Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/19363
DOI URL: http://dx.doi.org/10.21474/IJAR01/19363

RESEARCH ARTICLE

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY IN TEACHING LEARNING PROCESS IN HIGHER SECONDARY SCHOOL EDUCATION WITH RESPECT TO TEACHER'S PERCEPTION

Rikta Mukherjee[1], Ankhi Goon[2], Shauli Mukherjee[3] and Subhas Chandra Bhat[4]

1. Research Scholar, Department of Education, School of Education, Adamas University, Barasat, Kolkata, West Bengal.
2. Assistant Professor, Department of Education, School of Education, Adamas University, Barasat, Kolkata, West Bengal.
3. Professor & Dean, Department of Education, School of Education, Adamas University, Barasat, Kolkata, West Bengal,
4. Associate Professor in Chemistry (WBES), Government College of Education, Banipur, North-24-Parganas, West Bengal.

Manuscript Info

Manuscript History
Received: 25 June 2024
Final Accepted: 27 July 2024
Published: August 2024

Key words:-
Information and Communication Technology (ICT), Factor Structure, Teaching Learning Process

Abstract

Teaching-learning process in higher education is highly influenced by teacher's perception of ICT use. However, the current education system in India is far from incorporating ICT use at a national level. The present study explored the perception of ICT use among 138(one hundred thirty-eight) teachers by administering a questionnaire. Results revealed that teacher's perception of ICT use has six componentsnamely teaching effectiveness, quality of teaching, teaching support, innovative teaching, student engagement and technical accessibility. The perception of ICT use does not differ with respect to gender and academic backgrounds of the teachers. Present findings have implications in policy making related to ICT use in academic curriculum.There is rapid change in society. Growth and development of the society is associated with the advance application of technology (Daniels, 2002). Such growth depends upon our education sector performance. Today Information, Communication and Technology (ICT) is a detrimental part of the education sector and being considered as an essential skill like reading, writing and numeracy skill. Therefore, to be an effective learner student should have some expertise in ICT and it is very much essential tool in teaching and research (Yusuf, 2005). Now in the present context most of the academic activities the school is using information and communication technology tool for making the system smooth, error free and transparent (Davis & Tearle,1999; Lemke & Coughlin, 1998; Yusuf 2005). The use of ICT in elementary education has suddenly increase during coronaperiod but use of this technology in government school was not satisfactory.

Corresponding Author:-Subhas Chandra Bhat
Address:-Associate Professor in Chemistry (WBES), Government College of Education, Banipur, North-24-Parganas, West Bengal.

Introduction:-

In modern age, today's society has been bound rapidly with a developed technology amenity (Daniels, 2002). Therefore, Information, Communication and Technology (ICT) proficiency has been considered as one of fundamental skills beyond other skills such as reading, writing andnumeracy. Hence, the teaching and learning process and research cannot be separated from the influences of ICT (Yusuf, 2005). It is undeniable that every activity related to education field such as school activities, teaching &learning and development as well as work life have been assisted by the implementation of ICT.It has been believed that through ICT usage those works have been accomplished quickly and effectively. (Davis and Tearle, 1999; Lemke and Coughlin, 1998; cited by Yusuf 2005).

Digitalisation in schools has recently attained prominence. A key argument relates to closing the 'gap' between students' conventional learning and development at school and 'the experiences and skills that our youth need to enter the information economy' (Kozma 2011, 106): the school curriculum should increasingly be interwoven with ICTand students should be given opportunities to use advanced technological tools and digital resources for creative and innovative problem solving (Kozma 2011, 115). The school lockdown confronted teachers, students, and parents with an entirely new situation (Huber and Helm 2020). Continued teaching and learning was only possible through alternative means of schooling. Teachers had to change to online teaching, requiring them to use various digital tools and resources to solve problems and implement new approaches to teaching and learning (Eickelmann and Gerick 2020). Beyond instructional goals, teachers were also required to maintain contact with their students to account for the social integration of their learning groups.

Evidence suggests that digital technologies may enable new opportunities for teaching and learning (for a meta-analysis, see Chauhan 2017), and the use of ICT has become increasingly popular in elementary and secondary schools in recent decades.

E-readiness, or the readiness to use technology to achieve certain goals or work (Parasuraman, 2000) displays that teachers as human resources are technologically competent (Lawson & Comber, 1999). Teachers with e-readiness are able to use and adopt technology into their classroom when they think that technology is a tool that can be used by both teachers and students to obtain more knowledge and share meaning (Vrasidas& McIsaac, 2001). However, literature also notes that there are some factors that impact teachers' use of technology in the learning process, which includes positive perceptions (factors that lead to its use) and negative perceptions (factors that limit its use). In terms of positive perceptions, if teachers perceive training in ICT is worthwhile, they are inclined to use it in their teaching (Galanouli, Murphy & Gardner, 2004). Moreover, their openness toward the possible changes with technology is derived from their perception that technology can bring about innovation such as impact on higher thinking skill and on content acquisition for language learning (Baylor & Ritchie, 2002). Besides, Cope and Ward (2002) found that teachers' perceptions toward to technology include 'how' and 'what' effects technology can bring to students, for instance, whether students can manipulate language with specific software and interact directly with computers. Likewise, teachers can also identify the potential of technology to motivate students. On the contrary, negative perceptions from teachers reveal barriers which limit the use of ICT. These generally include the lack of facilities, knowledge, time, support, materials and training (William et al., 2000; Leaks, 2001; Samuel & Bakar, 2003; Pelgrum, 2001). For example, lack of facilities such as insufficient numbers of computers were the most frequent problem found by Pelgrum (2001), who specifically identified perceptions of educational practitioners from schools in 26 countries. Teachers may have knowledge of using ICT for their teaching, but insufficient numbers of computers may prevent them from using it. Moreover, lack of facilities may also mean lack of access. The limited number of computers may always be booked and cause frustration to users to gain access to them (Samuel & Bakar, 2005).

Wong et al. (2006) point out that technology can play apart in supporting face-to-face teaching and learning in the classroom. Many researchers and theorists assert that the use of computers can help students to become knowledgeable, reduce the amount of direct instruction given to them, and give teachers an opportunity to help those students with particular needs. It can help the teachers enhance their pedagogical practice and equip them with the knowledge and skills to use different computer technologies to access, analyse, interpret process and disseminate information to learners. It can also help the educational institutions to provide ICT capacity (resources) to ensure that all teachers and students have immediate access to all software that are required to support the curriculum and adequate support to implement its use in classroom teaching learning process without any difficulties.

There is some sort of difficulties faced by the teachers while using ICT like extrinsic which are associated with like first order, cited access to technology, time, support, resources and training which is more associated with institutions (Ertmer,1999). In other case intrinsic are related with teachers and their attitude, belief, practices and resistance. The other problem faced by teacher to implement ICT are insufficient numbers of computers and copies of software, less knowledge and skills of teachers on ICT, integration of use of ICT in instruction and insufficient teacher time (Pelgrum, 2001).

The above discussion made us clear that there is some obstacle of use of ICT in school education like competencies, resistance to change, lack of time of the teachers but there are lot of benefits provided to the teachers, if they use ICT in their teaching learning process which make the knowledge wider and more comfortable. Looking the above prospect, the present studies were trying to examine the effectiveness of ICT as a tool of teaching learning process in school education from the perspective of teachers. The study also evaluates the effectiveness of learning process within various stream of study. It critically analyses the mean differences of teacher's perception of ICT in various domain of knowledge.

ICT use in Teaching-Learning process

The application of digitalization in school education gets huge acceptance. It is method-work as a substitute for traditional method of teaching and learning. This also reduces gap between learning process through conventional learning and its associate skill development of the students. It helps learner to gain requisite skills and knowledge to enter "information economy" (Kozma, 2011; p. 106). Kozma recommend in his research that there should be an interconnection between ICT and curriculum structure of the school and the curriculum should design in line of ICT enabled process of learning, so that students should get an opportunity to learn and use of high-end technical tools and digital resources which make them to think the subject in innovative and creative manner. During pandemic, it was very much challenging task for the students, teachers and parents for helping the students in their academic system (Huber & Helm, 2020). That time learning was only possible through alternative mode that is virtual teaching and the role of ICT came into picture to reduce the learning gap of students and from onwards it is a medium of teaching and learning, communicating with the students, give some information as and when required (Eickelmann& Gerick, 2020). Chauhan (2017) made a meta-analysis and suggested that this digital technology is a new dimension of teaching and learning. It gives lot of opportunities to the students to learn extra thing beyond their curricula. So, the use of ICT become an important tool not for higher students but for elementary and secondary school system.

ICT uses among Teachers

Teachers are technologically competent if they display an E-readiness or the mental set to apply technology for achieving specific teaching goals (Parasuram, 2000; Lawson & Comber, 1999). Technological adoption in the classroom is possible if both teachers and students can develop an E-readiness for knowledge sharing (Vrasidas& McIsaac, 2001). Using technology in classroom teaching have positive and negative perceptions. For instance, perception of ICT training being worthwhile will foster a positive inclination among the teachers for using technology (Galanouli, Murphy & Gardner, 2004). Baylor & Ritchie (2002) explained that use of ICT in teaching make the teaching method more innovative and teachers become more open towards process of learning. Cope & Ward (2002) found that positive perception of technology also emerges from the realization of technological impact on students' performance, as manifested in students' ability to manipulate language with the help of specific software and direct interaction with computers.

On contrary, negative perception of technology use stems from the lack of infrastructure, knowledge and expertise, resources like technical training support (William et al., 2000., Leaks, 2001., Samuel & Bakar, 2003., Pelgrum, 2001). For instance, Pelgrum (2001) reported that inadequate access to computers is the most frequent cause of negative perception of technology. Lack of access is often caused by limited number of computers and this leads to frustration among the teachers (Samuel & Bakar, 2005).

Wong et al. (2006) mentioned that using technology in classroom teaching play a significant role which support face to face teaching and learning. It is often believed that computer use enables students to gain more knowledge, helps reduce the volume of instructions directed towards them, and provides teachers with a scope to assist students with special needs. Moreover, information and communication technology-based teaching helps teachers to improve their pedagogical skills, develop analytical and interpretation capability and they apply these skills to the learner's page.

There is some sort of difficulties faced by the teachers while using ICT, for instance, extrinsic factors like access to technology, time, support, resources, and training (Ertmer, 1999). On contrary, intrinsic factors are related to teachers and their attitude, belief, practices, and resistance. Apart from there are some other issues like poor infrastructure like a smaller number of computers, internet and software and lack of trained staff who can help others to handle this technology and work overload (Pelgrum, 2001).

From the above discussion, it is clear that there are lot of difficulties in the use of information and communication technology in education especially school education. There are few like competencies of teacher to use tools, resistance to change, lack of available time due to work overload and requisite infrastructure and training support. But the use of this technology help teaching learning more compact to the students. The study tried to examine the effectiveness of information and communication technology as a technical process for teaching-learning process to school education from teacher's perspective. The study also evaluates the effectiveness of learning process within various stream of study. It critically analyses the mean differences of teachers' perception of ICT in various domain of knowledge.

Skills required for ICT use among teachers:

The present discussion based on the implementation and use of ICT as a tool for teaching and learning by the teacher. To use ICT, the teacher should have knowledge in using computer and internet and use of smart phone. It is expected that most of teacher have basic knowledge on computer Budiman (2012). Therefore, educational institute should maintain minimum infrastructure like computer and internet. Faridi (2009) explained the advantages of internet in terms wider connection, any time connection, faster process of communication and information search, make learning system more interactive, peer learning process enhancement. On the other, Inggit (2011) discussed the minimum skills required by a teacher for effective use of ICT like teacher should be able to operate computer, maintain and solve basic issues in computer, basic knowledge on word, excel, power point, managing databases, design of interactive presentation. So, a teacher should have basic knowledge on computer and their operating process.

There are lot of discussion and debate on use of ICT, though digital transformation is going on but it is fact that there is still lack of operational knowledge observed among teachers to use of ICT as a teaching learning tool. There are lot of challenges of use of ICT among teachers. Mirzajani, Mahmud, Ayub, & Luan (2015) noted that due to lack insufficient training, infrastructure facilities, skill, time and self-interest among teachers, they are unable to perform ICT based teaching learning. Hadriana (2017) made some additional comments that interest to use ICT among teachers are less due of limited skills on computers, ICT process, additional teaching workload, poor ICT infrastructure in school etc. There are several other studies which highlight that lack of ICT operational competencies and support for capacity build be a challenging task of ICT implementation in school system (Amuko, Miheso, &Ndeuthi, 2015). However, the factors affecting the success of ICT use in education are not isolated from each other. Their presence is equally important for enabling teachers to integrate ICT in their teaching. A study conducted by Ojo&Adu (2018) discussed that lack of knowledge, skills among teachers on ICT do not motivate them to use as a teaching learning material but the reverse happens when due to lack of infrastructure facility teachers are unable to use ICT in their teaching process. Therefore, both the components like teacher's competency and facilities are strongly associated the success of ICT implementation in school (Hong, 2016). From the above discussion, it clearly indicates that a teacher needs to develop a positive perception on ICT and its proper use.

Implementation of ICT in school not only depends on students and teacher's perception but also the IT infrastructure available in school. In West Bengal more than 85% school run under government sponsored, out of them 16 % school has computer facility, 15.8 % has functional computer facility and out of that 15.5 % have internet facility (Source- UDISE-2021-22). So, these data clearly indicate poor infrastructure (Karunaratne, Peiris, & Hansson, 2018).

Not only IT infrastructure, there are lack of institutional and financial support from the government side and do not provide adequate technical skills staff to maintain this (Lim &Pannen, 2012). It is also noted by the researchers that though in present digital day teachers have adequate skills in using ICT but it is not clear to them the integration part of this technology into their academic curriculum which is methodological part (Muslem, Yusuf, & Juliana, 2018; Prasojo et. al., 2018). Therefore, institutional support play as a catalyst for developing teachers' competencies and capacity for integrating ICT in school (Mwawasi, 2014),

Therefore, provide training to teachers to enhance their technical skill on ICT use and develop easy way to solve complex problem (Michael, Maithya, &Cheloti, 2016; Ojo&Adu, 2018) and train the methodology part of ICT in an easy manner so they could feel comfort to use ICT as a teaching learning tools and forward their positive perception among (Prasojo et al., 2018). Most of schools fails to implement ICT, not only for infrastructure but intensity of teachers. They sometime become resistance to change the process (Papanastasiou&Angeli, 2008). Mwila (2018) and Tezci (2009) stated that more use of ICT helps to develop attitude of teachers and it is strongly associated. It means more use increase adaptation of a system and reduce technical difficulties (Azmi, 2017). Papanastasiou&Angeli, (2008) explained despite of these relationship, perception of teachers is an important factor for effective use of ICT as learning components, it persuades teachers to take effective decision on ICT integration on education especially school education where teachers have a huge role in learning system. Tondeur, & Zhu (2011) noted that it is the positive attitude of teachers that enable them to apply variable application of teaching learning activities that make the learning more interesting and pleasant. On contrary, teachers not willing to change tend to avoid integrating ICT-based learning methods in the school curriculum. Marshall (2016) elucidated that the teachers' perception of ICT differs and is often influenced by the thought that the use of information and communication technology in school curriculum requires continuous training and makes the teachers dependent on technology. Moreover, teachers thought that the updating of ICT skills is tough for managing classes with limited time and specific lesson plans.

Cope and Ward (2002) described that proper knowledge about the ICT use, adequate access to classroom setting, and philosophical explanation of technology supporting meaningful learning, positively influences the perception and use of ICT in classroom by most of the teachers. Weber (2021) noted that better training provided to teachers by the institution enhances successful implementation of technology in the learning process. Researcher also elucidated that schools of higher socio-economic status can smoothly include technology in their education system since students of such schools have higher access to technology at home and therefore can fulfil the curriculum related demands more appropriately using technology.

Considering the mentioned studies previously done, it is fact that use of ICT is indispensable todays' teaching-methodology process. However, implementation of ICT use in the curriculum still has a long way to go, owing to its' less acceptance among the teachers. Hence, it is important to understand the teachers' perspectives regarding ICT use, in order to smoothen the process, acceptance and implementation.

The current study therefore, purported to explore the teachers' perspectives regarding use of ICT in teaching learning process and its effectiveness in school education. This was done using exploratory factor analysis technique. Further, gender differences in the perspectives of the teachers were examined. Differences in perspectives on ICT use was also examined among teachers having different academic backgrounds.

Review Of Literature:-

Budiman (2012) views that the use of ICT in learning is closely associated with the use of computers and the internet. That is why computers and internet become important parts in the development of the use of ICT.

According to Faridi (2009) the use of computers and the internet as learning media provides a lot of advantages, among others: (1) The internet provides a very wide connection; (2) Information access to the internet can be done at any time; (3) Information access via the internet is much faster compared to finding information on pages of books in the library; (4) The internet provides interactive learning activities; (5) Users can discuss with peers various things if they enter the mailing lists.

According to Inggit (2011) the minimum standard competencies that must be possessed by teachers includes: (1) operating computers; (2) assembling, in-stalling, setting-up, maintaining, and solving problems of personal computers; (3) computer programming; (4) word processing; (5) spreadsheet; (6) managing databases and (7) creating interactive presentations that meet the rules of visual and interpersonal communication.

According to Mirzajani, Mahmud, Ayub, & Luan (2015), teachers are unable to utilize ICT in their classroom due to insufficient training, knowledge, skills, facilities, time and self-efficacy related to the use of ICT. This finding is supported by Hadriana (2017) who reveals that many factors may influence the teachers' use of ICT such as limited skills and limited knowledge of ICT, the availability of ICT equipment in schools, and teaching overloads.
Another study also highlights that the challenges of ICT integration are due to lack of ICT-related competency and support for capacity building (Amuko, Miheso, &Ndeuthi, 2015). However, the factors affecting the success of ICT

use in education are not isolated from each other. Their presence is equally important for enabling teachers to integrate ICT in their teaching. A study conducted by Ojo&Adu (2018) reveal that teachers did not utilize ICT in their teaching despite the adequate facilities due to limited knowledge and skill. Likewise, teachers with positive attitude towards ICT use and good skills could not use the ICT due to limited facilities (Hong, 2016). Therefore, both facilities and teachers' competency are keys to the success of ICT integration.

In developing countries, limited facilities are found to be the major constraint in integrating ICT in learning activities (Karunaratne, Peiris, & Hansson, 2018). However, Lim &Pannen (2012) also reveal other factors which also hamper Indonesian teachers from using ICT in their teaching, such as the lack of institutional and financial support and technical skills. Besides, it is also revealed that even though teachers seem to have adequate skill in using ICT, they did not integrate it into their teaching because they are either lack of methodological skills or supporting facilities (Muslem, Yusuf, & Juliana, 2018; Prasojo et al., 2018). This highlights the importance of the institutional support for teachers to build their capacity in using ICT for teaching (Mwawasi, 2014), such as by giving training related to technical skill of using ICT (Michael, Maithya, &Cheloti, 2016; Ojo&Adu, 2018) and training related to methodological knowledge of integrating ICT into teaching (Prasojo et al., 2018).

Another potential factor, yet somewhat underexplored, is the teachers' intensity of ICT use. In fact, this is one of important factors in ICT integration (Papanastasiou&Angeli, 2008). A study conducted by Mwila (2018) and Tezci (2009) show that there is a positive correlation between the frequency of ICT use and teachers' attitude towards ICT integration. Besides, another study reveals that there is positive correlation between the frequency of ICT use and teachers' computer literacy (Azmi, 2017). Despite the limited findings, understanding the relationship between the frequency or intensity of ICT use and teachers' perceptions might help in more effective decision-making in terms of ICT integration in education (Papanastasiou&Angeli, 2008).

Tondeur, & Zhu (2011) explained the relationship between ICT based teaching with teacher's perception. The study observed positive attitude of teachers facilitate them to apply diverse use of teaching learning activities and make the learning more interesting and enjoyable but on the opposite site who are resist to change do not promote to integrate ICT based learning methods in school education system.

Marshall explained that perception towards ICT on teacher vary as because they think that to integrate ICT in school education there is a need of continuous training and simplification of ICT integration in curriculum. They also thought that it can make themselves more technology dependent. Teachers thought that update of ICT skills is difficult for them and it also difficult to manage huge class in a little time with the lesson plan of the class.

ICT in classroom application based on two broad category of principles likely teacher centred perception and students-centred perceptions. These two principles are directly linked with the adaptation of ICT like former one highlights the process of learning attainment in a capacity of a skill expert whereas later emphasize constructivist-inspired teaching methods more focus on need and welfare. Students centric approach give more priority on students' active engagement in appropriate disciplinary task through utilizing of real tools such as ICT based tools. But in research, it stated that both teacher-students centric approaches make the learning more effective in developing a good learning environment.

While mentioned teacher perception play an important role on ICT integration like curriculum development, adopt new instructional support, but it may create difficulties if teacher thought that open nature technology may be inappropriate pedagogy compare to direct instructionalmethod. A study conducted by Lasky on secondary school teachers and stated that teachers should try to through understand that use technology can able to fulfil learning objectives or not.

Cope and Ward explained that perception and use of ICT in classroom by the most of the teachers increase when they had appropriate technical know-how, adequate classroom access, and a technology philosophy supporting meaningful learning.

There are two similar studies on area of ICT integration on teaching such as Hsu et.al. mentioned that if institution arrange better training to teacher, then they can successfully integrate technology in the teaching learning process. Zinger et al. stated that schools with a higher socio-economic status are fasten to incorporate technology in their

education system because teachers are confident that students have better access to ICT at home and can, therefore, complete homework in which technology is necessary for the completion.

Objectives Of The Study:-

1. To examine the effectiveness of ICT as a tool of teaching learning process in school education from the perspective of teachers.
2. To analyze the mean differences of teachers' perception of ICT in various domain of knowledge.
3. To evaluate the effective components of learning process within various stream of study using ICT.

Methodology:-

Participants:

Participants were 138 teachers from the different Higher Secondary schools in the disciplines of Science, Arts, and Commerce belonging to three different districts of West Bengali.e. Purba Burdwan, Hooghly and Birbhum.

Tool:

Participants were asked a set of 21 questions, about the effectiveness of ICT use among the students. The questions included five response categories, "Strongly Disagree", "Disagree", "Neutral", "Agree", and "Strongly Agree".

Procedure:

Permissions were obtained from the different Higher Secondary Schools across the three districts for data collection. After permissions were obtained, the teachers were approached for data collection. The set of questions were administered in small groups of teachers. After data collection, the data were arranged, standardised and analysis using different statistical techniques.

Statistical Analysis:

Principal Component Analysis was done to explore the component structure of the teachers' perception of ICT use. Cronbach's alpha was done to examine the internal consistency of their response. Further, the mean differences in their perception were checked with respect to their gender, location, and academic background using a t-test and one-way Analysis of Variance.

Results And Discussion:-

Descriptive statistics of the 21 statements (n=138) (Source –Primary Data). The mean values of all 21 questions ranged between 4.14 to 4.45, while the standard deviation value ranged between 0.54 to 0.81.

Components of ICT	Mean	Std. Deviation
Q1- ICT helps to present the lesson	4.14	.543
Q2- Attractive learning	4.28	.637
Q3- Comfortable learning	4.29	.675
Q4- Make lesson more interesting	4.46	.568
Q5- Adapt new style than personal process of teaching	4.38	.812
Q6- Better knowledge sharing	4.38	.664
Q7- Require more time flexibility	4.45	.640
Q8- Creative for preparing teaching content	4.30	.700
Q9- More engaged the lesson	4.34	.710
Q10- Bonding with tools	4.33	.756
Q11- Easy understand of difficult problem	4.25	.736
Q12- Evaluate progress quickly and effectively	4.16	.785
Q13- Integrating learning with other tools	4.15	.714
Q14- Link to real life practice	4.30	.666
Q15- Better of construct knowledge	4.41	.563
Q16- Development of global outlook	4.33	.608
Q17- Develop confidence	4.33	.618
Q18- Effective teaching method	4.36	.627
Q19- Teaching resources & material more effective	4.44	.616
Q20- Interrupt smooth teaching for technical challenges	4.43	.615

Q21- Limited access restrict teaching learning	4.27	.710

Descriptive Statistics on the basis of six components (n=138). (Extraction Method-Principal Component Analysis)

	Component					
	1	2	3	4	5	6
Q12- Evaluate progress quickly and effectively	.757					
Q13- Integrating learning with other tools	.753					
Q1-ICT helps to present the lesson	.718					
Q2- Attractive learning	.657					
Q10-Bonding with tools	.498					
Q3- Comfortable learning	.475					
Q17-Develop confidence		.750				
Q5- Adapt new style than personal process of teaching		.736				
Q11- Easy understand of difficult problem		.567				
Q14- Link to real life practice		.501				
Q6- Better knowledge sharing		.411				
Q16- Development of global outlook			.723			
Q18-Effective teaching method			.697			
Q15- Better of construct knowledge				.750		
Q19-Tecahing resources & material more effective				.657		
Q4- Make lesson more interesting					.756	
Q9- More engaged the lesson					.659	
Q20-Interrupt smooth teaching for technical challenges						.764
Q21- Limited access restrict teaching learning						.564
Q7- Require more time flexibility						.530
Q8-Creative for preparing teaching content						.460

Exploring factor structure:

PCA with Varimax rotation (orthogonal rotation) extracted six components, explaining a variance of 62.7%. Based on the items that loaded on each of the components, the components were named. The first component correlates with six items and is named as Teaching Effectiveness. The second component correlates with five items and is named as Quality of Teaching. The third component correlates with two items and is named as Teaching Support. The fourth component also correlates with two items and is named as Innovative Teaching. The fifth component includes two items and is named as Student Engagement. Finally, the sixth component correlates with four items and is named Technical Accessibility Hence, the perception of teachers towards ICT method can be understood in terms of six components, that is, its' Teaching Effectiveness (effectiveness of ICT in facilitating teaching process), Quality of Teaching (ICT ensuring quality content of teaching), Teaching Support (teaching process supported through ICT), Innovative Teaching (Innovation brought in teaching pedagogy through ICT), Student Engagement (Student engagement generated through ICT)and Technical Accessibility (Technical feasibility in the usage of ICT).

Reliability of the domains of Teachers' Perception of ICT use

As before, after the components were extracted, Cronbach's Alpha for each of the six domains were checked to examine the level of consistency in the components extracted. It was found that all the components are moderately consistent and therefore, reliable.

Cronbach's alpha for the extracted components

Name of the component	Items included	Cronbach's Alpha
Teaching Effectiveness	1, 2, 3, 10, 12, 13	.82
Quality of Teaching	5, 6, 11, 14, 17	.74
Teaching Support	16, 18	.53
Innovative Teaching	15, 19	.51
Student Engagement	4, 9	.53
Technical Accessibility	7, 8, 20, 21	.68

Mean differences in Teacher's Perception of ICT:

Following the PCA extraction, the item raw scores were converted to factor scores for standardizing the values. Finally, mean differences with respect to gender, district, and stream of the study were compared for the six components of teachers' perception of ICT.

Gender differences were examined using an independent sample t-test and the difference was found to be non-significant, that is, both male and female teachers perceive the use of ICT to be equal with respect to its effectiveness (p=.08), influence on the quality of teaching (p=.38), support in the teaching process (p=.71), innovation in the teaching process (p=.09) and to be promoting engagement (p=.06) and technical accessibility (p=.30).

Mean differences in the domains with respect to gender (n=138).

Domains		Mean	SD	t test	df	p value
Teaching Effectiveness	Male (70)	15.86	2.01	-1.743	137	.084
	Female (68)	16.44	1.86			
Quality of Teaching	Male	12.73	1.75	-.884	137	.378
	Female	12.95	1.29			
Teaching Support	Male	6.15	0.83	-.370	137	.712
	Female	6.19	0.65			
Innovative Teaching	Male	6.13	0.74	-1.672	137	.097
	Female	6.32	0.63			
Student Engagement	Male	6.09	0.91	-1.870	137	.064
	Female	6.33	0.65			
Technical Accessibility	Male	9.98	1.08	-1.052	137	.294
	Female	10.17	1.09			

On comparing the perspective of students from different districts, it was found that the teachers from all the districts perceive the use of ICT to be equal with respect to its' effectiveness (p=.78), influence on quality of teaching (p=.20), support in teaching process (p=.16), innovation in teaching process (p=.62) and to be promoting engagement (p=.26) and technical accessibility (p=.09).

Descriptive statistics and independent t-test showing the districts wise differences in the domains of teachers' perceptions of ICT use (n=138)

Domains		Mean	SD	F Value	df	p value
Teaching Effectiveness	**Purba Burdwan (69)**	16.35	1.20	.25	2, 136	.78
	Hooghly (25)	16.29	0.58			
	Birbhum (44)	16.08	2.69			
Quality of Teaching	**Purba Burdwan**	13.16	0.69	1.61	2, 136	.20
	Hooghly	13.00	0.72			

	Birbhum	12.63	2.04			
Teaching Support	**Purba Burdwan**	6.20	0.49	1.87	2, 136	.16
	Hooghly	6.33	0.56			
	Birbhum	6.06	0.89			
Innovative Teaching	**Purba Burdwan**	6.34	0.59	.48	2, 136	.62
	Hooghly	6.24	0.51			
	Birbhum	6.19	0.81			
Student Engagement	**Purba Burdwan**	6.20	0.74	1.36	2, 136	.26
	Hooghly	6.39	0.55			
	Birbhum	6.14	0.90			
Technical Accessibility	**Purba Burdwan**	10.29	0.62	2.44	2, 136	.09
	Hooghly	10.28	0.80			
	Birbhum	9.88	1.37			

Finally, all the teachers from different streams also perceive the use of ICT to be equal with respect to its' effectiveness (p=.71), influence on quality of teaching (p=.20), support in teaching process (p=.65), innovation in teaching process (p=.37) and to be promoting engagement (p=.33) and technical accessibility (p=.45).

Mean differences in the domains with respect to streams (n=138)

Domains		**Mean**	**SD**	**F Value**	**df**	**p value**
Teaching Effectiveness	**Science (46)**	16.33	1.78	.35	2, 136	.71
	Commerce (38)	16.35	2.19			
	Arts (54)	16.05	2.06			
Quality of Teaching	**Science**	13.04	0.97	1.62	2, 136	.20
	Commerce	13.15	0.93			
	Arts	12.61	1.95			
Teaching Support	**Science**	6.23	0.62	.43	2, 136	.65
	Commerce	6.21	0.86			
	Arts	6.11	0.80			
Innovative Teaching	**Science**	6.29	0.58	.98	2, 136	.38
	Commerce	6.41	0.56			
	Arts	6.16	0.79			
Student Engagement	**Science**	6.33	0.68	1.11	2, 136	.33
	Commerce	6.23	0.84			
	Arts	6.13	0.85			
Technical Accessibility	**Science**	10.13	1.06	.80	2, 136	.45
	Commerce	10.42	0.66			
	Arts	10.00	1.18			

Discussion:-

Effective use of ICT as a teaching learning process have lot of advantages in the current scenario. In the present study we found there are six important domains come out by the analysing of the data through factors analysis and 21 subcomponents have been associated with all high positive factors loading. These six domains are Teaching effectiveness, quality of teaching, teaching support, innovative teaching, student engagement and technical accessibility. In teaching effectiveness ICT helps teacher to integrated their teaching process with competency and ability to instructional technology with the need of students in their learning phase. It develops confidence, cooperation and collaboration within teachers which help them to design the curriculum and instruction that build

the attitude of the teachers to integrated better version of technology. There are few other studies by (Hong et al. 2021, Mundy et al. 2021,Gorder, 2018, Marshall,2016) talks in the same line.

When we talked about quality of teaching, it seems some different opinion observed from the analysis, teacher feels it is an adaptation of new thing than the personal process of teaching (high positive factor loading .736). It is also estimated that lot of initiatives taken by the institutions to enhance ICT based learning but acceptance level is low by the teachers (Has-san& Sajid, 2013; Wiranto, 2014). It also noted by the researcher that teachers feel (Donnelly et al, 2021), it is an inappropriate pedagogy that direct instruction in the class. The lack of teachers' autonomy has discouraged them from actively engaging themselves in the learning process of ICT integration and instruction (Seo, 2013). Therefore, it is necessary to empower teachers in order to overcome the challenges of ICT-based instruction and scale it up. Apart from this the other factors, teacher feel that ICT enhance quality teaching. The study pointed out that use of ICT not only to prepare and assistant students to classroom discussion but encourage students to learn out of box knowledge automatically which outside the classroom, it motivates the students to achieve their learning goals and holistic development of the students. The result supported by Miarso&Hadi (2007) and said that the "utilization of ICT in the learning process is one of the factors that support the realization of a good quality learning process to achieve educational goals. Therefore, teachers need to have technical and pedagogical knowledge to integrate ICT into their classroom".

In the third domain of our study indicates teachers support using ICT. It is a technique which help the teacher to do better assessment of the students, provide enrich contents, easy evaluate students' progress, preparation of lesson plan etc. There is also research talked ICT helps teachers to develop their social network where they can interact students at any time and space, solve problem with wider reach. They must be open to communicate, discuss, stimulate students to learn, help them in learning from a multitude of sources available. This has also changed the relationship between teacher and student, teacher ventures to explore more sources of information and knowledge to his students and shows them methods to acquire knowledge from other sources so that they are benefited from alternate sources. He must play the role of communicator, having one to one interaction with the students, he must collaborate with the students in small groups giving them proper individual attention, encouraging them to engage actively and participate in the process of learning. The above statement also supported by the similar studies like Sharma, 2017, Siciliano 2016, Frank et al. 2014 which explained the use of ICT on the ground of teacher support.

The fourth part of our study which is the domain of innovative teaching and all the associated factors shown high positive factor loading. Yes, ICT make the teaching learning more innovation through the access of various media. ICT reduced the operational cost of the students, it also saves time and energy and teachers can give instructions to the students at any time. Pedagogically, it has enabled hybrid mode learning through online and technology enhanced learning as well as a host of other capabilities. Students can access updated resources which can develop their better learning skills and enhance teachers' knowledge capabilities. The role of ICT enhances classroom delivery process, which promotes in the growth of research and development of teachers, expanding horizons for students mainly with limited accessibility to education and it has created an overall positive impact in the teaching–learning environment in general for students and teachers. There are always two sides to the coin and in this case inaccessibility, economic disparity, and ineffective implementation of ICT has also created impediments for effectively adopting and diffusing integration of ICT into pedagogy. Use digital system in the education, teachers can give better learning method like live case studies, value added courses, group study practices and in our result also support that teachers have believe that it is a method where multifaceted pedagogy can be adopted (Sengupta and Blessinger, (2022)., Ilomäki and Lakkala (2018).

In the present study, it reveals that teachers believe that ICT enhance student's engagement because ICT is a digital platform and there are lot of digital devices connected with that. Now a day social media, YouTube, google, LinkedIn, Facebook, these are not only source of entertainment but lot of learning resources. So, it helps students to access these through ICT and make the teaching- learning of experiential and collaborative which helps teachers to make the things clear to students. With the use of software, it can provide the benefit of gamification. There is various learning path like gaming clue, sound clue, audio clue makes students more involve in active learning participation. In the prospect of teachers, if a teaching covering multiple students in the class, it is difficult to concentrate one student at a time but if students are allowed to entertain and engaged in the tasks in front of them and declare reward, then itempowers them to be independent and autonomy in their task which reduces teacher's effort but without compromising learning.

The last domain which have impacted in the study is technical accessibility, yes, it is the era of digital and social media and these are so effective media not be entertaining but also learning path for the next generation. Therefore, the ICT use the technical accessibility of students and teachers. ICT and make the teaching- learning of experiential and collaborative which helps teachers to make the things clear to students. ICT promotes an inclusive ethos and develop learning potentiality for teachers and help them to reshape their learning understanding of teaching and helps learner to actively engage in the learning process (Weber, 2021).It is also mentioned by the various researchers that that ICT is a tools which offers more visual part, simulation, data storage, mind mapping, brainstorming, music etc. which the traditional learning incompetency and this is a part where students and teachers get exposure with the technology and outside world and market learning more fulfilling and meaningful (Finger & Trinidad, 2002). The other part, it gives open platform to the students instead of limited curriculum boundary. Helps teachers to design lesson plan more creative, assessment plan more rigorous, more creativity in overall deliberation, so that it maximizes students' ability in active learning (Finger & Trinidad, 2002; Jorge et al., 2003; Jamieson-Procter et al., 2013).

Conclusion:-

The use of ICT in teaching learning process is going to be a mandatory substitute in the learning process from teachers and students' perspective. The use of ICT in India and especially West Bengal is not significant. It is not because students' teachers' perception but also reason of lack of infrastructure, training and development etc. Till more than 60 percent institute run under government head. But we are not far from that as NEP 2020 talks about blended education system and it is 60:40 where 40 learning will be completed by using technology and there are lot of development in the curriculum which is more connected with value addition of learning and holistic development of the students.

Looking into this prospect the current studies have an attempt to understand the teacher's perception on use of ICT in West Bengal Private School as because private school have developed their system and they run their process using ICT during pandemic. Factor analysis and ANNOVA and t-test have been performed to find out the result. The finding of the study reveals that there are six important domains like teaching effectiveness, teaching support, students' engagement, technical accessibility etc. The interesting findings of the study is that there is no significant difference observed among teacher from gender wise, stream wise like art, science and commerce and region wise. Therefore, this study gives an idea to the policy maker of government schools as well as private schools who are yet to adopt ICT in their teaching learning process for better progress in the present scenario.

Bibliography:-

1. Azmi, N. (2017). Factors influencing the frequency of ICT use in the EFL classroom. Journal of Humanities and Social Sciences, 2(4), 321-327.
2. Amuko, S., Miheso, M., &Ndeuthi, S. (2015). Opportunities and challenges: Integration of ICT in teaching and learning Mathematics in secondary schools, Nairobi, Kenya. Journal of Education and Practice, 6(24), 1-7.
3. Baylor, A. L., & Ritchie, D. (2002). What factors facilitate teacher skill, teacher morale, and perceived student learning in technology-using classroom? Computers and Education, 39(4), 395-414.
4. Budiman, M. A. (2012). PemanfaatanTeknologiInformasi dan KomunikasidalamKelas Bahasa Inggris [ICT use in English classroom]. Paper presented at Seminar NasionalTeknologiInformasi&KomunikasiTerapan 2012 (Semantik 2012), Semarang. Retrieved from https://publikasi.dinus.ac.id/index.php/semantik/article/viewFile/228/242.
5. Cope, C., & Ward, P. (2002). Integrating Technology into Classrooms: the important of teachers' perceptions. Educational Technology & Society, 5(1) [electronic journal]. Retrieved from http://www.ifets.info/journals/5_1/cope.html.
6. Chauhan, S. 2017. "A Meta-analysis of the Impact of Technology on Learning Effectiveness of Elementary Students." Computers & Education 105: 14–30. doi: 10.1016/j.compedu.2016.11.005.
7. Daniels J.S. (2002) "Foreword" in information and communication technology in Education-A Curriculum for Schools and Programme Teacher Development. Paris: UNESCO
8. Donnelly, D.; McGarr, O.; O'Reilly, J. A framework for teachers' integration of ICT into their classroom practice. Comput. Educ. **2021**, 57, 1469–1483.
9. Ertmer, P. (1999). Addressing first-and second order barriers to change: Strategies for technology integration. Educational Technology Research and Development, 47(4), 47-61.

10. Eickelmann, B., and J. Gerick. (2020). "LernenMitDigitalenMedien: Zielsetzungen in ZeitenVon Corona Und UnterBesondererBerucksichtigungVonSozialenUngleichheiten [Learning with Digital Media: Objectives in Times of Corona and under Special Consideration of Social Inequities]." Die Deutsche Schule 16: 153–162. doi:10.31244/9783830992318.09.
11. Faridi, A. (2009). Inovasipembelajaran sastra berbasis ICT dalamrangkameningkatkanmutupendidikan [ICT-based literature learning innovation to improve education quality]. LembaranIlmuKependidikanJilid, 38(1), 59-67
12. Finger, G., & Trinidad, S. (2002). ICTs for learning: An overview of systemic initiatives in the Australian states and territories. Australian Educational Computing, 17(2), 3-14
13. Frank, K. A., Lo, Y. J., & Sun, M. (2014). Social network analysis of the influences of educational reforms on teachers' practices and interactions. Zeitschriftfu¨rErziehungswissenschaft, 17(5), 117–134.
14. Galanouli, D., Murphy, C., & Gardner, J. (2004). Teachers' perspective of the effectiveness of ICT-competence training. Computer and Education, 43, 63-79.
15. Gorder, L. A Study of Teacher Perceptions of Instructional Technology Integration in the Classroom. Delta Pi Epsil. J. **2018**, 50, 63–76.
16. Hassan, T., & Sajid, A. R. (2013). ICTs in learning: Problems faced by Pakistan. Journal of Research and Reflections in Education, 7(1), 52 -64. https://doi.org/10.11591/ijere.v1i2.1244
17. Hadriana. (2017). Analisispemanfaatanteknologiinformasi dan komunikasi (TIK) oleh guru-guru bahasainggris SMAN pekanbaru[Analysis of the use of ICT by public high school teachers in Pekanbaru]. Pekanbaru: Universitas Riau.
18. Hong, J. E. (2016). Social studies teachers' views of ICT integration. Review of International Geographical Education Online, 6(1), 32-48.
19. Hong, X.; Zhang, M.; Liu, Q. Preschool teachers' technology acceptance During the COVID-19: An adapted technology acceptancemodel. Front. Psychol. **2021**, 12, 691492.
20. Huber, S. G., and C. Helm. (2020). "COVID-19 and Schooling: Evaluation, Assessment and Accountability in Times of Crises—reacting Quickly to Explore Key Issues for Policy, Practice and Research with the School Barometer." Educational Assessment, Evaluation and Accountability 1–34. doi:10.1007/s11092-020-09322-y.
21. Innovation in Teaching Learning Methods in Higher Education (Innovations in Higher Education Teaching and Learning, Vol. 45), Emerald Publishing Limited, Bingley, pp. 3-9. https://doi.org/10.1108/S2055-364120220000045001.
22. Ilomäki, L., Lakkala, M. (2018), Digital technology and practices for school improvement: innovative digital school model. RPTEL **13**, 25 (2018). https://doi.org/10.1186/s41039-018-0094-8.
23. Inggit, D. W. (2011). Peningkatanpendidikanberbasis ICT [Improving ICT-based education]. Yogyakarta: UIN SunanKalijaga.
24. Jamieson-Proctor, R., Albion, P., Finger, G., Cavanagh, R., Fitzgerald, R., Bond, T., &Grimbeek, P. (2013). Development of the TTF TPACK Survey Instrument. Australian Educational Computing, 27(3),26-35
25. Jorge, C. M. H., Gutiérrez, E. R., García, E.G., Jorge M. C. A., & Díaz, M. B. (2003). Use of the ICTs and the perception of e-learning among university students: A differential perspective according to gender and degree year group. Interactive Educational Multimedia, 7, 13-28.
26. Karunaratne, T., Peiris, C., & Hansson, H. (2018). Implementing small scale ICT projects in developing countries- How challenging is it? International Journal of Education and Development using Information and Communication Technology (IJEDICT), 14(1), 118-140.
27. Kozma, R. B. (2011). "ICT, Education Transformation, and Economic Development: An Analysis of the US National Educational Technology Plan." E-Learning and Digital Media 8 (2): 106–120. doi:10.2304/elea.2011.8.2.106.
28. Lawson, T., & Comber, C. (1999). Superhighways technology: personnel factors leading to successful integration of information and communication technology in schools and colleges. Journal ofInformation Technology for Teacher Education, 8(1), 41-53.
29. Leaks, M. (2001). Issues in Teaching Using ICT. London: Routledge Falmer.
30. Lim, C. P., &Pannen, P. (2012). Building the capacity of Indonesian education universities for ICT in pre-service teacher education: A case study of a strategic planning exercise. Australasian Journal of Educational Technology &Society, 28(6), 1061-1067.
31. Mundy, M.; Kupczynski, L.; Kee, R. Teacher's Perceptions of Technology Use in Schools. SAGE Open **2021**, 2, 1–15.
32. Miarso, Y., &Hadi, Y. (2007). MenyemaiBenihTeknologi Pendidikan [Planning ICT education]. Jakarta: KencanaPrenada Media Group.

33. Marshall, J. Learning with Technology Evidence That Technology Can, and Does, Support Learning; Sage: Newbury Park, CA, USA, 2016.
34. Mirzajani, H., Mahmud, R., Ayub, A. F., & Luan, W. S. (2015). A review of research literature on obstacles that prevent use of ICT in pre-service teachers' educational courses. International Journal of Education and Literacy Studies, 3(2), 25-31
35. Muslem, A., Yusuf, Y. Q., & Juliana, R. (2018). Perceptions and barriers to ICT use among English teachers in Indonesia. Teaching English with Technology, 18(1), 3-23.
36. Mwawasi, F. M. (2014). Technology leadership and ICT use: Strategies for capacity building for ICT integration. Journal of Learning for Development, 1(2), 1-7
37. Michael, F. M., Maithya, R., &Cheloti, S. K. (2016). Influence of teacher competency on integration of ICT in teaching and learning in public secondary schools in Machakos. Journal of Education and E-learning Research, 3(4), 143-149
38. Mwila, P. (2018). Assessing the attitudes of secondary school teachers towards the integration of ICT in the teaching process in Kilimanjaro, Tanzania. International Journal of Education and Development using Information and Communication Technology (IJEDICT), 14(3), 223-238.
39. Ojo, O., &Adu, E. (2018). The effectiveness of information and communication technologies (ICTs) in teaching and learning in high schools in Eastern Cape Province. South African Journal of Education, 38(2), 1-11
40. Parasuraman, A (2000). Technology readiness index (TRI). A multiple item scale to measure readiness to embrace new technology. Journal of Service Research, 2(4), 307-320.
41. Papanastasiou, E. C., &Angeli, C. (2008). Evaluating the use of ICT in education: Psychometric properties of the survey of factors affecting teachers teaching with technology (SFA-T3). Educational Technology &Society, 11(1), 69-86.
42. Prasojo, L. D., Mukminin, A., Habibi, A., Marzulina, L., Sirozi, M., &Harto, K. (2018). Learning to teach in a digital age: ICT integration and EFL student teachers' teaching practices. Teaching English with Technology, 18(3), 18-32.
43. Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. Computers and Education, 37(2), 163-178
44. Samuel, R. J., & Bakar, Z. A. (2006). The utilization and integration of ICT tools in promoting English language teaching and learning: reflections from English option teachers in Kuala Langat District, Malaysia. Journal of Education and Development, 2(2) [electronic journal]. Retrieved fromhttp://ijedict.dec.uwi.edu/viewarticle.php?id=161&layout=html
45. Sengupta, E. and Blessinger, P. (2022), Introduction to ICT and Innovation in Teaching–Learning Methods in Higher Education, Sengupta, E. and Blessinger, P. (Ed.) ICT and
46. Seo, K. (2013). A community approach to teacher learning. The Journal of Educational Studies, 44(3), 161–191.
47. Sharma, MM (2017), Teacher in a Digital Era, Global Journal of Computer Science &Technology, vol. 17, no. 3, pp-55-65.
48. Siciliano, M. D. (2016). It's the quality not the quantity of ties that matters: Social networks and self-efficacy beliefs. American Educational Research Journal, 53(2), 227–262
49. Tezci, E. (2009). Teachers' effect on ICT use in education: The Turkey sample. Procedia Social and Behavioral Sciences, 1(1), 1285-1294.
50. Weber, H (2021), The Contribution of ICT to Accessible Learning Environments, in book Accessibility or reinventing education, https://doi.org/10.1002/9781119817956.ch6.
51. William, D., Coles, L., Wilson, K., Richardson, A., &Tuson, J. (2000). Teachers and ICT: current use and future needs. British Journal of Educational Technology 31(4), 307-320.
52. Wong, A. F. L., Quek, C. L., Divaharan, S., Liu, W. C., Peer, J., & Williams, M. D. (2006). Singapore students' and teachers' perceptions of computer-supported Project Work classroom learning environments. Journal of Research on Technology in Education, 38(4), 449- 479.
53. Yusuf, M.O. (2005). Information and Communication Education: Analysing the Nigerian National Policy for Information Technology. International Education Journal, 6(3), 316-321.