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Research Article

ASSESSING THE COMPUTER LABORATORY LEARNING ENVIRONMENTS IN RELATION TO THE STUDENTS' ATTITUDES TOWARDS COMPUTERS

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A R T I C L E I N F O

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A B S T R A C T

Computers have been used in higher education for over thirty years both as a subject of study and as a tool to assist in the learning process within other disciplines. In fact, computer laboratory classes have played a major role in the teaching of computing subjects in schools and colleges. Despite the perceived importance of laboratory classes little research has been done on computer laboratory learning environments in India. This study presents an assessment of the computer laboratory learning environments and students' attitudes towards computer and computer courses. This study employed two questionnaires to provide quantitative data i.e. The Computer Laboratory Environment Inventory (CLEI) and The Attitude Towards Computer and Computer Courses (ACCC) scale (Newby & Fisher, 1998). The sample consisted of 250 students taken from private secondary schools of Jammu. Preliminary analysis showed that CLEI and ACCC are valid and reliable instruments for assessing student's perceptions about their computer laboratory learning environments. The students were also found to have positive perceptions about their computer laboratory learning environments. Regarding associations between student's attitudes and perceptions of their computer laboratory environments, most scales of CLEI were statistically significant and positively associated with the four scales of the ACCC. No gender differences in perceptions of computer laboratory learning environments have been observed in this study.

INTRODUCTION

Each year, new technologies hold the promise to alter the way we think and learn. Computers are prevalent everywhere, and they are making their way into school systems around the country. It is obvious that there is a demand for technological instruction in high school and college. However, the question should computers be implemented into early childhood classrooms is still prudent. With computers all around us, it is inevitable that children will be exposed to them, and they will eventually be facilitated into their daily lives. Early experiences should maximize young children's overall growth and development. Their eyes should be opened to the wonderment of learning and the pleasures of discovery. Computers can by an important tool to optimize young children's potential and help aid the learning process. Before deciding to introduce children to computers, it is important to address the potential benefits and dangers the machines have on youths (Computers in Education, 2006).

Computers are a new and exciting part of education and learning. They have changed how students learn, study, and do assignments.

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Furthermore, they have changed the way teachers teach. Every day in the field of technology innovations are made that will improve how educators and students can use computers alike. The most basic way that computers help students is through word processing. Through word processing programs like Claris Works and Microsoft Word students can access programs to edit, correct spelling errors, and much more. Programs can also be bought that will change writing into the format. It also gives students the ability to be creative and add pictures, highlight, underline, and use different fonts. In some classrooms the teachers use computers to compound what they teach. Computers can be used as projectors, to run programs, or simply to print out information quickly. Use of the Internet is also now part of the modern classroom. There are many tutorial programs available. They are excellent in helping students hone their skills at home. These programs are for the most part affordable and have a wide range of topics. Many young children start using these even before entering school so that they are more prepared when they enter (Computers in Education, 2006).

As a researcher, I was interested in understanding the learning environments that exist in computer laboratories in private secondary schools of Jammu. I was also interested in assessing attitudes of students towards computer. Since gender differences may occur in students' perceptions, I was also

interested in investigating whether they occur in students' perceptions of their computer laboratory environments and their attitudes towards computers. This study involved the use of two instruments i.e. the Computer Laboratory Environment Inventory (CLEI) and Attitude Towards Computer and Computer Courses (ACCC) questionnaire. One was designed to assess student's perception of various aspects of their computer laboratory learning environments and other to assess the attitudes toward computers and computing courses. The instruments were also used to determine associations between laboratory learning environments and student attitudes.

Objectives of the Study

The objectives of the proposed research study were: 1) to determine the reliability and validity of Computer Laboratory Environment Inventory (CLEI) and Attitude Towards Computer and Computer Courses (ACCC) for use in Indian Computer Laboratory classrooms at the secondary level 2) to assess students' perceptions of their computer laboratory learning environments in selected private secondary schools of Jammu 3) to assess students' attitudes towards computer courses in selected private secondary schools of Jammu 4) to investigate associations between computer laboratory learning environments and students attitudes towards computers and 5) to study the gender differences in students perceptions towards computer laboratory learning environments and attitudes towards computers.

Background and Significance

The use of computers in teaching and learning for the majority of children is mostly likely to occur in classroom. Most experts in the field of educational computing (Lynch, 1990; Olson, 1988; Rieber, 1994) would characterize computers as interactive and thus admit them a place within the relationship structures within the classroom. The majority of classroom learning environments, in schools, which incorporate computers, could be depicted using the model in Figure 1. Strictly speaking, the computer systems and non-interactive technology are part of the context of the curriculum but, because computers are two- way interactive, it is more helpful to highlight them by separation. The elements of the traditional classroom learning environments as shown in Figure 1 provides a complex pattern of relationships. When computers are used with this environment, the complexity of this pattern of relationships increases, with all elements of the traditional classroom learning environments needing to interact with both the hardware and software.

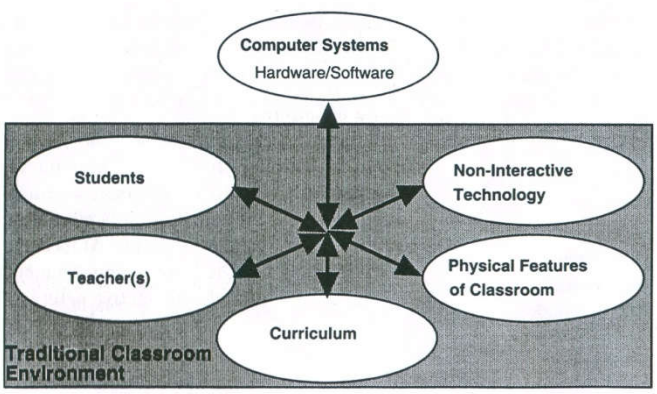

Figure 1 A model of the relationship of computer systems to the elements of the classroom learning environment.

As a teacher, I usually observe students working in a computer laboratory. I find students enjoying working on computers. Students were involved in practicing certain exercises on computers like using word processing and spreadsheet etc. Students were often found busy using the Internet for academic purposes also. Not only students, teachers also take benefit from computers. Lessons were also demonstrated by teachers through smart class i.e. also a part of computer technology. I feel that computers play an important role for both teachers as well as students in their professional development. So, I was very much interested in this study, as I wanted to investigate the attitude of each and every student towards computers and computer courses. I also wanted to know whether students are aware of the importance of computers for their future and whether the existing computer laboratory learning suits them or not, whether they enjoy their computer classroom environment or feel any sort of anxiety towards computers.

The present study is significant because it's for the first time that a study of computer laboratory learning environments has been undertaken in Indian secondary schools and associations of students' perceptions of computer laboratory learning environments with attitude towards computers is assessed. Significantly, the validation of CLEI and ACCC makes it more available for use in future studies on learning environments. This study helps in bringing an insight among the teachers that would help them to make the students more aware about the importance of the computer courses. Teachers could change the attitude of the students towards the computers and computer courses and remove the nervousness of students towards computer as a subject and help them to enjoy working on the computers.

LITERATURE REVIEW

Learning Environments Research has expanded remarkably during the past 40 years on the international scene, with Asian researches making important and distinct contributions particularly over the previous decade. A striking feature of this field is the availability of a variety of economical, valid and widely applicable questionnaires that have been developed and used for assessing students' perception of classroom environment. Asian researchers have cross-validated the main contemporary learning environment questionnaires that originated in the west and have undertaken careful translations and adaptations for use in the Chinese, Korean, Malay and Indonesian languages. Asian studies have successfully replicated Western research in establishing consistent associations between the learning environment and student outcomes, in using learning environment assessments in evaluation of education programmes and in identifying determinants of learning environments (Fraser, 2002).

The study of Newby and Fisher (1998) focuses on the computer laboratory class as a learning environment in university courses. In it, two previously developed instruments, the Computer Laboratory Environment Inventory (CLEI) and the Attitude towards Computing and Computing Courses Questionnaire (ACCC) were used. The CLEI has five scales for measuring students' perceptions of aspects of their laboratory environment. These are Student Cohesiveness, Open-Endness, Integration, Technology Adequacy and Laboratory Availability. The ACCC has four scales, Anxiety, Enjoyment, Usefulness of Computers and Usefulness of the

Course. These instruments were administered to a sample of 208 students taking computing courses within the Business School at Curtin University. The sample covered specialist programming courses as well as courses in which the students use software tools such as spread sheets etc.

Another study by Newby and Fisher (2000) focused on the use of computer laboratory classes in university courses. Two previously developed instruments, the Computer Laboratory Environment Inventory (CLEI) and the Attitude towards Computer and Computer Courses (ACCC), were used. The CLEI has five scales measuring students' perceptions of aspects of their laboratory environment: Student Cohesiveness, Open-Endedness, Integration, Technology Adequacy, and Laboratory Availability. The ACCC has four scales, namely, Anxiety, Enjoyment, Usefulness of Computers, and Usefulness of the Course. These instruments were administered to a sample of 208 students taking computing courses within the Business School at Curtin University of Technology in Western Australia. The sample covered specialist programming courses as well as courses in which the students use software tools such as spread sheets. The results showed that there were statistically significant associations between achievement and the attitudinal variables of Anxiety, Enjoyment and Usefulness of the Course. Regression analysis supported the findings that the learning environment variables made a significant contribution to the variance in attitudinal variables, and these in turn made a significant contribution to achievement variance. A two-level model was proposed and analysed using Structural Equation Modelling. This supported the hypothesis that the computer laboratory environment affects achievement indirectly by directly affecting students' attitudes.

The research study by Kanokporn (2006) is significant in that it is one of the first evaluations of a compute classroom psychosocial learning environment and investigation of associations between learning environment factors and students' attitudes at the tertiary level in Thailand. Both quantitative and qualitative methods were used in this study. Three questionnaires were employed to provide quantitative data: the College and University Classroom Environment Inventory (CUCEI), the Computer Laboratory Environment Inventory (CLEI), and the Attitude Towards Computer and Computer Courses (ACCC). The three questionnaires were administered to 905 computer science students in order to investigate their perceptions of their learning environment and associations between this and their attitudinal outcomes. Overall, the results generated from scale internal reliability analysis, mean correlations and ANOVAs suggested that the modified Thai versions of the CUCEI, CLEI and ACCC are valid and reliable instruments for measuring.

A few studies have been conducted internationally but research on computer laboratory learning environments have not been conducted in India. This study would further contribute to the knowledge in this field.

Sample for the Study

This study is unique because for the first time a study of computer laboratory learning environments is being done in selected private schools of Jammu. Since the schools under the state board of school education generally follow the same curriculum, teaching methodologies, evaluation process, offer computer as a compulsory subject and conduct practical's in well-established computer laboratories etc., their selection presents a right atmosphere to assess computer laboratory learning environments. This study has been done in the middle of the academic session so that students had adequate exposure of working in the computer laboratories, which would enable them to assess their learning environments. Sample for the present study was selected randomly from the five private schools of Jammu. The sample consisted of 250 secondary students that represent the whole population. 50 students were taken from each school. In order to permit an unbiased test of gender differences, an attempt was made to have equal number of boys and girls from each school.

Tools Used

For the purpose of this study two tools were used i.e. a) Computer Laboratory Environment Inventory (CLEI) and b) Attitude towards Computers and Computing Courses (ACCC) (Newby and Fisher, 1998). The Computer Laboratory Environment Inventory (CLEI) was used or measuring aspects of a computer laboratory environment and the other, the Attitude towards Computers and Computing Courses Questionnaire (ACCC) was selected to assess the attitude towards computer courses. Both these instruments have been widely used in a number of research studies and have been found to be reliable and valid. The CLEI has five scales for measuring students' perceptions of aspects of their laboratory environment. These are Student Cohesiveness, Open-Endness, Integration, Technology Adequacy and Laboratory Availability. The ACCC has four scales, Anxiety, Enjoyment, Usefulness of Computers and Usefulness of the Course. The scales consist of seven items, with each item being measured on a Likert Scale of 1 to 5 with some questions being reversed. A description of the scales used in the instruments is described in Table 1 and 2 with a sample item from each scale.

Table 1 Description of Computer Laboratory Environment Inventory Scales.

Scale	Description	Sample Item
Student Cohesiveness	Extent to which students know, help and are supportive of each other	I get on well with students in this laboratory class (+)
Open-endedness	Extent to which the laboratory activities encourages an open-ended divergent approach to use of computers	There is opportunity for me to pursue my own computing interests in this laboratory class (+)
Integration	Extent to which the laboratory activities are integrated with non-laboratory and theory classes	The laboratory work is unrelated to the topics that I am studying in my lecture (-)
Technology Adequacy	Extent to which the hardware and software is adequate for the tasks required	The computers are suitable for running the software I am required to use (+)
Laboratory Availability	Extent to which the laboratory is available for use	I find that the laboratory is crowded when I am using the computer (-)

Items designated (+) are scored 1,2,3,4 and 5, respectively for responses Almost Never, Seldom, Sometimes, Often, Almost Always. Items designated (-) are scored 5,4,3,2 and 1, respectively for responses Almost Never, Seldom, Sometimes, Often and Almost Always

Table 2 Description of Attitude towards Computers and Computing Courses Questionnaire Scales

Scale	Description	Sample Item
Anxiety	Extent to which the student feels comfortable using a computer	Working with a computer makes me very nervous (+)
Enjoyment	Extent to which the student enjoys using a computer	I enjoy learning on a computer (+)
Usefulness of Computers	Extent to which the students believes computers are useful	My future career will require a knowledge of computers (+)
Usefulness of Course	Extent to which the student found the course useful	I do not think I will use what I learned in this class (-)

Items designated (+) are scored 1,2,3,4 and 5, respectively for responses Strongly Disagree, Disagree, Not Sure, Agree, Strongly Agree. Items designated (-) are scored 5,4,3,2 and 1, respectively for responses Strongly Disagree, Disagree, Not Sure, Agree, Strongly Agree

FINDINGS AND RESULTS

Validation of the CLEI

To obtain reliability and validity, three statistical indices are generated. The three indices used are Cronbach alpha reliability, Mean Correlation with other scales and Analysis of variance i.e. ANOVA. eta^2 statistics (which is the ratio of 'between' to 'total' sum of squares).

Table 3 shows the alpha reliabilities, mean correlations with other scales and ANOVA eta^2 of CLEI. The alpha reliabilities ranged from 0.51 for the Open Endedness Scale to 0.59 for the Student Cohesiveness Scale. The reliability results of the CLEI were consistently above 0.50. This suggested that the CLEI could be considered a reliable tool (De Vellis, 1991) with Indian school students. The mean correlations ranged from 0.10 for the Integration scale to 0.30 for the Technology Adequacy scale. The eta^2 statistic (an estimate of the strength of association between class membership and the dependent variable) ranges from 0.01 for the Integration and Laboratory Availability scale to 0.06 for the Student Cohesiveness scale. Three values of eta^2 are significant at 0.01 level i.e. Student Cohesiveness, Open Endedness and Technology Adequacy of the CLEI. The one-way ANOVA for each scale involved class membership as the independent variable and the individual student as the unit of analysis.

Table 3 Internal Consistency Reliability (Cronbach Alpha Coefficient), Discriminant Validity (Mean Correlation with Other Scales) and Ability to Differentiate between Classrooms (ANOVA Results) for CLEI

Scale Name	No. of Items	Alpha Reliability	Mean Correlation with other Scales	ANOVA eta^2
Student Cohesiveness (SC)	7	0.59	0.21	0.06**
Open Endedness (OE)	7	0.51	0.22	0.03**
Integration (IN)	7	0.55	0.10	0.01
Technology Adequacy (TA)	7	0.54	0.30	0.03**
Laboratory Availability (AVA)	7	0.53	0.18	0.01

** Significant at $p<0.01$ n = 250
The eta^2 statistics (which is the ratio of 'between' to 'total' sum of squares) represents the proportion of variance explained by class membership.

Table 4 shows the alpha reliabilities, mean correlations with other scales and ANOVA eta^2 of ACCC. The alpha reliabilities ranged from 0.51 for Usefulness of Course Scale to 0.57 for Anxiety Scale. The mean correlations ranged from 0.17 for the Enjoyment scale to 0.93 for the Anxiety scale. The eta^2 statistic (an estimate of the strength of association between class membership and the dependent variable) ranges from 0.009 to 0.001. The one-way ANOVA for each scale involved class membership as the independent variable and the individual student as the unit of analysis.

Table 4 Internal Consistency Reliability (Cronbach Alpha Coefficient), Discriminant Validity (Mean Correlation with Other Scales) and Ability to Differentiate between Classrooms (ANOVA Results) for ACCC

Scale Name	No. of Items	Alpha Reliability	Mean Correlation with other Scales	ANOVA eta^2
Usefulness of Course (UC)	7	0.51	0.35	0.009
Anxiety (AN)	7	0.57	0.93	0.000
Usefulness of Computers (UCM	7	0.52	0.34	0.001
Enjoyment (EN)	7	0.54	0.17	0.004

n = 250 The *et al* 2 statistics (which is the ratio of 'between' to 'total' sum of squares) represents the proportion of variance explained by class membership.

Means and Standard Deviations on the CLEI

The data for the descriptive statistics concerning CLEI were collected from 250 students and the values of means and standard deviations are given in Table 5. Means and Standard Deviations of the items of the five Scales of CLEI were computed to find out the nature of computer laboratory learning environments. The highest mean value is 2.73 for the Technology Adequacy Scale and the least value is 2.50 for the Availability Scale. From Table 5, it can be seen that the mean scores of the five scales of the CLEI ranged from 2.50 for Availability Scale to 2.73 for Technology Adequacy Scale. Student Cohesiveness Scale also has the mean value of 2.72. This means students are quite aware of computer learning and want to learn more through computers technology. From Table 7 we can see that the standard deviation ranges from 0.33 for the Open Endedness Scale to 0.42 for the Technology Adequacy Scale. Since the values of the standard deviation are less than 1.00, it suggests that there is no major diversity in students' perceptions

Table 5 Means and Standard Deviations (SD) of CLEI

Scale Name	No. of Items	Mean	Standard Deviation
Student Cohesiveness (SC)	7	2.72	0.36
Open Endedness (OE)	7	2.62	0.33
Integration (IN)	7	2.66	0.39
Technology Adequacy (TA)	7	2.73	0.42
Availability (AVA)	7	2.50	0.33

n=250

Means and Standard Deviations on the ACCC

Means and Standard Deviations on the four scales of ACCC were also calculated to determine the attitude of student's towards computer courses. The highest mean value is 3.0 for the Usefulness of Computers Scale and the least value is 2.26 for the Anxiety Scale. Table 8 represents the mean scores of the four scales of the ACCC. Mean scores given in the Table 8 indicates that the students are very much familiar about usefulness of computers and computer courses for their future growth. Few students have also shown anxiety towards tackling a computer and working on it. From Table 8 we can also see that the standard deviation ranges from 0.35 for the Usefulness of Course Scale to 0.42 for the Anxiety Scale. Since the values of the standard deviation are less than 1.00, it suggests that there is no major diversity in students' perceptions.

Table 8 Means and Standard Deviations (SD) of ACCC

Scale Name	No. of Items	Mean	Standard Deviation
Usefulness of Course(UC)	7	2.69	0.35
Anxiety(AN)	7	2.26	0.42
Usefulness of Computers(UCM)	7	3.0	0.40
Enjoyment(EN)	7	2.78	0.36

n=250

Associations with the CLEI

As outlined in Research Question four of the present study, it was to be investigated whether there are any associations between students' perceptions of their computer laboratory learning environment with their attitude towards usefulness of course, anxiety, usefulness of computers and enjoyment. In order to carry out these investigations, simple and multiple correlation analyses along with the calculation of regression coefficients were conducted between the five classroom environment scales of CLEI and four scales of ACCC viz. Usefulness of Course, Anxiety, Usefulness of Computers and Enjoyment. The simple correlation was conducted to provide information about the bivariate association between each learning environment Scale and each student outcome. A multiple correlation analysis of relationships between each outcome and the CLEI was also carried out. To understand which individual Scale makes the largest contribution to explaining variance in student attitudes, the regression coefficients were examined to see which ones were statistically significant. The regression coefficient values describe the influence of a particular environment variable on an outcome when all other environment variables in the regression analysis are mutually controlled.

Associations of CLEI with Usefulness of Course

The results from Table 9 indicate that for simple correlation (r) the four scales of CLEI are statistically significant and positively associated with student attitudes towards Usefulness of Course (p<0.01, p<0.05) at the individual level of analysis. The values of correlation range from 0.11 for the Availability Scale to 0.39 for the Technology Adequacy Scale. There is positive association between student cohesiveness and usefulness of course. This indicates that if the students are helpful and supportive to each other, they would definitely find the computer courses useful for them. Open Endedness Scale is also found positively associated with Usefulness of Course Scale indicating that if divergent approach is applied among students they would know the course usefulness. Integration Scale also has positive association indicating that if theory and practical work of a computer course would be integrated, the course would become useful for students. Technology Adequacy Scale is also positively associated with Usefulness of Course. It suggests that if the hardware and the software is adequately used for the task, the students would be able to know the usefulness of the course.

The multiple correlation (R) between students' perceptions as measured by the different scales of the CLEI and the attitude toward Usefulness of Course Scale is 0.44 at the individual level of analysis, which is statistically significant at 0.01 level. The R^2 value indicates that 19 percent of the variance in the students' attitude towards usefulness of course can be attributed to the computer laboratory learning environment and thus the better the learning environment the more positive are the students' attitudes towards computer course. Standardized regression values were calculated to provide information about the unique contribution of each learning environment scale to the attitude towards usefulness of course scale. Regression coefficient values (β) indicate (see Table 9) that three of the five CLEI scales uniquely account for a significant (p<0.05) amount of variance in student attitudes towards usefulness of course; these are student cohesiveness, integration and technology adequacy. The β values for the significantly associated scales ranged from -0.04 for the Open Endedness Scale to 0.35 for the Technology Adequacy Scale.

Table 9 Associations between the CLEI Scales and Usefulness of Course Scale in terms of Simple Correlation (r), Multiple Correlation (R) and Standardised Regression Coefficient (β).

Scale Name	Usefulness of Course	
	r	β
Student Cohesiveness(SC)	0.24**	0.13*
Open Endedness(OE)	0.15*	-0.04
Integration(IN)	0.21**	0.15**
Technology Adequacy(TA)	0.39**	0.35**
Availability(AVA)	0.11	0.03
Multiple Correlation	R = 0.44**	
	R^2 = 0.19**	

** Significant at p<0.01, * Significant at p<0.05 n = 250 students

Associations of CLEI with Anxiety

The results from Table 10 indicate that for simple correlation (r) only two scales of CLEI are statistically significantly and one is positively associated and the other is negatively associated (p<0.01) at the individual level of analysis. The values of correlation range from -0.67 for the Availability Scale to 0.23 for the Technology Adequacy Scale. Anxiety Scale show significant association with the Student Cohesiveness and Technology Adequacy Scale. This could employ that less anxious students go beyond given class work and find computers more enjoyable. There is strong association between technology adequacy and anxiety, indicating the importance of using hardware and software that are suitable for required tasks.

The multiple correlation (R) between students' perceptions as measured by the different scales of the CLEI and the Anxiety Scale (see Table 10) is 0.33 at the individual level of analysis, which is statistically significant. The R^2 value indicates that 11 percent of the variance in the students' anxiety can be attributed to the computer supported learning environment and thus the better the learning environment, less the fear, the more positive are the students' attitudes towards computers. Regression coefficient values (β) indicate (see Table 10) that three of the five CLEI scales uniquely account for a significant (p<0.01) amount of variance in student attitudes towards anxiety; these are student cohesiveness, open endedness and technology adequacy. The β values for the significantly associated scales ranged from -0.06 for the Integration Scale to 0.22 for the Open Endedness Scale. Although the Student Cohesiveness Scale has a significant association with the Anxiety Scale, it is negatively associated. This means that the greater the anxiety perceived by the students in the classroom, the poorer the interest towards the subject.

Table 10 Associations between the CLEI Scales and Anxiety Scale in terms of Simple Correlation (r), Multiple Correlation (R) and Standardised Regression Coefficient (β).

Scale Name	Anxiety	
	r	*β*
Student Cohesiveness (SC)	- 0.17**	-0.14**
Open Endedness (OE)	0.05	0.22**
Integration (IN)	- 0.10	-0.06
Technology Adequacy (TA)	0.23**	-0.28**
Availability (AVA)	- 0.67	0.03
Multiple Correlation R = 0.33**		
R^2 = 0.11**		

** Significant at p<0.01, * Significant at p<0.05 n = 250 students

Associations of CLEI with Usefulness of Computers

The results from Table 11 indicate that for simple correlation (r) only one scale of CLEI are statistically significantly and positively associated with student attitudes towards Computers (p<0.001) at the individual level of analysis. The values of correlation range from 0.00 for the Availability Scale to 0.21 for the Student Cohesiveness Scale. Student cohesiveness correlates with usefulness of computers. It can be interpreted that those who find computers useful get on their work and also need social interaction in the class. The students also find a class more useful if their fellow students are more supportive.

The multiple correlation (R) between students' perceptions as measured by the different scales of the CLEI and the Usefulness of Computers Scale (see Table 11) is 0.23 at the individual level of analysis, which is statistically significant. The R^2 value indicates that 5 percent of the variance in the students' attitudes towards Usefulness of Computers can be attributed to the computer supported learning environment and thus the better the learning environment the more positive are the students' attitudes towards computers. Regression coefficient values (β) indicate (see Table 11) that one of the five CLEI Scales i.e. Open Endedness uniquely account for a significant (p<0.01) amount of variance in student attitudes towards Usefulness of Computers. The β values for the significantly associated scales ranged from -0.05 for the Availability Scale to 0.21 for the Student Cohesiveness Scale. Although the Open Endedness Scale has a significant association with the Usefulness of Computers Scale, it is negatively associated.

Table 11 Associations between the CLEI Scales and Usefulness of Computers Scale in terms of Simple Correlation (r), Multiple Correlation (R) and Standardised Regression Coefficient (β).

Scale Name	Usefulness of Computers	
	r	*β*
Student Cohesiveness(SC)	0.21**	0.21*
Open Endedness(OE)	0.05	- 0.03*
Integration(IN)	0.09	0.07
Technology Adequacy(TA)	0.10	0.05
Availability(AVA)	0.00	- 0.05
Multiple Correlation R = 0.23*		
R^2 = 0.05*		

** Significant at p<0.01, * Significant at p<0.05 n = 250 students

Associations of CLEI with Enjoyment

The results from Table 12 indicate that for simple correlation (r) the four scales of CLEI are statistically significantly and positively associated with Enjoyment Scale (p<0.01, p<0.05) at the individual level of analysis. The values of correlation range from 0.07 for the Availability Scale to 0.22 for the Technology Adequacy Scale. There is strong association between Enjoyment Scale and the four scales of CLEI viz. Student Cohesiveness, Open Endedness and Integration and Technology Adequacy. This association suggests that students would enjoy their computer laboratory environment only when they work together, when they are supportive of each other. Students enjoy using computer more in those courses in which the laboratory classes are integrated with the lectures, where the purpose of the laboratory class is clear and where the laboratories themselves are suitably equipped.

The multiple correlation (R) between students' perceptions as measured by the different scales of the CLEI and Enjoyment Scale is 0.23 at the individual level of analysis, which is statistically significant. The R^2 value indicates that 8 percent of the variance in the students' attitudes towards Enjoyment can be attributed to the computer supported learning environment.

Table 12 Associations between the CLEI Scales and Enjoyment Scale in terms of Simple Correlation (r), Multiple Correlation (R) and Standardised Regression Coefficient (β).

Scale Name	Enjoyment	
	r	*β*
Student Cohesiveness (SC)	0.19**	0.12
Open Endedness (OE)	0.19**	0.09
Integration(IN)	0.14*	0.10
Technology Adequacy (TA)	0.22**	0.13
Availability (AVA)	0.07	-0.02

Multiple Correlation R = 0.29**
R^2 = 0.08**
** Significant at p<0.01, * Significant at p<0.05 n = 250 students

Regression coefficient values (β) indicate (see Table 12) that none of the five CLEI Scales uniquely account for a

significance. The β values ranged from -0.02 for the Availability Scale to 0.13 for the Technology Adequacy Scale.

Gender Differences in CLEI

The means and standard deviations for each of the male and female groups were computed followed by a test of significance of difference between means (*t*-test for independent samples) on the five scales of the CLEI. The data obtained are presented in Table 13.

The data analysis reveals that there are no gender differences in students' perceptions of their computer laboratory learning environment shown in Table 13. Thus, both male and female students perceived their attitude towards computer and computer courses in a similar manner, thus signifying homogeneity in the group.

Table 13 Means, Standard Deviations and Significance of Difference between Means for Gender Differences in CLEI

Scale	Gender	Mean	Mean Difference (M-F)	Standard Deviation	*t*
Student Cohesiveness (SC)	Males	2.74	0.05	0.36	1.04
	Females	2.69		0.35	
Open Endedness (OE)	Males	2.65	0.06	0.36	1.25
	Females	2.59		0.30	
Integration (IN)	Males	2.64	-0.06	0.32	1.16
	Females	2.70		0.47	
Technology Adequacy (TA)	Males	2.73	0.01	0.45	0.27
	Females	2.72		0.38	
Availability (AVA)	Males	2.51	0.02	0.35	0.23
	Females	2.49		0.31	

Males: n = 146; Females: n = 104

Gender Differences in ACCC

The means and standard deviations for each of the male and female groups were computed followed by a test of significance of difference between means (*t*-test for independent samples) on the four Scales of the ACCC. The data obtained are presented in Table 14.

The data analysis reveals that there are no gender differences in students' perceptions of their computer laboratory learning environment. Thus, both male and female students perceived their attitude towards computer and computer courses in a similar manner, thus signifying homogeneity in the group.

Table 14 Means, Standard Deviations and Significance of Difference between Means for Gender Differences in ACCC

Scale	Gender	Mean	Mean Difference (M-F)	Standard Deviation	*t*
Usefulness of Course (UC)	Males	2.67	-0.05	0.03	1.12
	Females	2.72		0.31	
Anxiety (AN)	Males	2.27	0.04	0.35	0.70
	Females	2.23		0.41	
Usefulness of Computers (UCM)	Males	2.29	-0.76	0.35	1.86
	Females	3.05		0.35	
Enjoyment (EN)	Males	2.79	0.03	0.39	0.68
	Females	2.76		0.33	

Males: n = 146; Females: n = 104

CONCLUSION

Computers have been used in higher education for over thirty years both as a subject of study and as a tool to assist in the learning process within other disciplines. In that time, computer laboratory classes have played a major role in the teaching of computing subjects. Despite the perceived importance of laboratory classes little research has been done on computer laboratory learning environments. This paper presents an evaluation of a computer laboratory learning environment and student's attitude towards computer and computer courses. This study was done in Jammu, India. Quantitative methods were used in this study. Two questionnaires were employed to provide quantitative data: Computer Laboratory Environment Inventory (CLEI) and Attitude Towards Computer and Computer Courses (ACCC). The sample consists of 250 students taken from private secondary schools of Jammu. Overall, the results generated from scale internal reliability analysis, mean correlations and ANOVAs suggested that CLEI and ACCC are valid and reliable instruments for measuring student's perceptions about their computer laboratory learning environment. The students had positive perceptions about their computer laboratory learning environment. Regarding associations between student's attitudes and perceptions of the computer laboratory environment, most scales of CLEI were statistically significantly positively associated with the four scales of the ACCC. No gender differences in computer laboratory learning environments have been reported in this study. This research study happens to be the first of its kind in this region and should provide a thrust towards the use of computer laboratory as a medium to enrich computer education.

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