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Utility of Computer Labs in Secondary Schools as Perceived by Students with Diverse Demographics

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ABSTRACT

The accessibility of modern computer technologies in schools is increasing all over the globe. Generally, the presence of a well-equipped and functional computer lab facility in school provides the opportunity not only to modernize educational methods but also to augment students and teachers' interest towards the efficient use of computer technology along with access to quality education. In line with prevailing global trends, federal and provincial governments in Pakistan especially Government of the Punjab also made concerted efforts to provide computer lab facility in secondary schools in past two decades. In this context, this article mainly focused on examining the usefulness of computer labs for enhancement of secondary school students learning experiences. Descriptive survey design was used to achieve the objectives of this study in which a self-developed questionnaire designed on Likert five-point format was administered to 320 sample students selected from 32 secondary schools using cluster and stratified random sampling techniques. Both the descriptive (i.e., percentage, mean, SD) and/or inferential statistics (i.e., independent-sample t-test) were used to analyze collected data. The results revealed that secondary school students believe, with a higher level of consensus, that computer labs are useful for enhancement of their learning. Some concerns, however, were also highlighted by students regarding the availability of required physical facilities in computer labs. It was recommended for school authorities to provide well-equipped and fully functional computer labs in schools to achieve maximum benefits for students.

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1. Introduction

Technology has been playing a pivotal role in 21st century education from primary to university level. Over the years, computer technology has become an integral part of education and its impact on teaching

and learning is widely accepted (Mitra et al., 2000). Computer technology is utilized as a key instrument for creating conducive learning environment in an institution (Gilakjani, Sabouri & Zabihniaemran, 2015) as well as help learners to succeed and become more independent. It is beneficial not only for students to develop their creativity (Machnaik, 2002) but also for teachers to meet their instructional goals (Bennett et al., 2000) and to play more effective role as facilitators of learning (Gilakjani et al., 2015; Naimova, 2008). Writing in the same vein, Bajcsy (2002) stated that computers help both the teachers and students to interact with each other and provide useful materials. Likewise, a number of scholars (e.g., Campbell, 2001; Teo, 2009) consider information technologies as an indicator of economic development and job opportunities for students.

Computers are on demand throughout the school day in the new model of integrating technology into the curriculum. The successful integration of computers in educational settings mainly depends on availability of well-equipped and functional computer lab facility in schools (Saadon, Rambely & Suradi, 2011). The computer lab serves as the center for teaching computer usage to whole classes as well as to instruct in-service teachers of other subjects, usually by a specialist computer teacher. Zhao and Frank (2003) support this notion and emphasize that computer technology should be an inevitable component of all the educational settings as both the students and teachers can use it for numerous academic purposes. Computer labs equipped with necessary software packages attract students to come to labs (Saadon & Liong, 2011); influence students' motivation to learn and increase their interest in teaching-learning process (Gilakjani et al., 2015). Furthermore, computers help students to collect new information (Gilakjani et al., 2015); investigate topics and to be more productive (Naimova, 2008; Worthington & Zhao, 1999). Similarly, Saadon et al. (2011) concluded that "practical teaching and learning process in the labs helps students in internalizing scientific method and understanding mathematical science concept introduced"(p. 352).

Furthermore, modern computer technologies work as an effective instrument of change and innovation for all the stakeholders in educational settings. Computer technology boosts creative thinking among students (Wheeler, Waite & Bromfield, 2002) and they perform better while solving problems (Williams, 2003). Likewise, computer helps learners in improving as well as performing mental and creative activities more efficiently (Graff, 2003; Mikropoulos et al., 2003). Classroom teachers use computer labs for guiding students' learning, connecting curriculum to the real world activities (Gilakjani et al., 2015) and creating technology-based research projects. Likewise, computer technology helps the teachers of mathematical sciences subjects to integrate the elements of software use in the course curriculum (Saadon et al., 2012). In addition to students and classroom teachers, technology specialists use the computer labs for teaching in-service teachers where they instruct teachers on various aspects of using computers in educational settings. Finally, the traditional computer lab also serves as the location for networked printers and scanners that are used by the whole school.

Writing in the same vein, Graff (2003) proclaims that modern computer labs are beneficial for developing positive attitudes among students toward using computers. Al-Harbi (2010) found that students using computers had more positive attitude toward e-learning. Furthermore, studies on gender differences in students' attitudes towards use of computer prove that female secondary school students indicated less positive computer attitudes than boys (Al-Harbi, 2010; Sainz & Lopez-Saez, 2010; Volman et al., 2005) and female students also make less intense use of computers as compared to boys' students (Nelson & Cooper, 1997; Sainz & Lopez-Saez, 2010). Similarly, Graff (2003) found that girls did not like to use computers and felt lack of confidence in using computers than boys (Dickhauser & Stiensmeier-Pelster, 2002). Palaigeorgiou et al., (2005) also found that girls were much worried about hardware usage and did not find computer usage valuable in their personal as well as social life.

Studies of demographic differences in students' views about utility of computer technology tend to examine a number of diverse areas including boys' and girls' perceptions of computers, their interest in use of computers and students' access to computers. Some studies also focus on analyzing the influence

of students' experiences, educational level and school location on students' attitude towards using computers (Shashaani & Khalili, 2001). A number of researchers have found that male students as compared to their female counter parts have greater access to computers, take more interest in learning computer usage (Badagliacco, 1990; Shashaani, 1994) and enjoy working with computers (Reinen & Plomp, 1997; Zhao, Lu, Huang & Wang, 2010). Another group of scholars, however, summarized that gender was not a statistically significant predictor of students' attitude towards computers (Alothman, Robertson, & Michaelson, 2017; Kay, 2008). They found that male and female students were equally interested in using computers (Shashaani & Khalili, 2001) as well as participating in computer activities (Shashaani, 1993).

Several other scholars and researchers (Alothman et al., 2017; Dhamija, 2014; Sainz & Lopez-Saez, 2010) have studied the usefulness of computer technologies in relation to students' place of origin and school location. Alothman et al., (2017), for example, concluded that the location was among the key factors which significantly predict students' attitudes towards using computers. Likewise, Dhamija (2014) found that urban students in comparison with rural undergraduate students have more positive attitude towards the use of computer technology in education. These differences are more salient among rural area students enrolled in the domain of technology in secondary education (Sainz & Lopez-Saez, 2010).

Considering the global trends, it is evident that acquisition of computer skills is almost mandatory for students in this digital age to perform efficiently in their school subjects. The technologically advanced countries have made effective use of the implementation of computer technologies to modernize their educational landscape at secondary and even primary school level (Kosakowski, 1999). Generally, the presence of a well-equipped and functional computer lab facility in school provides the opportunity not only to modernize educational methods but also to augment both the students and teachers' interest towards the efficient use of computer technology along with access to quality education (World Bank, 2002). Writing in the same vein, Kreisel, (2003) stated that both the students and teachers in academically advanced societies use animation, visual design and design software to clarify as well as present important educational concepts.

In line with the prevailing global trends in education, the use of computer technologies in Pakistan has substantially increased in the past three decades and has become an important component of educational policies. In the fiscal year 2005-2006, Federal government initiated a project to establish computer labs in secondary schools to promote computer education in Pakistan. Consequently, 515 computer labs were established in secondary schools of Punjab. Later on in the year 2008-2009, in continuation of this policy, Government of the Punjab established computer labs in the total 4286 government secondary and higher secondary schools in all the 36 districts of the Punjab province. In the year 2013-2014, 636 computer labs were further provided in newly upgraded secondary and higher secondary schools along with equipping 500 elementary schools with computer labs to expand the project. It was assumed that the project will bring revolutionary changes in traditional methods of teaching presently used at secondary school level. It was also assumed that computer labs may be useful in providing necessary skills to secondary school students to meet the future challenges of competitive knowledge based economy.

Considering the above mentioned background, there is sufficient evidence in literature about the usefulness of computer labs in enhancing students' learning outcomes at all educational levels. It can, thus, be concluded that along with other school facilities, existence of a well-equipped and functional computer lab in secondary schools is also essential for enhancement of students' learning outcomes. As mentioned earlier, the past several years have witnessed a rapid growth of computer technology and its use in all the educational settings in Pakistan. However, little effort has been made to investigate the utility of computer labs from the perspective of secondary school students. It is, therefore, substantial to be acquainted with students' viewpoints about the utility of computer labs at secondary school level in Pakistan. Similarly, usefulness of computer labs has not much been studied from the perspective of

students' gender as well as location of secondary schools. The main purpose of this research paper, therefore, is to analyze secondary school students' perceptions about utility of computer labs. This article further explores the influence of secondary school students' gender and school location on utility of computer labs.

Research Questions:
This paper mainly examined secondary school students' views about utility of computer labs at Khanewal district. Following specific research questions were formulated for this study.

1. To what extent, secondary school students perceive computer labs as useful for their learning.
2. What differences exist in secondary school students' perceptions based on their gender regarding the utility of computer labs?
3. What differences exist in students' perceptions based on the location of secondary school (rural/urban) regarding the utility of computer labs?

2. Research Design and Methods

This study mainly focused on examining utility of computer labs in secondary schools of Khanewal district as perceived by students with diverse demographics. The researcher used descriptive survey design in this study. All the secondary school students, both male and female, presently enrolled in 9th grade and 10th grade in Government schools of district Khanewal, served as a population for this study. Total number of government secondary schools, both male and female, in Khanewal district was 183.

Out of 183 government secondary schools, 32 schools (i.e., 18% of the population) were selected using cluster sampling technique. Of these 32, sixteen schools were selected from each gender using stratified random sampling technique, eight from rural area schools and eight from urban area schools. At the next step, 10 students were randomly selected from each school from those students who were present on the specific days of data collection, 5 from 9th grade and 5 from 10th grade. This resulted into random selection of 320 secondary level students, who served as a sample for this study. Of these 320 sample students, 160 (i.e., 50%) were boys and 160 (i.e., 50%) were girls. Similarly, 160 (i.e., 50%) were from urban area schools and 160 (i.e., 50%) were from rural area schools. Table 1 presents the details about demographic information of sample students.

Table 1: Demographic Information of Sample Students

Total Students	**Frequency**		**Total**	**%age**	
	9th Class	**10th Class**		**9th Class**	**10th Class**
Boys	80	80	**160**	50%	50%
Girls	80	80	**160**	50%	50%
Grand Total	**160**	**160**	**320**	**100%**	**100%**
Urban Schools					
Boys	40	40	**80**	50%	50%
Girls	40	40	**80**	50%	50%
Total	**80**	**80**	**160**	**100%**	100%
Rural Schools					
Boys	40	40	**80**	50%	50%
Girls	40	40	**80**	50%	50%
Total	**80**	**80**	**160**	**100%**	**100%**

A self-developed questionnaire, comprising two sections, was used in this study as a research tool for data collection. First section of the questionnaire sought for demographic information from the sample respondents. The second section comprising 26 closed-ended items was designed on Likert 5-point scale format. The items were constructed after thorough review of related literature. These items were

representative of various dimensions essential for exploring students' perceptions regarding utility of computer labs in secondary schools.

To check the face validity as well as content validity of the self-developed instrument, two retired Professors and one serving Associate Professor of Education were selected as experts. All the three experts provided encouraging comments and helped in finalizing the instrument. As a second check, the researchers administered the instruments to 30 secondary level students who were enrolled in schools of Multan city for pilot testing. The participating students were particularly requested to point out any problems regarding reading, understanding and completion of the questionnaire. Generally, students reported the instrument to be easy and understandable. The research instrument was finalized according to the experts' opinions and students' comments received during pilot testing. The Cronbach's Alpha value of the questionnaire was 0.81 in final study which is considered highly reliable.

After seeking permission from the respective Chief Executive Officers [CEOs] as well as school heads and class teachers, the tool was administered personally in 32 secondary schools. The entire process of the questionnaire administration took approximately 15 to 20 minutes in each school. Finally, total 320 students completed the questionnaires in all the 32 sample schools.

3. Data Analysis and Results

In response to specific research questions, data were analyzed on two bases and results were presented in following sections. First, statement-wise analysis of students' views about utility of computer labs was done by using descriptive statistics i.e., mean and standard deviations. For ease of analysis, responses on options 'agree' and 'strongly agree' were combined into one option i.e., 'agree'. Likewise, 'disagree' and 'strongly disagree' were combined into one option i.e., 'disagree'. Second, comparison of students' perceptions gender-wise and area-wise was done by using independent sample t-test. Results were presented in Table 2, Table 3 and Table 4 followed by interpretation.

Table 2: Students' Views of Computer Labs' Utility

Sr. no	Statement/theme	Agree % age	Disagree % age	Undecided% age	Mean	SD
1	My computer lab is always functional	99.7	0.3	0.0	4.3	.45
2	Allotment of only one period for computer practice	100	0.0	0.0	4.5	.50
3	Comfortable in using computer in computer lab	66.9	33.1	0.0	3.4	1.1
4	Availability of well-trained computer teacher	99.7	0.3	0.0	4.6	.49
5	I like to attend the computer lab	91.6	5.6	2.8	4.1	.72
6	I visit the computer lab regularly	88.4	11.3	0.3	4.1	.86
7	Regularity of computer teacher	87.5	12.2	0.3	4.2	.94
8	Computer teacher comes to the lab in time	99.7	0.0	0.3	4.5	.51
9	Availability of sufficient number of computers	12.5	87.5	0.0	1.6	.99
10	Easy access to computer at the time of need	37.5	62.5	0.0	2.6	1.3
11	Importance of computers success in school subjects	94.1	0.0	5.9	4.2	.50
12	Computers improve the quality of work	90.0	3.4	6.6	4.0	.62
13	Computers encourage group work	93.1	2.8	4.1	4.1	.60
14	Participation in computer lab activities	99.4	0.3	0.3	4.4	.51
15	Positive effect of computer lab work on studies	96.2	2.2	1.6	4.2	.59
16	Permission to use printer	0.0	100	0.0	1.0	.00
17	Computer lab fulfills my course requirements	25.0	75.0	0.0	2.5	.87
18	Computer lab an integral part of educational process	98.8	0.0	1.2	4.6	.52
19	Learning with computers is waste of time	0.0	100	0.0	4.6	.49
20	I often play computer games in computer lab	0.0	100	0.0	4.6	.50
21	Enjoying with power point presentations	99.4	0.6	0.0	4.3	.50
22	Use of internet more at school than at home	0.0	100	0.0	1.9	.32
23	Sufficient seating arrangement in the computer lab	12.5	87.5	0.0	1.8	1.3
24	Importance of computer skills for future life	93.8	0.0	6.2	4.1	.47
25	Internet facility at home	30.9	69.1	0.0	2.9	1.4
26	Importance of computers skills to get a job	83.7	3.1	13.1	4.0	.66

	Overall Perceptions				**3.66**	**.68**

Analysis of students' responses in Table 2 shows that majority of the respondents agreed with most of the statements (i.e., 17 statements), and reacted positively by agreeing with these seventeen statements. It can, thus, be concluded that there are positive acknowledgements by the students regarding functionality of computer lab, availability of trained teachers, interest in computer lab activities and utility of computer labs for enhancement of their learning and success in future life. Table 2 further depicts that most of the participants disagreed with 9 statements and very low percentage of respondents remained undecided on all the 26 statements. It can, thus, be inferred that almost all the students were participating in computer lab activities in their schools and they had a clear-cut view about the facilities available as well as activities performed in their computer lab.

Overall, the findings (Mean= 3.66, SD= 0.68) from the questionnaire portrayed that majority of the participants acknowledged that computer labs are useful at secondary school level. However, participating students expressed their concerns regarding the availability of sufficient number of computers, restrictions on using printer and availability of required seating arrangement in computer lab. The Table 2 also shows that values of standard deviation for majority of the statements were around 0.50, which shows higher level of consensus among the participants. On the whole, it is inferred that secondary school students believe, with a higher level of consensus, that computer labs are useful for enhancement of their learning.

The differences between secondary school students' perceptions based on their gender regarding the utility of computer labs were examined by using an independent sample t-test, and results are shown in Table 3.

Table 3: Gender-wise comparison of students' views of computer labs' utility

Category	N	Mean	SD	t	Sig. (2-tailed)
Male	160	97.63	6.47	4.90	.000
Female	160	94.36	5.43		

Table 3 presents the mean scores for the responses of male and female secondary school students. The mean scores of male participants are reasonably higher than their female counter parts. The p-value of 0.000 (i.e., $p<0.05$) demonstrates that there is a statistically significant difference between views of students based on their gender regarding the extent of the utility of computer labs at secondary school level. It can, therefore, be inferred that students' gender has significant impact on their perceptions about the utility of computer labs. Students enrolled in boys' secondary schools believe that computer labs are more useful for enhancement of their learning**.**

Furthermore, the differences between secondary school students' perceptions based on the location of secondary school (rural/urban) regarding the utility of computer labs were examined by using an independent sample t-test, and Table 4 presents the results.

Table 4: Area-wise comparison of students' views of computer labs' utility

Category	N	Mean	SD	t	Sig. (2-tailed)
Urban	160	99.06	4.78	10.21	.000
Rural	160	92.92	5.91		

Table 4 indicates that the mean score for the responses of urban area secondary school students is reasonably higher than their rural area counter parts. The p-value of 0.000 (i.e., $p<0.05$) demonstrates that there is a statistically significant difference between the views of urban and rural area secondary school students regarding the extent of the utility of computer labs. It can, therefore, be inferred that school location has significant impact on students' perceptions about the utility of computer labs. Students

enrolled in urban area secondary schools believe that computer labs are more useful for enhancement of their learning**.**

4. Discussion

This study contributes to the analysis of secondary school students' perceptions about utility of computer labs within the context of Pakistan. The study of computer lab's utility in attitudinal research is substantial because of the belief that awareness of the usefulness of computer technology in daily life will motivate students to learn about it. A number of previous studies (Shashaani & Khalili, 2001; Zhang & Espinoza, 1998) found that an individual's attitude towards computers is directly related to his or her perception of the usefulness of computers. Individuals feel a need to learn computing skills when they recognize that computer technology is essential in their future careers (Zhang & Espinoza, 1998). In this study, secondary school students perceived computers as beneficial and valuable tools that could be helpful for them to improve their learning. This is an encouraging finding, particularly, in Pakistani context.

This article further explores the influence of secondary school students' gender and school location on utility of computer labs. Findings of this study verify previous predictions about lower perceptions of female students towards the usefulness of computers than their male counterparts and confirm the results of several earlier studies (Dickhauser & Stiensmeier-Pelster, 2002; Nelson & Cooper, 1997; Shashaani & Khalili, 2001; Volman et al., 2005). Nonetheless, and in line with the conclusions of meta-analysis completed by Whitley (1997), it cannot be postulated that even though female embrace less positive attitudes towards usefulness of computers as compared to male counterparts, their attitudes towards computer use are negative. Major reasons for these divergent attitudes of boys and girls towards computer use might be the differences in their interests and motivations in considering the utility of computers, and the role computers play in their lives (Sainz & Lopez-Saez, 2010); as well as their ultimate use of computers (Volman et al., 2005). Deyoung and Spence (2004) recommend that gender differences in attitudes towards computer use can be reduced by making girls get in contact with computers from early years of schooling.

At the same time, our findings prove that students enrolled in urban area secondary schools hold more positive views about the utility of computer labs than students who are enrolled in rural area schools. These findings are aligned well with earlier scholars (Dhamija, 2014; Sainz & Lopez-Saez, 2010). Lack of physical facilities in rural area schools' computer labs as well as discouraging attitude of administration regarding the use of computer labs can limit the rural students' use of computer labs in a higher extent than urban area school students who have relatively more opportunities of using computer labs. Corresponding with the results of this study, it is suggested for future researchers to include different types of contextual variables to explore the adolescents' perceptions towards utility of computer labs in order to gain in-depth understanding of the conditions and situations which influence their views.

5. Conclusions and Recommendations

It is evident from the findings of this study that the views of secondary school students about the utility of computer labs are positive but respondents also exhibited their concerns about deficient physical resources in computer labs particularly in relation to the number of computers and availability of required seating arrangement. To be specific, following most important conclusions were drawn to answer the three main research questions. First, students believe that computer labs are useful for enhancement of their learning and success in future life. Second, students enrolled in boys' secondary schools believe that computer labs are more useful for enhancement of their learning**.** Third, school location has significant impact on students' perceptions about the utility of computer labs. Students enrolled in urban area secondary schools believe that computer labs are more useful for enhancement of their learning**.** Based on the results of this study, it is recommended for school authorities to provide well-equipped and fully functional computer labs in schools to achieve maximum benefits for students.

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