

# ICT Integration in Secondary Schools: Evaluating Ease of Use and Perceived Benefits for Effective Teaching and Learning

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## Abstract

*This research investigates the integration of Information and Communication Technology (ICT) in secondary schools, focusing on educators' perceptions of its ease of use and perceived benefits for effective teaching and learning. Utilizing a quantitative approach with a survey methodology, data was collected from 60 secondary schools across Lahore and Gujranwala districts, involving 310 secondary school educators (144 males and 166 females). A proportionate stratified sampling technique was employed, and a modified version of the QICT (Questionnaire on the Integration of ICT) was used to assess teachers' views on ICT integration. Five experts validated the instrument with a reliability coefficient of 0.789. Results indicate that ICT integration is crucial for enhancing teaching and learning in secondary schools. Teachers with ICT-related qualifications demonstrated a more significant influence on classroom ICT usage. The study found that teachers generally perceived ICT integration as easy and beneficial, noting improved teaching effectiveness and student engagement. Educators with advanced ICT skills were more effective in incorporating technology into their teaching practices. Overall, the research underscores the importance of ICT in creating dynamic and effective learning environments in secondary education.*

**Keywords:** ICT's, Teaching-Learning Process, Perceived Ease, Perceived Usefulness.

## Introduction

ICT (Information and Communication Technology) gives people the correct necessary information. Today, ICT impacts growth, sparks new ideas, and helps people and groups work better in the digital world and global community (Hafeez et al., 2021). Advanced countries quickly adopt new tech, but developing countries often lack resources, which slows them down. We see this gap in schools, too. Some teachers are just starting to learn basic computer skills, while students in other places know how to use computers, tablets, and smartphones well. In the last 20 years, schools worldwide have started to use more ICT (Saira et al., 2021). People have always tried to use tech to solve problems, and now new ideas come faster than ever.

Adding ICT to education matters greatly to teachers, teacher's society, the government, and local leaders. However, most efforts to bring ICT into schools focus on buying new equipment instead of using it in ways that help students learn. When people use them, current ICT tools can become strong helpers for education. But if folks don't use them well, it can waste a lot of money (Hafeez, 2021a). Teachers need to think about using ICT to improve teaching and learning. Buying stuff like computers, gear, and smart boards doesn't help if you don't know how to use ICT in class. Just

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having tech around doesn't mean teaching and learning will be great. ICT might change what teachers do, but it doesn't always change how they teach. To make fundamental changes, teachers should see ICT as a vital teaching tool, improve at using digital things, and use tech in everyday teaching. Pakistan, like many countries that are still growing, is just starting to bring ICT into its schools. This isn't easy, and many things affect how well schools can start using tech. Even with these problems, ICT could help make teaching and learning better. At its heart, ICT lets people get, mix, keep, and work with info in how we talk. It makes independent learning easier and gives students and teachers worthwhile experiences. When schools use ICT, they can set up livelier, more hands-on, and better learning spaces that prepare students for what the digital world needs (Hafeez, 2021b).

As Pakistan and other growing countries keep investing money into using ICT, it's crucial to focus on the basics and build the know-how and plans to use these tools well. This way, they can close the gap in digital skills and help their people participate in the world's knowledge-based economy.

### **Statement of the Problem**

Sometimes, the belief is that using ICTs will force teachers and learners to change, whereas teaching and learning processes go from being almost exclusively teachers-dominated to students. This change may result in the enhancement of students' learning progress, such as creativity, skills in solving problems, knowledge, and reasoning processes, and prepares students for new technologies in culture and the world. The current study focused on the "integration of Information and Communication Technology (ICT) for effective teaching and learning process at the secondary school level."

### **Objectives of the Study**

The objectives of the study were to:

1. Analyze teachers' perceived ease of use of ICT in secondary school classrooms.
2. Examine the perceived usefulness of ICT in secondary school classrooms.

### **Research Questions**

1. What is teachers' perceived ease of use of ICT integration in secondary school classrooms?
2. What is the teacher's perceived use of ICT integration in secondary school classrooms?

### **Significance of the Study**

ICT is considered significant today as a characteristic of the education process. Students choose the Internet to enhance their social competencies and increase their sense of self. Every day, youths employ technologies, possess good ICT skills, and believe that ICT should be used in learning. For these standards and the national priorities for ICT skills growth education to be met, teachers must be qualified in ICT. Teachers face understandably problematic issues regarding the amount of ICT incorporation in the classroom. Still, to time with, Richardson (2011) opined that teachers and students should maximally utilize the network. Due to the lack of adequate time teachers are given for professional development, this is made more challenging to accomplish. Concerning the role played by schools and teachers, they have to alter how they perceive technology integration into classrooms to achieve effective ICT implementation. This means that educators require an enhanced understanding of how ICT should be incorporated. Including ICT in everyday teaching will also help them strengthen their ICT competencies. This also shows that there were few areas of information deficiency where teachers could apply the ICT approach in teaching high school

technology subjects in Pakistan. A deeper analysis has been done, and this particular subject needs to be addressed. The understanding of the perspectives of the ICT teachers would strengthen the school systems so that ICT is adapted positively into the technology program, as could be gathered from this review.

## **Review of the Related Literature**

### **ICT in Education**

Information and Communication Technologies (ICTs) have revolutionized the accessibility, management, and dissemination of information, contributing significantly to the development of an information-based economy (Cheng, 2006; Hafeez et al., 2022). The role of ICT in education has evolved considerably, with a strong emphasis on its inclusion in advanced education systems. In Pakistan, government initiatives such as the Medium-Term Growth Framework (2005-2010) and Vision 2030 Approach Paper aim to transform the country into an information-based economy. Despite these efforts, effective ICT implementation in education faces challenges like inadequate teacher awareness and poor curriculum integration (Bakhsh et al., 2022).

In developed countries, ICT has successfully enhanced teaching and learning processes. Studies show ICT improves access to information, supports e-learning, and facilitates online enrollment (Hennessy et al., 2010; Rosenberg & Koehler, 2020). However, challenges such as varying teacher training and integration practices persist. For example, despite efforts to introduce ICT in Punjab, India, there is still resistance and ineffective use (Sahu & Pradhan, 2014; Basit et al., 2021).

### **ICT Literacy**

ICT literacy is essential for both educators and learners in the 21st century. Proficiency in ICT is increasingly viewed as critical as traditional literacy skills. The advent of digital media has transformed the concept of literacy, necessitating the ability to navigate and evaluate information effectively. In Pakistan, students' lack of digital literacy poses significant challenges, including exposure to unreliable sources and misinformation (Hashim, 2007).

Kitschner and Davis (2003) identify critical skills for effective ICT use in education, including integrating ICT into teaching and assessment. According to the Organization for International Cooperation and Development (2005) and Gbenga (2006), ICT should support student training, teacher development, and the overall learning process. Jones and Preece (2006) stress the importance of students and teachers valuing technology for educational progress, highlighting the need for continuous development and reduced resistance to technology.

### **Integration of ICT in the Classroom**

The integration of ICT in the classroom is a complex process involving multiple stages. Dawes and Wegerif (2004) outline a four-step model for integration:

1. Incorporating ICT as an extra subject.
2. Using ICT for administrative tasks.
3. Integrating ICT into classroom teaching.
4. Implementing ICT at a systemic level impacts the overall school organization.

Buda (2010) emphasizes the importance of infrastructure, the availability of electronic devices, and teachers' attitudes towards ICT. Challenges in classroom integration include student motivation, administrative support, and the selection of appropriate resources and training. Alazam et al. (2013) identify factors such as lack of expertise, negative attitudes, and institutional support as significant barriers.

### Attitude of Teachers and Their Use of ICT

Teachers' attitudes towards ICT are critical determinants of the application of ICT in teaching and learning. According to Kozma (2005), one of the essential conditions influencing ICT effectiveness is teachers' training, their favourable attitude towards ICT, and their possibilities for applying technologies in their practice. Noss and Pachler (1999) establish that teachers' behaviours, knowledge, and understanding of implementing ICT in educational settings determine its incorporation into the system.

### Theoretical and Conceptual Framework

To analyze ICT integration into education, this study employs two theoretical frameworks. First, constructivist theory is pointed out in the works of Piaget and Vygotsky, which regard education as a process in which learners build knowledge by actively participating in learning experiences. This theory supports the argument that technology should be used as an enhanced, effective means of carrying out what is known as active learning instead of passive knowledge acquisition. In this respect, ICT tools are viewed as constructing meaningful, complex, and engaging contexts to foster students' construction of knowledge. Second, the framework to be evaluated is the Technological Pedagogical Content Knowledge approach, or TPACK, developed by Mishra and Koehler. According to what it says, technology integration is a proposal that is only possible through realizing a teacher's six understandings of technology integration that target in-application teaching methods and subject matter. In integrating these frameworks, the study hopes to assess how ICT can be implemented to support constructivism in education and increase the general performance of instruction.

### Research Methodology

#### Philosophical Research Design

This work's epistemology was positivism. In line with the positivists' view, it is argued that ideas' scientific and realistic consequences should be considered when assessing proposals on conducting analysis and prescribing practical approaches towards developmental solutions (Johnson & Onwuegbuzie, 2004).

#### Research Design

This study adopted a quantitative research method with survey research as the specific design. Descriptive surveys employ questionnaires to establish perceptions, opinions, and practices regarding various issues regarding education and society (Orodho, 2009). This study aimed to investigate the use of ICT in the teaching and learning process to enhance the extent of secondary school education.

#### Population of the Study

The target participants in this research were selected teachers from the secondary schools in the Gujranwala and Lahore districts. The total number of secondary schools and teaching staff in these districts has been elaborated in table 1.

**Table 1: Boys and Girls Secondary Schools of Lahore and Gujranwala Districts**

District	Boys School	Girls School	Male Teachers	Female Teachers
Lahore	153	180	3369	5718
Gujranwala	122	143	2684	2896

### **Sample Size and Sampling Technique**

Two districts of Punjab were chosen: Gujranwala and Lahore. These are two cities in the north-eastern province of Pakistan running along the eastern side of the river Ravi. A sample of an appropriate size was taken through the technique of proportionate stratified sampling, in which each strata of the sample constituted a proportionate of the frequency of that strata in the total population (Ary et al., 2010).

For the case of the Gujranwala district, the sample consisted of 10 percent of the schools and yielded 12 male schools and 14 female schools. Lahore district was selected for the study; the sampling technique involved the selection of 10% of the schools in the district; 15 male and 18 female schools were selected. Therefore, 60 male and female public secondary schools from both districts were identified for data collection and included 310 teachers (81 male and 92 female teachers in Gujranwala).

### **Research Instrument**

A survey questionnaire (QICT) was modified to evaluate the use of ICT for successful teaching and learning at the secondary level. The questionnaire included questions on demographics (gender, academic qualification, age, ICT-related qualification, and ICT handling competence), perceived ease of use of ICT, and perceived utility of integration. The tool, modified by the researcher, included 20 items with a 5-Point Likert Scale ranging from strongly agree (5) to strongly disagree (1).

### **Validity and Reliability of Instrument**

To ensure validity and reliability, the instrument underwent pilot testing. Expert opinions and previous trials verified its legitimacy. A sample of 50 respondents participated in the pilot test. Cronbach's alpha was used to assess reliability, yielding a value of .889, indicating a high level of reliability (Hulin et al., 2001).

### **Data Collection**

Data were collected directly from public secondary schools in Lahore and Gujranwala. Respondents were assured of confidentiality and informed about the study's objectives and purpose.

### **Data Analysis**

The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 16.0. Descriptive statistics (frequencies, percentages, mean, maximum, minimum, and standard deviation) and inferential statistics (independent sample t-test and one-way ANOVA) were employed to determine differences.

### **Ethical Considerations**

The research adhered to ethical guidelines, respecting individuals through informed consent, confidentiality, privacy, and prevention of harm. These principles were strictly observed throughout the study.

### Delimitation of the Study

Due to time constraints and limited resources, the study was delimited to ICT-integrated secondary schools in Lahore and Gujranwala. Secondary school teachers were preferred as primary respondents due to their key role in ICT usage.

### Data Analysis and Interpretation

The present research was undertaken in Secondary Schools to examine the integration of information and communication technologies (ICT). A total of 310 teachers from the districts of Lahore and Gujranwala were surveyed. The data was evaluated in sequential stages. Various statistical methods, such as descriptive variables, descriptive statistics (mean, standard deviation, frequencies, and percentages), tabulated the results. The t-test and ANOVA were also run as an external analysis to figure out the differences between the perception of male and female teachers and their ability to handle ICT in classrooms.

### Results

Table 2 shows the analysis of demographic variables. The table shows that there were 44.8% female teachers and 55.2% male teachers. 52.3% of respondents were aged 30-40, 36.1% were aged 20-30, and 11.6% were aged 40 and above. The overwhelming majority of 48.1% of teachers had an ICT-related degree, while 26.1% had an ICT certification and 25.8% had ICT-related experience. 55.2% of teachers had a high capacity to handle ICT in classrooms, 43.5% had a medium capacity, and 1.3% had a very low capacity.

**Table 2: Frequency and Percentage of the Demographic Variables**

Variables	Frequency	Percentages
<b>Gender</b>		
Male	171	55.2
Female	139	44.8
<b>Age</b>		
20-30	112	36.1
30-40	162	52.3
40-Above	36	11.6
<b>ICT related Qualification</b>		
Diploma	81	26.1
Degree	149	48.1
Experienced	80	25.8
<b>Ability of handling ICT</b>		
High	171	55.2
Medium	135	43.5
Low	4	1.3

### Perceived Ease of Use of ICT in Classrooms

Research Question 1: What is the teacher's perceived ease of use of ICT integration in secondary school classrooms?

The table 3 shows the results of analysis of the perceived ease of use of ICT integration among teachers in secondary school classrooms reveals a generally positive sentiment. Teachers reported

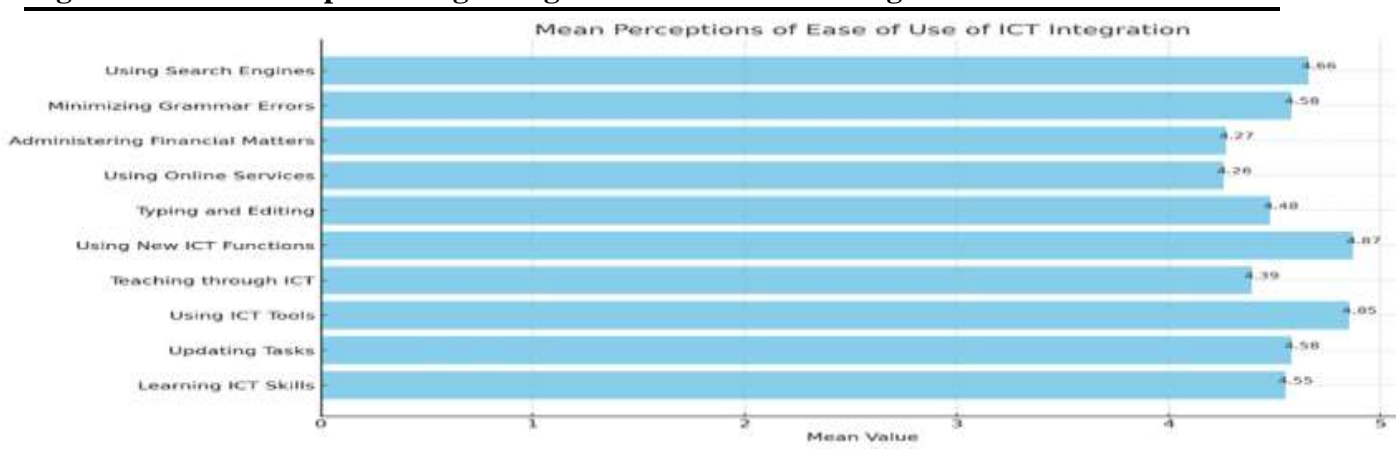


a high level of confidence in learning new ICT-related skills (Mean = 4.55, SD = .49) and found it easy to update their tasks using computer software (Mean = 4.58). They also expressed that using current ICT tools, even with new functions included, was manageable (Mean = 4.87), and overall ease of use for ICT tools was rated highly (Mean = 4.85). The simplicity of typing and editing on computers (Mean = 4.48) and using online services provided by school administration (Mean = 4.26) were also highlighted. Teachers found administering financial matters with software to be straightforward (Mean = 4.27) and acknowledged the benefit of computer software in minimizing grammar errors (Mean = 4.58). Furthermore, using internet search engines like Yahoo, Google, and MSN was considered very easy (Mean = 4.66). Collectively, these findings indicate that teachers are generally comfortable with and find value in using ICT tools in their professional tasks, contributing to a more effective and efficient teaching environment.

**Table 3: Mean Perceptions Regarding Ease of Use of ICT Integration**

Statements	SDA %	DA %	UD %	A %	SA %	Mean	SD
I feel confident in learning new skills related to ICT.	0.0	0.0	0.0	44.5	55.5	4.55	0.49
Updating my tasks using computer software is easy.	1.9	1.9	3.9	20.3	71.9	4.58	0.81
I find it easier to teach by using ICT.	0.0	5.8	12.6	18.1	63.5	4.39	0.91
It is easy for me to use current ICT tools even if new functions are included.	1.9	3.9	9.7	23.2	60.0	4.87	4.46
I feel that using a computer for typing and editing is easy.	1.9	3.9	5.5	21.3	67.4	4.48	0.90
Using online services provided by the school administration is easy.	1.9	6.1	11.3	25.2	55.5	4.26	0.01
It is easy for me to use current ICT tools.	0.0	7.7	13.9	25.8	51.3	4.85	5.59
Administering financial matters using computer software is easy.	0.0	3.9	18.1	25.2	52.9	4.27	0.89
Computer software can minimize grammar errors when producing letters.	0.0	1.9	8.7	18.1	71.3	4.58	0.73
Using an internet search engine such as Yahoo, Google, and MSN is easy.	0.0	1.9	4.8	18.1	75.2	4.66	0.66

**Figure 1: Mean Perceptions Regarding Ease of Use of ICT Integration**



### Perceived Usefulness of ICT

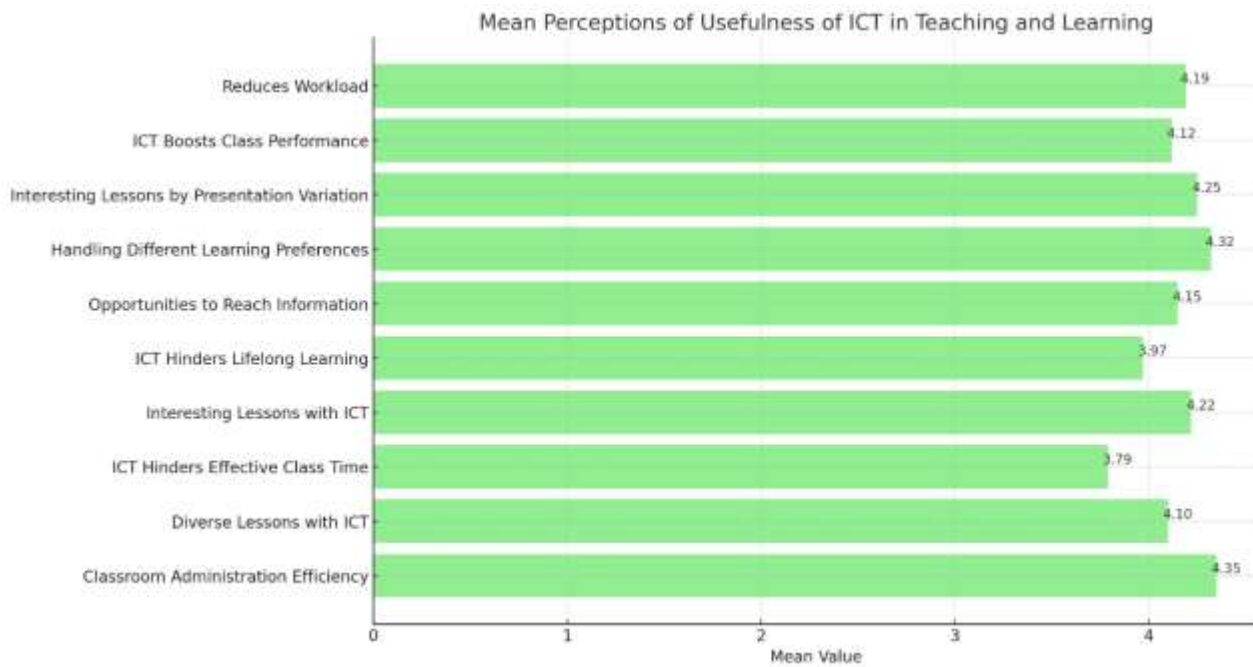
Research Question 2: What is the perceived usefulness of ICT to make teaching and learning more effective in secondary school classrooms?

Table shows the analysis of the perceived usefulness of ICT in teaching and learning. The table demonstrates that teachers generally recognize the benefits of ICT integration in enhancing educational processes. Teachers agreed that ICT significantly improves classroom administration efficiency (Mean = 4.35) and diversifies lessons by incorporating various materials and ideas (Mean = 4.10). However, there was a mixed response regarding whether ICT might hinder effective use of class time (Mean = 3.79) and potentially impact students' lifelong learning abilities (Mean = 3.97). Despite these concerns, teachers found that ICT makes lessons more interesting by incorporating multimedia elements (Mean = 4.22) and offers substantial opportunities to access a vast array of information resources (Mean = 4.15). Additionally, ICT was perceived to support different learning preferences (Mean = 4.32), make lessons more engaging through varied presentation methods (Mean = 4.25), encourage deep cognitive processing and improve class performance (Mean = 4.12), and reduce workload for both teachers and students (Mean = 4.19). Overall, these results demonstrate a great perceived utility of ICT in boosting the teaching and learning experience in secondary school classrooms.

**Table 4: Mean Perceived Usefulness of ICT in Teaching and Learning Process**

Statements	SDA %	DA %	UD %	A %	SA %	Mean	SD
The use of ICT makes my classroom administration more efficient.	4.2	3.9	2.9	30.0	59.0	4.35	1.01
Using ICT makes my lessons more diverse by bringing in different materials/ideas.	3.9	6.1	13.2	31.0	43.9	4.10	1.11
Using ICT for teaching could hinder the effective use of my class time.	5.8	12.3	20.3	20.3	41.3	3.79	1.26
Using ICT makes my lessons more interesting with a mixture of texts, sounds, and images.	4.2	5.8	9.7	24.2	56.1	4.22	1.10
Using ICT for teaching could hinder my students' developing ability for lifelong learning.	10.0	6.5	10.0	23.5	50.0	3.97	1.32
ICT offers me great opportunities to reach a world of information resources.	9.7	3.9	7.7	18.7	60.0	4.15	1.29
I can handle different learning preferences of my students by using ICT.	3.9	1.9	3.9	38.7	51.6	4.32	0.93
Using ICT makes my lessons more interesting by varying the ways it is presented.	1.9	4.2	5.8	42.3	45.8	4.25	0.89
ICT encourages deep processing and boosts class performance.	3.9	10.0	7.7	27.7	50.6	4.12	1.16
Using ICT reduces the workload for my students and me.	3.2	9.0	8.1	24.5	55.2	4.19	1.12



**Figure 2: Mean Perceived Usefulness of ICT in Teaching and Learning Process**

## Discussion

The study provides a comprehensive look into how secondary school teachers perceive the integration of ICT tools in their classrooms, breaking down their views into two main areas: In the context of the theory of technology acceptance model, two constructs that are generally recognized by the researchers are perceived ease of use and perceived usefulness.

### Perceived Ease of Use

As for the first factor, the perceived ease of use, the teachers established that ICT's tools were fairly easy to use, which enhanced their desire of embracing technology in teaching. Such ease of use is generally associated with simplicity and comprehensible layouts of interfaces, as well as comprehensible solutions and helpdesk services. It is worth noting that ICT incorporation did not pose technical difficulties; hence, facilitation of the integration was easy for many teachers (Rosenberg & Koehler, 2015).

Several of these were the following: enrolment in technologically integrated professional development programs that enhance the mastery of ICT tools helped the teachers to develop adequate skills and knowledge for using IT in their teaching. This was also supported by Ertmer and Ottenbreit-Leftwich (2010), who stated that the teachers who claimed to have continuous technical support also expressed increased confidence while using the tools.

However, those marvellous experiences were sometimes accompanied by some not-so-pleasant feelings. Some of the concerns described by teachers were more related to the practical components of the use of ICT tools, where, for instance, the software was outdated, the tools were incompatible with some of the classrooms' settings and equipment, and the tools were difficult to use due to some technical hitches. These are the barriers that should be well addressed so as to allow numerous teachers to optimally incorporate the advantages of ICT in their teaching practice.

### Perceived Usefulness

The other important finding of the study is the actual acknowledgement of ICT tools by the teachers as being purposeful in the learning environment. They mentioned some positive effects, including students' increased interest, opportunities to use a greater number of instructional resources, and the capacity to alter tutors' behaviours. ICTs were viewed as supporting the following instructional approaches: differentiation, interactions, and grouping (Ertmer & Ottenbreit-Leftwich, 2010). Among the most attractive advantages, it is possible to list the overall flexibility, which would allow for creating individual lessons. ICT tools enabled the teacher to adapt to student needs, preferences, and learning style needs, which in the diverse secondary education context can be very crucial.

Teachers' knowledge of ICT devices revealed that these tools also contributed to the effective development of stimulating learning environments. Huge importance is usually given to games, interactive media presentations, and learning software, citing that they would engage the attention of the students and stimulate them into participation. Multimedia as a concept was considered as a method to enhance the learning process and make it more relevant and 'fun' for the students. However, some issues arose concerning the relevance of ICT instruments. A certain number of teachers pointed out that, at times, the technology might not fit well with the standardized course outcomes or instructional purpose and plans. Some expressed that technology could divert the students' attention or even limit direct contact in the classroom. Meeting these concerns entails trying to make ICT part of teaching in ways that would improve on the traditional methods.

### Conclusion

The study on effective practices revealed that teachers of secondary schools mostly discover ICT as beneficial tools that contribute to the enhancement of their teaching techniques. Taking into account the outlook that the teachers presented, they appear to work in a receptive environment that accepts the integration of technology in the class. This finding proves antecedents by other scholars that have declared perceived usefulness and ease of use to hold a lot of influence on the acceptance of new technology. Educators' sentiment towards the use of ICT can also be given by the readiness with which they deploy the technology in their teaching. If the teacher discovers that such technologies have utility and can be implemented in the course conveniently, then the teacher will be more inclined to embrace such technologies. Such conditions could produce more creative and effective ways of teaching and learning. The work does though identify several deficiencies that require correction before the optimum use of ICT in the classroom can be made. Difficulties can be attributed to issues with technology, the absence of money, or inadequate education. Denis & Lamothe suggest that it is essential to identify solutions to the challenges if one wishes teachers to effectively use ICT in the class as well as offer the best to pupils.

### Recommendations

Based on the study's findings, the following recommendations are proposed to enhance the integration of ICT in secondary school classrooms: Based on the study's findings, the following recommendations are proposed to enhance the integration of ICT in secondary school classrooms:

1. Invest in educator professional development: The integration of ICT can only be effective if it has professional development that is devoted to improving the educators' TPACK. The presets should enable training to prepare educators with the gadgets to map usable technology to personal teaching style and course content.

2. Strengthen Support Structures for Technology Adoption: To increase the acceptance for or use of technology in a school setting, enhance the existing support structures as a way of controlling possible factors. This consists of aspects dealing with performance indicators and expectations in relation to access to appropriate technical support, ICT resources, and requisite infrastructure for effective implementation of ICT.
3. Priorities User-Friendly and Flexible Technology Solutions: Select ICT tools that are easy to use, can interface with the existing systems, and can be easily monitored to observe the results. Teachers tend to adopt technologies that are easy to use and/or easy to show the effectiveness of when applied in the classroom.

## References

- Ajmal, S. F., & Hafeez, M. (2021). Critical Review on Flipped Classroom Model Versus Traditional Lecture Method. *International Journal of Education and Practice*, 9(1), 128-140.
- Alazam, A. O., Bakar, A. R., Hamzah, R., & Asmiran, S. (2013). Teachers' ICT skills and ICT integration in the classroom: The case of vocational and technical teachers in Malaysia. *Creative Education*, 3(08), 70.
- Ary, D., Jacobs, L. C., Sorensen, C., & Razavieh, A. (2010). *Introduction to research in education 8th edition*. Canada: Wadsworth Cengage Learning.
- Bakhsh, K., Hafeez, M., Shahzad, S., Naureen, B., & Faisal Farid, M. (2022). Effectiveness of digital game based learning strategy in Higher Educational Perspectives. *Journal of Education and E-learning Research*, 9(4), 258-268.
- Basit, I. F. F. A. T., Bakhsh, K. H. U. D. A., & Hafeez, M. (2021). Adult learning theories and their role in instructional design, curriculum development and educational technology. *Wseas Transactions on Environment and Development*, 17, 1149-1159.
- Buda, A. (2010). Attitudes of teachers concerning the use of ICT equipment in education. *Journal of Social Research & Policy*, 1(2), 131.
- Cheng, Y. C. (2006). New paradigm of learning and teaching in a networked environment: Implications for ICT literacy. In *Handbook of research on literacy in technology at the K-12 level* (pp. 1-20). IGI Global.
- Dawes, L., & Wegerif, R. (2004). *Thinking and learning with ICT: Raising achievement in primary classrooms*. Routledge.
- Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of research on Technology in Education*, 42(3), 255-284.
- Gbenga, A. (2006). Information and communication technology and web mining techniques. In *education trust fund capacity building workshop for knowledge-driven growth for Nigerian universities, University of Ilorin, Nigeria*.
- Hafeez, M. (2021a). Systematic review on modern learning approaches, critical thinking skills and students learning outcomes. *Indonesian Journal of Educational Research and Review*, 4(1), 167-178.
- Hafeez, M. (2021b). Teaching-learning process and ict tools-a review. *Indonesian Journal of Basic Education*, 4(1), 18-27.
- Hafeez, M., Ajmal, F., & Kazmi, Q. A. (2021). Challenges faced by the teachers and students in online learning. *International Journal of Innovation, Creativity and Change*, 15(2), 325-346.

- Hafeez, M., Naureen, S., & Sultan, S. (2022). Quality indicators and models for online learning quality assurance in higher education. *Electronic Journal of e-Learning*, 20(4), 374-385.
- Hashim, J. (2007). Information communication technology (ICT) adoption among SME owners in Malaysia. *International Journal of Business and Information*, 2(2), 221-240.
- Hennessy, S., Harrison, D., & Wamakote, L. (2010). Teacher factors influencing classroom use of ICT in Sub-Saharan Africa. *Itupale online journal of African studies*, 2(1), 39-54.
- Hulin, C. (2001). Can a reliability coefficient be too high? *J Consum Psychol*, 10(1-2), 55.
- Jones, A., & Preece, J. (2006). Online communities for teachers and lifelong learners: A framework for comparing similarities and identifying differences in communities of practice and communities of interest. *International Journal of Learning Technology*, 2(2-3), 112-137.
- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational researcher*, 33(7), 14-26.
- Kirschner, P., & Davis, N. (2003). Pedagogic benchmarks for information and communications technology in teacher education. *Technology, Pedagogy and Education*, 12(1), 125-147.
- Kozma, R. B. (2005). National policies that connect ICT-based education reform to economic and social development. *Human Technology: An interdisciplinary journal on humans in ICT environments*.
- Noss, R., & Pachler, N. (1999). The challenge of new technologies: doing old things in a new way, or doing new things. *Understanding pedagogy and its impact on learning*, 195-211.
- Orodho, J. A. (2009). Elements of education and social science research methods. *Nairobi/Maseno*, 2(6), 26-133.
- Ranga, M., & Pradhan, P. (2014). Generating Solutions for Rural Development through ICT in India. *Journal of WEI Business and Economics-August*, 3(2).
- Richardson, C. J. (2011). Perception of export barriers in a high-tech sector in a less developed country: the case of ICT SMEs in Malaysia. *The South East Asian Journal of Management*, 5(2), 91-105.
- Rosenberg, J. M., & Koehler, M. J. (2015). Context and technological pedagogical content knowledge (TPACK): A systematic review. *Journal of research on technology in education*, 47(3), 186-210.