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Computer access to teachers… reality or legend??

Jyoti Bhalla

Department of Educational Studies, Faculty of Education, Jamia Millia Islamia, New Delhi 110025, India

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ABSTRACT

The integration of computers to enhance teaching learning process is contemporary in this era. The teachers' access to computers is a major issue for its integration in teaching-learning. This paper assesses teachers' perceptions regarding computer availability, location, provision of requisite computer resources, and home computers. The findings put forward that the overall access to computers is not satisfactory. Among the five categories of computer access understudy the computer location category calls for immediate attention followed by access to home computers, access to variety of hardware, access to types of software, and provision of computers for teachers'- students' use. The findings suggest that significant efforts have to be made towards improving computer access. The study has put forth an understanding and various recommendations regarding teachers' access to computers that would empower the policy framers with vital information to aid strategy formulation to execute use of computers in teaching-learning.

Keywords: Computer; Education; Teachers; Learning

Introduction

In the recent past several attempts have been made to incorporate technology in various ways to achieve a variety of educational goals. Researchers are using variety of research methods to explore the ways in which computers are used for teaching and learning (Ely, 1995; Blankenship, 1998; Lehtinen and Sinko, 1999; Smeets, Steffens, Mooij, 1999; Wallace, 2001; Omur, 2008). In years 2000 and 2005 the researchers Harris, Kellenberger, Martin and Attah identified that teachers use computers in different ways, such as, for teaching, non-teaching work, administration work, and personal growth. Computers proved useful in instructions of subjects like science, mathematics and language (Sheingold and Hadley, 1993; Shute and Psotka, 1996; Glennan and Melmed, 1996). Computers also proved useful by teachers for non-instructional (student record, result, communication, etc.) and pre-instructional (lesson planning, instructional material preparation, etc.) work. The educationists have accepted that use of computers catalyzes constructivist, and inquiry-based learning and enhance students academic achievement (Means and Olson, 1995; Sivin-Kachala, Bialo and Langford, 1997; Bracewell, Breuleux, Laferriere, Benoit, and Abdous, 1998).

In India, National Curriculum Framework for School Education (2000) by NCERT provides a list of Information Technology Tools for schools. The National Policy on Information and Communication Technology (ICT) in School Education of MHRD 2009 also emphasized ICT practices for imparting school education. Various organizations like Central Institute of Educational Technology (CIET), National Council of Educational Research and Training (NCERT), Indira Gandhi National Open University (IGNOU) are engaged in preparing digital learning content and developing training modules to train teachers so that they can effectively integrate computers in their profession.

In spite of these several initiatives by the government it is observed that there is an unwillingness in teachers to integrate computers in curriculum (Harris, 2000 and Stoddart, 2001). Although computers have been made available in schools but this has not accelerated computer use by teachers (OTA, 1995, NCES, 2000). With only a few computers available in a school choices need to be made as to which classes, teachers and students are allowed to use the available equipment, and whether it is possible to integrate computers in whole class activities or whether they should be applied on the basis of individual or small-group work by students and/or teacher demonstrations in front of the class.

Various researchers attempted to investigate the predictors of computer use while others looked into relationship with variables like attitude, access support, training, confidence. Some researchers (Yedekcioglu, 1996; Williams et. al., 2000; Pedro Hernandez-Ramos, 2004; Mohd Yunus, 2007; Franklin and Cheryl, 2007) identified a combination of access, training and support as the leading factors determining use of computers while some other researchers reported that teacher's lack of confidence, access to resources and technical support (Winnans and Brown, 1992; Fisher, 1996; Morton, 1996 Fairbrother and Kurina, 2000; Pelgrum, 2001 Aduwa-Ogiegbaen and Iyamu, 2005) were the major obstacles in implementation of computers in teaching-learning process. Hadley and Sheingold (1993) revealed (a) time-table

*Dr. JyotiBhalla
322, Pragati Apartments, Punjabi Bagh Club Road,
PaschimVihar, New Delhi 110063, India
Tel:+91 9311443210
Email: jyoti1507@hotmail.com

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constrains, (b) less number of computers, and (c) less financial assistance for purchasing and maintenance of computer and related equipment's, as some of the barriers in integrating computers in education.

From the above studies it seems that, one of the important hurdles towards integrating computers in teaching-learning is the limited access to computers for teachers and students. Access should not be interpreted as availability of hard and software alone but should also include issues related to availability of time for the teacher to access this technology, and the ease with which she can access the content through hard and software. Evidently, researches clearly emphasize the importance of computer availability for teachers, but the assessment thereof has not been dealt with in an appropriate manner. Therefore, it is required to assess current levels of teachers' access to computers in order to design appropriate remediation plans for improving teachers' accessibility to computers, so that the use of computers in teaching-learning may be enhanced.

Study

For this study, the term computer means a multimedia device which is used for any teaching and related work by teachers and for learning by students.

Computer access is operationalized from the teachers' perspective about the availability, location, provision of requisite computer resources, and home computers. Availability includes types of hardware devices and instructional software programs. Location means placement of computers in the school. Provision includes availability of equipment for teachers' use as well as students' use to accomplish the given task. Access to computers at home is also taken into consideration.

(i) Availability of Hardware and Software: Besides the number of computers in a school, the type of available hardware is an important condition which may be of potential influence in determining how computers are used in schools.

The types of hardware devices required in the school are presented in Figure 1.

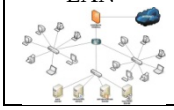
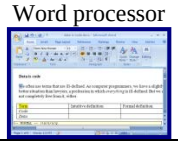
Hardware Devices	Characteristics
Computer 	Computers manufactured in the 5 years prior to data collection.
Multimedia Computer 	Computer with text, audio, pictures, graphics, video.
Projector 	For projection of computer-generated data to be viewed by a group of students in the class.
Speakers 	Amplifier for computer audio
Printer 	computer peripheral to reproduce matter on paper
Scanner 	Device to convert page into a graphics image for the computer.
Digital Camera 	records video or still photographs
Earphone 	loudspeakers for ears
CD Writer 	Equipment to record data permanently onto a compact disc.
USB (Universal Serial Bus) 	Interface between a computer and add-on devices.
Zip Drive 	for copying large documents onto special disks
Internet Connectivity  	Worldwide users connectivity to access and share information resources, communication, networking, publishing, conferencing, etc.
LAN 	A local area of network of interconnected computers for high data-transfer rates, and communication.

Figure 1. Hardware devices required

The availability of instructional software is another determinant of using computers in school. The types of software programs usually required in the schools are given in figure 2.

Software	Characteristics
Word processor 	The software used for creating text
Presentation software 	Program used to create a presentation of information.
Spreadsheet 	It organizes numerical data into rows and columns for calculations and manipulating data, eg. gradebooks, maths.

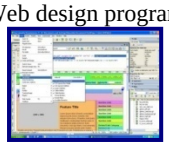
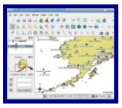
Publisher 	Software for creating layout and design like brouchers, posters, newsletters, pamphlets.
Media player 	software for playing back multimedia audio and video file
Web design program 	Create, edit, update web pages and websites Eg: Macromedia Dreamweaver.
WWW Browser 	to navigate to related information resources through webpages and weblinks
DVDs/CDs 	Digital Versatile Disc or Digital Video Disc, is an optical storage device for video/data
CAL Software Packages 	for teaching or self-learning.
Databases 	Integrated comprehensive collection of information;
Antivirus Program 	To protect multimedia from malware, adware, spyware viruses

Figure 2. Software

Some other educational software tools that help support specific productivity and teaching/learning activities are given in figure 3.

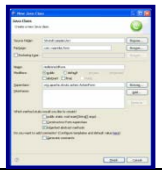
Software Tool	Software Functions
Test & rubric generators 	Teachers create question banks and develop tests from them, these tests can be administered online and offline. Example: Exam View; Easy Test Maker
Worksheet & puzzle generators 	Teachers prepare exercises for student content mastery and skill practice. Example: Puzzlemaker; Worksheet Generator
Graphic Document makers	Teachers and students create awards, certificates, cards, recognitions and other decorated documents. Example: Photoshop; Smart Draw
	
PDF and form makers 	Teachers and students create PDF files to send documents, formatted documents, and webpages. Example: Adobe Acrobat; PDF Maker Pilot
Electronic grade book 	Teachers maintain students' grades and keep track of their progress. Example: Class Action; Grade keeper
Statistical packages 	Teachers, students use statistical techniques to analyze research and experimental data. Eg.: SPSS Inc.; Stata Statistical Software.
Student information system 	Teachers, administrators, parents keep track of student record and progress on curriculum objectives. Example: PowerSchool; Pinnacle.
Computer-based testing systems 	Students take tests on a computer, software evaluates students' performance, compiles data. E Example: Simple Quiz; ExamBuilder
Draw/paint programs 	Students create their own drawings, paintings, illustrations. Example: Adobe Illustrator; Kid Pix
Image editing tools 	Teachers and students create, edit, and integrate images for illustrations. Example: Adobe Photoshop.
Clip art, animation, sound, video 	Teachers and students insert drawings, pictures, animations, sounds, movies, text designs into documents and media they create. Eg: Animation Factory; Microsoft Clip Art Media Collection.
Lesson planners 	Help teachers to prepare, modify, update lesson/unit plans. Example: Lesson Power Lesson, Planner for Windows.

Figure 3. Education Specific Software

This is the list of hardware and software for today, in future, the above catalog may be upgraded but the basic purpose will remain same.

(ii) Location: Next essential condition for making use of computers in teaching-learning process is the location or placement of computers. There are benefits and limitations inherent in any placement of computers. The ideal placement may be one that places computers in a lab and also in individual classrooms. Unfortunately, this ideal computer placement has not been achieved as far as Indian schools are concerned. There is a definite need for computers placed in the laboratory for training of students in Ms-Office, programming and business-related software, but what about mathematics, science, social studies, vocational education, or English classes? How can effective plans to utilize computers in teaching-learning process be made? There are no easy answers to this question, and what may be perfect for one subject area may not be perfect for another.

Here some locations are discussed, with the understanding that more than one location can be implemented within a school.

- Classroom with interactive board and LCD
- Lab with interactive board and LCD
- Resource room with interactive board and LCD
- Mobile computers with wireless access to resources and internet
- Laptops with wireless access to resources and internet
- Library with sufficient number of multimedia computers with internet for online resources.
- Media centre with sufficient number of multimedia computers with internet for online resources.

(iii) Provision: this refers to access for teachers to multimedia computers, laptops, instructional softwares, and internet resources, as and when required by them. It also includes access for students to multimedia computers, laptops, internet resources for completing teacher assigned tasks that require them to use computers.

(iv) Home Computers: The use of multimedia computer with internet connectivity at home may provide teachers with greater motivation and time to use computer for developing lesson plans, preparing instructional material, assessing students' performance, communicating with parents and professionals, updating subject knowledge and teaching skills.

Method

Sample

The data was collected from 20 Kendriya Vidyalayas of Delhi Region, India. From each of the selected school, a sample of 15 teachers was chosen in a manner that a set of 5 teachers (excluding computer teachers) was selected from each of the three grades (PRT, TGT and PGT grade). Thus, 300 teachers were included in the study.

3.2 Construction of Questionnaire

In the initial questionnaire, since all the items related to computer access were found valid by the experts, hence no item was removed. This questionnaire was administered for try-out to a sample of 30 teachers, 10 each from the three selected schools of Delhi to determine the reliability. The Cronbach's Alpha for 'computer access' was calculated to be 0.94 and significant at $p<0.01$ level (Table 1).

Table 1 Mean, SD, Reliability Coefficient for Computer Access (N = 30)

Construct	*N Items*	*Mean*	*SD*	*α**
Teachers' Access to Computers	37	0.58	0.27	0.94

* Significant at $p<0.01$ level

As the questionnaire was established to be fairly reliable (Cronbach's Alpha=0.94), thus, the final 37-items questionnaire was prepared to assess the school teachers' access to computers for integrating computers in teaching-learning process.

3.3 Administration of Questionnaire

The questionnaire (Appendix) was given to each selected teacher in the free periods and the filled-in questionnaires were collected from the teachers.

2.4 Analyses of Data

The data was analyzed using Statistical Package for Social Sciences (SPSS) software and interpreted accordingly.

Result

Access was defined as the teachers' perceptions about the availability, location, provision of requisite computer resources. The teachers were requested to specify the level of computer access in context of hardware availability (12 items), software availability (12 items), computer location (8 items), provision of requisite computer resources (2 items) and home computers (3 items) by checking all that apply (1 = checked; 0 = not checked). Table 2 demonstrates distribution of mean scores of the checked items on computer access.

Table 2 Allocation of Mean Scores of the Available Items on Computer Access

Categories of Computer Access	*No. of Items*	*Mean of Checked Items*	*Mean Percent of Checked Items*	*SD*
Hardware Availability	12	6.45	53.75%	3.40
Software Availability	12	6.55	54.58%	3.59
Computer Location	8	2.08	26.00%	1.57
Computer Provision	2	1.48	74.00%	0.73
Home Computers	3	1.41	47.00%	0.92
Overall Access	37	17.97	48.56%	8.33

From the Table 2, it is depicted that the mean values and standard deviation of the total sample on overall computer access were 17.97 and 8.33 respectively. The mean value indicated that out of 37 items related to overall computer

access approximately 17.97 items were marked as available. In other words, the average percentage obtained in the overall access by 300 teachers was 48.56%. Since the average percentage was less than 50, it could be concluded that the overall access to computers was not satisfactory.

Further, the, teachers reported access to hardware and software 53.75% and 54.58% among listed items respectively, which indicates that the access to hardware and software was satisfactory. When asked about the provision of computers for the teachers' use and their students' use, teachers confirmed 74% provision, which was also satisfactory. However, the average percentage of marked responses on computer location category was only 26% which was the lowest among the five categories of computer access and merits immediate attention. In addition, teachers reported 47% availability of computers and related facilities at home, which was also not satisfactory, and also needs attention.

In each of the five categories, percentage of teachers who had checked the individual items related to computer access was also calculated and given in Table 3.

Table 3 Percentage Distribution of Respondents on Access to Computer Resources

Items		*N*	*%*
School provides Access to the Hardware	Computer with Multimedia	241	70.3
	Projector	238	68.0
	Speakers	236	67.7
	Printers	253	70.3
	Scanner	194	64.7
	Digital Camera	103	34.3
	Earphone	71	23.7
	CD Writer	211	60.3
	USB Device	192	54.0
	Zip Drive	77	25.7
	Internet Connectivity	249	63.0
	LAN	151	40.3
School provides Access to the software	Windows	258	85.3
	Word Processor	218	74.3
	Multimedia presentation software	196	65.3
	Spreadsheet	170	56.7
	Publisher	49	16.3
	Media Player	187	62.3
	Web designing program	83	27.7
	WWW Browser	176	58.7
	CDs/DVDs	207	69.0
	CAL Software package	65	21.7
	Database	126	42.0
	Antivirus program	200	66.7
School provides access to the computers in the form of	Classroom with interactive board and LCD	42	14.0
	Lab with interactive board LCD	171	57.0
	Resource room with interactive board and LCD	169	52.7
	Mobile computers with wireless access to resources and internet	20	6.7
	Laptop with wireless access to resources/internet	14	4.7
	Library with sufficient multimedia computers with access to online database and periodicals	84	28.0
	Media Centre with sufficient multimedia computers with access to online database and periodicals	46	15.3
	Access to Computers elsewhere...	68	22.7
Availability of computer in home	For your own use	223	74.3
	With Internet connectivity	153	51.0
	With Internet connectivity through school network	46	15.3

As can be depicted from the above table, in the first category related to access to hardware items, three quarter teachers indicated that school provides access to computer with multimedia, projectors, printers, scanners and Internet. Half of teachers indicated access to LAN, CD writer, and USB. Almost less than a quarter of teachers reported to have access to digital camera, ear phone and zip drive.

In the second category related to access to software items, more than 90% of teachers indicated as having access to Microsoft® Windows, 60% to 90% of teachers had access to word, presentation, spreadsheet, media player, CDs/DVDs and antivirus programs. Less than half of teachers had access to databases, CAL software packages, WWW browser, web designing and publisher.

In the third category related to computer location, about half of teachers reported that school provided access to computers in the form of either lab or resource room. A quarter of teachers had access to computers in the library, staff room and elsewhere (Vice Principal room, Head Mistress room, science lab and examination room). Only 10% of teachers had access to computers in the classrooms with interactive board and LCD and 5% of teachers reported as having access to mobile computers and laptops.

In the next category related to provision of computers for the teachers' own use and their students' use, a high number of

teachers (80%) had access to computer for their own use and a half of the teachers had access to computers for students' use to accomplish the given tasks.

In the last category related to home computers, three quarters of teachers indicated that home computer was available for their own use and half of the teachers indicated the access with Internet connectivity too. Less than a quarter of teachers had access to Internet through school network.

A selected set of photographs illustrating various types of computer access in the schools included in the survey are presented in Figure 4.

Computer Lab KV, Cantt 1

Vice Principal Room KV, Janakpuri

Staff Room, KV, Masjid Moth

Library, KV, Pitampura

Science Lab, KV, RK Puram 4

Resource Room, KV, Masjid Moth

Figure 4. A Selected Set of Photographs Illustrating Various Types of Computer Access in Central Schools (Kendriya Vidyalaya KV) Included in the Survey.

Discussion

It is obvious that to use computers in teaching-learning process, teachers must have access to computers. The OTA report (1995), has defined access as: classroom computers, students to computers ratio, computers at home, hardware and software availability, and location of computers. There are efforts from government, public and private sectors to provide computer technology in schools, still teachers confess that they are not making as much use of technology as they could and the type of access is an important obstacle in this field.

Although the importance of computer access for promoting use of computers in education has been emphasized through

researches but its savoir faire has not been dealt comprehensively. Therefore, this needs to be addressed before making use of computers to transform teaching-learning process in efficient manner (Sharma, 2015; wadhwa 2017; malik 2017). Hence, the study focuses on designing an all-inclusive scaffold for understanding teachers' computer access with regard to their use of computers in teaching-learning process. The computer access is calculated with respect to teachers' perceptions regarding current level of computer availability, location, provision of requisite computer resources, and home computers.

The findings reveal that overall computer access to computer resources stood at a little less than fifty percent (mean percent of checked items, based on a quantitative scale defined by the researcher) and was found to be less than satisfactory. In particular, computer location category ranked the lowest (with 26% availability) among the five categories of computer access and called for immediate attention. Similarly, availability of computers and related facilities at home was reported to be less than satisfactory (47% availability). On the other hand, access to types of hardware and software was found to be just satisfactory (54% availability) and provision of computers for teachers' use and their students' use, was also found to be satisfactory (74% provision). Thus, the study revealed that the overall access to computers is still less than satisfactory, and significant steps need to be taken for improving the levels of access to computers.

In particular, teachers have access to computers mainly in lab or resource room (as reported by half of teachers), followed by access in Vice Principal room, Head Mistress room, science lab and examination room (as reported by a quarter of teachers). Only 10% of teachers had access to computers in the classrooms with interactive board and LCD and 5% of teachers reported as having access to mobile computers and laptops. This paucity of computer access in classrooms has been stated in the literature also. Blackenship (1998), Fairbrother and Kurina (2000), Williams (2000), Pelgrum (2001), Jones (2004), Aduwa-Ogiegbaen and Iyamu (2005) reported insufficient number of computers and limited access to computer resources as an important barrier in integration of ICT in professional practice. Likewise, Ginsberg and McCormick (2000) indicated that issues surrounding computer hardware were the most serious obstacles in implementation of computers in education, wherein regarding hardware, teachers in both highly and less effective schools reported 'serious' to 'very serious' concern with 'too few computers' and 'too few printers' and the present study also put-forth such hardware deficiencies regarding computer with multimedia, projector, printer, scanner, internet, CD writer, USB, digital camera, ear phone. Ginsberg and McCormack also listed a number of teacher issues and potential barriers to implementation that were software resource related: matching courseware to curriculum, evaluation, quality control, acquisition, setting priorities, security, placement, appropriate use. The findings of the study validate this as teachers indicated deficiencies regarding access to databases, CAL software packages, WWW browser, web designing and publisher. The provision of computers at home followed by provision of computers for teachers' own use and their students' use to accomplish the given tasks are also concerns put forward in the study that requires urgent attention. The researchers Jones (2004), Sahin and Thompson (2006), Mohd Yunus (2007) have concluded that ICT integration in teaching learning is dependent upon adequate access, adequate computer resources, teacher development opportunities, and onsite support – all of which require funding, thought, planning and support. The present study endorses such acquaintance in existing literature wherein "computer integration in education" related important factor "access to computer resources" has again arrived as a lacking area and requires imperative efforts to improve its levels.

Conclusion

Although computers are established as being an inseparable component of teaching and learning, but only a few teachers truly integrate computers as a teaching tool or learning device. In developing countries the integration of computers in teaching and learning is a contemporary area of attention among stakeholders. In absentia of a comprehensive scaffold for understanding the current levels of teachers' access to computers it is not possible to channelize the efforts for effective integration of computer technology in education. This fundamental necessitate forms the basis of study wherein the researcher endeavored to prepare a comprehensive questionnaire to assess current levels of teachers' access to computers in the form of their perceptions regarding the availability, location, provision of requisite computer resources, and home computers. A detailed review of the current levels of teachers' access to computers, as alleged by school teachers, would prove to be an absolutely necessary mechanism in scheming procedures for increasing computer access of teachers.

Although the study was conducted in government institutions, the implications are relevant to public and private institutions in India and abroad.

The study has put forth that the overall computer access to computer (that is, hardware and software availability, computer location, computer provision, and home computers) was not satisfactory and major efforts would have to be made towards improving the access to computers to desirable levels. Due consideration is required to improve sufficient provision of computers and related peripherals in easily accessible locations.

Therefore, it is highly recommended that the first and foremost step towards promoting teachers' use of computers is to ensure that adequate number of computers with requisite functionalities must be available to teachers without undue limitations on access time. In case of practical or financial constraints regarding provision of computers, it becomes necessary to make the greatest use of available connections and equipment. The following allocation strategies may be explored by the schools:

- careful scheduling of computer labs to ensure high utilization

- provisioning of one computer lab for each grade

- provisioning of mobile-computer-labs that can be moved to various classrooms

- providing personal laptops to all the teachers

- provisioning for providing discounted loans to teachers as well as students to purchase their personal computers or laptops

- provisioning of wifi enabled school campus and 3G data connection facility at home.

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