

Influence of ICT on Teaching Effectiveness in the Digital Age: A Perceptual Study among Educators

Dr. S. Kumar

Assistant Professor, PG Department of Commerce, S.A.College of Arts & Science, Chennai

Mail id : kumarspm2013@gmail.com Orcid id: 0000-0003-2355-8886

Abstract

Purpose: This study primarily aims to evaluate school teachers' perceptions of ICT usage in the teaching and learning process and to determine the level of teaching performance following the implementation of ICT.

Design/methodology/approach – A descriptive research design was employed. The study population comprised CBSE-affiliated schools in the Tenkasi educational district of Tirunelveli district in Tamilnadu. Schools were selected using a judgmental sampling technique, focusing on those that have integrated ICT for over five years. Data collection was conducted using a well-structured questionnaire.

Findings – The findings indicate that teachers view the use of ICT to design learning materials and integrate them into classroom teaching with enthusiasm, considering ICT an essential tool in education. Post-ICT implementation, improvements were noted in teaching performance, including enhanced thinking ability, confidence, and creativity. Correlation analysis results demonstrated a positive and significant relationship between teachers' perceptions and teaching performance related to ICT. Challenges identified include inadequate ICT infrastructure, insufficient ICT training, and a lack of motivation and reward systems for conducting classes through digital technology.

Practical Implication – The study's results may encourage government and government-aided schools to fully implement ICT infrastructure in both urban and rural areas, thereby offering students a world-class education. In the near future, substantial investment in school ICT infrastructure could present lucrative business opportunities for the ICT industry.

Originality/Value – This study highlights how CBSE-affiliated school teachers perceive ICT and the extent to which their perceptions influence their performance.

Keywords - *Academic Performance, CBSE affiliated schools, Information and Communication Technology, ICT usage, Teachers' perception*

1. Introduction

The new era of education significantly enhances creative learning through the integration of Information and Communication Technology (ICT). ICT has dramatically transformed the educational landscape, enabling access to education from anywhere in the world. Defined as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information" (Blurton.C, 1999), ICT in education encompasses tools such as interactive whiteboards, smart TVs, educational mobile applications, desktops, laptops, notebooks, web cameras, CD-ROMs and DVDs, the Internet and World Wide Web, as well as applications like word processors, spreadsheets, simulations, tutorials, digital libraries, electronic mail, videoconferencing, computer-mediated conferencing, and virtual reality. Integrating any of these ICT tools into education undoubtedly elevates it to the next level. Emdin (2008) suggests that incorporating technology into the curriculum will enhance educational practices, allowing teachers to present textbook content more authentically and fostering student-centric learning. Technology integration in the classroom ensures student autonomy and promotes active learning (Samira Nikian, 2013). Despite the significant changes technology brings to classroom education, the role of teachers remains crucial. Teachers play a powerful and essential role in educational institutions, and those with world-class knowledge are a primary requirement in today's educational landscape. Rockman (2000) identified that teachers with regular access to computers adopt teaching practices that become the center of effective learning for students. Nowadays, the quality of teaching outcomes is determined by how effectively teachers use ICT applications and integrate them into classroom teaching. Effective ICT usage requires teachers to have a positive perception of ICT applications. Teachers' teaching performance can be enhanced if they have a positive perception of ICT and use it effectively in teaching. Van Braak, Tondeur, & Valcke (2004) concluded in their research that teachers' attitudes toward computers in education significantly influence their classroom use of computers

and their technological innovativeness. Petko (2012) also explained that the perceived effectiveness of Information and Communication Technology is one of the most crucial predictors of computer use in the classroom. Teachers' perceptions play a vital role in practicing ICT in the classroom.

2. Research Questions

1. How do teachers perceive the use of ICT in the teaching and learning process?
2. What is the level of teaching performance among teachers following the implementation of ICT in their teaching?
3. How does teachers' perception relate to their teaching performance after the implementation of ICT?
4. What challenges or barriers do teachers encounter when using ICT?

3. Methodology

The study employed a descriptive research design, focusing on the opinions of respondents. Primary data were gathered from school teachers at Central Board of Secondary Education (CBSE) affiliated schools in the Tenkasi Educational District of Tirunelveli District, Tamil Nadu. Recently, the integration of ICT in schools within the Tirunelveli district has been commendable. Notably, ICT implementation is more prevalent in CBSE-affiliated schools compared to government, government-aided, and matriculation schools in the district. Consequently, the researcher selected CBSE schools in the Tenkasi educational district of Tirunelveli as the study population. According to government records, five CBSE schools operate in the Tenkasi educational district. Of these, two schools, each with over five years of ICT implementation experience, were chosen. The study utilized a judgmental sampling technique, with the total number of teachers in these two schools, 82, serving as the sample size. A well-structured questionnaire was employed for data collection, comprising three parts. The first part addressed the socio-economic profile of the respondents, the second part explored teachers' perceptions of ICT usage in the teaching-learning process, and the third part examined variables related to teaching performance levels post-ICT implementation. In both schools,

interactive whiteboards and smart TVs are used in classroom teaching. The analysis section includes both descriptive and inferential analyses, conducted using the Statistical Package for Social Science (SPSS 23.0).

4. Data Analysis

Table I. Profile of the Respondents

Determinants		Frequency	Percentage
Gender	Male	10	12.2
	Female	72	87.8
Age group	21-30	36	43.9
	31-40	31	37.8
	41-50	12	14.6
	51-64	3	3.7
Marital Status	Married	62	75.6
	Unmarried	20	24.4
Educational Qualification	UG	28	34.1
	PG	47	57.3
	M.Phil	5	6.1
	Others	2	2.4

Determinants		Frequency	Percentage
Handling Classes	Primary	38	46.3
	Middle	7	8.5
	High School	21	25.6
	Higher Secondary	16	19.5
Average number of students per class	Fewer than 10	18	22
	10-20	5	6.1
	20-30	24	29.3
	31 and above	35	42.7
Teaching hours per week	Fewer than 10	1	1.2
	10-15	5	6.1
	16-20	15	18.3
	21-25	17	20.7
	More than 25 hours	44	53.7
Teaching Experience at school	1-10	69	84.1
	11-20	11	13.4
	21-30	2	2.4

Determinants		Frequency	Percentage
Years of Experience of teachers in using ICT for teaching	0-6	62	75.6
	7-12	17	20.7
	13-18	3	3.7

Source: Survey Data

Major portion of respondents in the survey are female (87.8 percent). In relation to the age group of the respondents, 36 respondents (43.9 percent) belong to the age category of 21-30, Majority of the respondents (75.6 percent) are married. When considering the educational qualification of respondents, it is clear that majority are PG holders (57.3 percent), 38 respondents (46.3 percent) are primary class teachers. 35 respondents (42.7 percent) take class for students averagely 31 and above per class. Majority of 44 respondents (53.7 percent) have more than 25 teaching hours per week. With regard to teaching experience at school, 69 respondents (84.1 percent) have 1-10 experience of teaching experience. Majority of 62 respondents (75.6 percent) have 0-6 years of ICT experience in teaching.

Research question I

How do teachers perceive the use of ICT in the teaching and learning process?

In order to identify perception of teachers about ICT usage twenty three questions in five point ordinal rating scale were used starting from Strongly Agree-5, Agree-4, Neither Agree Nor Disagree-3, Disagree-2 and Strongly Disagree-1.

Table II. Exploratory Factor analysis

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.908
Bartlett's Test of Approx. Chi-Square Sphericity	1720.518
df	253
Sig.	.000

KMO test and Bartlett’s test are data suitability test for factor analysis. Value of KMO of 0.908 indicates that a factor analysis is appropriate for the present data. In order to identify whether variables are unrelated correlation matrix is used which is an identity matrix through Bartlett’s test of Sphericity. The significance level gives the result of the test. Here, the significant value is 0.000 which indicates that there exist significant relationships among the variables. The resultant value of KMO test and Bartlett’s test indicate that the present data is appropriate for factor analysis.

Table III. Rotated Component Matrix

Statements	Component				
	1	2	3	4	5
I am eager to participate in workshops/seminars about the ICT for teaching	.824				
I believe that ICT enhance students’ learning and academic performance	.741				

The use of ICT in teaching learning process makes curriculum more functional	.730				
ICT assist me to effectively plan teaching-learning process in the classroom.	.729				
ICT give useful information immediately when knowledge and information is needed	.723				
I believe ICT usage in teaching learning process makes students motivated.	.685				
ICT is a valuable tool for teaching and learning process	.585				
I can save preparation time for teaching through the use of ICT		.791			
I give priority to use ICT more than textbooks in teaching learning process		.772			
I reinforce my students to use ICT for effective learning		.752			
I reinforce my colleagues to use ICT in teaching learning process		.653			
I can save energy through ICT enabled teaching		.626			
I enjoy teaching because of ICT		.555			
I can save teaching time through the use of ICT		.550			
I can make confident presentation by integrating technology into classrooms		.534			

I believe ICT as a powerful tool in helping students' understanding of abstract content			.788		
Teaching materials can be presented clearly by integrating technology into classrooms			.707		
ICT enabled teaching improve students' interest and attention towards subject			.705		
I think that technology supported teaching makes learning more effective.			.660		
I feel enthusiastic to use ICT to design learning materials and to integrate them into my class				.846	
Use of ICT for teaching is important				.826	
I feel easy to demonstrate difficult concepts with the support of ICT					.757
Usage of Information and Communication Technologies makes it easier to prepare course materials (assignments, handouts etc.)					.557

For the purpose of extraction Principal Component Analysis method is used. The Component matrix so formed is further rotated orthogonally using Varimax rotation algorithm for convenience factors are reduced to five. After the rotation all the statements are loaded on the five factors. Among the factors, the first factor which accounts for 22.796 percent of variance as the prime criteria considered to study the teachers' perception towards ICT usage in teaching learning process. The second, third fourth and fifth factors account for 20.157, 16.581, 12.835 and 6.932 respectively. The cumulative variance of all the four factors is 79.301 percent. . Factors with large co-efficient for a variable are closely related to that variable. Thus the 23 variables in the data are reduced into five factor models and each factor is identified with the

corresponding variables. Factor 1 is named as Attitude, Factor 2 is named as Usage and Factor 3 is named as Belief, Factor 4 is named as Interest and Factor 5 is named as Skill.

Research Question 2

What is the level of teaching performance among teachers following the implementation of ICT in their teaching?

To measure Teaching performance of teachers after using ICT, performance dimensions like subject knowledge, teacher-student interaction, classroom management, level of management of students behaviour, professional behaviour, Response to students’ questions, interactive skill, confidence level in teaching, presentation skill, creativity, thinking ability, organizing skill are used in five point ordinal rating scale. It includes ratings like Very High-5, High-4, Medium-3, Low-2 and Very Low – 1)

Table IV. Teaching performance of teachers after implementation of ICT in teaching.

S.No.	Statements	N	Mean	Standard Deviation	Result
AP1	Teacher-student interaction in the classroom	82	3.61	1.141	High
AP2	Subject Knowledge is deepened		3.90	.795	High
AP3	Classroom management (efficient use of lesson time, coordinating classroom resources)		3.90	.855	High
AP4	Level of management of students behaviour in the classroom		3.89	.903	High
AP5	Improvement in your professional behaviour		4.05	.735	High

AP6	Level of your response to students' questions		3.90	.764	High
AP7	Level of improvement in your Interactive Skill		3.84	.808	High
AP8	Improvement in your Confidence Level		4.15	.788	High
AP9	Improvement in your Presentation Skill (Teaching delivery)		4.10	.747	High
AP10	Enhancement in your creativity		4.12	.674	High
AP11	Improvement in your level of Thinking ability related to academic performance		4.17	.814	High
AP12	Improvement in Organising Skill related to teaching		3.99	.868	High

The three highest means scored by the statements:

- Improvement in your level of Thinking ability related to academic performance(mean=4.17)
- Improvement in your Confidence Level(mean=4.15)
- Enhancement in your creativity(mean=4.12)

The three lowest means scored by the statements:

- Teacher-student interaction in the classroom (mean = 3.61)
- Level of improvement in your Interactive Skill(mean=3.84)
- Level of management of students behaviour in the classroom(3.89)

It is inferred from the table that after implementation of ICT, teachers felt that thinking ability, confidence level and creativity are high after implementation of ICT in teaching.

Research Question 3

How does teachers' perception relate to their teaching performance after the implementation of ICT?

Table V. Correlation between Teachers' perception and Level of Teaching performance after implantation of ICT

Sl. No.	Variable	Correlation efficient	Co-Significant Value
1	Teachers' Academic performance	.514**	.000

**Correlation is significant at the 0.01 level (2-tailed)

To identify whether there exist a relationship between teachers' perception towards ICT usage in teaching learning process and the level of teaching performance after implementation if ICT in teaching a Pearson's correlation was calculated. This result indicates that teachers' perception have positive and significant relationship with teachers' teaching performance after implementation of ICT in teaching. Through this result it is inferred that Teachers' teaching performance improve if ICT usage is encourage in schools.

Research Question 4

What challenges or barriers do teachers encounter when using ICT??

To understand challenges/ barriers of teachers in relation to ICT usage statements listed in Table VI were used with the five point ordinal rating scale starting from Strongly Agree-5, Agree-4, Neither Agree Nor Disagree-3, Disagree-2 and Strongly Disagree-1.

Table VI. Challenges/Barriers of teachers to use ICT

S.No.	Statements	N	Mean	Standard Deviation	Result
B1	Lack of teachers' technical knowledge to prepare materials based on technology	82	3.33	1.187	Neither Agree nor Disagree
B2	Shortage of resources like computer, projector etc in the school		3.85	.995	Agree
B3	Lack of training restrict teachers to make use of ICT resources effectively		3.79	1.063	Agree
B4	Absence of motivation and reward systems for ICT usage		3.63	1.117	Agree
B5	Lack of Interest of teachers in ICT usage for teaching		3.33	1.334	Neither Agree nor Disagree
B6	Lack of interest of students		3.18	1.287	Neither Agree nor Disagree
B7	Technical problems during class hours disturb teaching		3.62	1.224	Agree
B8	Controlled learning environment is difficult in ICT enabled classroom teaching		3.59	1.175	Agree
B9	Restricts the content of the lesson		3.38	1.234	Neither Agree nor Disagree

The three highest means scored by the statements:

- Shortage of resources like computer, projector etc in the school(mean = 3.85)
- Lack of training restrict teachers to make use of ICT resources effectively (mean = 3.79)
- Absence of motivation and reward systems for ICT usage(mean = 3.63)

The three lowest means scored by the statements:

- Lack of interest of students(mean=3.18)
- Lack of Interest of teachers in ICT usage for teaching(mean=3.33)
- Lack of teachers' technical knowledge to prepare materials based on technology(mean=3.33)

It is observed from the table that shortage of resources like computer, projector etc in the school, Lack of training restrict teachers to make use of ICT resources effectively, Absence of motivation and reward systems for ICT usage are the challenging factors of teachers to use ICT.

5. Results and Discussion

The analysis of the data showed that the integration of information and communication technology (ICT) into classroom teaching has led to an improvement in teachers' performance. Furthermore, there is a positive link between teachers' performance and their perceptions. Despite the enhanced performance post-ICT implementation, certain factors continue to impede teachers' effective use of digital technology in their teaching practices. Issues such as inadequate school infrastructure, lack of sufficient training in ICT tools, and the absence of motivation and reward systems for ICT usage in schools present significant challenges. To elevate teachers' teaching skills and provide students with a world-class education, these challenges must be addressed by schools. Investing in ICT infrastructure not only enhances teachers' performance but also improves student outcomes. Significant investment in ICT infrastructure within the education sector also contributes to the growth of the ICT industry. The introduction of new technology requires comprehensive hands-on training whenever feasible. Therefore, schools should regularly invite trainers to instruct teachers on independently operating digital technology. In Southdown, Tamil Nadu, only CBSE-affiliated schools have fully implemented ICT in all classrooms. As a result, the Tamil Nadu government might consider taking steps to implement ICT in all government schools by allocating adequate funds.

6. Conclusion

This study explored teachers' perceptions regarding the use of ICT in the teaching-learning process. The incorporation of ICT into this process has sparked enthusiasm among educators. Teachers regard ICT as an essential tool in education and are eager to attend workshops and seminars related to ICT. Concerning academic performance, the study indicates that teachers have experienced enhancements in their thinking abilities, confidence, and creativity following the adoption of ICT in teaching. The study identified a positive and significant correlation between teachers' perceptions of ICT usage and the teaching-learning process. From the study's findings, the researcher concluded that ICT acts as a catalyst for improving teachers' teaching performance.

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