COMPUTER ATTITUDE OF ENTRY LEVEL UNIVERSITY STUDENTS IN RURAL AREAS OF PAKISTAN: A CASE STUDY

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ABSTRACT

Attitudes related to the mind are the key influencing elements of students' learning and educational outcomes. It is believed that students possessing positive attitudes towards learning a particular subject learn more readily and deeply as compared to those who possess negative attitudes. Likewise, students' attitude toward learning computers highly influences their learning outcomes and success rate in the computing field. Accordingly, assessing students' attitudes toward computers serves as a predictor of their subsequent behavior during studies as well as in the practical field afterward. Assessing students' attitudes also assists in determining the effectiveness of teaching-learning approaches and thus helps to select the most appropriate approach. In this regard, the current paper undertakes the assessment of the attitude of entry-level university students towards computers in rural areas of Sindh province of Pakistan. Assessing students' attitudes in rural areas specifically is necessary as students belonging to such regions have different socio-economic conditions and, therefore, varying computing facilities and resources as compared to students from urban areas. The results show that overall students possess a positive attitude towards computers; however, they depict higher levels of computer anxiety as a result of a lack of previous knowledge and experience of working with computers. Results further show that male students are slightly more likely to outperform female students as more male students possess prior knowledge and they experience less computer anxiety.

INTRODUCTION

Over the recent years, computers have pervaded every aspect of human life. The introduction of new and the advancement of existing computer applications and technological tools have enormously changed the way people live, communicate, and work in everyday routines (Abdullahi, 2014). They have changed the interpersonal as well as professional behavior of people around the globe to an extent that now it has become almost impossible to imagine undertaking any activity without the involvement of computers in one way or another (Al Sulaimani, 2010). Given such an important and ever-increasing role of computers nowadays, it has become essential for people to acquire computer skills to survive in the marketplace. It is observed that nowadays, more and more jobs are being created that require computer proficiency as a mandatory skill. Research shows that even for jobs that are not specifically computer-related, employers are

looking for candidates who possess computer literacy because they believe that being computer literate enhances critical thinking, problem-solving ability, and work efficiency (Katz & Macklin, 2007; Oluwatayo, 2012).

To cater to these computer proficiency requirements and thereby prepare students for the future marketplace, academic institutions have encapsulated computer education in their curriculum at different levels of education systems worldwide. The computer is being taught as a compulsory supplementary module at primary and secondary school levels, as well as Higher Education Institutions such as universities are offering dedicated computing degree programs to prepare computer graduates. One aspect of the successful implementation of these computing programs is user acceptance (Al-Emran et al., 2016; Hussein, 2017). Accordingly, much research has been carried out to explore the factors that either motivate or hinder people from accepting the use of computers. A significant number of research studies have also focused on technophobia (also referred as computerphobia), meaning the negative attitudes possessed by people towards using technological devices such as computers. Attitude, in general terms, is defined as a mix of perceptions and beliefs (related to cognition) and positive or negative feelings (related to emotions), which people learn and organize through individual experiences that collectively shape their reaction to other people, objects, places, and situations (Ajzen & Fishbein, 1975; Scarpa et al., 1992). The attitude of students/learners toward computers is defined as their perceptions in terms of four attributes relating to computers, i.e., computer anxiety, computer confidence, computer liking, and computer usefulness (Loyd & Loyd, 1985).

As the attitudes are related to the mind, they influence students' learning. It is believed that the students who are feeling positive about learning are more likely to like the institute, feel safe and nurtured in terms of physical and emotional aspects, and learn at a rapid and deeper level as compared to those who possess negative attitudes. As a result, it is important to assess the attitudes of students and then work accordingly in order to create a productive learning environment (Stiller & Köster, 2016). Therefore, students' attitudes, interests, and values are considered very powerful predictors of students' subsequent behavior by education policymakers and other stakeholders. Similarly, it is necessary to assess the attitude of entry-level university students towards computers in order to predict their success rate in the field of computer science and to devise the most suitable teaching strategy for teaching computing degree programs.

Problem Statement and Research Objectives
While assessment of students' attitude towards computers at different levels of formal education has been under consideration by the scientific community across different regions for decades, the research on students' attitude towards computers in the developing country of Pakistan has not got much attention yet. More specifically, the attitude towards computers of students residing and studying in far-flung rural areas of the country is largely left unknown. Assessing their attitude specifically is necessary because, as opposed to developed urban areas of the country, the residents of rural areas are generally deprived of technological environments and resources. Most of them even do not have a computer at their home or any computer-literate person in the family. The availability of public computing resources such as computer/internet cafes, digital libraries, and computer centers is also scarce in these regions. Therefore, students do not possess any prior knowledge or experience of working with computers to a greater extent. Accordingly, the instructional design and teaching methodologies to be adopted in these areas need to encapsulate the socio-economic differences of these regions in order to be more effective and fruitful. Thus, in order to understand the prior understanding level of students and employ the most suitable teaching approaches to them according to their specific behaviors, their attitude towards computers should be studied and explored specifically.

In order to address the abovementioned research gap, the present study aims to study the attitude towards computers of entry-level university students in less developed areas. In doing so, the study examines the attitude towards computers of the students of a remote area campus of a public university located in a rural

city of Sindh province of Pakistan. We refrain from including identification of campus in order to respect the privacy concerns of study participants. More specifically, the study aims to determine: 1) the overall extent of students' attitude towards computers in far-flung rural areas, 2) the extent of students' attitude towards computers with respect to four subscales of the Computer Attitude Scale (CAS); i.e., computer anxiety, confidence, liking, and perceived usefulness, and 3) the gender-wise difference in students' attitude towards computers in less developed areas.

Given the fact that successful implementation of computer courses depends on users' acceptance, which in turn might be greatly influenced by users' attitudes, this study will contribute to enhancing the curriculum design and teaching methodology for computer science subjects to the students at various institutes with greater efficiency and effectiveness. Furthermore, the study will help to spot key differences and students lacking in particular regions with respect to different aspects of CAS in attending a computer science degree program. The study will also establish the grounds for revealing differences in students' attitudes toward computers across different regions and institutions.

Background

With the increasing recognition of the need and importance of formal computer education at educational institutions, the scientific community has also focused on exploring students' attitudes toward computers. Attitudes of persons are consistent opinions regarding other people, things, or events that are shaped by individual experiences, world views, cognition, and emotions (Ajzen & Fishbein, 1975). This view points out that students who are introduced to and trained in working with computers in their formal education may possess some positive opinions regarding computers, which successively motivates them to acquire knowledge and skills. Furthermore, attitudes are a combination of several sub-factors that collectively shape how one behaves or responds to a specific activity, such as learning computers.

Previous studies have identified several factors associated with attitude toward computers. Lee (1970) initially investigated the attitudes of the American public towards computers with respect to two attributes, i.e., the extent to which computers are a beneficial tool in daily life activities and the extent to which computers are independent and powerful thinking machines. Afterward, Loyd and Gressard (1984) suggested a more comprehensive Computer Attitude Scale that measures the attitude toward computers with respect to three attributes, i.e., computer anxiety, computer confidence, and computer liking. Byrd and Koohang (1989) have successively suggested to also include another useful attribute of the perceived usefulness of computers. Accordingly, a highly accepted and frequently used scale for measuring attitude towards computers is the scale given by Loyd and Loyd (1985), which identifies four attributes that collectively shape the attitude towards computers: i.e., computer anxiety, computer confidence, computer liking, and perceived computer usefulness. The first attribute influencing the students' attitude towards computers is computer anxiety, meaning a variety of negative feelings towards using computers, including the lack or scarcity of confidence, potential, easiness, and trust regarding the essential skills and even the minimal knowledge about the computer (Loyd et al., 1987). Given that people generally avoid anxiety-provoking situations, it is believed that if students possess a negative attitude toward computers, they may avoid learning and working with computers. Previous research has shown that with the actual computer experience, the levels of computer anxiety can be reduced as the type and higher amount of computer experience are found to be indirectly proportional to the levels of computer anxiety (Dyck & Smither, 1994). The second attribute contributing to the student's attitude towards computers is computer confidence, meaning the belief in one's own ability to learn to use and master computers for a variety of reasons (Loyd et al., 1987). Students' computer confidence levels may be estimated from the time they spend using computers to explore and acquire new knowledge, skills, and expertise. In comparison, students who lack computer confidence would avoid employing computers for any task and would prefer to learn and work with traditional models. In general, with practice and prior experience, the students' confidence in using computers increases proportionally. The third element affecting the overall students'

attitude towards computers is computer liking, meaning the feeling of pleasure, motivation, and willingness to learn and use computers in daily life. Computer liking of students can be observed from the extent and the way they talk and think about computers. As much they talk about computers, as much they tend to improve their interest and knowledge set in mastering the computer. The fourth attribute determining the students' attitude toward computers is the perceived computer usefulness, meaning the perceptions about computers being able to enhance and improve performance and efficiency in achieving particular goals (Davis, 1989; Loyd et al., 1987). It is believed that when students perceive computers as useful tools, they tend to operationalize more use of computers for their life and work-related tasks. This is an important factor to explore as the use of computers in a real work environment ranges on a broad spectrum from hardware-related areas (Sohu et al., 2019; Sohu et al., 2022) to software development (Bhanbhro et al., 2022; Memon et al., 2017) to the using computers in order to aid supplementary work tasks (e.g. Åborg, 2002; Carayon-Sainfort, 1992; Fikes & Henderson Jr, 1980; Memon et al., 2023; Samoon et al., 2022; Shah et al., 2018; Stepulevage, 2003) and routine life activities (Clements, 1997; Sohu, 2020)

Previous research has focused on assessing students' attitude towards computers at different levels of education in different regions with different aspects (Heflin et al., 2017; Rashid & Asghar, 2016; Unger & Meiran, 2020). They have focused on assessing attitude towards computers in general as well as in relation to different personal aspects such as gender differences, previous computer experience, age, and others (Al-Kathiri, 2015; Cai et al., 2017; Chao et al., 2015; Hoi, 2020). Other studies have also focused on assessing the interdependency of different attributes of the computer attitude scale. Chin (2001) studied the attitudes toward computers of 354 undergraduate students at the Chihlee Institute of Commerce in Taiwan. The study mainly focused on the exploration of variation in attitudes with respect to the age, field of study, and previous computer experience of the students. The findings collected therein postulate that younger students, males, and students with access to computing facilities tend to possess a more positive attitude than older ones, females, and students without access to a computer at home, respectively. Similarly, several studies (Al-Khaldi & Al-Jabri, 1998; Krendl & Broihier, 1992; Linn, 1985) have suggested significant differences in attitudes of different genders regarding anxiety, confidence, and liking towards computers. The findings advocate that male students are less anxious and possess higher levels of confidence in learning and mastering the use of computers (Linn, 1985), are more willing to undertake computer programming courses (Colley et al., 1994), enjoy working with computers (Krendl & Broihier, 1992), and have better learning performance and self-efficacy than females (Chou & Wang, 2000; Kay, 1992; Moon, 1994; Simon & Werner, 1996). On the contrary, a number of studies show that male students do not outperform female students in any way regarding attitude towards computers. According to the study of Alsebail (2004) conducted with 256 students of the College of Education at King Saud University in Riyadh, there is no influence of gender on the overall attitude of students; however, on the subscales, female students show more confidence and linking in attaining the computer knowledge and skills than the male students. Similarly, Dyck and Smither (1994) stated that gender did not influence students' attitude; rather, prior experience with computers significantly influences students' attitudes towards computers. Davis (1999) postulates that even that the female students are more anxious about using computers, they exhibit same attitude and perform at same level as male students.

METHODOLOGY

Study Participants

The study took place at a distant campus of a public university situated in a rural city of Sindh province of Pakistan. The selected institute offers various 4-year graduate degree programs, wherein a Bachelor's degree program in the field of Computer Science is one of them. The study targeted first-year, freshly enrolled students of the computer science degree program. The study population comprised about 100 students, including both genders. The inclusion criteria for participation included first-year students of CS of both genders, enrolled as full-time student at the institute, and voluntary willingness of students to

participate in the study. All the population of study was invited for participation in the study and a clear description of the study objectives and data processing policy was given to the students. At the end, 67 students (51 males and 16 females) participated in the study. Out of 67 responses, six responses were discarded due to incomplete answers and other discrepancies. As a result, the final study sample included 61 participants comprising 47 male and 14 female students.

Research Instrument

The Computer Attitude Scale (CAS) given by Loyd and Loyd (1985) is used to assess the attitude of students towards computers. CAS is a Likert-type attitude scale that consists of 40 questions, each with four-point possible responses (i.e., strongly disagree, disagree, agree, and strongly agree). The questions are intended to measure attitude toward computers in terms of four aspects: computer anxiety, computer confidence, computer liking, and computer usefulness. Each subscale consists of 10 questions of both positively and negatively phrased statements in order to force the respondents to think properly and constructively about each item before recording the responses (Loyd & Loyd (1985) for a detailed description of CAS).

Data Analysis

The responses were recorded on a rating scale of 1-4, indicating strongly disagree, slightly disagree, slightly agree, and strongly agree in ascending order of scores of 1 to 4. The questions were coded in a way that the higher score corresponds to a more positive attitude. It is important to mention here that negatively worded questions were reverse-coded so that the higher score corresponds to a more positive attitude. Accordingly, the total score of an individual can range between 40 and 160. Accordingly, higher scores on each of the individual subscales of computer attitude, i.e., confidence, linking, and usefulness, correspond to more positive attitudes, whereas higher scores regarding anxiety towards using computers correspond to more negative attitude. As the individual score on any of the subscales of a particular student who answers all questions can vary from 10 (minimum) to 40 (maximum), an attitude score of 25 or above is considered a positive attitude on a specific subscale of CAS. The coded scores were recorded on an Excel sheet, and successively, the mean and standard deviation were calculated for each subscale, and conclusions were drawn accordingly.

RESULTS AND DISCUSSION

Participant Statistics

Table 1 shows the participant statistics in terms of their primary attributes, including gender, availability of a computer and internet facility at home, acquisition of previous education in the computing field, any previous experience of working with computers, and the level of interest and type of motivation to join a computing degree program. Gender-wise breakdown of participants with respect to various attributes is also given.

As shown, 42 participants (69%) have no computer facility available at their homes, and it predicts that there is no computer-literate person in their family. These students, as a result, generally lack motivation and background information related to computers and begin their studies in the computing field as very naive and, therefore, face difficulties in keeping pace. There were only eight students (13%) who had proper computer facilities along with an internet connection available at their homes. Therefore, only these students can be expected to have some knowledge as well as enthusiasm to work with computers. Having limited access to computer facilities also calls for attention from education policymakers and other stakeholders of these rural societies to offer public computer facilities such as internet cafes, digital libraries, computer centers, and others for the citizens so that the students who cannot afford such facilities at home can avail these public facilities and be able to face and compete in the future world as good as students from urban areas.

Similarly, only 10 students (16%) have acquired previous education (up to 12th grade) in the computer field, while the majority have gained higher secondary education in other science and engineering fields. This shows that only a few students are primarily motivated by computer education as opposed to many interested in joining and working for other domains. Likewise, 45 students (74%) reported no prior experience with computers. This is in alignment with not having any computer facility at their homes and no previous computer education. Only 16 students reported that they have already worked with computers for some time. Out of these, only 4 students (6%) have experience of more than one year, which can be regarded as substantial for motivating students to pursue and excel in a computer degree program.

Table 1. Survey participants' statistics w.r.t primary attributes.

Attribute	Scales	Distribution					
Gender	Male	47 (77.04%)					
	Female	14 (22.95%)					
		Overall population		Male		Female	
		N	%	N	%	N	%
Computer ownership	No computer	42	68.85	33	70.21	9	64.28
	Computer without internet facility	11	18.03	7	14.89	4	28.57
	Computer with internet facility	08	13.11	7	14.89	1	07.14
Previous computer education	Yes	10	16.39	9	19.14	1	07.14
	No	51	83.60	38	80.85	13	92.85
Prior computer experience	No experience	45	73.77	33	70.21	12	85.71
	Up to 1 year experience	12	19.67	10	21.27	2	14.28
	1 – 3 year experience	04	06.55	4	06.55	0	00.00
Computing degree as first choice	Yes	25	40.98	18	38.29	7	50.00
	No	36	59.01	29	61.70	7	50.00
Motivation to join the computing program	Personal choice	12	19.67	10	21.27	2	14.28
	Family suggestion	21	34.42	11	23.40	10	71.42
	Perceived scope of the field	28	45.90	26	55.31	2	14.28

An interesting finding of the study is that less than half of the students (41%) have selected the computing field as their first choice, while the rest were interested in and have tried other science and engineering degree programs and joined computer degree programs because of not being selected in the aptitude test for other programs. Likewise, only a few students (20%) have selected a computing degree program based on their personal choice, whereas the majority have chosen the computing field either because of a family suggestion or because they feel graduating with a computer-oriented degree will open more doors of employment for them as this field is gaining increasing attention and vacancies in the job market. This shows that students or their families are aware of the importance of studying computers; however, this also calls for attention from education policymakers to incorporate substantial computer education in school education so that students are well aware of these opportunities along with proper understanding and background information regarding computers. This will help them to be already prepared and motivated, and thus perform well and excel in their studies and eventually win good jobs.

CAS Results

Figure 1 presents the results of participants' response scores on the CAS questionnaire, whereas Table 2 shows the total score, mean, and standard deviation of the study population with respect to four subscales

of the computer attitude scale. CAS includes 10 items for each CAS subscale, which were ordinal and rated on a 4-point Likert-type scale. The total score in Table 2 refers to the total aggregate points that the respondents have gained. As there are 10 items for each subscale and the maximum points for a particular item are 4 (strongly agree for a positively worded item and strongly disagree for a negatively worded item), a maximum of 40 points can be earned by each participant regarding each subscale of CAS. As the study sample included 61 participants, a total of 2440 points are possible maximum scores for each CAS subscale. Negatively worded items have validated the results in a way that they force respondents to carefully consider all choices, think well, and then respond to each item. If all items were worded positively, there is a possibility that respondents can respond to all items in a more or less similar fashion without giving much attention to the meaning of each item.
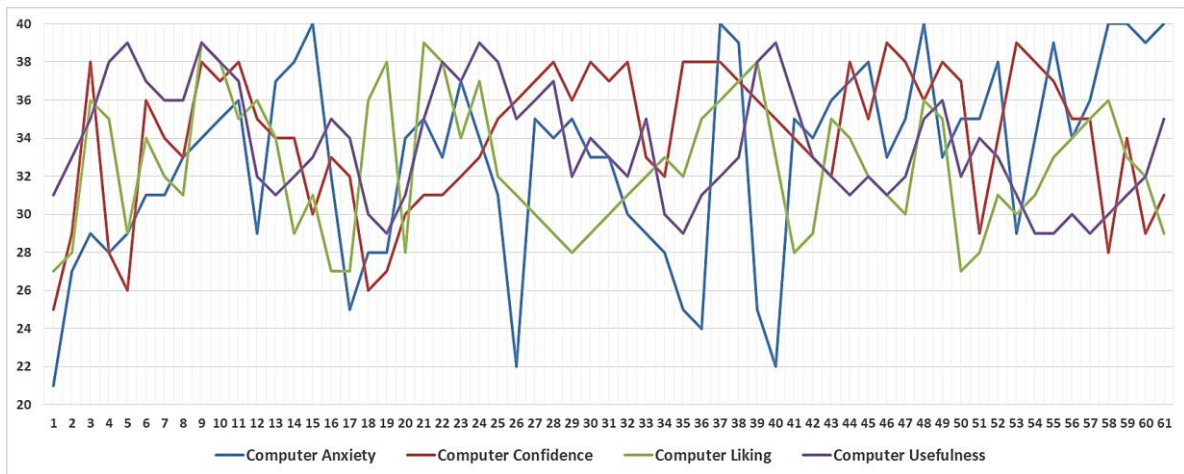

Figure 1. Survey participants' scores with respect to different subscales of the CAS questionnaire.

Table 2. CAS results of the study (N=61).

Computer Attitude Subscale	Total score (Out of 2440)	Minimum score	Maximum score	Mean (Out of 40)	Standard deviation
Computer anxiety	2009	21	40	32.93	4.97
Computer confidence	2081	25	39	34.11	3.70
Computer liking	1983	27	39	32.50	3.43
Computer usefulness	2052	29	39	33.63	3.00

The results in Table 2 show the mean scores of each subscale of CAS. The threshold score for each scale is 25; i.e., the mean score above is considered positive. The results indicate that the students have somewhat high confidence in working with computers (avg. 34.11), more tendency towards linking the computers (avg. 32.50), and a high perception of computers' usefulness in achieving personal and professional goals (avg. 33.63). However, the students have also reported higher levels of computer anxiety (avg. 32.93). This may be due to the lack of their previous training and experience of working with computers.

Figure 2 presents a comparison of mean scores of male and female students in terms of four subscales of the computer attitude scale whilst the gender-wise standard deviation of study participants and t-test values are given in Table 3. As shown in Figure 2, the male and female students show almost the same level of confidence (around 34) and liking (around 32) in working with computers; however, differences can be observed in terms of perceived usefulness (t-test value of 2.98) and computer anxiety (t-test value of -4.140). Specifically, females exhibit less perceived usefulness of computers and experience more anxiety in working with computers. One possible reason for this differentiation is that in rural areas, apart from a general lack of access to computing resources and facilities, female students of these areas are less social, get less attention, and have limited access to public facilities and facilities available from social connections.
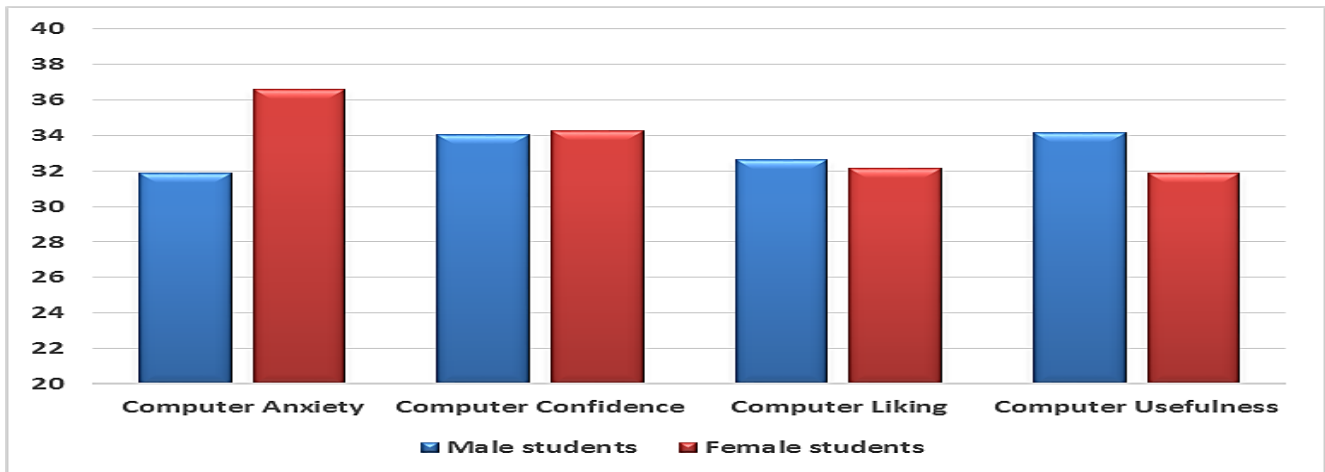
Figure 2. Gender-wise average scores of survey participants w.r.t four CAS subscales.

Table 3. Results of gender-wise independent groups t-tests of survey sample w.r.t. four CAS subscales.

Computer Attitude Subscale	Gender	Score	Mean	Standard deviation	t-text value
Computer anxiety	Male	1497	31.85	4.88	-4.140
	Female	512	36.57	3.39	
Computer confidence	Male	1601	34.06	3.74	-0.198
	Female	480	34.28	3.66	
Computer liking	Male	1533	32.61	3.59	0.499
	Female	450	32.14	2.93	
Computer usefulness	Male	1606	34.17	2.98	2.98
	Female	446	31.85	2.41	

CONCLUSIONS

The main aim of the present study was to assess the attitude towards computers of entry-level university students in rural areas in the Sindh province of Pakistan. The results indicate that the students in rural areas are deprived of enough computing facilities, whereby a larger number of study participants do not own a computer at home, lack prior knowledge, experience, and motivation in working with computers, and are pursuing a computing degree program only on the understanding that graduating in computing field will open more job opportunities for them. The CAS scores of study participants, as presented in Figure 1 and Table 2, show that overall, students possess positive attitudes towards computers; however, they depict higher levels of computer anxiety as a result of a lack of previous knowledge and experience of working with computers. Furthermore, results depict that male students are slightly more likely to outperform female students as more male students possess prior knowledge and experience in working with computers and are less anxious than their female counterparts (Figure 2 and Table 3).

Based on the findings discussed in Section 4, the present study makes several policy recommendations. First, the current school and college curriculum needs to be revised with the compulsory inclusion of computer education so that students can overcome their anxiety and gain basic knowledge and skills in working with computers. Second, the schools and colleges must have enough computers and other related resources, the teachers should be well-trained in computer education, and the administration should have a clear vision of incorporating computer education for all. Third, the government should envisage and execute nationwide ICT education improvement plans in rural areas and thereby establish public computing facilities such as training centers and cafes so that financially bounded students can also get access to computing facilities.

Despite that the authors believe this study has yielded significant results concerning the computer attitude of entry-level university students of rural areas of developing countries in general and in Pakistan in

particular, it has some limitations. The study has included only one degree-awarding institution with 61 participants. While the socio-economic conditions and, thus, the students' attitudes across all rural areas are almost the same throughout the country, the authors are convinced that the results are valid and generalizable to any other institution as well. However, further investigation on a larger sample covering other institutions in other regions of the country is certainly necessary to test the generalizability and comprehensiveness of the findings and establish larger evidence at the national level.

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