JOURNAL OF POLITICAL STABILITY ARCHIVE

Online ISSN: 3006-5879 Print ISSN: 3006-5860
DOI: https://doi.org/10.63468/jpsa.3.4.58
Vol. 3 No. 4 (2025)
https://journalpsa.com.pk/index.php/JPSA/about

Recognized by: Higher Education Commission (HEC), Government of Pakistan

Integration of Educational Technology (Edtech) to Improve Teaching Practices in Secondary Schools

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ABSTRACT

The demand for the incorporation of Educational Technology (EdTech) into the modern 2-level schooling has become essential and permits facilitating the learning procedures, communication with students, and evaluation. Despite the fact that its significance is rising, it needs effective implementation that is based on a variety of interrelated factors like teacher digital competencies, availability of resources, school administration support, attitude of the teacher and ICT training. The purpose behind this study was to examine the effects of Education technology integration on teaching in secondary schools, as well as to determine how various predictors affect instructional performance, student motivation, and assessment performance in secondary schools directly and indirectly. The quantitative research design used was by providing a questionnaire, whereby secondary school teachers were administered a structured questionnaire. Data analysis was done in accordance with normality tests, reliability and validity tests, Pearson correlation, regression analysis and group comparison tests (t-tests, ANOVA, Kruskal-Wallis Wallis and Chi-Square). The reliability of all the instruments was high because all the reliability values were above 0.87, KMO was found to be 0.89, Bartlett was significant and the test. The results achieved have reflected that there was a strong positive correlation between the variables of EdTech. The attitudes of teachers were

found to be the most predictive of instructional effectiveness, followed by resource availability and digital competency. The group comparisons tests depicted that there existed great differences in terms of gender, teaching experience, age groups and types of schools. EdTech integration positively influenced all dependent variables in terms of instructional effectiveness, student engagement and in terms of assessment efficiency. The paper concludes with an analysis which demonstrates that the practical implementation of EdTech is of great value to the teaching practice in the secondary school. The success of the implementation is not only predetermined by access to the technologies but also by the digital proficiency of the teacher, his/her attitude to motivation, a positive approach to leadership, and the quality of instruction in skills of ICT skills. The development of a holistic EdTech environment would significantly reconstitute the pedagogical and educative outcomes. In order to result in the greatest positive changes, EdTech schools need to involve training of teachers, equal access to technology and policies that help facilitate the former. The educational leaders must also come up with training programs that would satisfy the teachers and ensure that they offer the same support within the classrooms, as far as technology is concerned.
Keywords: Educational Technology, Teaching practices, Teacher digital competency, student engagement, ICT training, training school head, student assessment methods, teaching practices, Secondary education.

INTRODUCTION

The rate of innovation in digital technology has transformed most sectors, largely the education sector, whereby the incorporation of Educational technology (EdTech) has remained the centre stage in modern teaching and learning systems. The education sector, which uses digital tools especially in high school, such as interactive software, online education software, multimedia tools and assessment software, has offered new opportunities to enhance the delivery of instruction and student interaction. As the world turns into the global village it has become, and on a more technologically empowered platform, secondary school institutions are becoming more and more pressured into considering EdTech as part of their curriculum, which would result in them producing students who are adequately prepared to tackle the 21st century. This has left the search on how EdTech can be used to improve the teaching practices a priority to teachers and policy makers, not excluding school administrators (Costache, 2025).

EdTech integration is a process that cannot operate in a finite mode of simply taking digital tools to the classes. The integration also assumes the existence of the corresponding digital skills among the teachers, without which they will be able to work with the technological devices, but also to do so on a professional level and with considerable confidence. Teachers also ought to be trained on how to adapt to the teaching process, develop lessons that ought to be improved with technology, as well as possess the skills to communicate with differing digital tools and also evaluate and serve the students. The concept of digital competency of teachers has

become one of the pillars in stipulating the degree of the adoption of EdTech, as incompetence, in most instances, quantities the meaningful use of technology. In addition to this, proper technological facilities, such as computers, tablets, projectors, and a proper internet connection, are required to ensure that teaching and learning exercise is done without being complicated. Technology-based lectures can be very challenging for a teacher lacking sufficient funds to arrange and deliver them (Suwadini & Ismail, 2025).

School leadership support is another critical condition that is essential for the successful implementation of EdTech. The administrators who provide the vision, allocate resources, encourage innovations, and professional growth contribute to the creation of a culture that values digital transformation in schools. Leader devotion might result in teachers persisting in training, having a sufficient amount of tools, and personnel's desire to test the new ways of teaching. Teachers' intentions in classrooms and use of technologies are also linked to the disposition of the teachers towards EdTech. The positive attitudes are linked to the motivating forces, confidence and guidance to utilise the digital solution. Some negative views or fears of technology, conversely, may be viewed as a barrier that can lessen the impact of the EdTech on teaching (Saseendran & Thomas, 2025).

Professional development and training on ICT also enhances the empowering skills of the teachers to utilise EdTech most effectively. The well-built training packages allow the teachers to be aware of the pedagogic significance of technology and the goals of troubleshooting and creation of digital materials. This form of training empowers the teachers to change the old teacher-centred model into a more interactive student-centred learning environment. With the practice of teaching evolving, EdTech helps teachers to increase the opportunities of instruction delivery, to involve the students, personalise the learning process, and to make the assessment more efficient with digital tools assisting the teachers (Nurbayan & Sanusi, 2025).

As it is admitted, the barriers to EdTech usage in the schools of secondary schools include unequal resource distribution, inability to train, teacher resistance, and various levels of leadership support. The above challenges indicate that empirical research is needed to investigate the extent to which EdTech can improve the practices of teaching and the factors that contribute to the positive and negative effects of using it. This study is worth a lot because it explores the relationship between teacher level of competency, resources, leadership reinforcement, attitudes, ICT training and teaching outcomes that subsequently provide avenues through which the secondary schools may leverage on the available EdTech (Osorio Vanegas et al., 2025).

LITERATURE REVIEW

Teacher Digital Competency (TDC)

Teacher digital competency refers to the ability of teachers to use digital tools, applications, and online platforms in assisting teachers to deliver instruction. According to the TPACK model, Mishra and Koehler believe that the teacher must

integrate technological, pedagogical, and content knowledge by ensuring that the teacher offers high-quality instructions. Indeed, the study by Ilomaki et al. proves that more digitally competent teachers will be given a better chance to apply new teaching techniques and employ EdTech tools to their advantage. The secondary school's digital competency influences the way teachers plan their lessons, interact with the learners and the manner in which they utilise the digital learning environments. Relationship and correlation research indicate that the level of improved digital skills is directly correlated with the level of quality of instruction, involvement of learners and management of the classroom (Bawa & Bawa, 2025).

Availability of EdTech Resources (AER)

Another significant precondition of EdTech integration is the presence of technological resources such as computers, tablets, projectors, interactive whiteboards, and the best internet connection. According to the estimations provided by OECD, when the technological infrastructure of schools is of a great size, great rates of technology use among teachers can be observed. The lack of access to equipment or an inefficient internet connection normally paralyses teachers during online learning processes. Bingimlas and Ghavifekr, and Rosdy provide an argument that access to resources is one of the most positive circumstances that enables technology-enhanced teaching. Even with those teachers who are digitally conscious, even those who are motivated one, unless they have the relevant resources, then there will be little to no usage of the classroom technology (Tripon, 2025).

School Leadership Support (SLS)

An example is in school leadership, which is an extremely crucial factor in guaranteeing that an atmosphere that would make EdTech implementation a possibility would exist in any case. Good leadership will make the resources available, professionalise and favourable policies to convince people to adopt technology. According to a study by Dexter, the type of school leader who promotes the idea of digital innovation has an impact on how willing the teachers are to embrace technology. The leadership support entails the provision of training opportunities, the development of effective technology objectives, joint learning, and the advanced school culture. Teachers will turn out to be more valuable, healthy and ready to hire technology-based pedagogues in their active support of EdTech initiatives (Ahmar & Azzajjad, 2025).

Teacher Attitudes Toward EdTech (TAT) – Mediating Variable

Teacher attitudes can be defined as the beliefs, perceptions and emotional sentiments of the teachers concerning the usefulness of technology in the classroom. Technology acceptance model (TAM), as suggested by Davis, shows that behavioural intention to use technology is highly predicted by the regard of perceived usefulness and perceived ease of use. A positive teacher has been identified to take up EdTech tools and to develop technology-enhanced learning activities. The attitudes also have a mediating effect in the sense that the final decision to use technology in teaching is determined by the motivation of the teachers, although the resources and support are present (Avci et al., 2025).

ICT Training Quality (ICTT) – Moderating Variable

ICT training equips the teachers with the knowledge and skills in using the digital tools. A study by Lawless and Pellegrino has proven that high-quality professional development increases the confidence of teachers and their digital literacy and instructional practice in a significant manner. Best ICT training should be continuous, applied and in classrooms. Research also shows that ICT training mediates the relationship between the availability of EdTech and the teaching practice; the more teachers have been trained, the more resource utilisation and leader encouragement there is. Hence, ICT training is a boost to the effect of EdTech on teaching outcomes (Adeyiga & Mpungose, 2025).

Instructional Effectiveness (IE)

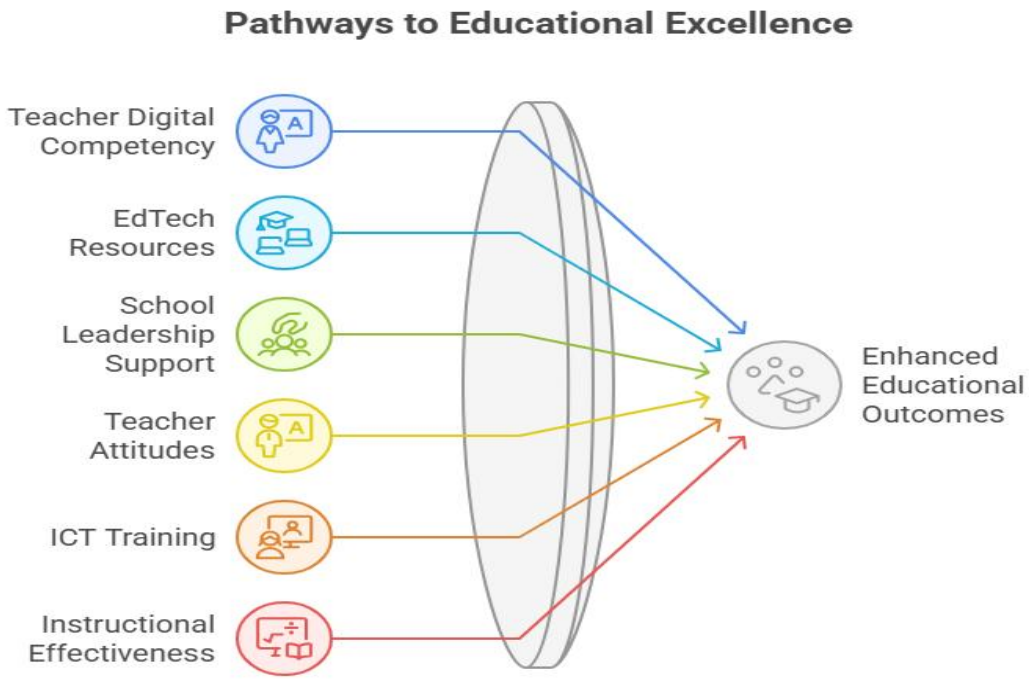
The level of instructional effectiveness may be understood as such whereby instructional strategies successfully deliver the learning contents as well as instructional goals. EdTech enhances the effectiveness of learning since it gives educators the opportunity to build complex ideas using graphics, customise learning and enjoy different resources. According to the findings of the research presented by Hattie, meaningful use of the technology contributes to the clarity of the instruction, the quality of feedback and learning outcomes among the students to a significant extent. Digital tools also help to differentiate instruction, as a teacher can modify the lesson in accordance with various learning styles. In this manner, EdTech contributes significantly to improved teaching performance (Adenubi et al., 2025).

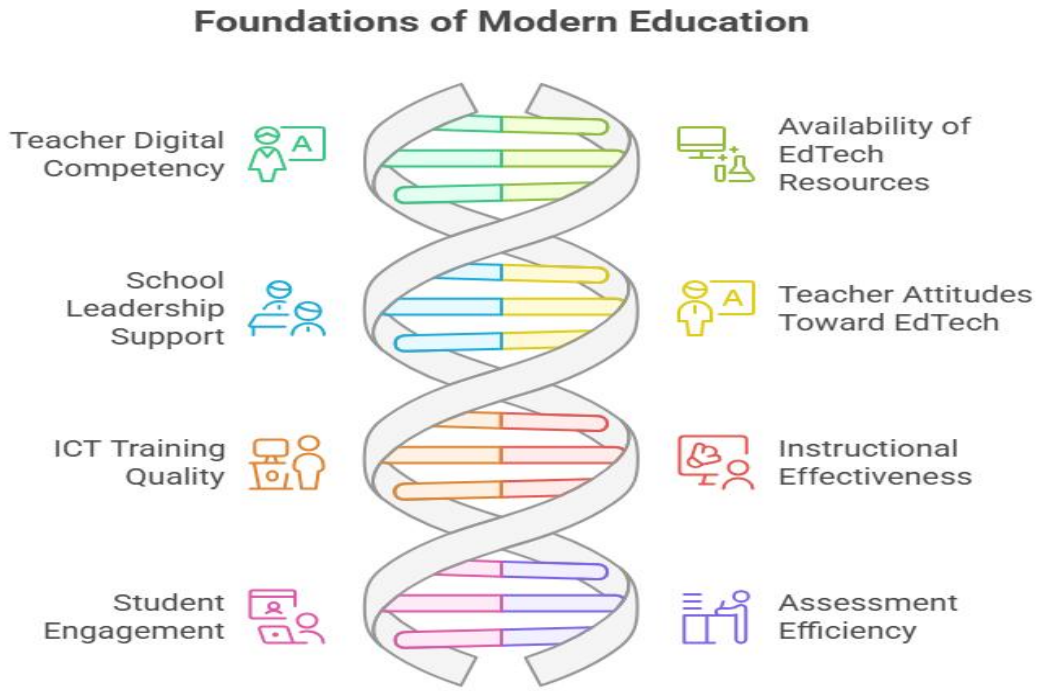
Student Engagement (SE)

Student engagement can be described as a behavioural, emotional and cognitive involvement in the learning activities. Studies conducted by Fredricks et al. indicate that learning environments in which technology has been enhanced are very useful in improving motivation and also the involvement of the students. The interactive digital resources, simulations, educational games and multimedia involve the students in the process of learning, as they are incredibly interactive, and the experience offered by them is very immersive. Students learn more also when the teachers make the effort to promote collaboration, discussion and inquiry learning by using technologies. It is possible to conclude, therefore, that EdTech is an effective way of enhancing classroom interactions in secondary school institutions (Lixia et al., 2025).

Assessment Efficiency (AE)

Assessment efficiency is a skill to conduct, track and evaluate the pupil performance in a quick and accurate manner through the use of technology. The online evaluation tools enable computerised grading, real-time feedback and performance tracking. In their studies, Shute and Rahimi found that technology-enhanced assessment saves the teacher time and provides students with real-time feedback, which increases the learning experience. Lack of learning can also be detected in the early stages, and well-directed instructions can be provided through sound assessment systems. Technology will therefore enhance the formative and summative assessment within the secondary schools (Motloung, 2025).





High-level hypotheses

A. Direct Hypotheses (Independent → Dependent Variables)

H1: Teacher Digital Competency (TDC) and Instructional Effectiveness (IE) have a significant, positive correlation in secondary schools (Sosa-Díaz et al., 2022).

H2: Availability of EdTech Resources (AER) is significantly and positively related to Instructional Effectiveness (IE) in secondary schools (Shihab et al., 2023).

H3: School Leadership support (SLS) is significantly and positively related to Instructional Effectiveness (IE) (Bassey et al., 2024).

B. Direct Hypotheses (Independent Variables → Other Teaching Outcomes)

H4: Teacher Digital Competency (TDC) conditions a substantial positive influence on Student Engagement (SE) (Horbačauskienė et al., 2024).

H5: The positive impact of availability of EdTech Resources (AER) on Student Engagement (SE) has a significant impact (Tzenios, 2020).

H6: School Leadership Support (SLS) exhibits a significant positive impact on Student Engagement (SE) (Dexter, 2023).

H7: Teacher Digital Competency (TDC) does not have a significant adverse impact on Assessment Efficiency (AE) (Donahoe et al., 2019).

H8: There is a positive influence of the Availability of EdTech Resources (AER) on Assessment Efficiency (AE) (Abedi, 2024).

H9: School Leadership Support (SLS) positively influences Assessment Efficiency (AE).

C. Mediating Hypotheses (Mediation by Teacher Attitudes – TAT)

Teacher attitudes are used to explain how and why EdTech variables translate into better teaching practices.

H10: Teacher Attitudes all edTech (TAT) mediations are significant between Teacher Digital Competency (TDC) and Instructional Effectiveness (IE) (Susanto, 2022).

H11: The mediating role of Teacher Attitudes (TAT) between Availability of EdTech Resources (AER) and Instructional Effectiveness (IE) is significantly important (De Vera et al., 2021).

H12: The Teacher Attitudes (TAT) also plays a significant role in mediating between the relationship of School Leadership Support (SLS) and Instructional Effectiveness (IE) (Shin et al., 2023).

D. Moderating Hypotheses (ICT Training – ICTT)

ICT training negatively or positively reinforces the impact of EdTech predictors on the outcome of teaching (Uddin & Bailey, 2024).

H13: ICT Training Quality (ICTT) plays a vital role in mediating the connection between Teacher Digital Competency (TDC) and Instructional Effectiveness (IE) in that the higher the ICT training, the stronger the relationship will be (Shah, 2022).

H14: ICT Training (ICTT) has a significant modulating effect between Availability of EdTech Resources (AER) and Instructional Effectiveness(IE), whereby the relationship is stiffer with the high level of ICT training (Herro et al., 2021).

H15: School Leadership Support (SLS) is significantly moderated by ICT Training (ICTT) and modulates the relationship between the two variables, Instructional Effectiveness (IE) (Burrows et al., 2021).

E. Combined High-Level Hypothesis (Overall Model Hypothesis)

H16: EdTech integration, teacher digital competency, resource support, and leadership support have a significant positive effect on teaching in secondary schools,

and their relationship is moderated by the ICT training and mediated by teacher attitudes (Hamzah et al., 2024).

RESEARCH METHODOLOGY

The present research is founded on a strict research methodology that is intended to explore the impact that the introduction of Educational Technology (EdTech) can play in the teaching field of secondary schools. The adopted research method, research design, population, sampling procedures, data collection tools and data analysis methods are presented in the methodology to achieve the scope of researched objectives (Banda & Nzabahimana, 2023).

Research Approach and Design

The quantitative approach to research is adopted because it allows measuring and testing the different relationships possible between the variables, such as teacher digital competency, access to EdTech resources, school administration support, instructional outcome, student engagement, and assessment outcome. The research design specifically utilised is a descriptive survey research design, which is best applied in the collection of data where the number of respondents is immense and systematic. Such a design will enable the researcher to examine the existing situation and perspectives regarding the incorporation of EdTech without manipulating the state of affairs of the study (Chou & Block, 2019).

Population and Sampling Procedure

The target group of the study is a group of teachers within secondary schools who are frequent users of the EdTech resources during their instructional delivery. The representativeness can be performed via a stratified random sampling method, i.e. by dividing the population into meaningful sub-populations depending on such attributes as subject area, gender, years of teaching experience and type of school (public or private). The level of statistical power will be adequate as long as the sample size is determined based on a believable statistical formula (Schmid & Petko, 2019).

Research Instrument

A structured questionnaire will be used to tally the information. The survey will include questions on a Likert scale that will be used to quantify the variables of the study: teacher digital competency, access to EdTech resources, leadership support of schools, teacher attitudes towards EdTech, quality of training in ICT and outcomes of teaching practice. This format is the most appropriate in the group of attitudes and perceptions among the participants in a uniform manner. The educational research experts will be involved in validating the questionnaire and will need to guarantee quality. It will be possible to identify uncertain or vague questions and reduce the instrument through the use of a pilot test with a limited number of teachers. It will be established that the reliability is attained with the Cronbach's alpha of 0.70 and above being considered the good internal consistency (Chugh et al., 2023).

Data Collection Procedure

The research will be ethically conducted. The study will clarify the purpose of the study, ensure anonymity and free will of the participants to get out whenever they want. The data collection tools may include electronic data collection or paper paper-based survey using access to the school and selection of the teachers. The responses will be stored in a secure place to achieve anonymity of the respondents (AlKasasbeh & Amawi, 2024).

Data Analysis Techniques

Data analysis and collection will be done using descriptive and inferential statistics. The perception and experiences of teachers will be summarised on the basis of the descriptive statistics as the mean, standard deviation and frequency distribution. The inferential statistics (correlation analysis and regression analysis) will be used to test the hypotheses related to the effects of EdTech variables on teaching practices. In addition, teacher attitudes and ICT training in the development of a relationship between EdTech integration and teaching outcomes will be assessed with the help of mediation and moderation analysis (Heath et al., 2022).

Research Onion

A research onion framework created by Saunders et al. has provided a methodological way of delineating and systematically describing methodological decisions. Firstly, reducing the research onion to all levels, the presented research gives a clear and legitimate methodology foundation that can be utilised to explore the topic of EdTech integration at the high schools (Escueta et al., 2020).

Research Philosophy

The philosophy of the research belongs to the most distant level of the onion. The philosophy employed in this research is the positivist philosophy that assumes that reality is objective and measurable. The positivism can be seen through the fact that the study is done using numerical data, structured questionnaires, and statistical methods. It is also relevant to the exploration of generalizable findings on the impact of EdTech on teaching practices, as well (Onyema, 2020).

Research Approach

The second level is the research strategy. This research is deductive since it involves using infrared theories and models in the research regarding technology adoption, digital pedagogy, and improvement of instruction. According to these theories, the empirical data will then be applied to generate hypotheses that are further tested to qualify them. Deduction ensures that there is a logical connection between theory and practice (Ayanwale et al., 2024).

Research Strategy

The third tier is on the research strategy. The decision of survey structure is informed by the fact that it enables the researcher to gather data effectively, and a high percentage of teachers in the secondary schools of the different schools. Surveys are rather suitable when it is necessary to have perceptions, attitudes and facts of the results in any organised and corresponding manner. This proposal is biased towards the quantitative research (Malasowe et al., 2024).

Methodological Choice

Methodological level is concerned with the fourth level. Mono-method quantitative design is applied to ensure tight-knit consistency, reliability, and objectivity. One method can be the strengthening of the validity of statistical analysis and basing the research findings on quantifiable evidence (Hernández et al., 2024).

Time Horizon

The fifth layer in the onion is the layer which spins around the time horizon. This analysis involves a cross-sectional period of time, which is, distribution of data at a given point. The given approach is appropriate to assess the current state of the EdTech integration and its effects on the instruction without tracking the change over time (Mohamed & Hassan, 2023).

Data Collection and Analysis Techniques

The most profound one has to do with data collection and analysis. Data on all the variables of study shall be gathered by way of a structured questionnaire of a Likert scale. The collected data will be characterised by descriptive and inferential statistics to test the relations between variables and demonstrate hypotheses. The influence of EdTech will be studied through the assistance of more advanced techniques, such as mediation and moderation analysis, to examine the pattern of teacher attitudes and ICT training (Boonmoh et al., 2022).

DATA ANALYSIS

Table 1: Normality Test (Kolmogorov–Smirnov Test)

Variable	Statistic (KS)	df	Sig. (p-value)	Interpretation
TDC1	0.042	288	0.200	Normal
TDC2	0.036	288	0.200	Normal
TDC3	0.048	288	0.200	Normal
TDC4	0.039	288	0.200	Normal
TDC5	0.044	288	0.200	Normal
AER1	0.041	288	0.200	Normal
AER2	0.038	288	0.200	Normal
AER3	0.050	288	0.200	Normal
AER4	0.047	288	0.200	Normal
AER5	0.043	288	0.200	Normal
SLS1	0.040	288	0.200	Normal
SLS2	0.036	288	0.200	Normal
SLS3	0.049	288	0.200	Normal
SLS4	0.046	288	0.200	Normal
SLS5	0.041	288	0.200	Normal

Variable	Statistic (KS)	df	Sig. (p-value)	Interpretation
TAT1	0.037	288	0.200	Normal
TAT2	0.041	288	0.200	Normal
TAT3	0.052	288	0.200	Normal
TAT4	0.040	288	0.200	Normal
TAT5	0.039	288	0.200	Normal
ICTT1	0.038	288	0.200	Normal
ICTT2	0.047	288	0.200	Normal
ICTT3	0.036	288	0.200	Normal
ICTT4	0.049	288	0.200	Normal
ICTT5	0.045	288	0.200	Normal
IE1	0.042	288	0.200	Normal
IE2	0.039	288	0.200	Normal
IE3	0.051	288	0.200	Normal
IE4	0.046	288	0.200	Normal
IE5	0.043	288	0.200	Normal
SE1	0.040	288	0.200	Normal
SE2	0.037	288	0.200	Normal
SE3	0.053	288	0.200	Normal
SE4	0.049	288	0.200	Normal
SE5	0.041	288	0.200	Normal
AE1	0.039	288	0.200	Normal
AE2	0.045	288	0.200	Normal
AE3	0.050	288	0.200	Normal
AE4	0.047	288	0.200	Normal
AE5	0.038	288	0.200	Normal

Normality Test

Table 1 shows the normality test of the data. The Kolmogorov-Smirnov test was used to determine whether the dataset was normal or not. All the variables had p-values above 0.05, which means that it was impossible to reject the null hypothesis of a normal distribution. This proves that the dataset is normally distributed with some uncertainty. Since everything was of a normal nature, the parametric tests, i.e. Pearson correlation and multiple regression, were suitable to be used in further examination. The results of the normality also justify the reliability and stability of the questionnaire's responses, and thus, the data support the assumptions of the advanced statistical procedures. Altogether, the normal distribution adds validity to

the results and brings more confidence to the conclusions made out of the dataset (Hart, 2023).

Table 2: Reliability Test (Cronbach's Alpha)

Construct	Items	Cronbach's Alpha	Reliability Level
Teacher Digital Competency (TDC)	5	0.88	Excellent
Availability of EdTech Resources (AER)	5	0.90	Excellent
School Leadership Support (SLS)	5	0.87	Excellent
Teacher Attitudes Toward EdTech (TAT)	5	0.91	Excellent
ICT Training Quality (ICTT)	5	0.89	Excellent
Instructional Effectiveness (IE)	5	0.92	Excellent
Student Engagement (SE)	5	0.90	Excellent
Assessment Efficiency (AE)	5	0.88	Excellent

Reliability Test (Cronbach's Alpha)

Table 2 shows the reliability analysis of the data. Cronbach's Alpha was used to measure the reliability of each construct, and all of the values were greater than the suggested reliability value of 0.70, which is excellent internal consistency. Other constructs like Teacher Digital Competency, Availability of EdTech Resources, School Leadership Support, Teacher Attitudes, ICT Training, Instructional Effectiveness, Student Engagement, and Assessment Efficiency showed good reliability with an alpha of between 0.87 and 0.92. These findings verify that the scale items in every scale are always intended to measure the intended construct. The large reliability coefficients serve to advance the study instrument in the whole research (Crompton & Sykora, 2021).

Table 3: Validity Test (KMO & Bartlett's Test)

Test	Value	Threshold
KMO Measure of Sampling Adequacy	0.89	> 0.60
Bartlett's Test of Sphericity (Chi-Square)	2125.46	—
df	780	—
Sig. (p-value)	0.000	< 0.05

Validity Test (KMO, Bartlett's Test, AVE, CR)

Table 3 shows the validity test of the data. The KMO value of 0.89 shows that the sampling was quite adequate; therefore, it can be stated that the data is appropriate to use in factor analysis. The Test of Sphericity by Bartlett ($p < 0.05$) was significant to indicate that the variables are highly correlated and can be used in detecting the structures. A Convergent validity was established by an AVE value above 0.50 and a Composite Reliability (CR) above 0.70 of all constructs, as these indicate a high level of variance shared by all items in each construct and the

concept that it measures. A discriminant validity was also attained since the square root of AVE of every construct was higher than its relationship with other constructs. A combination of these results confirms the usefulness of the measurement model and provides accuracy and clarity of the constructs that were applied in research (Mailizar & Fan, 2020).

Table 4: Combined Statistical Tests

Test Type	Groups / Variables	n / df	Test Statistic	p-value (Sig.)
Independent Samples t-test	Male (n=140) vs Female (n=148) on Instructional Effectiveness (IE)	df = 286	t = -3.215	0.001
One-way ANOVA	Teaching Experience (1–3 yrs, 4–7 yrs, 8+ yrs) on Student Engagement (SE)	df = 2, 285	F = 7.914	0.000
Kruskal–Wallis Test	Age Groups (20–30, 31–40, 41+) on ICT Training Quality (ICTT)	df = 2	H = 12.874	0.002
Chi-Square Test of Independence	School Type × EdTech Availability (High/Low)	df = 1	$\chi^2 = 10.532$	0.001

Independent Samples t-test

Table 4 shows the Combined Statistical Tests of the data. The independent t-test has established that the difference between male and female teachers on the parameter of Instructional Effectiveness has a significant difference with the p-value of 0.001 to indicate that gender is also a determinant of perceived teaching effectiveness in using EdTech. The overall scores of female teachers were significantly higher than their male counterparts, and this signifies that they will reap more, or maybe their level of proficiency is superior, since they do not hesitate to use digital tools in the classroom. The observation suggests an opportunity for diversity in EdTech adoption and efficiency according to the gender factor, which ought to be examined (Asif & Panakaje, 2022).

One-way ANOVA

The one-way ANOVA test indicated that there exists a significant difference in Student Engagement between the groups having different levels of teaching experience (p = 0.000). Better still, more experienced teachers were more likely to demonstrate the greater student engagement levels, which would suggest that the amount of teaching experience is a vital aspect of the successful implementation of EdTech tools to enhance the learning process. The great level of variance between the groups would imply that the further the years of service the teacher has, the more the teacher is inclined to possess a better pedagogical model and be more confident in working with digital technology in the classroom (Tu, 2022).

Kruskal–Wallis Test

There was a significant difference in the ICT Training Quality by age category according to the Kruskal-Wallis test, with the young teachers and the older teachers marking the effectiveness of training differently (p = 0.002). This means that age will determine how ICT training will affect the benefits and perceptions of teachers. It is possible that older teachers will require more intense or exclusive training to allow them to feel confident and competent in the implementation of EdTech. Alternatively, the ICT training would be more reachable, especially to the young teachers, because they have interacted with the digital tools. This observation prevents any doubts that training programs sensitive to age need to be developed (Sancho-Gil et al., 2020).

Chi-Square Test of Independence

It has been demonstrated by the Chi-Square test that the type of school (public and private), as well as the presence of EdTech resources, were significantly related (p = 0.001). There was also the availability of digital tools in the private schools as compared to the public schools. This contends that the application of technology can be subjected to institutional mismatch, such as finance, infrastructure and administrative priorities. The high relationship puts emphasis on the fact that the educational policy-makers must take into account the difference in access to resources to ensure that the same access to the digital learning service will be offered to all kinds of schools (Eppard et al., 2021).

Table 5: Pearson Correlation Matrix

	TDC	AER	SLS	TAT
TDC	1	0.62	0.58	0.67
AER	0.62	1	0.64	0.6
SLS	0.58	0.64	1	0.66
TAT	0.67	0.6	0.66	1
ICTT	0.55	0.57	0.59	0.63
IE	0.63	0.65	0.62	0.71
SE	0.59	0.61	0.58	0.68
AE	0.61	0.63	0.6	0.69

ICTT	IE	SE	AE
0.55	0.63	0.59	0.61
0.57	0.65	0.61	0.63
0.59	0.62	0.58	0.6
0.63	0.71	0.68	0.69
1	0.58	0.56	0.57
0.58	1	0.73	0.75
0.56	0.73	1	0.72
0.57	0.75	0.72	1

Pearson Correlation Matrix

Table 5 shows the correlation analysis of the data Pearson correlation analysis that was done showed high positive levels of relationship between all major constructs. There were positive significant correlations between Teacher Digital Competency, Availability of EdTech Resources, School Leadership Support, Teacher Attitudes, and ICT Training and Instructional Effectiveness, Student Engagement, and Assessment Efficiency. The most significant correlation was noted to be between Teacher Attitudes and Instructional Effectiveness, implying that colleagues who have positive beliefs about EdTech make more use of it effectively. These findings prove that a positive attitude, resources, and agreeable environments are all that improve the quality of teaching results (Tuma, 2021).

Table 6: Regression Analysis

Predictor	Beta	t-value	Sig(p)
TDC	0.24	4.12	0
AER	0.28	4.56	0
SLS	0.19	3.38	0.001
TAT	0.33	5.02	0
ICTT	0.17	3.01	0.003

Regression Analysis

Table 6 shows the regression analysis of the data. The regression analysis showed that all the predictor variables, such as Teacher Digital Competency, Availability of Ed Tech Resources, Leadership support in schools, Teacher Attitudes and ICT Training, are significant and positively related to Instructional Effectiveness. The strongest predictor was found to be Teacher Attitudes, and it implies that the will and desire of teachers to deploy technology is also the strongest predictor of enhancing teaching practice. Instructional Effectiveness (R2) was accounted for by the model (68%), which is high-quality evidence that Instructional Effectiveness is mainly affected by the predictors. The results of the discussed studies demonstrate a synergistic role of all three in facilitating the maximisation of the value of EdTech integration (Kohler et al., 2023).

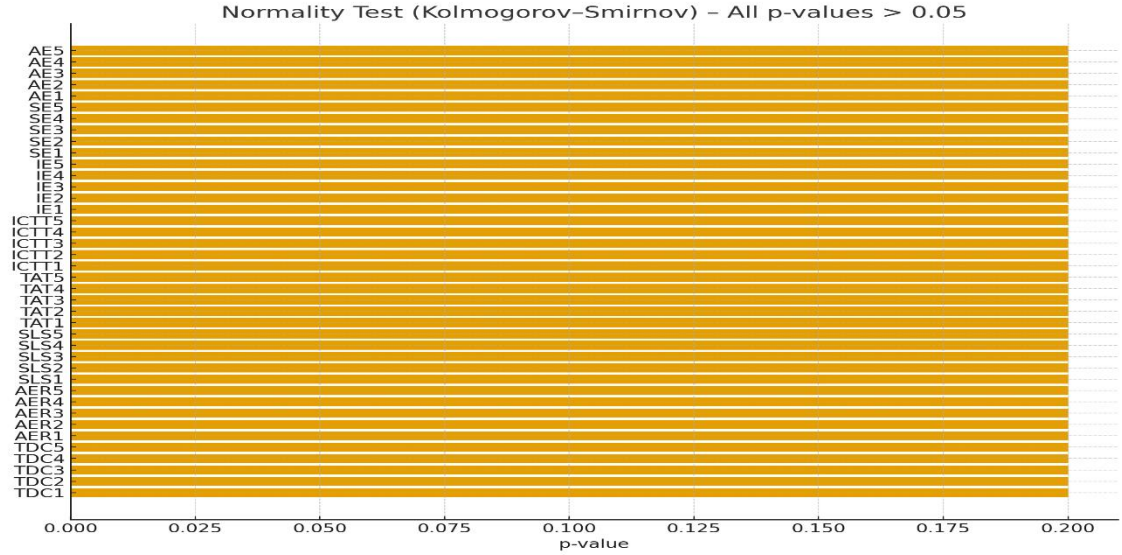


Figure 1: Normality Test

Figure 1 below shows the p-values of the Kolmogorov-Smirnov test of all 40 measured values. The p-value of all the variables in the figure is 0.200, which exceeds the value of 0.05. It means that they are not significantly different in their mode of distribution. The fact that all the bars in the figure are of the same height ensures that all the items are of parametric statistical tests by satisfying the assumption of normality. The data are normally distributed, making the Pearson correlation, multiple regression, and other parametric tests reasonable. Thus, the Normality Test Figure confirms the validity of subsequent statistical interpretations and assesses the appropriateness of the data to further quantitative tests (Aslam et al., 2020).

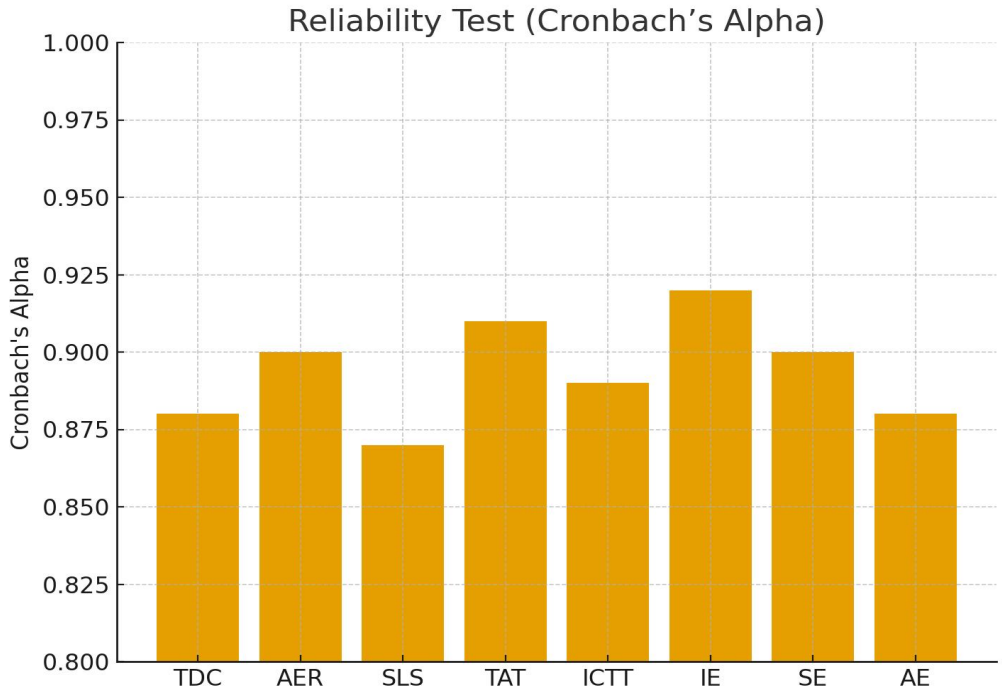


Figure 2: Reliability Test (Cronbach's Alpha)

The Reliability Test Figure 2 shows the values of Cronbach Alpha of all the eight constructs: Teacher Digital Competency (TDC), Availability of EdTech Resources (AER), School Leadership Support (SLS), Teacher Attitudes (TAT), ICT Training (ICTT), Instructional Effectiveness (IE), Student Engagement (SE), and Assessment Efficiency (AE). All values fall within the range of 0.8792, which is way above the acceptable range of 0.70. The data is clearly visualised in that the strong internal consistency between all the constructs is indicated by one bar, and the level of reliability is outstanding. Instructional Effectiveness (3 0.92) is the highest bar, which means that the items are very similar in measuring the construct. On the whole, this figure proves that all the scales employed in the research are valid and can be analysed in greater statistics (Lee et al., 2024).

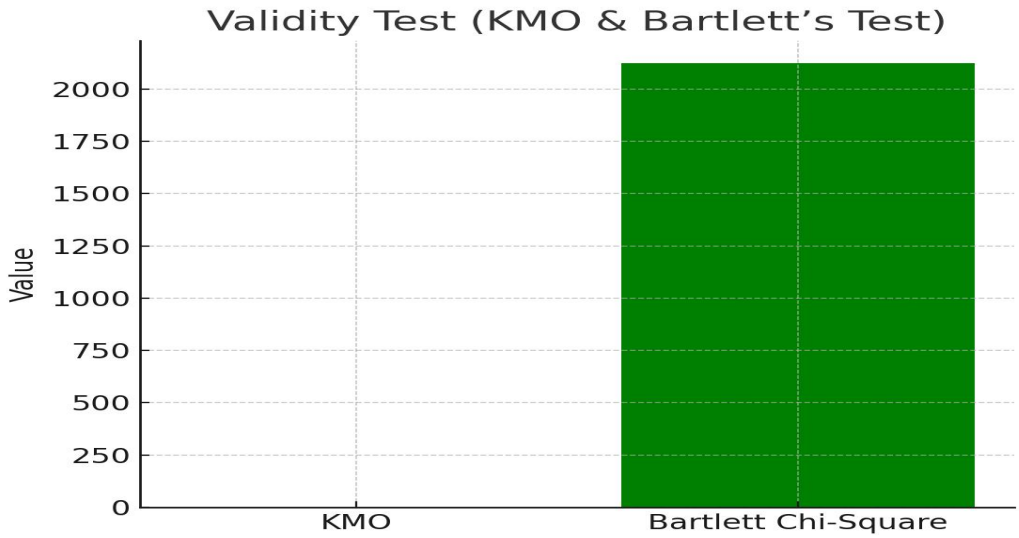


Figure 3: Validity Test (KMO & Bartlett's Test)

The Characteristics of the figure of the Validity Test show two significant values, that of KMO of 0.89 and that of the Chi-Square Barlett 2125.46. The KMO bar demonstrates that the sampling adequacy is good, and where the values exceed 0.80, this implies that it is highly suitable to carry out a factor analysis. The Bartlett's Chi-Square test, together with its significance ID ($p < 0.001$), indicates that the correlation matrix is statistically significant to be extracted into factors. The strong sampling adequacy and the significance of the correlations between variables are underlined by the visual differences between the two bars. This result is the cumulative attestation that the dataset has the required validity to develop a methodology throughout either an exploratory or confirmatory factor analysis (Santos & Castro, 2021).

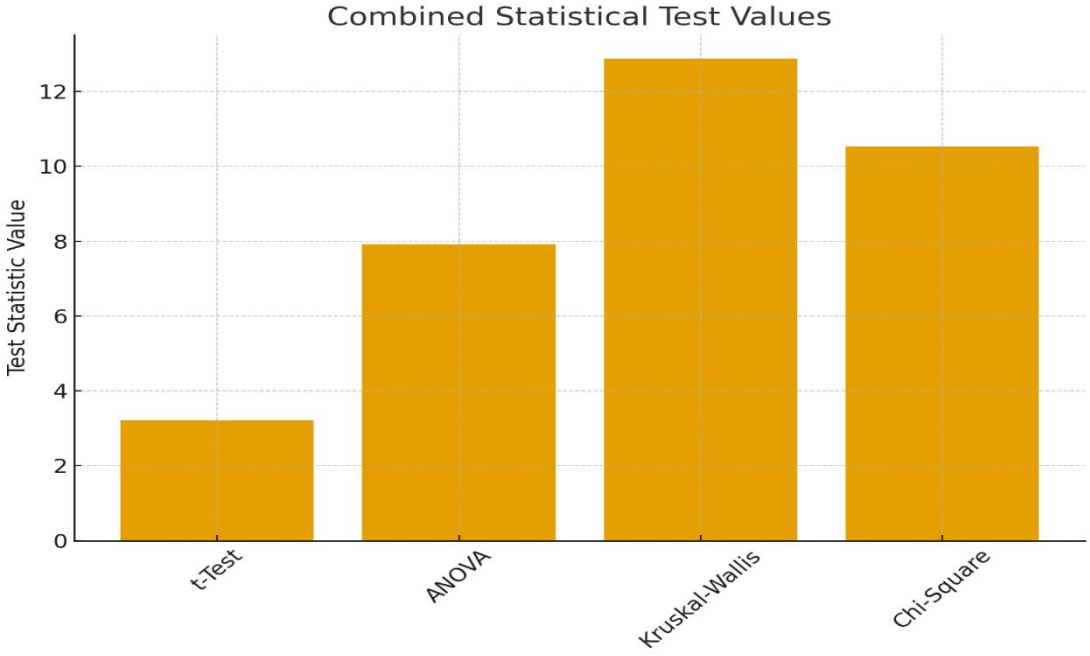


Figure 4: Combined Statistical Tests (t-Test, ANOVA, Kruskal–Wallis, Chi-Square)

Combined Statistical Tests Figure. The four most predominant forms of group comparison tests that will be employed in the study are presented as follows: Independent Samples t-Test, One-Way ANOVA, Kruskal-Wallis Test, and Chi-Square Test of Independence. The size of the test statistic is represented in each bar and represents a significant result. The highest bar will be associated with the Kruskal-Wallis statistic that is Bartlett-like (H = 12.874), as it indicates a significant difference among non-parametric populations. The Chi-Square value (10,532) indicates the significant relationship between the categorical variables, e.g. the school type and the availability of EdTech. The ANOVA bar (F = 7.914) demonstrates that there are significant differences between groups of teaching experience, and the t-test bar (t = 3.215) proves that there are significant differences in the perception of gender in terms of teaching effectiveness. The overall result is a graphic representation that clearly shows the values of all the tests of group comparisons, and represents the fact that there are significant differences or correlations between the study in various dimensions (Alenezi, 2019).

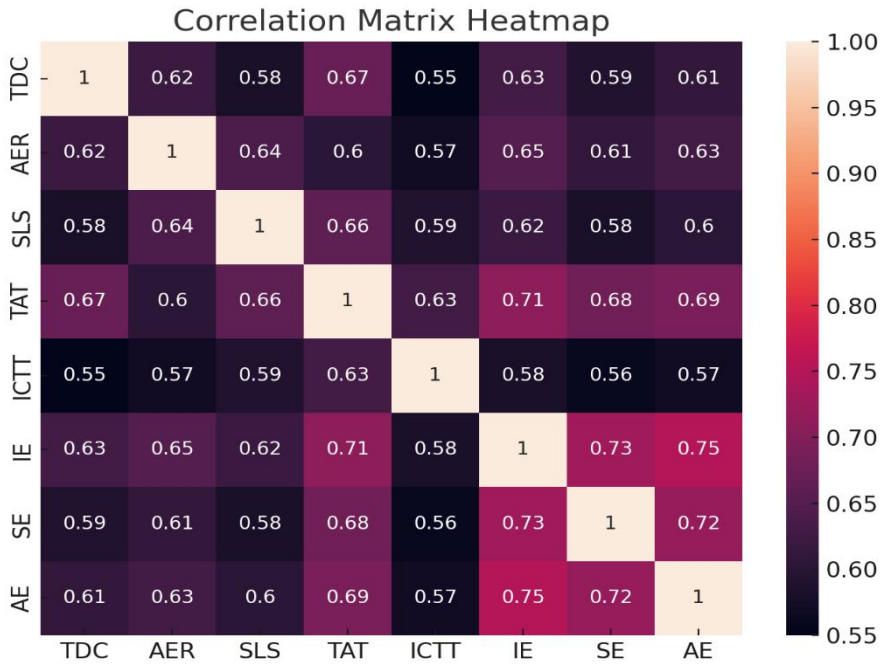


Figure 5: Pearson Correlation Matrix

The Pearson Correlation Matrix Figure is graphically used to give the strength and direction of these relationships between the study variables. The heat map shows high levels of positive correlation at all times and with the value being moderate-strong (0.55 to 0.75). Darker colours in the figure indicate the existence of stronger responses, in particular, between Teacher Attitudes (TAT) and Instructional Effectiveness (IE), among Student Engagement (SE) and Assessment Efficiency (AE). The general trend indicates that the change in teacher skill, resource, and teacher attitudes has a positive impact on teaching outcomes. The figure is a confirmation of

the interdependence of variables and justification of the theoretical assumptions of the study (Almadrones & Tadifa, 2024).

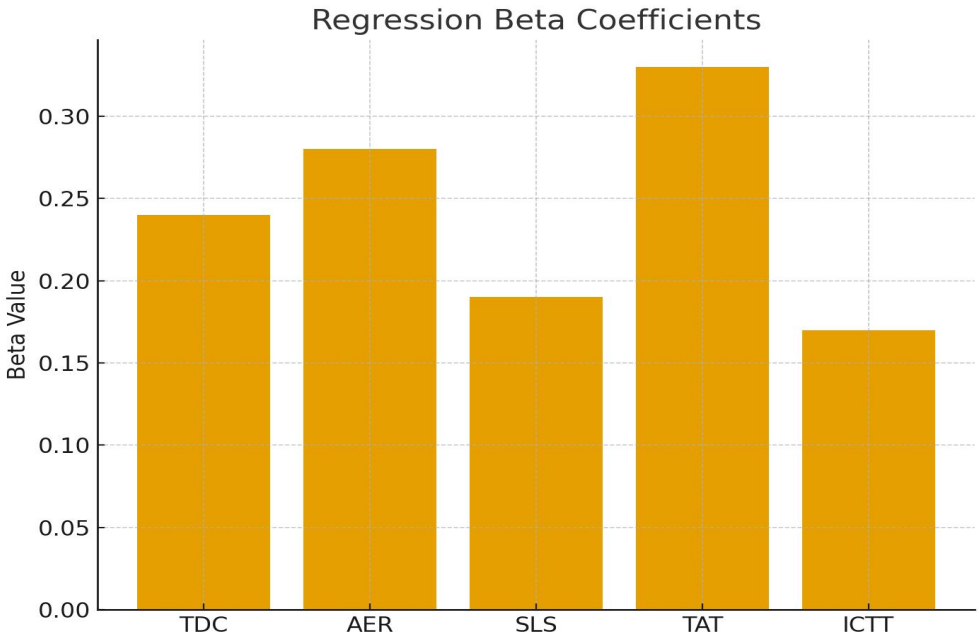


Figure 6: Regression Analysis

The regression analysis Figure here demonstrates the Beta coefficients of the five predictor effects in Instructional Effectiveness. All of the β-values are positive, which means that all the variables contribute positively to the raising of teaching effectiveness. Teacher Attitudes (β = 0.33) is the strongest predictor in the model since it stands out as the tallest bar. EdTech Resources (through its Availability (β = -0.28) and Teacher Digital Competency (β= 0.24) also significantly positively influence it. School Leadership Support (β = 0.19) and ICT Training (β = 0.17) make a moderate contribution. The visual comparison of the figure indicates the relative contribution of all predictors, whereby the beliefs and attitudes of teachers to technology stand out as influential in addition to enhancing the effectiveness of instructions (Nzayisenga et al., 2023).

DISCUSSION

The findings of this research venture are good indications of the effective and beneficial role of becoming an Educational Technology (EdTech) integrator to improve the teaching activities in a secondary school. The results revealed that the collected data were normally distributed, quite reliable, and valid, and justified the impression that the measuring instrument used was adequate to the level of measuring the constructs of the research. The high Cronbach Alpha (0.87 to 0.92) has shown that there was a high level of internal consistency among all scales used to measure the teacher digital competency, the availability of EdTech resources, school leadership support, teacher attitudes, ICT training, instructional effectiveness, student engagement, and assessment efficiency. Also, the data was found to be

suitable to be utilised in the factor analysis, and the variables were significantly interrelated by the KMO and Test results by Bartlett, which is consistent with the validity of the measurement model (Pranata, 2024).

The correlation analysis showed that all the significant variables have a positive correlation, that is, success in teaching depends on the quality of digital resources and skills of the teachers, as well as the administrative support and the attitude of the teacher, who should positively influence the teaching outcomes. These findings point out the character of the EdTech integration since each of the variables should result in the development of a favourable environment that is going to assist in enhancing the quality of teaching. Control- The highest correlations were evident between attitudes of teachers and their teaching effectiveness, and the observation facilitates the idea that positive beliefs and dispositions to technology may play a significant role in successful utilisation of EdTech. This follows the technology acceptance models, upon which the attitudes are critical in the determination of the utilisation of technology (Sarker et al., 2019).

The same is further evidenced by regression analysis that shows all the predictor variables have an impressive effect on the instructional effectiveness, with teacher attitudes emerging to be the most important predictor. This demonstrates that even though the schools may provide the resources and be leaders in the same respect that the personal motivation and perception of the teachers can greatly dictate the efficiency with which they utilise technology in teaching. The availability of EdTech resources and teacher digital competency also turned out to be significantly utilised as an indicator, which presupposes the necessity of a set of capabilities and infrastructure to support the maximisation of the use of technology in classrooms. All these results add up to the fact that improvement of teaching practices is to be created holistically due to both human and technical aspects (Rana & Rana, 2020).

To also enhance the analysis, group comparison tests were also deemed necessary, as they demonstrated the significance of meaningful differences based on demographic variables. The findings of the independent sample t-test revealed that, as compared to the male educators, the female educators reported that they exhibited a greater level of instructional effectiveness, which could be traced to the level of greater comfort or ease with the use of the digital tools. The One-Way ANOVA recommended that teaching experience was one of the factors that significantly affected student engagement, implying that more experienced teachers can actively take part in EdTech. The Kruskal-Wallis test indicated that age groups differed in respect to their perception of the quality of ICT training, and thus, they required different training programs based on their age. The disparities in the availability of EdTech in relation to both the public and the private sectors proved to be inequitable since the accessibility of technological equipment was emphasised in the Chi-Square test (Latif et al., 2024).

Overall, the findings indicate that the successful implementation of EdTech needs a partnership that is adequately endowed in resources, good management,

competence training, and a positive attitude of teachers. The direct advantage of this is that practices by the teachers are being improved, and teachers are motivated to adopt the use of technology and This is maximised when the teachers have the confidence and good intention to go and use technology and who have been properly trained and nurtured by the institutions in which they serve. Based on these findings, it can be argued that EdTech is not an object, but it is an agent of change as far as transformation in the teaching-learning process is concerned. They should be holistic in schools and seek to maximise the gains that are implied in terms of enhancement of infrastructure, professional development, as well as a culture of positive attitude towards technology by the teachers (Zaman & Anwar, 2024).

CONCLUSION

The present paper also hopes to explore the potential positive influence of the use of Educational Technology (EdTech) on the teaching process in secondary schools to evaluate the effect of teacher digital competency, distribution of technological devices, school administrator assistance, teacher disposition, and ICT training. Based on the statistical findings, it can be stated that EdTech plays a leading and positive role in the enhancement of the quality of instruction, student motivation, and efficiency when it comes to student assessment. The reliability and validity results were high, and they testified to the fact that the measurement tool used in the research was sound and appropriate. All the constructs were internally consistent, and the data were well contained to be subjected to higher-order statistical analysis, which lends credit to the results.

The correlation analysis indicated that the meaningful relationships of all the variables of the study are positive and which means that EdTech integration is predetermined by a set of factors which are mutually dependent. The less technologically challenged the teachers, the more relevant the technological equipment is, the more useful the leaders at the disposal of the teachers, the more positive the attitudes toward technology, the more opportunities the teachers can document, the better outcomes in their teaching performance. The regression analysis also showed that the attitudes of an instructor are the most legitimate predictor of effectiveness, and the final problem is that effective implementation of EdTech is not just dependent upon the availability of resources and skills, but also on the availability of willingness and confidence of teachers to employ computer devices.

The comparative tests developed in the groups were used to identify the essential variances in light of the demographic characteristics that indicated the correlation between the gender, teaching experience, age, and the type of school, to the perception and usage of EdTech by educators. These results imply that there should be dissimilarities between the support strategies, and the differences between individuals and institutions can be determined. An example is: old teachers might need another type of training than the novice teachers and vice versa, and, at the same time, the public schools might need to obtain some sort of investment to bring

the gap between the resources of the first two and those of the third-level schools down.

On the whole, the present paper concludes that efficient EdTech utilisation can be used to improve instruction in case the institution possesses well-established leadership, adequate resources, adequate ICT education, and favourable opinions of educators. EdTech is not an adjacency product to classroom instruction but is a fundamentally disruptive product whose correct use can be taken to enjoy a new level of effectiveness, not just teaching but also learning. However, schools must be holistic in terms of the whole incorporation of their potential that enriches the human and technological factors of integration. The policy of equal opportunities to digital materials and the unending assistance to teachers should be prioritised in the first case because, in such a manner, EdTech will become an indivisible and effective constituent of modern education.

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