CHAPTER 2

REVIEW RELATED LITERATURE

2.1 Studies Related to ICT Mediated Teaching and Academic Achievement

Imafido and Ijeh (2023) studied how teachers' backgrounds and use of ICT resources affected students' academic progress in Mathematics. The study used the ex post facto research design. Three hundred and thirty pupils of the eighth class from secondary schools in Delta State's Delta Central Senatorial District make up the study's sample. The findings indicated that teachers with a background in education and those who use ICT tools when teaching Mathematics have a positive impact on their student's academic success in the subject.

Josephine, Osei, and Asamoah (2023) explored the role of ICT in teaching and learning Mathematics at the College level. A systematic literature review was conducted on a sample of twenty-seven studies using various academic databases. The findings indicate that the use of ICT in Mathematics education has positively impacted teaching and learning. The studies review reported improved student engagement, motivation, and achievement in Mathematics, as well as increased teacher effectiveness and confidence in their ability to teach Mathematics.

Courtney, Karakus, Ersozlu, and Nurumov (2022) examined the relationship between students' usage of ICT and their performance in Maths and science by analyzing the four PISA surveys from 2009, 2012, 2015, and 2018 using the ICT engagement theory as a theoretical framework and a three-level hierarchical linear modeling strategy. ICT-related interest as an independent variable was incorporated into the models at the student, school, and country levels. Across the four cycles, the total school students' sample size was two hundred forty-seven thousand three hundred fifty-two, two hundred forty-three thousand sixty, one hundred ninety-four thousand three hundred ninety-nine, and two hundred twelve thousand six hundred fifty-two respectively. The set of models showed that ICT use had no substantive positive relationship with student performance in Math or science. Conversely, higher student attitude toward ICT was associated with higher Math and science performance for each of the four years of the study.

Huang, Jiang, Yin, and Jong (2021) extensively investigated the relationships between East Asian students' Science achievement and their ICT use in learning, ICT self-efficacy, motivating variables, and socioeconomic level using the PISA 2015 dataset. Six East Asian nations and regions' data were utilized. The synthesized structural equation modeling results revealed a positive relationship between students' ICT self-efficacy and their use of technology during learning, whereas a negative relationship existed between ICT use during learning and students' degree of science proficiency. Socioeconomic status had a strong correlation with students' levels of science proficiency but only a slight relationship with their use of ICT.

Muhammad and Prema (2017) conducted a study on awareness about ICT and academic achievement and the relationship between ICT awareness and academic achievement. The study was conducted in Tarauni and Nassarawa Local Government Areas of Kano State, Nigeria. A descriptive survey design was used for the study with a sample size of one hundred and eighty-three students. Results revealed that (i) The level of ICT knowledge was high (ii) The academic achievement level is average (iii) The mean scores of ICT awareness and academic achievement change significantly depending on (a) gender (b) branch of study, and (iv) there is a substantial correlation between ICT awareness and academic achievement among senior secondary school students.

Nwokocha, Emeka, and Timothy (2016) conducted a study on "Bridging the barriers: ICT in girl-child education in Nigeria". The study, which selected a sample of 300 female respondents from the Department of Social Studies, was carried out at the College of Education in Zing, Taraba State. The study used a survey approach, and the results showed that access to ICT, particularly the Internet, increases female students' enthusiasm and interest, which in turn boosts their academic performance.

Kaur (2015) observed the effect of computer-based interactive simulations on achievement in physics, problem-solving ability, and attitude towards physics of senior secondary school students with different levels of intelligence. This experimental investigation is carried out in Chandigarh schools with a sample size of 180 pupils. The results showed that using interactive computer-based simulations improved student mean gains. Additionally, pupils who were exposed to computer based interactive

simulations as opposed to the conventional method had a higher attitude towards Physics.

Fernandez-Gutierrez, Gimenez, and Calero (2020) analysed the impact of ICT on secondary school pupils' Maths, reading, and science skills. Data was collected from three PISA cycles (2009, 2012, and 2015) for the areas in Spain. The findings revealed that while there was a beneficial impact on PISA scores in science, there was no evidence of a positive impact on maths or reading PISA scores when ICT use at schools in autonomous communities increased. Findings also showed that the subject matter and method of technology used determine the ICT effects on educational achievements.

Das (2019) explored the role of the application of ICT tools in Mathematics teaching. Document-based analysis was done based on data from research papers, books, edited books, reports, and online documents. Document analysis showed that students can use ICT as a tool to perform calculations, draw graphs, and help solve problems. A dynamic geometry program's image can assist a pupil in comprehending, resolving, and demonstrating a geometrical problem. Maxima-an algebra solver software, GeoGebra, and SymPy-like software can be used to understand Mathematics easily.

Kucuk (2023) studied the positive and negative consequences of technology's impact on education. A total of twenty-six educators from various education levels participated in the survey via Google Forms. The findings indicated that educators found it challenging to incorporate technology into lessons, despite their belief that doing so will increase students' success. Some of the negative consequences were attention problems in students, limited students' face-to-face communication, and increased incidences of cheating among students.

Mutlu-Bayraktar, Cosgun, and Altan (2019) systematically reviewed papers dealing with cognitive load and multimedia learning from 2015 to 2019. A total of ninety-four publications were explored in terms of the different forms of cognitive load, multimedia learning principles, cognitive load measurements, cognitive processes, various multimedia learning environments, and study demographics. The findings showed that extraneous cognitive burden was explored more frequently than other types of cognitive load in the papers that were reviewed. Modality and signalling/cueing concepts were the two that were most frequently discussed in articles. Researchers from Europe, particularly Germany, followed by researchers from Asia, America, Australia, and

Africa conducted the maximum of reviewed cognitive load studies on multimedia learning.

Demir and Akpiner (2018) examined the impact of mobile learning apps on undergraduate students' academic performance, mobile learning attitudes, and animation development levels. The study employed a quasi-experimental design. The control group with twenty-six students attended a lecture-based classroom, while the experimental group with fifteen students employed a mobile learning-based technique. Student interviews were done as part of the exploratory investigation. The results imply that mobile learning encourages pupils to achieve academically. The attitudes towards mobile learning were highly positive for both groups. Furthermore, mobile learning helped in increasing their motivation.

Heflin, Shewmaker, and Nguyen (2017) examined students' involvement, critical thinking, and attitudes in three different collaborative learning environments, both with and without the use of mobile devices. Six intact classes of first-year courses were taken as sample. A quasi-experimental research methodology was used. Multiple data sources, including student surveys, classroom behavioural observations, and a finished written product were employed in a multimethod analysis. According to the findings, mobile technology is linked to increasing student disengagement in class but also favourable student impressions of collaborative learning. Comparing students who used a computer keyboard or wrote their comments by hand to those who used a mobile device, the latter group showed much less critical thinking.

Schneider, Nebel, and Rey (2016) studied the effect of decorative images as a prime for emotions and context-relatedness. In this study, four categories of decorative images are examined. The cells of a between-subjects, factorial design with two (emotionally positive vs. emotionally negative photos) and two (school context vs. leisure context pictures) were randomly assigned to eighty-two pupils. According to the findings, positively valenced images improve memory and transfer abilities. The relationship between the valence of images and learning outcomes is found to be mediated by pleasure.

2.2 Studies Related to ICT Integration Teaching Pedagogical

John (2022) designs an ICT integration framework in primary schools in a district of Uganda with the objectives: to investigate the factors affecting ICT integration situation; to design a framework for ICT integration and to validate the framework for integrating ICT in the primary schools in Bundibugyo district. The study used a cross sectional research design with a sample size of 189 respondents (60 pupils and 129 teachers).Stratified and simple random sampling was used as sampling techniques while questionnaires and interviews were used as research instruments. The study found the factors including lack of teacher preparedness, lack of learners‘ preparedness, and lack of administrative preparedness.

Melo et al. (2020) established a pedagogical strategy aimed at supporting the integration of ICTs into the higher education process. A survey was carried out aiming focus on the analysis of teachers‘ practices so that competences in ICT use at university education in Colombia could be enlarged. 81 universities answered the survey questionnaire: 51 private and 30 public, and a total of 423 lecturers from different academic disciplines. Our findings show the degree of attention paid by teachers to strengthening ICT skills in their training tasks. This research is complemented with Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis performed with 50 professionals experienced in ICT use in higher education.

Maruti (2020) in his work on the role of ICT in teaching and learning process in higher education assessed that language learning and teaching is taken into account to be a posh process. ICT has its noticeable impact on the standard and quantity of teaching learning process. ICT can enhance teaching and learning through its dynamic, interactive and engaging content and it can provide real opportunities full stop in the current situation when any teacher used ICT at that time. This paper casts the sunshine on the ICT tools which will help the event of English learning and teaching process to point out how Technology affects the foreign language education and how it can be used effectively in the higher education.

Pico and Rodríguez (2021) found in their study that the way of teaching learning process has significantly changed. The main objective of their research was to analyze the use of ICT and their impact on the educational practices of teachers. To establish a method aimed at reducing monotony, it is necessary to establish a new form of

discipline that allows reflection and acquisition of the most recent knowledge in combination with the teacher's guidance. The incorporation of technological tools allows changing traditional training methods by integrating new methodologies. Traditional preparation includes teachers as evaluation entities and learners as evaluated persons.

Bhattarai (2019) in his paper focuses on the issues of the management of multicultural classes, and the role of ICT-integrated pedagogy to manage such a classroom context. The finding of the study shows that ICT-integrated pedagogy is the best strategy to manage multicultural classes by respecting students‘ personal feelings.

Okeke et al. (2018) in their work examined the role of ICT in improving teaching and learning in Nigerian Universities. They adopted a descriptive survey design and simple random sampling technique was used to select sample population of 360. The findings of the study revealed that Nigeria University suffers lack adequate skills no online discussion with lecturers and there are partial limited bandwidths.

2.3 Studies Conducted in India on the Perceptions of Secondary School Teachers Towards Integration of ICT in School Curriculum

Subaveerapandiyan, A. and Nandhakumar, R. (2021) conducted a study to know the teaching faculties’ ICT skills and related online class skills in higher educational institutions in India. 220 faculties were selected randomly from 26 Central Universities, 43 State Universities, 6 National Institutions and 2 other Institutions. These faculties have been working in the Departments of Education, Institutions of Educational Technology, Departments of Special Education and Continuing Education in India. The researchers used questionnaires to collect data from the respondents. The variables considered for the study include age, gender, academic rank, teaching experience and type of organization. Out of 220 participants, only 201 faculties filled-in the questionnaires properly and returned. The data were analyzed using a one-way ANOVA and independent t-test on SPSS software**.**

The results of the study revealed that based on the teachers’ demographic information, the teaches in the age group of 35-49 years were more skilful in the use of ICT as compared to their counterparts belonging to other age groups. Computer competency is intermediary among majority of teachers using it. The Google platform and Zoom

online platforms are preferred as major online platforms in online teaching. The researchers suggested for a strategic long term plan for online teaching providing necessary computers and sufficient internet connectivity. ICT training should be integrated in the curriculum of Teacher Education Institutions so as to enable pre-service teachers acquire necessary skills in online teaching.

Himanshoo Kumar Sharma (2021) conducted a study to explain the concept and importance of ICT in the present education scenario. The study also focused on the challenges and barriers to integrate ICT in Indian schools; and discussed the role of the teachers in the process. These challenges include: lack of infrastructure, lack of funds, lack of trained teachers to use ICT, lack of uniform abilities on the part of the students and the psychological thinking of teachers and students that the use of ICT tools is very complex. The study concluded that ICT applications are not going to replace the physical form of information sources completely; but no doubt these applications are useful to meet present demands, to satisfy the remote users and to provide information instantly. With the help of ICT enabled services, it is easy for users to gather information, to segregate information, to use multiple search words, to save cost, time and efforts of staff and users and to provide remote access to information and different databases. Now, innovative strategies can be adopted to develop the knowledge innovation culture in education.

Nagaraj, D. and Tholappan, A. (2020) felt that Information and Communication Technology (ICT) has brought lot of positive changes on human life such as business, transport, communication, administration, agriculture, health, industry etc.; and the field of education has no exception. Drastic changes have been happened every page of teaching and learning for the past two decades. Redesigned strategies have arrived in all aspects of education right from primary to higher education. The research paper intended to examine the perception of secondary level teachers of social science towards Information and Communication Technology (ICT) for which researcher used self- structured perceptional scale to the 100 sample size by using simple random sampling technique under the method of normative survey. The findings of the study revealed that there is average level in perceptional level among these teachers and significantly differ in terms of their gender, locality, age and experience.

Arnab Kundu and Tripti Bej (2020) conducted a study to investigate the state of ICT integration and the degree of expertise these schools have attained. A survey of forty teachers from twenty purposively selected private high schools was conducted using a set interview protocols. Data were analyzed following the grounded theory approach. Results revealed that despite a high level of appreciation among teachers of the importance of ICT integration into teaching and learning, classroom integration was not found problem-free. Several factors that hinder the integration of ICT in schools were identified in the study. There factors include: lack of ICT infrastructure, lack of institutional encouragement, weak policies; and above all lack of sufficient skills among teachers at all levels – technological, pedagogical and integrative. This shows poor conviction in the hypothesis that private schools are good at ICT integration. Based on the analysis the study proposed 3E-Model along with a program of action for its implementation to improve ICT integration by dampening down the challenges and recommending schools to establish independent authorities; for example Working School Governing Bodies (WSGBs) that would look after the model and issues relating to the promotion of ICT integrated pedagogies in schools.

Soumen Biswas (2019) conducted a study to focus on integration of ICT with Indian school education system. The researcher felt that the ability to work with ICT is recognized as one of the key competencies necessary for success in life. Worldwide research has shown that, demands are growing for ICT, not only in business and economic sector, but also in the domain of teaching and learning. In this digital era, ICT can improve the teachers' role as creators of pedagogical environments. Moreover, teaching-learning may become very easy and attractive with the help of ICT. But for a developing country like India, it is a challenging issue to integrate ICT with all the schools of the country. The study discussed in detail the emerging challenges of ICT integration in Indian schools. The researcher identified some barriers like infrastructure, finance, language, lack of trained teachers, lack of motivation among educators etc., are the key challenges for integration of ICT in Indian schools. Though the 'Operation Blackboard' ensured the minimum requirements of all schools of India up to upper primary level, we have a good number of schools where facility of electricity or telephone is unavailable till now. So we cannot think about modern technology in such schools. Language is another powerful barrier to access online contents. Worldwide research has already shown that, 80% online contents are in English language.

Moreover maximum educational software is being produced in English only. This is creating difficulties not only in India, but also in other countries where English is not treated as first language. Economic reality is another obstacle to achieve the educational goals. The researcher concludes that integration of ICT in school education always helps for knowledge building and consolidation; and application in new contexts. Teachers can integrate their pedagogic expertise with technology.

2.4 Studies Conducted in Abroad on The Perceptions of Secondary School Teachers Towards Integration of ICT in School Curriculum

Shephard Pondiwa et al. (2022) conducted a study on 'Integration of ICT into Education: Lessons Learnt at the State University of Zanzibar and the Midlands State University in Zimbabwe'. This study looks at how the Midlands State University (MSU) and State University of Zanzibar (SUZA) have adopted the use of ICT in many ways. ICTs do not work for everyone in the same way. It has become inevitable, in the current digital era for educators to integrate ICT in their teaching and gradually replace traditional teaching methods with modern ones which are ICT led. The main objective of this study is to find out challenges and opportunities of using ICT in education.

The study employed a case study approach to study the integration of ICT in education at Midlands State University and the State University of Zanzibar. The study used a total of 100 University workers and 150 students from the two institutions. 60 of the workers were from MSU and 40 from SUZA. Of the 150 students, 100 were form MSU whilst 50 were from SUZA. The study purposively selected the Directors of ICT of the two institutions and the rest of the respondents were randomly selected. This comparative analysis of the two institutions helped to make a closer look at the differences and similarities in the adoption and use of ICT in the two institutions. Two questionnaires were developed and used for collection of data from the participants. One was used to collect data from lecturers from the two institutions while the other one was used to collect data from students. Interviews were also conducted with randomly selected lecturers and students, as well as the Directors of ICT.

The results of the study indicated that there has been the integration of ICT in education at both the SUZA and MSU and this has greatly changed the way teaching and learning taking place at the two institutions. The integration of ICT in education has been influenced by the fact that the major stakeholders of the two government institutions,

lecturers and students have embraced in the use of ICT. This is in line with the Technology Acceptance Model (TAM), where adoption of technology largely depends on it been accepted by the users. This study also revealed that new technologies spur spontaneous interest more than tradition approaches of learning. Both Lecturers and students from the two institutions indicated that they would prefer the use of ICT in education. 78% of students who answered the questions from the questionnaire indicated that they would prefer to have lectures and other teaching material delivered using ICT. One learner from the MSU Harare campus indicated that instead of lecturers having to travel to campus, they could just use ICT facilities such as Google class, Skype or the E- learning accounts of students to deliver teaching and learning material.

Murithi, J. and Yoo, J.E. (2021) felt that the use of Information and Communication Technology (ICT) in education has been widely advocated as much needed 21st century skills by governments and policymakers. Nevertheless, several challenges in integrating ICT into the curriculum have been reported in previous research, especially in studies on Sub-Saharan African countries. Focusing on the case of Kenyan public primary schools, the researchers investigated the availability of ICT facilities; teacher capacity to integrate technology into their lessons; and teacher perceptions towards technology in schools. In particular, the study is based on the constructivist learning theory and the Technology Acceptance Model. A total of 351 teachers completed an online questionnaire. Teachers perceived that ICT facilities were inadequate in schools, which presented a challenge in the integration of technology during the implementation of the new curriculum. Most of the teachers answered that they received only basic computer literacy training. Although teachers perceived the use of computers as necessary, they faced difficulties in integrating technology in their lessons. The effect of age and gender on teacher capacity was also investigated in inferential statistics, specifically with Welch tests and Games-Howell post hoc comparisons. Teachers in their 40s had a higher perception of usefulness than teachers in the 30s. Male and female teachers did not show any differences in their perceptions in terms of teacher capacity and perceived usefulness towards use of technology in schools.

Kelemnesh Seifu and Shuyan Wang (2020) conducted a study to investigate factors that determine the integration of Information and Communication Technology (ICT) in teaching-learning process in Aksum University, Ethiopia. Descriptive survey research design was employed in the present study. The size of population was 550 teachers and

5 College deans. Of these, 385 teachers and 5 college deans were selected as samples with the help of stratified random sampling and comprehensive sampling techniques, respectively. For the purpose of collecting data, questionnaire and semi-structured interview were employed. The quantitative data gathered through the questionnaire were analyzed with the help of both descriptive and inferential statistical techniques. That is, one sample t test, Pearson product moment correlation, and multiple regressions were mainly employed to analyze the quantitative data.

The result of a one sample t-test shows that teachers' attitude towards the use of ICT, accessibility of ICT facilities, teachers' self-efficacy, teachers' competence, and technology characteristics highly influenced the ICT integration while technical support, the nature of curriculum, administrative support and ICT policy were less likely to influence ICT utilization. In addition, the result of correlation indicated that ICT integration had positive relationship with all independent variables. With regard to regression, 88.1 % of ICT integration was predicted with the combination of teachers' self efficacy, attitude, the characteristics of technologies, accessibility of ICT facilities, teachers' competence, ICT policy and administrative support. The results of interview also indicated that inadequate administrative and technical support, restrictive nature of curriculum, lack of sufficient time, shortage of electric power and concrete models to integrate technologies hinder from using ICT in teaching-learning process.

Peggy Siamisang et al. (2019) opined that Information and Communication Technology (ICT) has been growing so fast for the past 20 years in most of sectors, but still a lot of done in the education sector. Teachers are still relying on the old traditional way of teaching methods. Botswana schools are still far behind in benefiting from ICT usage in classroom. This study reviews various technology adoption frameworks such as Technology Pedagogy and Content knowledge, Teacher Development model, and Conceptual framework. This study aims at knowing the ICT infrastructure found in Botswana public junior secondary schools, makes an assessment of teachers' skills, knowledge, confidence and the perception on the integration of ICT in teaching and learning. A quantitative research design is used to collect data from teachers in Botswana Junior Secondary Schools. The major findings show that integration of ICT in Botswana Junior secondary schools is very low or not yet started. This has been influenced by factors such as lack of skill, lack of confidence in the use of technology by teachers, and lack of ICT equipment in schools. The study recommends that schools

should be equipped with education ICT supporting infrastructure, and teachers should be trained on the pedagogy of ICT in teaching. Furthermore, the curriculum should be designed in such a way that it includes ICT integration in subject areas.

2.5 Studies Related to Academic Achievement in Physics

Maamin and et al. (2022) present an article on "The Influence of Student Engagement on Physics Achievement among Secondary School Students." The primary goal of this was to investigate the relationship between secondary school student's mathematics achievement and engagement. The researcher adopted the survey method to complete his research. 227 schools were selected from Selangor, Malaysia, using random sampling, and the researcher selected a total of 1000 students from 227 schools using stratified random sampling. The researcher included students' previous year's physics achievement for data acquisition and developed 57 questions for student engagement in physics, which were based on 5-Likert scales. Using Pearson correlation, multiple regression, and ANOVA techniques, we concluded that there is a positive relationship between secondary school student's physics achievement and engagement. In particular, there is a positive relationship between behavioural engagement and affective engagement in physics achievement. A negative relationship was found between math achievement and cognitive engagement.

Rashid and Singh (2021) wrote a research paper on "Analysing physics achievement among students." The main objective of this study was to find out the physics achievement of public and private school students, and the researcher formulated the null hypothesis that there is no significant difference between the physics achievement of government and private school students. The researcher adopted the descriptive survey method to complete his research. The researcher selected a total of 200 students from Class IX using random sampling techniques. The researcher used the instrument developed by Sharma, S. S (2015) to collect the data. The collected data were analysed using descriptive and comparative analysis techniques, and it was determined that there is no significant difference in the physics achievement of public and private school students.

IIIlyas and Charles (2017) presented an article on "Interest in Physics and Academic Achievement of High School Students in the Chennai District." The main purpose of this article was to study the interest in Physics and the academic achievements of

secondary school students. Researchers used the survey method to complete their research. With the help of a stratified random sampling technique, 9 schools were selected from the Chennai district that included urban and rural schools. The researchers enrolled 300 students from 9 schools. The researcher used two types of tools to collect the data; one is an interest in Physics and the other is the Academic Achievement Inventory. There was a significant difference in the interests of secondary school students in Physics and in their management of higher education. There was no significant difference in interest and Physics achievement between male and female students, i.e., there was no difference between them on the basis of gender. There was no significant difference in Physics achievement between rural and urban school students.

Anjum (2015) wrote a research paper on "Gender differences in Physics Achievement and its relation with Reading comprehension of children at the upper primary stage." The main purpose of study the basis of gender in the Physics achievement of Western UP students. To study on the basis of gender in the reading comprehension of Western UP students. The researchers adopted descriptive research. Researcher included 307 students from four city of Western UP, Aligarh, Buland Shahar, Khurja and Jahagirabad out of which 147 boys and 160 girls were included in the study. Researcher used standard instruments Mathematics Achievement Test and Reading Comprehension Test developed for data. Using mean, SD, t-test and correlation statistical techniques to analyze the collected data, researcher concluded that there is a difference in Physics achievement between boys and girls at the upper primary school level. At the upper primary school level, there was a significant difference in reading comprehension between girls and boys, and there was a positive correlation between Physics achievement and reading comprehension.

2.6 Studies Related to ICT – Mediated Constructivist Approach

Kumari (2021) writes in her article that Constructivist Approach of communication is an emerging Approach of teaching and learning process which is basically student centric. This theory is based on the premise that students build their creation of knowledge and new information with the help of their previous knowledge, understanding, experience and mental perception. Today, in the modern age, ICT has become an important part of all aspects of life. ICT always provides a wide platform

for student self-learning. In this article, the researcher concludes that in the present era, ICT is affecting all aspects of life, including education. Learning style, learning environment, transfer of information and teaching methods are being promoted. The use of ICT facilitates the learning environment to be more active, collaborative, creative, and integrative and to evaluate. Constructivist Approach is a student-centred in which students actively involved in the creation of knowledge based on their mental cognition. Constructivist approach promotes students to be more active, critical thinking, decision-making, knowledge-seeking, and more. In this way, in the process of teaching and learning, it creates knowledge by making the students passive and active.

Kaur and Kaur (2022) examined the "Effect of constructivist approach on achievement in mathematics in relation to problem solving ability." Its main objectives were to compare the constructivist approach and the traditional methods taught to mathematics groups and to compare the problem-solving abilities of high and low-achieving groups of students. An experimental method was used to carry out this research. In this, math achievement is the dependent variable and problem-solving ability is the independent variable. The researcher made 12 lesson plans based on data on different math topics and constructivist ways of looking at them. used the tool developed by Dr. Kawaljit Kaur (2017) for testing mathematics knowledge and the tool developed by L.N. Dubey (2011) to test problem solving ability. The researcher used descriptive statistics, three-way analysis of variance (2×2), and F-test and t-test techniques for data analysis. His researcher analyzed the data and concluded that the achievement of students in mathematics taught by the constructivist approach was more effective than the traditional method and that there was no difference between a high and low-achieving group of students in problem-solving ability.

Manas (2020) write in his article that technology refers to the design and environment that engages the learner. The researcher based his study on two areas. The first concern is to promote constructivist learning in ICT in the classroom today and the second is the educational and professional development of the teachers especially for the implementation of constructivist approach in the classroom. Constructivist approach is student-centred learning and supports student participation. From which the student builds new information or creation with the help of his previous knowledge. Teachers are less hesitant to use ICT because they know that it helps them to design or instruct teaching methods that support their theoretical approach. The ICT and the constructivist

approach used better together and can effectively integrate technology tools into the classroom.

Majumder (2022) presented the research paper "Review of literature on Constructivist Approach." Their main objectives were to analyze the review of constructivist theory according to different strata and to understand the trend of constructivist theory. The documentary analysis method was used to carry out this research. The researcher reviewed a total of 56 papers for data collection in this study. The researcher concluded that a constructivist approach is a modern learning approach. It is a child-centred approach where students are actively involved in constructing information. Most research findings have indicated that the constructivist approach was more effective than any other approach. When compared to behavioural teaching, the constructivist approach worked just as well for boys and girls, and it helped teachers learn and get better at what they do.

Viquarunnisa (2019) writes in his article that ICT has affected the education system and every aspect of life, which has made teaching in the classroom easier and more effective. ICT has made an impact in the teaching and learning process and ICT is being used from primary education to higher education. The main objective of the researcher in this article was to find out the effect of ICT mediated Constructivist and accessibility approach through ICT on the success of secondary students of Hyderabad. The purpose of this research was to investigate whether ICT mediated constructivist approach or traditional methods of teaching improve achievement in science of students. This study's design, which included an experimental group and a control group, was based on pre and post testing. The control group received traditional instruction whereas the experimental group received ICT-mediated constructivist instruction. After that, post test of both groups was taken. The study concluded that students who were taught ICT mediated Constructivist teaching approach significantly improved their skills in science, knowledge, understanding, application and science skills.

Chand (2018) published an article entitled "Constructivism approach towards integration of ICT for collaborative learning." This article focused the point of Constructivist approach by integrating ICT for collaborative learning. The process of learning through constructivist approach builds new information by changing the mind from passive to active mind. ICTs provide learning opportunities in which learners

formulate their ideas, test and draw conclusions and convey their knowledge in a coherent learning environment. ICT provides collaborative learning techniques to help learners develop content knowledge, critical thinking, and problem solving skills. ICT-integrated tools facilitate collaborative learning opportunities in the constructivist approach.

The constructivist classroom environment promotes in social and communication skills. Students should express their ideas, communicate with others and participate in a socially acceptable manner. ICT integrated tools offer an unlimited gift, challenging human intelligence, imagination and a variety of learning initiatives. It will guide the student towards a better and higher standard of living.

Sandhu and Rani (2017) examined the "effect of constructivist approach on the academic achievement of an elementary school student." and had two main objectives. The first objective is to construct a constructivist approach to teach the concepts of Hindi grammar to seventh grade students and the second objective is to find out the effect of constructivist approach in elementary school students' Hindi learning. Researchers chosen experimental research to carry out his research. One is the control group and the other is the experimental group. The researcher selected 60 students from the seventh grade through Purposive Sampling in which he placed 30 students in the experimental group and another 30 students in the control group. The researcher first took pre-test of both the groups. The experimental group was then taught a lesson plan based on the constructivist approach and the control group was taught a lesson plan traditional method. Researchers then found that the Hindi achievement of the experimental group was significantly higher than the control group.

Adak (2017) published an essay on the "Effectiveness of constructivist approach on academic achievement in science at secondary level." The main purpose of study to find out the effect of constructivist theory on the traditional method for learning physical science of students and the second purpose was to find out the effect of constructivist theory on the traditional method for learning physical science in terms of students' intelligence. To compare the researcher adopted quasi-experimental pre-test, post-test control group design. The researcher selected a secondary school with a purposeful sampling technique to enable his research to be successful, which included 58 students. Out of these, two groups were formed, one experimental group and the

other control group. The research was limited to Bengali medium students, physical science and ninth grade. The researcher used two types of tools to collect the data, one is the project lesson based on 7E model and the other is Reven Progressive Matrices. The researcher analyzed the obtained data using ANOVA, t-test, SD, Mean statistical techniques. The researcher concluded from his research that no significant difference was found in the attainment of high, average and low intelligence students by constructivist theory on traditional teaching methods. Constructivist theory is an effective and efficient means of learning that has a significant impact on students' scientific achievement.

2.7 Studies Related to ICT Mediated Physics Teaching

Sarmah, et al. (2020) presented an article on "Role of ICT in teaching and learning Physics - An overview." The main purpose of which is to investigate the various roles of ICT in the teaching of Physics in the secondary classroom and to study the functions of tools as well as the skills of teachers and the effective use of ICT in the teaching of various subjects of Physics in the classroom. ICT is the ability to provide more interactive skills to enhance the mental and creative abilities of the users. The digital education system makes students more efficient and effective than the traditional education system. Digital technology is changing the way concepts are learned in school. The traditional chalk and talk method has adapted itself to interactive teaching and the rapidly evolving technology and change of ICT. ICT is an important tool in the modern education system. Therefore, proper use of ICT is essential to make the teaching process effective and efficient. The math classroom needs to be integrated with ICT and advanced planning. Proper ICT infrastructure is required and the result is an effective learning environment and maintaining what is being taught.

Pandey and Pandey (2020) writes in their essay that the use of Information and Communication Technology (ICT) has been widely acknowledged for decades. The impact of ICT is an interesting place in teaching that should be known in order to find the output. The main objective of researchers is to get an overview of the use of ICT in teaching and learning in India. Researchers collected data with the help of Internet, Institutional Library, Google and Google Scholar to complete his research. The study was limited to India. Researchers found in his study that the use of ICT in various research articles has shown a positive effect on the quality of education. ICT is more

prominent in urban areas than in rural areas. The researcher has studied the role of ICT in this article from secondary school to higher education. Based on the published data, it is observed that studies in the southern, eastern and northern zones of India use ICT more. In contrast, it is very rare in Central India. It has also been observed that the use of ICT in India among developing countries is less than in developed countries. Researchers conclude that there is a lack of such studies, so more studies are needed to know the global impact of ICT in the future.

Das (2019) studied the "Role of implementation of ICT tools in teaching Physics." Technologies (ICT) are now an essential component of daily life in the processes of teaching, learning, and communication. The science of mathematics is revered as the supreme discipline. For a very long period, Physics was used exclusively in academic settings. But the use of Physics nowadays is not just restricted to the academic world. It has entered the field of technology and industry. In this paper, the researcher seeks to emphasize the importance of integrating Information and Communication Technology (ICT) into the teaching and learning of teacher training college and school-level Physics. The researcher has used different methods and techniques, which includes secondary sources of communication, discourse, observation, and study, which collected its data through books, articles, dissertations, university news, expert opinions, and websites. The researcher found in his study that the integration of ICT in Physics education has a positive effect on both teaching and learning process. The researcher also found that there are barriers to the integration of ICT in the teaching and learning of Physics at the level of colleges and secondary schools.

Suparman, et al. (2019) presented an article on "The Use of ICT in Physics Learning." The main purpose of this article was to find out the potential of teachers in ICT field before and after training. In this study, Researchers has adopted non experimental pre-test / post-test design. Researchers selected 25 math teachers through Purposive Sampling. Researchers used the questionnaire to collect the data. To analyze the data obtained, the researcher used descriptive statistics and Wilcoxon rank sum test technique. Researchers analyzed the data and concluded that in the field of ICT, there is a difference in the abilities of teachers before and after training. After training teachers in the field of ICT, their ability improves.

Sharma (2022) gives immense importance to New Education Policy (NEP) 2020 and emphasizes the role of ICT as an effective tool in facilitating teacher education and encourages the utilization of technology platforms for online teacher training. ICT integration for pre-service teacher training programs plays a crucial to equip and prepare future teachers for the classroom. Teacher Education Institutes must create an environment for teachers to enable them to create an appropriate learning experience for teachers to enable them to create an appropriate learning experience for students in the new age of learning.

Usou and Joseph (2022) highlighted NEP 2020 and various provisions for ICT in teacher education and the present status of ICT usage in B.Ed colleges in Nagaland with some challenges for implementation. NEP 2020 were recommended the education policy which has broaden the horizon of India education system mainly focused on technological based education which will develop in students‘ inventive thinking, higher- order thinking and sound reasoning, effective communication, and high productivity.

Sharma (2021) examines the impact of ICT on teaching practices, perceptions of teachers about the use of technology in the classroom, and their professional development. Teachers' well-equipped preparation with ICT tools and facilities is one of the main factors in the success of technology-based teaching and learning. Although the perception of Indian teachers towards the use of ICT is positive, still need more support with the infrastructure and training especially in the rural regions.

Marong (2021) focused on integrating the use of ICT into teaching and learning in the teacher training program in the Gambia shows the integration of ICT and use is generally linked to traditional teaching approaches. Most of the barriers are due to the lack of available resources. ICT is not integrating properly in the teacher training program to making efficient use of technology in the classroom. The advantages of ICT depend on the learning approach used, the attitude, belief, and skills of the teacher, and the availability of teaching and learning support.

Devi (2021) in his work pointed out the increasing use of information and communication technologies (ICTs) has revolutionized the teaching-learning process in the 21st century. The use of ICT in education not only improves classroom teaching learning process, but also provides the facility of e-learning and distance learning to the

learners. Currently, a teacher is been teaching his students through the use of ICT even though they are geographically scattered. People are using ICT in every walk of life for their various purposes and also from higher educational books to online courses that all are beneficial for the learners in 21st century.

Niroula (2021) investigates the role of ICT in educational development during the COVID-19 pandemic in three zones of Nepal. Teachers who were not fully equipped with ICT knowledge and the skills required to teach online, had to go through the learning process quickly in order to teach their students, especially in inaccessible areas of the given zones. Using the mixed methods approach and analyzed 64 high school teachers‘ responses and finds that teachers‘ using ICT tools in such remote areas indicates that teachers had to go through intensive learning during the pandemic.

Murithi and Yoo (2021) investigated the availability of ICT facilities; teacher capacity to integrate technology into their lessons; and teacher perceptions towards technology in schools. The study is premised on the constructivist learning theory and the Technology Acceptance Model. A total of 351 teachers completed an online questionnaire. Teachers perceived that ICT facilities were inadequate in schools, which presented a challenge in the integration of technology during the implementation of the new curriculum. Most of the teachers answered that they received only basic computer literacy training.

Alghamdi et al. (2020) found in their study that work on online and face-to-face classroom multitasking and academic performance in the classroom has been demonstrated to have a negative impact on students' academic performance in studies. The indirect impacts of multitasking on academic achievement Grade Point Average (GPA) in males and females were explored using self-efficacy for self-regulated learning (SESRL), by gender. University students were given SESRL and measures of multitasking behaviors in both online and traditional, face-to-face format courses. Female students with higher levels of SESRL experience a limited impact of online multitasking on GPA, resulting in better academic performance.

Mahdy (2020) in his cross-sectional investigated how COVID-19 lockdown affected the academic performance of veteran medical students and researchers. The study revealed that COVID-19 pandemic lockdown had varied degrees of impact on the academic achievement of the majority of participants. Although, online education

allows for self-study but the fundamental problem that online education faces in the field of veterinary medicine is how to deliver practical courses because most of the subjects are practical, learning them online is difficult and students believe that completing veterinary competencies only through an online education system is challenging.