mainly women, our sample included only five male respondents. The gender gap in our research limits the understanding of the difference between the women's and men's perceptions of using ICT at school or their technology skills (Baytak, 2022). However, the novelty of the research lies in the fact that this study investigated the relationship between secondary school

teachers' age, education, work experience, ICT skills, integration of ICT into the teaching practice, and their barriers to using ICT.

This research proved that integration of ICT into secondary school education contributes to a substantial improvement in the quality of education leading to the solution of the main task of educational policy. Moreover, it also indicated that ICT is not a priority for Kazakhstani secondary school teachers. This finding contradicts the findings of the previous studies stating the teachers' perception of using technology as a primary tool for pedagogical use (Evans-Amalu & Claravall, 2021; Kabel et al., 2021; Kim et al., 2021; Oguilve et al., 2021).

Contradicting the findings of ul Haq & Akhtar (2013) and Maolosi (2013) that years of teaching experience can affect teacher effectiveness as they can become less motivated due to many years in the service and fatigue, this study shows no relationship between the teachers' age, level of education, work experience with their ICT skills and their interest in the integration of ICT in education. Moreover, the correlation analysis confirmed that teaching experience is associated with less barriers to using ICT during teaching practice.

This study's findings provide possible solutions for refining the ICT use in education and offering insights into the effective teaching using technology in secondary schools. To improve the classroom environment at any level, we encourage that educators promote ICT integration into the educational process by ensuring that using ICT increases technological pedagogical content knowledge of learners in line with the previous research of Erbilgin and Şahin (2021).

Conclusion

The analysis of the secondary school teachers' perceptions about ICT use during classes demonstrated that ICT allows teachers to implement their teaching plans and keep the lesson up-to-date. Integrating technology into the educational process affects the growth of teachers' professional competence. In addition, it contributes to high student motivation, achieving beneficial results in teaching and a substantial improvement in the quality of education, even though it causes specific challenges for teachers and schools' administration. Most teachers actively use ICT during their classes and in everyday life. However, for senior teachers, ICT integration into the classroom may be challenging due to health reasons and the rapid development of ICT.

Barriers to ICT integration into schoolteachers' practices include a limited number of classrooms equipped with computers at school, outdated equipment, and inadequate functioning of the Internet. Most schools are not satisfactorily supplied with appropriate educational technologies. The analysis of the possible relationship between the teachers' age, level of education, work experience, and their aptitude for using ICT during the classes showed no significant correlation. However, the study proved that experienced teachers are less associated with the barriers to using ICT during teaching practice such as the outdated computer equipment, the lack of computer equipment and electronic educational resources. One can conclude that experienced teachers have more opportunities to benefit from using ICT in secondary school education.

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