Information and Communication Technologies for Educational Purposes: Measuring Intensity of Students Attitudes towards Digital Journey

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A R T I C L E   I N F O

A B S T R A C T

Applications of information and communication technologies are generating attraction and intentions for human beings since their birth. Continuous practice of ICT directly enhances attitudes towards innovative and novelty of thoughts. Teachers and students are assets of the State that bring technical revolt in the nation having constructive attitudes towards information and communication technologies. Concerning the worth of information and communication technologies, the present study was designed to explore male and female secondary school students' attitudes towards information communication technology enrolled in science, arts and computer science streams of rural and urban secondary schools of District Lahore. The sample of the research consisted of 1,826 respondents randomly selected from five male and five female schools. From each schools, the researchers conveniently selected students from rural and urban schools. The researchers collected the data from the 10th graders administering Attitudes towards ICT Scale adopted from the authors upon request. The instrument consisted of 12-items mode of 5-point Likert type options. After ensuring ethical considerations, the researchers collected data from the respondents. Results of independent sample t-test and one-Way ANOVA reflect that male and female students have about same attitudes towards ICT, rural students have more attitudes towards ICT as compared to urban students and science students had better attitudes than arts students; computer science students had better attitudes than arts students whereas computer science and science students have same attitudes towards ICT. Based on the results of the study, the current research recommends that urban secondary schools teachers and headteachers have to focus on students' attitudes towards ICT by delivering lectures, providing attractive learning environment and hiring skilled staff to meet the demands of present technical innovations.

Introduction

Worth of technology is well-known for human beings since decade. Technology is performing energetic functions in penetrating every individuals life to burn technological hunger. Technology is dramatically revolutionizing the digital universe since decades. The pervasiveness of Information and Communication Technologies; ICT in every walk of life has significant contribution (Agyei, 2021; Demir&Önal, 2021; Livingstone, 2012; Wood et al., 2011). They are transferring traditional ways to innovative teaching ways (Wu et al., 2016). Availability of ICT for stakeholder in the modern era is unquestionable (Campbell, 2006; End et al., 2010; Hakoama&Hakoyama, 2011). ICT has been occupying since last few decades in promoting financial, societal, communal and educational affairs of the country (Barak, 2014; Kim & Keller, 2011; Inan& Lowther, 2010; Getenet et al., 2016; Gu et al., 2013; Hsu &Kuan,

2013; Duveskog et al., 2012). It is flattering crucial characteristic for every literate/illiterate human. Everyone is familiar from its attractive, useful, communicative, and presentation potential (Hembrooke& Gay, 2003) that also has unlocked many ways related to education (Harman & Sato, 2011). Handling of ICT is penetrating aspects of teaching learning and revolutionizing the societies (Hassan & Akbar, 2016; García-Marttinez et al., 2021; Qaddumi et al., 2021). Moreover, educationbal institutions are continuously making benefits from the rapid spreading of technology. Schools, colleges and universities are increasing continuous usage technology for the teaching-learning purpose (Aoki, 2010; Kozma, 2008; Onwuagboke& Singh, 2016; Oye et al., 2011; Silva et al., 2021).

ICT helps students to communicate with peer in classroom projects, as a means of insuring student safety, maintaining relations with peers, class fellows, making wider their societal connections, sense of protection and well-beings. Utilization of technology brings together every individual with family members and colleagues (Pozzebon&Diniz, 2012; Selwyn, 2003; Strudler&Hearrington, 2008). Students make use of the mobile phone in imperative and burning situation (Papanastasiou&Angeli, 2008; Wastiau et al., 2013). Students are in touch with ICT in every span of time. Moreover, students are unable to hear their family members, they remain touch with them through short message service (Galeon et al., 2019; Thomée et al., 2007). Students are also acknowledged towards ICT because of its prevalent, eye catching and industrious use of ICT (Agyei, 2021; Fredriksson et al., 2008).

Attitude is a learned predisposition to respond cognitively, effectively and behaviorally towards particular way/phenomena (Baron et al., 2006). Attitudes are positive/negative evaluations of people towards objects, and, ideas/events (Cepni&Kose, 2006), referred as opinion, judgments and idea about constructive/destructive tasks (Cepni et al., 2006; Gray, 2007; Yu & Yang, 2006), provide logical understanding (Yara, 2009), produce reaction towards positive/negative tendencies (Kaiser & Schultz, 2009) and are gauged through attitudinal scales (Ajzen&Fishbein, 2000; Eagly&Chakin, 1993; Hassan & Akbar, 2016). Students attitudes towards ICT are formulated through interaction and experiences which they have with various components of ICT. Students have limited interactions with digital gadgets develop their attitude towards ICT. Sustained interaction and confidence in using ICT for teaching and learning and for other purposes bring change in students attitudes. Students have positive attitudes towards IC (Samah et al., 2011; Tondeur et al., 2011; Tengku, 2005) that enhance their technological learning (Judi et al., 2011). Students have *implicit*; automatically understood and *explicit*; need mental effort toward phenomenon understanding (Wilson et al., 2000) while some have constant attitudes (Arrosagaray et al., 2019; Kennewell& Morgan, 2003; Ngo &Eichelberger, 2019; Osborne et al., 2003).

Despite gender gaps in attitudes towards ICT, it is important to look into such gaps by locale and academic stream. There is hardly any literature available about attitudes towards ICT (Brun, 2014; Duveskog et al., 2012). Female students have destructive/negative attitudes towards ICT (Islahi, 2019; Yeo & Grant, 2019) because less availability of technological gadgets at home (Kadel, 2005; Townsend, 1997) that is major hurdle in female students destruction towards ICT (Schaumburg, 2001) as compared to male students. Furthermore, female students negative attitudes towards ICT are major obstacle in the progress of states and women empowerment (Al-Qaysi et al., 2020; Anastasiades&Vitalaki, 2011; Apeanti, 2016; Arrosagaray et al., 2019; Bhandari, 2019; Islahi, 2019; Ngo &Eichelberger, 2019; Penn &Ramnarian, 2019; Siddiq& Scherer, 2019; Tourón et al., 2019; Yeo & Grant, 2019).

There is agreement on measuring attitudes towards ICT through towards its usage, anxiety, confidence, usefulness, cognitive, affective and psychomotor aspects (Arriffin, 2005; Hassan & Akbar, 2020; Onwuagboke& Singh, 2016; Wu et al., 2017; Yu & Yang, 2006; Zuhari et al., 2009). The social scientists make significant contribution in exploring students intensity of attitudes towards ICT (Agyei, 2021; Demir&Önal, 2021; García-Marttinez et al., 2021; Kundu&Bej, 2021; Lee & Lee, 2021; Nikolopoulou et al., 2021; Pradana et al., 2020; Qaddumi et al., 2021; Silva et al., 2021; Simsek, 2008; Slechtova, 2015; Stromquist, 2009; Supardi et al., 2021; Wu et al., 2016; Yusuf &Balogun, 2011). Findings reveal that students possess constructive attitudes towards ICT and eager towards its usage. Edmunds et al. (2014) structured quantitative research in UK to explore students attitudes towards and usage of ICT focusing technology acceptance model approach on sample of 239 female and 181 male participants. The researchers collected data through online survey. Results of one-way ANOVA established significant difference between students attitudes towards and usage of ICT on factors; course of usefulness, (F (5, 371) = 3.89, $p< .05$) and ease of usage (F (5, 371) = 13.72, $p< .05$). Furthermore, students possess constructive towards ICT

usefulness and its ease in context of their work. Chi et al. (2009) framed comparative research to find out Singaporean and Taiwanese students attitudes towards ICT on sample of randomly selected 108 participants. After adopting *Chan and Elliot* (2004) scale, the researchers administered questionnaire among students. Overall results showed that students have realistic and constructive attitudes towards ICT. Moreover, results of independent sample t-test declared no significant difference between Singaporean and Taiwanese students attitudes towards ICT on factors; confidence of knowledge, $t(106) = -.356$, $p> .05$, ability/proficient knowledge, $t(106) = 1.501$, $p> .05$, inherent aptitude, $t(106) = 1.090$, $p> .05$, learning effort process, $t(106) = 1.425$, $p> .05$, positive teaching, $t(106) = 3.119$, $p> .05$, conventional teaching, $t(106) = 2.149$, $p> .05$ and computer attitudes, $t(106) = -.721$, $p> .05$; Singaporean students of have same attitudes towards as compared to Taiwanean students. Albirini (2006) framed descriptive research to measure the students attitudes towards ICT on the sample of randomly selected 326 participants, administering self-structured instrument. The authors validated the instrument from the experts. Results of descriptive statistics ensured that students have maximum attitudes on behavioral factors ($M = 1.13$, $SD = 0.5$) mediate attitudes towards cognitive aspects ($M = 4.05$, $SD = 0.4$) and possess least attitudes towards affective aspects ($M = 4.00$, $SD = .05$). Moreover, students attitudes were good/better predictor on ICT in education. Wu et al. (2016) make their significant contribution in exploring students attitudes towards ICT in Taiwan on sample of 288 respondents. The researchers administered self-developed questionnaire among students to collect the data. Results revealed that students perceived ICT as better instrument for educational use, future deployment and strengthening peer relations.

Information and communication technology is 25 years old in the Pakistan. Some essential achievements were started in 1980s for the reason that individuals have right to use this technology in undersize trade and commerce and for the residential customers. Pakistan, have speedily and hastily implemented latest and modern technologies in educational institutions (Hassan & Akbar, 2016). For this purpose, a number of organizations recognized to endow with the necessities of IT customers. In addition, Pakistani educational institutions embarked on IT teaching and learning in the behind schedule of 1990s. First computer schooling institute in Pakistan named The Foundation for Advance Science and Technology; *FAST* launch his foremost institution in Karachi in 1985 and in Lahore in 1990. In the era of 1993, Lahore University of Management Sciences started degree in Computer Science. Unexpectedly, with the stipulation demand of IT and software, preponderance and countless Software Houses; SWHs were launched. The Pakistani Software Export Board registered only 664 software houses in 2001. Among them 90% SWHs shared business with the USA. These software houses uses across their yearly goal of 40 USD, by late 2001. On the other hand, ICT industry in the Pakistan put up with harsh, cruel and uncompromising retard due to 9/11 disaster. Intact software trade goes away from beginning to end in a roller coaster ride. Throughout this complicated era, no more than 443 firms continue to exist. The IT experts developed software focusing need high schooling environment in particular area of occupation and specialism. In the most parts of educational institutional of the Pakistan, program of study to some extent is still old, stale and fusty. Frequently used languages are taught where the fee is high-priced. The human race is touching to the superior usage in technology, intentions be suppose to put in order for e-commerce and e-corporations. The states demand and recruits outfitted workers focusing hi-tech, scientific, industrial and managerial talent to cope with present-day rising necessities (Khan & Shah, 2004). Government of the Punjab, being cognizant of the important role ICT in national development initiated a scheme for the free distribution of laptops at the higher education level. Similarly, the Punjab Government established computer labs at high school level in the province of Punjab. ICT is a relatively new phenomenon in the Pakistani secondary schools. It is perceived that ICT initiatives provide an opportunity to the students to benefit from the latest technology in their academic and the research endeavors. Since government has been spending billions of rupees in its technology initiatives, it is important to find out students attitudes towards ICT. Ultimate purpose of the study was to explore male and female students attitudes enrolled in science, arts and computer science streams in rural and urban secondary schools of district Lahore, Punjab-Pakistan.

Research Methodology

The research methodology deals with methods and procedures applied in the research. The current research was quantitative and descriptive in nature. The present research was structured to find out students attitudes towards ICT enrolled in male and female public sector rural and urban secondary schools of district Lahore. The population of the research consisted of 353,382 students of 10th grade enrolled in science, arts and, computer science streams. The sample of the research consisted of 1,826 students randomly selected from five male and five female schools of each rural and urban locations of Lahore district. The researchers

collected the data from 10th grades students through administering, *Edmunds*, *Thorpe and Conole* (2012) scale having 35-items mode of 5-point Likert responses. The researchers obtained unfettered and unrestricted permission from the authors to collect the data from the respondents. The list of schools where students were enrolled in all the three streams was obtained from the Punjab Education Department. The researchers got addresses of selected schools, obtained cell numbers of headteachers, telephonically call, explained the purpose of the research and fixed date and time for the data collection. On the scheduled day, the researchers personally met with heads of the institutions and visited in normal classrooms. The initial questionnaire was the pilot tested on the sample of 85 participants to ensure instrument reliability; .750. After ensuring instrument's reliability, the researchers ensure ethical considerations; anonymity, informed consent, volunteer participation, fairness, self-respect, integrity and no physical and psychological harm in case of the respondents' volunteer participation prior to collect data from the participants (Bryman, 2012; Bull &Lindegger, 2011; Cohen & Dunn, 2011; Bhutta, 2004; Kass et al., 2005; Beebe & Smith, 2008; DeCosta et al., 2004; Jegede, 2009; Marshall et al., 2014). Final questionnaire comprised of 12-items. Copies of the questionnaire were distributed among 1,920 students of 10th grades in their classrooms. The participants completed one thousand Eight Hundred and Twenty Six (1826), remaining 94 copies were discarded due to incomplete data. The researchers entered collected data in SPSS for the smooth results.

Data Analysis and Interpretation

The following section provides the analysis of data regarding students attitudes towards ICT by gender, locale and academic stream. The researcher applied independent sample t-test and ANOVA to find out significant difference among variables.

Table 1 *Independent sample t-test on students attitude towards ICT by gender and locality*

Sr. No	Variables		N	M	SD	F	t	p
1	Gender	Male	765	44.2	6.02	.224	3.868	.64
		Female	1061	45.9	5.68			
2	Locality	Urban	736	45.5	5.72	.003	3.644	.01
		Rural	1090	44.4	5.98			

As yielded in Table 1, the researchers run independent sample t-test to find out significant difference between gender-wise students attitudes towards ICT. The results revealed no significance difference between students attitudes towards ICT by gender, $t(1826) = 3.868$, $p >. 01$; male students have same attitudes towards ICT ($M = 44.82$, $SD = 6.02$) as compared to female students ($M = 45.89$, $SD = 5.68$) and found significant difference between students attitudes towards ICT by locality, $t(1826) = 3.644$, $p <. 01$; rural students have more attitudes towards ICT ($M = 44.84$, $SD = 5.98$) as compared to urban students ($M = 45.85$, $SD = 5.72$).

Table 2 *One-Way ANOVA on students attitudes towards ICT by academic stream*

	Sum of Squares	df	Mean Square	F	p
Between Groups	383.403	2	191.702		
Within Groups	62044.944	1823	34.035	5.633	.01
Total	62428.347	1825			

As established in Table 2, the researchers applied one-Way ANOVA to find out significant difference between science, arts and, computer science students attitudes towards ICT. In Pakistani secondary schools students are offered admissions in one of the three academic streams; science, arts and computer sciences. Interpretation reveals significant difference between science, arts and computer science stream students attitudes towards ICT, $F (2, 1826) = 5.633$, $p < .05$. To explore the significant difference between science, arts and computer sciences students attitudes towards ICT, the researchers performed Tukey Post test

Table 3 *Tukey Post Hoc test on students educational stream towards ICT*

Streams	Group	N	M	SD	E	MD	SE	p
Science	Arts	56	45.76	6.07	22	.040	.331	.904
	Computer science					1.01764*	.328	.002
Arts	Science	26	45.72	5.67	25	-0.040	.331	.904
	Computer science					.97776*	.357	.006
Computer Science	Science	44	44.74	5.66	24	-1.01764*	.328	.002
	Arts					-.97776*	.357	.006
*. Mean difference is significant at .05 levels.								

As ascertained in Table 3, the researchers performed Tukey Post Hoc test to explore significant different between science, arts and computer science students attitudes towards ICT. The results ascertained no significance difference existed between science and arts students attitudes towards ICT (p = .904); science students have about same attitudes towards ICT (M = 45.76, SD = 6.07) as compared to arts students (M = 45.72, SD = 5.67), claimed significant difference between science and computer science students (p = .002), science students have more attitudes towards ICT (M = 45.76, SD = 6.07) as compared to computer science students (M = 44.74, SD = 5.66) and also found significant difference between arts and computer science students attitudes towards ICT (p = .006); arts students possess more attitudes towards ICT (M = 45.72, SD = 5.67) as compared to computer science students (M = 44.74, SD = 5.66).

Table 4 *One-way ANOVA on students age towards ICT*

	Sum of Squares	df	Mean Square	F	p
Between Groups	517.497	2	258.748		
Within Groups	61910.850	1823	33.961	7.619	.01
Total	62428.347	1825			

As represented in Table 4, results of one-way ANOVA on students age group. Interpretation reflect significant difference between students age groups enrolled in public sector secondary schools, (F (2, 1826) = 7.619, p< .05. To explore further difference between students age, the researchers applied Tukey Post test.

Table 5 *Tukey Post Hoc test on students' age towards ICT*

Age (I)	N	M	SD	SE	Age (J)	MD (I-J)	SE	p
14 to 15	767	44.84	6.02	0.22	15 to 16	-.90660*	.31	.003
					16 to 17	-1.27522*	.36	.001
15 to 16	667	45.74	5.97	0.23	14 to 15	.90660*	.31	.003
					16 to 17	-.37	.37	.320
16 to 17	392	46.11	5.17	0.26	14 to 15	1.27522*	.36	.001
					15 to 16	.37	.37	.320

As delineated in Table 5, the researchers run Tukey Post Hoc test to measure significant difference between students attitudes towards ICT by their age. The results declared significant difference between students attitudes towards ICT having 14 to 15 and 15 to 16 years of age (p = .03); students having 15 to 16 years of age possess more attitudes towards ICT (M = 45.74, SD = 5.97) as compared to students having 14 to 15 years of age (M = 44.84, SD = 6.02), also found significant difference between 14 to 15 and 16 to 17 years of age group students (p = .001) students having 16 to 17 years of age have more attitudes towards ICT (M = 16.11) as compared to 14 to 15 years of age group students (M = 44.84, SD = 6.02). Interpretation further reflect no significant difference between 15 to 16 and 16 to 17 years of age students' attitudes towards ICT (p = .320) students having 15 to 16 years of age possess same attitudes towards ICT (M =

45.74, *SD* = 5.97) as compared to students having 16 to 17 years of age (*M* = 46.11, *SD* = 5.17).

Discussion

Attitudes play imperative responsibility in influential students feedback in the current circumstances. The researches showed that students are implementing latest technologies to adopt computer technology, they have accurate type of attitudes towards ICT. Students which professed the helpfulness of IT come into sight more constructive and encouraging attitudes and usage towards ICT. Mostly learner's attitudes are painstaking of the most important usage towards innovative technologies in the learning environment. Both rural and urban students' tangible use of computers for male and female students, produce constructive attitudes towards ICT. Likewise, ICT increase most authentic understanding in learning process, on a daily basis in the 21st century. Better study, and one who make sure about the best demonstration, gave authentic standard of use, improvement, and expected goals with high opinion to rural areas. While some studies have concentrate on the phase of ICT, its drawbacks across Canada (Cameron et al., 2005; Looker & Thiessen, 2003; Ramsey & Moss, 2009), worldwide study requires that reproduce the rural areas. Results show significant difference between students' attitudes of males and female secondary school students towards ICT. Results are in contradiction with the studies carried out in other countries that claim gender gaps in favor of males (Kadel 2005; Schaumburg, 2001; Townsend, 1997). According to the result of the study, students in rural areas have more positive attitudes towards ICT than students in urban areas. There is a need to further explore this phenomenon. Since attitudes toward ICT by locale have remained un-researched area, therefore there is a dire need to further explore it and develop a knowledge base in this field. Comparison of attitudes towards ICT by academic stream showed that science and computer science students have better attitudes towards ICT as compared to arts students. These results are in contradiction with the studies carried out in other countries that reported gender gaps in favor of males (Kadel, 2005; Looker & Thiessen, 2003). Comparison of attitudes towards ICT by academic stream has shown that science and computer science students have better attitudes towards ICT as compared to arts students. In Pakistan, only those students opt for arts stream who fail to score better at the end of 8th grade. These students lack motivation to study mathematics and other subjects that require critical thinking and problem solving. Such students may have developed lower interest in using ICT for teaching and learning, and other purposes that may have resulted into lower attitudes towards as compared to students in the other streams. Edmunds, Thorpe and Conole (2012) conducted/framed a study to investigate students' attitudes towards and usage of ICT applying technology acceptance model on sample of 420 respondents. Results of ANOVA reflect significant difference of ICT on factors regarding courses of usefulness ($F_{(5, 325)}$ = 5.88, *p*< .01, ease of students' usage ($F_{(5, 325)}$ = 7.14, *p*< .01) and exist no significant students' motivation for the sake of ICT. Results of present study report that ICT is one of the important aspects that significantly enhance students' attitudes towards positive use. There exist gender variations in attitude towards ICT that plays productive function in attitudes formation towards ICT. Researchers have opinioned that male and female students possess constructive/unconstructive attitudes towards ICT (Gressard&Loyd, 1986; Shapkaa&Ferrarib, 2003; Woodrow, 1992). Results of the present study support with the results of the study conducted by Bakr (2011) that male and female students enrolled in public sector educational institutions have about same attitudes towards ICT, *t*(1826) = 3.868, *p* >. 01; male students have about same attitudes towards ICT (*M* = 44.82, *SD* = 6.02) as compared to female students (*M* = 45.89, *SD* = 5.68), whereas, other studies reflect that male have more attitudes towards ICT as compared to female (Sadik, 2005; Baş&Bastuğ, 2021) that contradict with the results of the study. It is one of the factors that female remain anxious and less confident towards ICT knowledge, skills and usage (Bakr, 2011) due to lack in computer training opportunities (Ray et al., 1999). Applications of information and communication technologies in teaching learning process act as catalyst towards attitudes constructive formations (Bakr, 2011; North & Noyes, 2002) as in public sector educational institutions of Lahore, Pakistan. Results of studies reported that male have greater attitudes towards ICT (Balka& Smith, 2000; Brosnan& Lee, 1998). Learners' self-assurance towards ICT play significant role in attitudes formation for the sake of daily life educational and professional use (Niemi, 2002; Norris et al., 2003; Todman, 2000; Stromquist, 2009; Tondeur et al., 2007; Williams & Coles, 2007; Wong & Li, 2007).

Conclusion

Attitudes are important construct that show humans interest towards phenomenon. They are key attributes that enhance understanding towards constructive/destructive tasks. Focusing importance of information and communication technologies; the current research was structured to explore male and female students attitudes towards ICT. Overall research concludes difference among male and female students attitudes enrolled in rural and urban public sector secondary schools divided in science, arts and computer

science streams towards ICT. Male and female secondary schools' students' have same attitudes towards ICT whereas urban students have more attitudes as compared to rural students. It is one of the factors that due to urbanization, students have more intentions towards innovations, technical appliances and better application of ICT. Urban areas have more accessibility of computers, laptops, tabs and other latest technical devices. Educational institutions of urban areas are more equipped with advanced technologies and offering diversity of courses that motivate students towards usage of ICT. Government mostly launches projects in urban areas that catch individual's intentions. On the other hand, urban students are more technical, they have to make maximum attitudes towards ICT and other appliances that clearly support with the results of the current research. The Pakistani public sector educational institutions are offering science, arts and computer science streams at secondary level. Results of the current research established that science students have more attitudes towards ICT as compared to computer science and arts students. Logically science students have to study painstaking subjects; biology, chemistry and physics that demands concentration, intentions, practical and projects which arouse students' hidden abilities and enhance their craze towards innovations that is due to ICT. Science students have to search science related topics and make assignments that's why they make maximum use of ICT that sharpen their attitudes. Secondary students are enrolled in public sector institutions have different age levels. Results of the current research conclude significant difference between students age groups. Students having more years of age possess better attitudes towards ICT as compared to students having fewer years of age. More age possessing students are more conscious, have maximum potential to catch technical gadgets, better sources and publically fear free. They enthusiastically learn things, make them processed and try their best to contribute for educational purposes. Technological attitudes bound them to earn money for smooth running of their parental living standards.

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