Examining The Impact Of Extrinsic And Intrinsic Barriers To Adopting Information Communication Technology In Classroom Teaching In Intermediate (K 12) Colleges Of Karachi, Pakistan

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Abstract

Information communication technology is a necessary tool for any individual and country to compete globally. Competency in using ICT (Information Communication Technology) is much more needed for personal growth, social cohesion, and success in the twenty-first Century. Nevertheless, irrespective of its great significance, many educational institutions are not using ICT at all instructional levels in our country. Previous studies advocate that extrinsic barriers, educationists' beliefs, and Information Communication Technology-related self-efficacy determine ICT use in classroom lessons. This study aimed to find the impact of extrinsic barriers, teachers' beliefs, and ICT-related self-efficacy on their ICT in classroom teaching. A sample of 305 college teachers from 48 private colleges in Karachi responded to the survey instrument. Multiple Regression Analysis analyzed the data. The data analysis revealed a statistically significant impact of extrinsic barriers, teachers' beliefs, and ICT-related self-efficacy on their ICT usage in classroom teaching practices.

Keywords: ICT (Information Communication Technology), Extrinsic barriers, Intrinsic barriers, teachers' beliefs, self-efficacy.

Introduction:

Information communication technology is a necessary tool for any individual and country to compete globally. Competency in using ICT is much more needed for personal growth, social cohesion, and success in the twenty-first Century (Chandio, Semen, Samsuri, & Shah, 2016; November; Salam, Yang, Shaheen, Movahedipour & Zeng, 2017). Technology integration is essential for the successful learning of students in their classroom lessons. Like in every organization, ICT is now the backbone of every department of education. Integrating ICT into the teaching process may give students better learning opportunities and enhance their digital skills to meet digital challenges.

Teachers' competency to integrate technology in pedagogy is affected by different factors such as external and internal barriers (Ertmer,1999), which may be infrastructure, training, availability of technology, their confidence level, self-efficacy, and willingness to use technology-integrated lectures in the classrooms (Hew & Brush, 2007; Aziz & Qureshi, 2018). The use of technology-based lessons during teaching practices depends on

teachers' beliefs about technology integration and their ICT-related self-efficacy (Kundu and Dey, 2020; Birisci and Kul, 2019; Mukminin, Habibi, Muhaimin, Haryanto, & Setiono,2019; Xu, & Zhu,2020). Our lives and habits are often changing radically because of information technology. Without a doubt, it also contributes to our social, moral, ethical, and economic values. In addition, information communication technology alters teaching and learning methods and what is expected of information communication technology to connect students with their learning habits. For all these changes to occur successfully, teachers need to be fully trained for the required skills. Furthermore, to good student learning habits, teachers need to have excellent teaching methods.

Likewise, in other second-world countries, Pakistan is also struggling to incorporate ICT into educational institutions for an advanced level of learning. Indeed, educational institutions face (Ali, Nargis, Yasmeen & Iqbal, 2015) several barriers to using and integrating ICT. There can be many reasons which may hinder the use of ICT by teachers during their lessons. Communication technology enhances self-study. ICT is essential for teachers and students because it provides learning opportunities for both parties, namely students and teachers. Furthermore, active learning is encouraged by using ICT in classroom teaching practices. A teacher with ICT skills can plan and prepare technology-based lessons and plan process by process.

Many studies have been conducted (Muhametjanova and Cagiltay, 2016; Han, Shin, & Ko, 2017; Ekberg and Gao,2018) to observe the barriers to ICT usage in classroom teaching practices. However, there is no research evidence to gain insight into factors that affect ICT use in classroom teaching practices at the intermediate (K-12) level in Karachi City. The problem highlighted by this research study was needed because of the unavailability of enough statistics

on the Issues influencing the teachers' ICT practices in classroom teaching in Karachi's educational institutions at the intermediate (K 12) level. Henceforth, this research contributes to filling the knowledge gap by investigating the major causes, i.e., extrinsic and intrinsic barriers affecting teachers' ICT in the classroom teaching process and practices.

This study will be beneficial for the stakeholders to find/adapt the possible strategies for technology-supported classroom teaching. Primarily this study will fill the gap in the existing work in this area. This study was limited to some private colleges in Karachi because of time constraints. This study only covers technology integration by the teachers in their classroom teaching.

Literature Review

Extrinsic Barriers and ICT Integration in Classroom Teaching:

Several diverse factors may affect technology integration in pedagogy (Ertmer, 1999). Various research studies have recognized possible hindrances in integrating technology. However, A meta-analysis of 48 different studies was conducted by Hew & Brush (2007). They concluded that resources, knowledge, and skills are the most identified barriers and focused on these two barriers (Lashari, Umrani & Buriro, 2021). Sometimes teachers wish to use ICT in their teaching practices but face problems with access to ICT resources, or they may not be trained enough for using the required ICT tools.

Inadequate access to ICT resources (Salehi & Salehi, 2012) was found to be a critical barrier for many of the teachers under consideration. Rahim (2013) claimed that Pakistan is far behind in integrating ICT because of underprivileged ICT-related progress in the region, especially in Punjab. Jita & Munje (2020) concluded in their study that instead of being competent in using technology but restricted

because of challenges (Lashari, Umrani & Buriro, 2021), including unavailability of resources and access to ICT gadgets, a dearth of support from administration and technical departments.

These resources can impact the teachers' decision to integrate technology into their instructions or classrooms. However, awareness of how to use technology is equally important. However, adequate support can embrace new teaching and learning methodologies. There should be more computer labs, technical staff, and the availability of the Internet in educational institutions. However, teachers - whether they teach in schools, colleges, or universities - must be trained to use ICT effectively. Furthermore, the implementation of ICT in institutions should align with the ICT policy framework in education.

Hence, the first hypothesis for this study is

H1a: Extrinsic barriers to using ICT in classroom teaching are significantly related to Teachers' use of ICT in classroom teaching.

H1b: Extrinsic barriers to using ICT in classroom teaching significantly impact teachers' use of ICT in classroom teaching.

Intrinsic Barriers and ICT Integration in Classroom teaching:

Teacher's beliefs and ICT Integration in Classroom teaching:

Several research studies conducted worldwide have revealed that beliefs are essential elements in examining how teachers integrate ICT into their classroom teaching. Teachers' beliefs seem to guide their teaching practices and influence their identity (Ahmed & Abdelraheem, 2019; Pajaras,1992). Integrating ICT in pedagogy can improve the quality of education, but according to Ertmer (2005,2012,2016), teachers' beliefs portray a fundamental part in adding technology in instructional process. Ertmer, (2005) illustrates

that the teachers' opinion about their knowledge and skills are significant in predicting teachers' decision to practice the available technology in their instruction and classrooms. Teachers' beliefs can outline their teaching practices and their behaviour in the classroom, and these beliefs may be positive or negative in using ICT. According to Mlambo, Rambe & Schlebusch (2020), there is a mediating influence of beliefs on implementing educational innovations (Lashari, Mashori, Abbasi & Talpur, 2018). These educational innovations referred to making lesson plans, adopting any method to deliver the lesson, and integrating ICT into classroom teaching. Studying the effects of educators' educational beliefs Hermans, Tondeur, Van Braak and Valcke (2008) revealed that in determining and elucidating teachers' computer use in classrooms, their beliefs play a significant role. Moreover, Tondeur, van Braak, Ertmer and Ottenbreit-Leftwich (2017) studied a literature and cocluded that there is positive connection between teachers' beliefs of teaching and incorporating the technology in teaching . Willis, Lynch, Fradale and Yeigh (2019) explored the factors that might forecast the purposeful execution of ICT in classroom teaching. Findings show that belief in the importance of ICT for an improved classroom environment was found to be the convincing predictor of ICT combination into the classroom. Hence the second hypothesis for this study is.

H2a: Teachers' beliefs are significantly related to their use of ICT in classroom teaching.

H2b: Teachers' beliefs have a significant impact on their use of ICT in classroom teaching.

Teachers' Self-Efficacy and ICT Integration in Classroom teaching

K. Li, Y.Li, and Franklin (2016) conducted a quantitative research study using the technology acceptance model. They discussed self-efficacy of technology awareness, educationist attitudes toward technology, observed ease of technology usage and perceived hurdles to adopting

technology employing regression analysis. Results reported that perceived self-efficacy and observed ease of use are stronger predictors of ICT adoption. However, perceived barriers are not significant predictors. Baydas and Goktas (2017) also claimed that there is a direct affect of claimed ease of use and self-efficacy on the teachers' ICT practice. The enhanced level of self-efficacy leads to integrating technology into teaching practices and bringing innovation in teaching strategies.

Hatlevik (2017) conducted quantitative research and concluded that Self-efficacy predicts 36% of ICT use in teaching. Cyprus, Coban & Atasoy (2019) also inquired quantitatively about the link between teachers' self-efficacy perception towards integrating ICT. This study used a bigger sample size of 42,307 and concluded the same remarks that self-efficacy is a stronger interpreters of ICT integration and urged that teachers' development in ICT is essential because ICT skill is needed for a better quality of education. As teachers are change agents, teachers need to change their strategies for the implementation of change. Li, Yamaguchi and Takada (2018) conducted a mixed-method research study on 838 primary school teachers and found that perceived benefits of ICT integration and teachers ICT related competencies are significantly correlated with the ICT use in classrooms that are students-centred

Kwon, Ottenbreit-Leftwich, Sari, Khlaif, Zhu, Nadir & Gok (2019) revealed that self-efficacy is highly correlated with ICT use in teaching and suggested that teachers' training may play a vital role in enhancing self-efficacy and building up confidence towards ICT use. Use

of ICT can be enhanced if there is enough self-efficay.

Hence the Third hypothesis for this research study is:

H3a: Teachers' Self-Efficacy is significantly related to the use of ICT in classroom teaching.

H3b: Teachers' Self-Efficacy has a significant impact on their use of ICT in classroom teaching.

Conceptual Framework:

The study's conceptual framework explains the concept in fig 1 that external and internal barriers are significant in examining the extent of teachers' ICT use in classroom teaching. The flowsheet diagram shows the connection between the independent variable and dependent variables. Moreover, the ICT use of college teachers is positioned on one side, whereas the independent variable is placed on the other side. The conceptual diagram shows two independent variables, i.e., Extrinsic barriers on top of the left-hand side and Intrinsic barriers on the bottom of the left-hand side. This research has taken one variable from Extrinsic barriers(B) and two variables from Intrinsic barriers, i.e., Teachers' beliefs (TP) and the teachers' self-efficacy (TS). Arrows head pointing towards the dependent variable, showing a significant impact of independent variables on the teacher's use of ICT in classroom teaching. Previous studies conducted in different countries have shown that intrinsic barriers have comparatively more impact on ICT use. Hence this study has selected two constructs from intrinsic barriers and one construct from extrinsic barriers. Altogether there are three independent variables, i.e., extrinsic barriers(B), Teachers' beliefs and teachers' self-efficacy.

Figure 1 Conceptual Framework
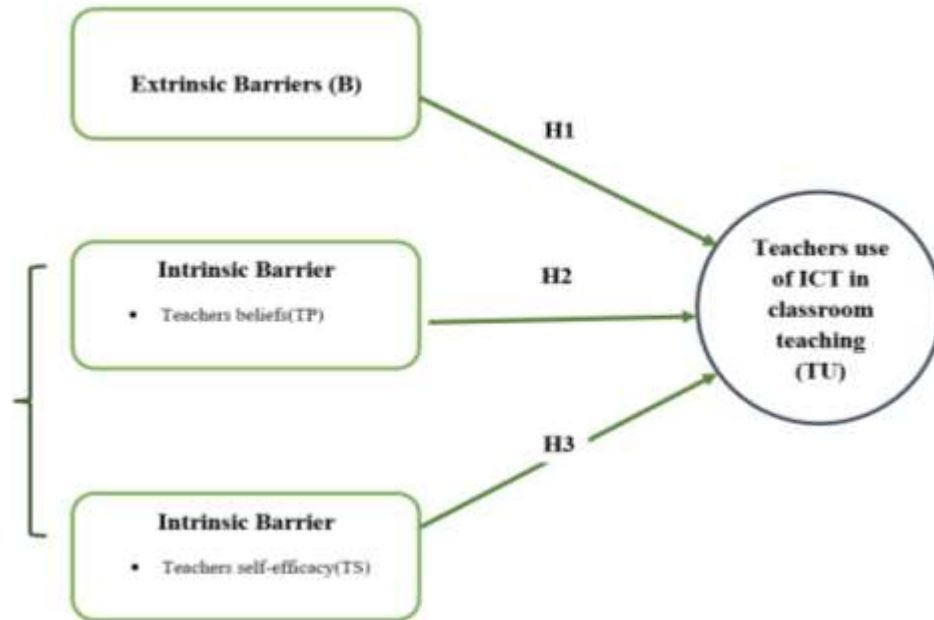
Research Methodology

A quantitative research approach is used to examine the research variables. Analyze. The questionnaire was prepared from the previous research (Ghavifekr, Kunjappan, Ramasamy, & Anthony, 2016; Özdemir, 2017; Mlambo, Rambe & Schlebusch, 2020). The instrument was then checked by three experts to evaluate the content validity before being circulated to the respondents' targeted group. The questionnaire comprises twenty-four items relating to four variables as extrinsic barricades to the ICT usage in the classroom instructional process, two intrinsic barriers as two variables, i.e., teachers' beliefs (TP) and self-efficacy (TS), and one dependent variable teachers' use of ICT(TU). Respondents rating responses on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). This research was conducted online, where teachers of forty-eight different colleges were requested to fill out the questionnaire. The target population of this study was teachers of 59 private colleges affiliated with the board of intermediate education of Karachi.

Approximately 960 colleagues from 48 private colleges teaching different subjects were requested to fill out the questionnaire.319 filled out the questionnaire, so the response rate was 33%. This research study uses a simple random sampling technique.

Data analysis was done by SPSS V.22. The reliability of the instrument was checked by calculating Cronbach's alpha value. The inter-correlations among all instrument questions were checked by exploratory factor analysis (EFA). Pearson's correlation was done to check the correlation among the variables, reliability, and multiple linear regression to check the impact of one variable on another. A statistical significance level of 0.05 (Zamir & Thomas, 2019; Teo, Sang, Mei, & Hoi, 2019) was established for the convention.

After the reliability testing of the survey instrument, the pilot study was done to check for any confusion or ambiguity in the variables. The internal consistency was tested by Cronbach alpha value on SPSS.22. An instrument of 24 items gives Cronbach alpha value =0.860. The first independent variable was Barriers to ICT

use(B), and seven items in this variable show α = 0.739. There were five items in the second independent variable: teachers' beliefs (TP) which showed α = 0.850. The third independent variable in this study was Teachers'self-efficacy (TS) had six items, and the value of Cronbach alpha for this variable was = 0.854, and the dependent variable was Teachers' use of ICT(TU) had six-item showed the value α = 0.865

Data Analysis and Discussion

Descriptive and Inferential statistical tools were used to analyse the data. The reliability of the instrument was checked by calculating Cronbach's alpha value. Exploratory factor analysis (EFA) was done to examine the inter-correlations among all instrument questions. The correlation between the dependent and independent variables was checked by Pearson correlation analysis. Moreover, the impact of the independent variable on the dependent variable was checked by multiple regression analysis. For convention, a level of 0.05 was established for determining statistical significance. Content and face validity was analysed first, and then, by using a simple random sampling technique questionnaire was sent to approximately 960 teachers from 48 private colleges in Karachi. Three hundred and nineteen responses were received from the teachers. After data cleaning, 305 responses were used for further analysis, including 121 (39.7%) male teachers and 184(60.3%) female teachers. There were 24 items in the questionnaire of four variables: Barriers to ICT use (B), perceptions and beliefs (TP), self-efficacy (TS), and Teachers' use of ICT(TU). The hypothesised model equation, thus, formulated:

$$TU = \propto + \beta 1 \, (Barriers) + \beta 2 \, (TP) + \beta 3 \, (TS) + \varepsilon$$

Moreover, β is the coefficient of variables, ∝ is constant, and ε is the error symbol in the model.

The overall reliability of the instrument was calculated as 0.860. Whereas the reliability for each of the constructs of the instrument was also calculated. The reliability of first independent variable (B) items =0.742, of the second independent variable(TP) items=0.847,the third independent variable (TS) items = 0.856 and the reliability of dependent variable(TU)items =0.798

Data Screening:

Removal of missing values, out-of-the-range values, and outliers:

Data was cleaned to remove missing values, out-of-the-range values and any outlier is there. There was no missing and out-of-range value in the data, but there were 14 univariate outliers in the data, and they were removed by using a standardised (Z) score (cutoff value 3.29) on SPSS, Version 22. Cases are potential outliers if having scored more than 3.29(Tabachnick and Fidell, 2007). After the removal of outliers, there were 305 usable responses left.

Main Study (n=305):

Composition of Data:

The sample comprises 121 (39.7%) male teachers and 184(60.3%) female teachers at Karachi City's private colleges. Out of them, there were 1% (03 respondents) were below 25 years of age,101 respondents (33.1%) were between 26-35 years of age,129 respondents (42.3%) were between 36-45 years,61 respondents (20%) were between 46-55 years, and 11 respondents(3.6%) were above 55 years of age. Moreover, Out of 305 respondents, 114(37.4%) were Masters in Science subjects (M. Sc),142 (46.69%) were Masters in Arts (MA), 46 (15.1%) were having M. Phil degree, and 03 (0.98%) of them were PhD. Furthermore, 10.8% were having teaching experience of 1-4 years, 21.6% were in between 5-6years of teaching, 30.8% were in between 11-15 years, 23.3% were in between 16-20 years, and 13.4% of the teachers were having more than 20 years of teaching exposure, however,4.6% were

teaching Islamiat,22.6% were teaching English,8.9% were teaching Urdu, 7.5% were teaching Pakistan Studies,10.5% were teaching Math, 28.9% were teaching Science Subjects, 10.5% were teaching Commerce subjects,3.3%

were teaching Humanities, and 3.3% were teaching Computer Science.

Frequencies of all the Variables:

Barriers to using ICT

Items	Strongly disagree (1) %	Disagree (2) %	Neutral (3) %	Agree (4) %	Strongly agree (5) %
B1: Lack of administrative support for adopting technology	13.8	20.0	13.8	39.7	12.8
B2: Lack of technical support for adopting technology	8.2	20.0	12.5	44.3	15.1
B3: Lack of time to prepare lessons that use technology	3.6	26.6	13.8	47.5	8.5
B4: The infrastructure of classroom(size/furniture) is appropriate	5.6	26.9	16.4	35.7	15.4

Table 1 Barriers to using ICT

Results show that in response to the statement item B1 "There is a lack of administrative support for adopting technology into teaching and learning", 13.8% of the respondents show strong disagreement, 20.0% shows disagreement, 13.8% shows neutral response, 39.7% shows agreement, and 12.8% shows strong agreement. In response to the statement item, B2 "There is a lack of technical support for adopting technology into teaching and learning", 8.2% of the respondents show strong disagreement,20.0% shows disagreement, and 12.5% show a neutral response, 44.3% shows agreement and 15.1%shows strong agreement. In response to statement item B3 "There is a lack of time to

prepare lessons that use technology", 3.6% of the respondents show strong disagreement, 26.6% show disagreement, 13.8% show neutral response, 47.5% show agreement and 8.5% show strong agreement. In response to statement item B4, "The infrastructure of the classroom (size/furniture) is appropriate", 5.6% of the respondents show strong disagreement, 26.9% shows disagreement, 16.5% shows neutral response, 35.7% shows agreement and 15.4%shows strong agreement. It shows that extrinsic barriers are one of the most prominent hindrances to using technology in classroom teaching.

Teacher's beliefs:

Items	Strongly disagree (1) %	Disagree (2) %	Neutral (3) %	Agree (4) %	Strongly agree (5) %
TP8: I believe that I will be a better educator when by technology in teaching practices	1.3	3.9	2.3	49.5	43.0

TP9: I believe students' learning increases when information communication technology is used in teaching practices.	1.0	3.6	7.2	35.1	53.1
TP10: I believe that classroom management is easier while using technology	2.0	3.6	3.3	35.4	55.7
TP12: When technology is integrated into classroom teaching, students understand more easily what they learn.	0.7	1.0	13.4	42.3	42.6

Table 2. Teacher's Beliefs

Results show that in response to the statement item TP8 " I believe that I will be a better educator when by technology in teaching practices ", 1.3% of the respondents show strong disagreement,3.9% shows disagreement, and 2.3% showed a neutral response 49.5% shows agreement and 43.0% shows strong agreement. In response to the statement item TP9, " I believe that students learning increases when information communication technology is used in teaching practices.", 1.0% of the respondents show strong disagreement,3.6% show disagreement, 7.2% show a neutral response, 35.1% show agreement and 53.1% shows strong agreement. In response to the statement, item TP10 "I believe that classroom management is easier while using

technology", 2.0% of the respondents show strong disagreement,3.6% show disagreement, 3.3% show a neutral response, 35.4% show agreement and 55.7% shows strong agreement. In response to the statement, item TP12 "When technology is integrated into classroom teaching, students understand more easily what they learn", 0.7% of the respondents show strong disagreement,1.0% shows disagreement, and 13.4% show a neutral response, 42.3% shows agreement and 42.6% shows strong agreement. Results show that the firm beliefs of the teachers in the importance of ICT can lead towards the increased use of technology in classroom teaching.

Teachers' self-efficacy

Items	Strongly disagree (1) %	Disagree (2) %	Neutral (3) %	Agree (4) %	Strongly agree (5) %
TS14: I can create a presentation with modest computer graphics functions.	1.3	4.9	1.3	66.6	25.9
TS15: I can teach classes in which I am required to use instructional technology.	1.0	5.2	6.9	58.4	28.5
TS16: I can prepare lesson plans in which I am required to use instructional technology.	1.3	3.0	4.3	62.0	29.5
TS17: I am confident that I have the required skills to use information communication technology for instructions.	1.3	3.0	10.8	59.0	25.9

Table 3. Teachers Self Efficacy

Results show that in response to the statement item TS14, "I can create a presentation with modest computer graphics functions", 1.3%

of the respondents show strong disagreement,4.9% shows disagreement, and 1.3% showed a neutral response, 66.6% shows

agreement and 25.9%shows strong agreement. In response to the statement, item TS15, "I can teach classes in which I am required to use instructional technology", 1.0% of the respondents show strong disagreement,5.2% shows disagreement, and 6.9% show a neutral response, 58.4% shows agreement and 28.5%shows strong agreement. In response to the statement, item TS16 "I can prepare lesson plans in which I am required to use instructional technology.", 1.3% of the respondents show strong disagreement,3.0% show disagreement, 4.3% show a neutral

response, 62.0% show agreement and 29.5%shows strong agreement. In response to the statement, item TS17, "I am confident that I have the required skills to use information communication technology for instructions.", 1.3% of the respondents show strong disagreement,3.0% show disagreement, 10.8% show a neutral response 59.0% show agreement and 25.9%shows strong agreement. Consequently, greater self-efficacy of the teachers can lead towards the increased use of ICT in classroom teaching.

Teacher's use of ICT in classroom teaching:

Items	Strongly disagree (1) %	Disagree (2) %	Neutral (3) %	Agree (4) %	Strongly agree (5) %
TU30: I practice ICTs to design or redesign numerous activities that cater for the diverse students in my classes.	2.0	8.5	17.4	53.8	18.4
TU31: I usually prepare PowerPoint presentations to support my teaching	1.6	7.2	2.0	51.8	37.4
TU32: I use the computer for preparing assessments and grading sheets	1.3	5.9	7.9	52.5	32.5
TU33: I usually assess my students through online quizzes	1.3	18.7	15.1	42.0	23.0
TU34: I incorporate various web tools in my lesson to make my lessons engaging.	0.7	10.2	5.9	66.2	17.0
TU35: I Use ICT/technology to communicate with students and colleagues	1.3	5.9	10.8	67.2	14.8

Table 4. Teacher's use of ICT in classroom teaching

Results show that in response to the statement item TU30, "I practice ICTs to design or redesign numerous activities that cater for the diverse students in my classes.", 2.0% of the respondents show strong disagreement, 8.5% show disagreement, 17.4% show a neutral response 53.8% show agreement and 18.4%shows strong agreement. In response to the statement, item TU31, "I usually prepare PowerPoint presentations to support my teaching", 1.6% of the respondents show strong

disagreement,7.2% shows disagreement, and 2.0% show a neutral response, 58.1% shows agreement, 37.4% shows strong agreement. In response to the statement, item TU32, "I use the computer for preparing assessments and grading sheets", 1.3% of the respondents show strong disagreement,5.9% shows disagreement, and 7.9% show a neutral response, 52.5% shows agreement, and 32.5% shows strong agreement. In response to the statement, item TU33, "I usually assess my students through online

quizzes", 1.3% of the respondents show strong disagreement,18.7% show disagreement, 15.1% show a neutral response, 42.0% show agreement, 23.0% show strong agreement. In response to the statement, item TU34, "I incorporate various web tools in my lesson to make my lessons engaging.", 0.7% of the respondents show strong disagreement,10.2% show disagreement, 5.9% show a neutral response, 62.2% show agreement, and 17.0% show strong agreement. In response to the statement, item TU35, "I Use ICT/technology to communicate with students and colleagues", 1.3% of the respondents show strong disagreement,5.9% shows disagreement, and 10.8% show a neutral response, 67.2% shows agreement, and 14.8% shows strong agreement.

Exploratory Factor Analysis: (N=305):

The principal component is used to condense the Likert-based items of the questionnaire into the required factors. Therefore, the Exploratory Factor Analysis (EFA) is used to measure ICT use (dependent variable), extrinsic barriers to using ICT, teachers' beliefs and Self-efficacy (predictors) of the colleges' teachers'

questionnaire. The value of Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy was calculated at 0.718, which shows each component's items' adequacy. Leech, Barrett, and Morgan (2005) suggested that the minimum value of KMO for sample adequacy should be 0.70. Bartlett's Test of Sphericity and the values (Approx. Chi-Square=3386.313, df=276 and p=0.000) illustrates that correlations between variables are all zero, and the correlation matrix is not an identity matrix (Leech, Barrett, and Morgan, 2005). Tabachnick and Fidell (2007) mentioned that the Bartlett method gives unbiased factor scores. Seven components obtained described 72.74 % of the total variance. The Kaiser Normalization method was used to rotate the initial solution through varimax rotation. According to Tabachnick and Fidell (2007), Varimax rotation maximizes the variance of factor loadings. Results of factor loadings below |0.50| were excluded. Hence, eighteen items were loaded onto their corresponding variables or constructs. The rotated component matrix table illustrates the factor loadings of the rotated factors.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.718
Bartlett's Test of Sphericity Approx. Chi-Square	3386.313
Df	276
Sig.	0.000

Table 5. KMO and Bartlett's Test

Rotated Component Matrix

	Teachers' use of ICT(TU)	Teachers' self-efficacy (TS)	Teachers' beliefs (TP)	Extrinsic Barriers(B)

Item			
B1: There is an absence of administrative support for implementing technology into teaching practices			0.889
B2: There is an absence of technical support for implementing technology into teaching practices.			0.872
B3: There is a lack of time to prepare lessons that use technology			0.521
B4: The infrastructure of the classroom (size/furniture) is inappropriate			0.694
TP8: I believe that by adopting technology in my instructions, I will become a better educationist.		0.822	
TP9: I believe students' learning increases when information communication technology is used in teaching practices.		0.552	
TP10: I believe that classroom management is easier while using technology		0.614	
TP11: Teaching my subject requires technology integration		0.483	
TP12: When technology is integrated into classroom teaching, students understand more easily what they learn.		0.708	
TS14: I can create a presentation with simple animation functions	0.805		
TS15: I can teach classes in which I am required to use instructional technology.	0.871		
TS16: I can prepare lesson plans in which I am required to use instructional technology	0.645		
TS17: I am confident of having the essential expertise to use information communication technology for instructions.	0.716		
TU30: I practice ICTs to prepare or reprepare various activities that accommodate the miscellaneous students in my classes.	0.712		
TU31: I usually prepare PowerPoint presentations to support my teaching	0.551		
TU32: I use the computer for preparing assessments and grading sheets	0.558		
TU33: I usually assess my students through online quizzes	0.794		
TU34: I incorporate various web tools in my lesson to make my lessons engaging.	0.767		
TU35: I Use ICT to communicate with students and colleagues	0.692		

Table 6. Rotated Component Matrix

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 13 iterations.

Reliability Analysis (N=305)

The reliability (Cronbach Coefficient Alpha) of each factor was calculated after exploratory analysis. The reliability value of 18 items obtained after exploratory factor analysis was 0.870. An alpha value of 0.65–0.80 is usually considered "acceptable" for a scale used in human dimensions research (Green, Lissitz, and Mulaik, 1977; Spector, 1992; Vaske, 2008).

Hypothesis Testing:

After exploratory factor analysis and reliability testing, multiple linear regression was done to test the following.

1) The relationship and its significance between ICT use (dependent variable) and extrinsic barriers in using ICT, Teachers' beliefs, and self-efficacy (predictors)

2) To what extent there is a contribution of all these variables to predict the ICT use of college teachers? For this purpose, the researcher proposes the following hypothesis:

H1a: Extrinsic barriers to using ICT in classroom teaching are significantly related to Teachers' use of ICT in classroom teaching.

H1b: Extrinsic barriers to using ICT in classroom teaching significantly impact teachers' use of ICT in classroom teaching.

H2a: Teachers' beliefs are significantly related to their use of ICT in classroom teaching.

H2b: Teachers' beliefs have a significant impact on their use of ICT in classroom teaching.

H3a: Teachers' self-efficacy is significantly related to the use of ICT in classroom teaching.

H3b: Teachers' self-efficacy has a significant impact on their use of ICT in classroom teaching.

Hence, based on the hypothesis the following model equation was formulated:

$$TU = \propto + \beta_1 (Barriers) + \beta_2 (TP) + \beta_3 (TS) + \varepsilon$$

Moreover, $\propto$ is a constant sign, and ε expresses the error symbol in the model.

Furthermore, standard deviations, means and correlation values for college teachers' ICT use and predictors of ICT use are shown in the table. Mean, Standard Deviation, and correlations of Predictor Variables with the dependent variable

Pearson Correlation (N = 305).

		Mean	Std. Deviation	MTU	MB	MTP	MTS
MTU	Pearson Correlation			1			
	Sig. (2-tailed)	4.04	0.704				
	N			305			
MB	Pearson Correlation		.907	-.162[**]	1		
	Sig. (2-tailed)	3.29		.004			
	N			305	305		
MTP	Pearson Correlation	4.16		.858[**]	-.068	1	

	Sig. (2-tailed)			.539	.000	.236	
	N			305	305	305	
MTS	Pearson Correlation	4.1123	.57844	.903**	-.110	.920**	1
	Sig. (2-tailed)			.000	.055	.000	
	N			305	305	305	305

Table 7. Pearson Correlation (N=305)

**P < 0.01 (2-tailed); *P < 0.05 (2-tailed)

Pearson correlation value -0.162 and significant value p=0.003 depicts a negative, weak but significant relationship between barriers in using ICT and teachers' use of ICT in classroom teaching, which supported the hypothesis. Pearson correlation value of 0.858 and significant value p=0.000, which depicts a positive, significant, and robust relationship between teachers' beliefs and their use of ICT in classroom teaching. Pearson correlation value at a value of 0.903 and a significant value of p=0.000 depicts a positive, significant, and robust relationship between teachers' self-efficacy and their use of ICT in classroom teaching.

Furthermore, multiple linear regression analysis is used to test the hypothesis, which predicts college teachers' ICT usage in teaching practices. The calculated value of the value of r-square (0.825) shows that model is fit to forecast the college teachers' use of ICT and the F value (472.316), P< 0.05), indicates that these three variables suggestively predicted the ICT use of teachers. Besides, the value of the variance inflation factor (VIF) for every individual variable was less than 10, indicating no multicollinearity issue.

Regression Analysis Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.908^a	0.825	0.823	0.296

Table 8. Regression Analysis Model Summary

a. Predictors: (Constant), MTS, MB, MTP

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	124.321	3	41.44	472.316	.000^b
	Residual	26.409	301	0.088		
	Total	150.73	304			

Table 9. ANOVA

a. Dependent Variable: MTU
b. Predictors: (Constant), MTS, MB, MTP

$$MTU = \propto + \beta1 \, (MB) + \beta2 \, (MTP) + \beta3 \, (MTS)$$
$$MTU = -0.424 - 0.055 \, (MB) + 0.253 \, (MTP) + 0.873 \, (MTS)$$

Testing of hypothesis #1

H1a: Barriers to using ICT in classroom teaching are significantly related to Teachers' use of ICT in classroom teaching.

Coefficients

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-0.424	0.15		-2.824	0.005		
	MB	-0.055	0.019	-0.07	-2.892	0.004	0.981	1.02
	MTP	0.253	0.081	0.194	3.123	0.002	0.152	6.596
	MTS	0.873	0.076	0.717	11.527	0	0.15	6.646

Table 10. Coefficients

a. Dependent Variable: MTU

The correlation table showing the Pearson correlation value -0.162 and significant value p=0.003 depicts a negative, weak but significant relationship between barriers to using ICT and teachers' use of ICT in classroom teaching, which supported the hypothesis. Values of Pearson correlation (Akoglu, 2018; Khalid and Irshad, 2010) from +1 to -1 show strong positive and negative relationships depending upon a positive and negative sign with these values. Values ranging from 0.7-1 show a strong relationship,0.3 to 0.6 show a moderate relationship and values lesser than 0.3 show a weak relationship. the value 0 shows no relationship

H1b: extrinsic barriers to using ICT in classroom teaching significantly impact teachers' use of ICT in classroom teaching.

The coefficients of the independent variable "extrinsic barriers in using ICT in classroom teaching (MB) were calculated as -.055 with a p-value of 0.004(< 0.05), which shows that this predictor has a significant and negative impact on Teachers'use of ICT in classroom teaching. Furthermore, the value of the coefficient also shows that if this value is increased by one unit. Hence, the value of the dependent variable decreases by -0.055 units, and the p-value is 0.004 (<0.05), this shows that this calculated value of the coefficient is acceptable and unbiased because it is showing 0.4% chances of error which lies within the set limit (Pallant,2011) of probability percentage (5%) of error. Henceforth it is concluded from the data that extrinsic barriers to using ICT have a significant negative impact on Teachers' use of classroom teaching, supporting the hypothesis.

Testing of hypothesis #2

H2a: Teachers' beliefs are significantly related to their use of ICT in classroom teaching.

The correlation table shows a Pearson correlation value of 0.858 and a significant value of p=0.000, which depicts a positive, significant, and robust relationship between teachers' beliefs and their use of ICT in classroom teaching, which supported the hypothesis.

H2b: Teachers' beliefs have a significant impact on their use of ICT in classroom teaching.

The coefficients of the independent variable "Teacher's beliefs about integrating ICT in classroom teaching (MTP) calculated as 0.253 with a p-value of 0.002(< 0.05) which shows that this predictor has a significant and positive impact on Teachers'use of ICT in classroom teaching. Furthermore, the value of the coefficient also shows that if this value is increased by one unit, the value of the dependent variable increases by 0.253 units, and the p-value is 0.002 (<0.05), showing that this calculated value of the coefficient is acceptable unbiased because it is showing 0. 2% chances of error lie within the set limit (Pallant,2011) of probability percentage (5%) of error. Henceforth it is concluded from the data that Teachers' beliefs have a significant positive impact on Teachers' use of classroom teaching, which supported the hypothesis.

Testing of hypothesis #3

H3a: Teachers' self-efficacy is significantly related to the use of ICT in classroom teaching.

The correlation table showing the Pearson correlation value at a value of 0.903 and a significant value of p=0.000 depicts a positive, significant, and robust relationship between teachers' self-efficacy and their use of ICT in classroom teaching, which supported the hypothesis. Moreover, this predictor shows the highest correlation value among all three predictors.

H3b: Teachers' self-efficacy has a significant impact on their use of ICT in classroom teaching.

The coefficients of the independent variable "Teachers self-efficacy (MTS) calculated as 0.873 with a p-value of 0.000($<$ 0.05), which shows that this predictor has a significant and positive impact on Teachers'use of ICT in classroom teaching. Furthermore, the value of the coefficient also shows that if this value is increased by one unit, the value of the dependent variable increases by 0.873 units, and the p-value is 0.000 (<0.05), showing that this calculated value of the coefficient is acceptable and unbiased because it is showing 0. 0% chances of error, and it lies within the set limit (Pallant,2011) of probability (5%) of error. Henceforth it is concluded from the data that Teachers' self-efficacy has a significant positive impact on Teachers' use of classroom teaching, supporting the hypothesis. Moreover, based on the coefficient values, it is also depicted that teachers' self-efficacy has the highest impact on the teachers' use of ICT in classroom teaching among all three predictors.

Discussion:

Three research questions guided this research study. First, the multiple linear regression analysis results display a statistically significant association between ICT use in classroom teaching and its predictor variables. Second, these findings expose that college teachers' beliefs, self-efficacy towards ICT use, and extrinsic barriers to using ICT are vital in forecasting ICT integration in classroom teaching.

The outcomes of hypothesis testing showed a significant relationship between extrinsic barriers to using ICT, teachers' beliefs, self-efficacy, and ICT use in teaching. The finding suggests that teachers' self-efficacy is the most significant among all three predictors for integrating ICT in classroom teaching. However, their strong positive beliefs and perception about using technology in classroom teaching and strong administration support are also essential factors in determining technology integration in classroom teaching.

Nevertheless, the findings of the first hypothesis are consistent with the results of the former research studies, which point out that extrinsic barriers to using technology have a significant and negative relationship with ICT integration (Spektor-Levy & Gronot-Gilat,2012; Al-Ansari, 2006; Alharbi, 2014; An, & Reigeluth,

2011; Hew & Brush, 2007; Aslan & Zhu, 2016; Rabah, 2015; Carver, 2016; Ertmer,1999; Iqbal,2017; Lawrence & Tar,2018). The quantitative data also pointed out that the barriers reported in previous studies also persist in Karachi city to a considerable degree. According to this research finding, Lack of administrative and technical support, time to prepare a lesson plan, and classroom infrastructure are significant barriers to using ICT in classroom teaching. This finding appears to be in harmony with other research studies conducted in different countries of the world.

Furthermore, the results of the second hypothesis confirm the results of previous studies, which show that teachers' beliefs have a significant and positive association with the integration of ICT in classroom instructional processes (Sang, Liang, Chai, Dong, & Tsai, 2018; Almekhlafi, and Almeqdadi, 2010; Ertmer,2005; Galvis, 2012; Tondeur, Van Braak, Ertmer, and Ottenbreit-Leftwich, 2017). The positive perceptions towards using technology motivate teachers to bring innovation and change in their teaching strategies to complete their professional tasks in an exemplary manner. Teachers' perceptions of technology help facilitate teaching and learning processes (Teo, Sang, and Hoi,2019). These studies also emphasised that their pedagogical beliefs greatly influence teachers' classroom practices, and these beliefs lead to practice techniques that support the development of 21st-century skills. This research findings show that most respondents' beliefs that they can become better educators by integrating technology in their teaching and classroom management are also easier while using technology in their teaching. Technology integration in classroom teaching increases students' learning, and they understand more easily what they learn. Beliefs influence to a greater extent than knowledge in defining and organising the task (Pajaras,1992). Thus, productive teaching and learning happen due to

the positive association between technology incorporation and awareness of using ICT tools in the instructional process (Ertmer and Ottenbreit-Leftwich, 2017).

Moreover, the third hypothesis testing results reveal tha teachers' self-efficacy is positively and significantly related to their use of ICT in classroom teaching. Compared to the other two variables, statistically found to be the most substantial relationship with ICT integration in classroom teaching. Abbitt (2011), Al-awidi and Alghazo (2012), Anderson, Groulx, and Maninger (2011), Ertmer and Ottenbreit-Leftwich (2010), Sang, van Braak, and Tondeur (2010), Wang, Ertmer, and Newby(2004)also explored that teachers self-efficacy is a critical factor in determining the extent of using technology in teaching practices. Thus, self-efficacy is an essential concept in explaining the extent to which teachers integrate technology into their teaching practices.

Conclusion:

The outcomes of this study are consistent with the results of previous studies conducted in different countries worldwide. Findings showed that the barriers to using ICT, teachers' beliefs and perceptions, and their self-efficacy are significantly related to ICT use in classroom teaching. In conclusion, theoretical concepts, hypotheses, and theoretical models were supported by the findings.

This study was limited to 305 teachers from the different private colleges of Karachi because of time constraints. Therefore, it could be difficult to generalize the results because of the small sample size. Moreover, because of the COVID-19 pandemic, the researcher could not increase the research study's scope and hardly covered a limited number of colleges for data collection through email and WhatsApp. However, to gain a deeper inside into the beliefs of the teacher mix method, research could be conducted. Lesson observations could give a

better understanding of the extent of ICT use in classroom teaching. The research model used in this study has a good fit, but other models may be fit to examine the ICT usage of teachers in classroom teaching. Nonetheless, the study findings give a clear understanding of predicting ICT use in classroom teaching.

Recommendations

As this study was conducted in private colleges of Karachi city, many respondents were used to technology, and few of them are not using ICT in their classroom teaching. Consequently, teachers should try to accept the change and shift them to a technology-based lesson plan. Additionally, they should have a higher moral level to teach 21st-century students.

As the findings show that most of the respondents are capable enough to integrate ICT into their teaching practices, but 55% of the respondents show their concern that they face a lack of administration and technical support and time constraints, and infrastructure issues while using ICT in the classroom teaching, and 14% were neutral in showing their point of view. Private colleges' management should facilitate the teacher to integrate ICT into their teaching by providing the best technical and technological support. This facilitation would lead to an increase in the use of ICT in teaching practices. According to the data, only 5.3% of teachers are incapable of efficiently using technology in their teaching. Colleges' heads can play an essential role in diminishing these numbers by arranging training programs for these teachers because ICT-related self-efficacy is crucial for using ICT in classrooms. Teachers should be encouraged to be more focused on enhancing their competencies for technology-integrated teaching and learning practices.

However, most respondents have positive beliefs towards technology integration and can integrate technology into their teaching practices. Consequently, policymakers should make ICT training programs in teacher education mandatory. However, the Ministry of Education must invest in the progress and growth of ICT affluence to improve Information communication technology facilities and the development of the expertise of teachers. Furthermore, it is the government's responsibility to provide training facilities to teachers in a conducive environment by skilled and experienced resource personnel in ICT.

To gain a deeper insight into the teacher's beliefs, mixed-method research could be conducted in the future. Lesson observations might give a better understanding of the extent of ICT usage in classroom teaching. Context-specific constructs. e.g., ICT policy and allocated budgets are also essential elements for determining the extent of ICT use in classroom teaching. Future research can be conducted to discuss the impact of teachers' demographics on the use of ICT in teaching practices.

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