Technology: Its Potential Effects on Teaching in Higher Education

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Abstract

Background: Technology brought radical changes at each level of education. Traditional concept of education, 'learning by doing' has extended by 'doing and making to learn with technology'. Pedagogically, technology facilitated in terms of management, communication, administration, coordination, development, collaboration and distribution of learning activities. It also turned classroom environment from teacher-centered to student-centered and overall the educational institution structure. The invention of new technological approaches in education has resulted in debates about their implementation, positive and negative impacts on teachers and students in different universities of Pakistan.

Aims: The vital role of technology motivated the researchers 'to investigate limitations and perceptions of the possible or actual effects of technology in teaching at higher education level in Pakistan'.Method: Survey method was adopted to collect the required data. To conduct the survey, questionnaire was developed, which was applied in eight different universities of Punjab. The questionnaire was administered among 450 teachers; out of which 336, (81%) questionnaires were collected successfully after completion.

Results: Maximum 74%-100% sampled teachers classified demographically were utilizing technology in constructing question papers and preparing lectures/notes online. Minimum 2% or no response was observed in assessing students online.

Conclusion: The prominent effects found from teachers' responses were 'the re-usability of lectures and easy to update and modifications; re-produce ability of question papers with minimum mistakes; students' interest in multimedia-based lectures; preparing and sorting students' merit lists'.

Keywords: Effects of technology on students and teachers, role of technology at HEIs

科技對高等教育教學的潛在影響

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摘要

*背景：*科技在每個階段的教育帶來急劇的改變。傳統的教育觀念，已從「學習去做」擴闊至「學習和使用科技去做」。在教學方面，科技促進了管理、溝通、行政、協調、發展、協作和分配等學習活動，也使課堂環境從以教師為中心轉為以學生為中心，以及整個教育機構從組織上的改變。教育引進新科技，導致巴基斯坦不同大學的教師和學生們，辯論其在實施上正面和負面的影響。

*目的：*科技的重要角色驅使研究人員去探查科技的觀念和限制，對巴基斯坦高等教育中教學的可能或實際影響。

*方法：*此研究採用問卷調查法來搜集資料。為此而設計的問卷，在旁遮普省八個不同的大學進行調查，共發給450位教師，收回其中336份（81％）問卷。

*結果：*大部份（74%-100％）教師得科技之助，在線上構建試題及備課，但很少（2%或以下）在線上評估學生。

*總結：*從教師的反應清楚看到其教學得科技之助——易於更新和修改課堂講義、減少了印製和設計試卷的錯誤、學生對多媒體的課堂感興趣、容易準備和整理學生的成績名單。

關鍵字：科技對大學的教師和學生的影響、在大學中的角色

Introduction

The inclusion of ICTs changed the relationships in terms of deciding to adopt or give up a technology or to use it more, less or in different ways; where changes might be gradual, dramatic, predictable, anticipated and some more unexpected (Haddon, 2004). The revolutionary effects of technology are not limited to the relationships of routine life but education greatly. Recent innovative changes in higher educational institutions (HEIs) are due to the expansions of the applications of technological approaches in teaching and learning. Modernization, national development and nation building; manpower and human capital development; democratization and social transformation; economics growth and competitiveness are the underpinned concepts of education at HEIs (Sörlin and Vessuri, 2006). To achieve these objectives at HEIs, World Bank Staff (2003) suggested the educationists of developing countries by emphasizing greatly in attaining the skill of science and technology as, 'the challenges facing education and training systems in developing countries and transition economies are immense. They must raise the level of learners' achievement in the basic skills of language, math and science. They must equip learners with new skills and competencies. And they must do all of this for more learners with different backgrounds, experiences, levels of motivation, and preferences. Achieving these goals requires a fundamental change in the ways learning takes place and the relationship between teachers and learners.'

Norman (1999) quoted from three historic educationist i.e., Thomas Edison (1922) 'motion pictures would replace textbooks in classrooms', William Levenson (1945) 'radio receivers would be as common in classrooms as the blackboard', and B. F. Skinner (1960s) pre-claimed that 'new technology devices would vastly increase students interests in learning'. In the same way Shirely, Philip, and Jennifer, (2007) explained that the use of computer in education during 1991 to 1994 has transformed the traditional concepts of education. Traditional educational theorists emphasized on 'learning by doing' but ICT incorporated the concept with 'doing and making to learn with technology' (Sanchez, Savage, &Tangney, 2004) which motivate the learners to experience things around them at their own pace. They further explained that educational technology facilitated in management, communication, administration, coordination, development, collaboration and distribution of learning activities among participants. Vital role of technology in education has changed classroom environment from teacher-centered to students-centered, and overall the educational institution structure (Daniel, 2002).

Lebedev (2010) described that technological developments took place in education during 1990s and 2000s that followed Moore's law which stated that computer multiplied twice the efficiency approximately every two years. In the same way Southerland, Robertson, John and et al., (2009) found in survey that the role of technology sharply increased in teaching since 2005. According to Southerland and et al., 'besides of teaching learning activities, uses of ICT are limited to word processing and Internet search. Young teachers exhibited more positive attitude towards uses of ICT; large majority of teachers agreed or strongly agreed that ICT could have positive impacts for students' motivation and attainments; a good majority of the teachers were in favor of incorporating ICTs in teaching and learning; because it has changed learner attitude from passive to active. Technology altered the social relationships

in the classroom among students; between teachers and the students in ways that are challenging'. The other important factor of technology is management of learning process to the active and creative teachers to integrate a range of preferred learning styles in such a way to achieve learning goals. It facilitates to develop learners' interest and help to improve retention during instruction (Muller, Lee, & Sharma, 2008).

As time passed and uses of computer and related technologies increased; the percentages of graduates with university degrees rose at world level. Administrators of universities were required to equip and train their teachers to handle large group of students and for improving the standards of education globally (Shirley, Philip, Jennifer, 2007). Bach, Hynes, and Smith (2007) simplified the influence of ICT as a changing role of the teacher in HEIs, including the need for knowledge, training of management skills, team work abilities and moving towards resource based learning.

To meet international standards of education; schools and universities in Pakistan producing adequate flow of trained people to use technology in education appropriately (Ali and Proctor, 2005). The Higher Education Commission (HEC), Pakistan has paid special attention for the development and training of faculty in universities. According to HEC (2010) 'to compete and progress in a globally changing environment, it is absolutely necessary for a nation to improve its standards of teaching, research practices in science, technology and engineering'. To achieve these goals, HEC has launched several projects such as Pakistan Research Responsibility, Campus Management Solution, Video Conferencing, National Digital Library, Networking Universities and many scholarships for researchers and teachers to visit abroad and/or within different research institute and universities of Pakistan to improve standards of teaching and learning. Now, almost every teacher has access to computer and internet at their offices in universities, so that, teachers could use technology to achieve the national objectives of education. This motivated the researchers to investigate the perceptions of the possible or actual effects of technology on teaching in a limited range of subjects at universities in Punjab.

Literature Review

While reviewing the literature, researchers face difficulty to retrieve publications regarding the negative impacts/effects of technology on teaching and/or learning at higher educational institutions. But Gulley (2003), Lit (2008), and Norman (1999) were found to be describing following prospected negative effects and/or limitations of using technological resources from primary to higher level of education as: computer does all the work for students and not allowing them to digest what they have learned; computers may take the emotions, heart and mind out of the classrooms; the most alarming effect of technology on students involves poor formal writing i.e., text messages on cellular phone, emailing, and internet searches; teachers had little time or resources to learn more about technology; useful educational software products are nearly impossible for the institutions to purchase; mostly schools, including colleges and universities do not have budget to upgrade their students; computer can waste time, if not in the hands of the right users; becoming more dependent to technology. But positive effects and advantages of using technology in teaching and learning has outweighed these limitations.

'Technology can be used to improve the ways in which we teach and learn' (Shimabukuro,

2010). It was reviewed from literature that many authors such as Lebedev (2010), Cradler and Bridgforth (1997), Norman (1999), Gulley (2003) and many others described potential positive effects of technology on teaching and learning such as: technology allows faster, more efficient, effective and interactive classroom experiences; online research tools and resources saved time and fasten the research process; improved interest and confidence; can increase opportunities for student-constructed learning; lessen lecture method with more students centered classrooms; improved writing skills; power point and projectors reduced the need of blackboard and whiteboard in classrooms; clickers supports students in quizzes during class; wi-fi technology allows students to study in more comfort and ergonomic settings; mathematical software and advanced calculators allow students to solve equations and produce graphs; internet allows students to read books and educational supplements at home; college assignments and job applications can now be completed online; handicapped students and students with job can now complete their degrees easily; online education also benefits lower-income students; increased emphasis on individualized instruction; more time engaged by teachers advising students; increased administrator and teachers productivity; rethinking and revision of curriculum and instructional strategies; increased teachers and administrators communication with parents; supportive in teaching of abstract concepts and problem solving as basic skill; and technology developments allowed the creation of new IT jobs and improved economic development in general.

Roblyer (1989) analyzed previous research studies conducted during 1980-87 based on assessing the impacts of computer-based instructions. Roblyer used statistical summary procedures to enable the reviewers to focus on impact in specific areas and with specific kinds of students, for example: computer applications were found more effective at college and adult levels than at elementary and secondary levels; using computers had equal effects in teaching cognitive skills i.e., problem solving and critical thinking; no statistically significant relationships were found between students' ability level and effectiveness of computer applications, neither was firmed the effectiveness is linked to a students gender; word processing was found to have positive effect on students writing skills but not firm conclusion can be drawn about the effect of word processing on writing quality, length of composition and number and kind of revisions; and computer application were found to be significant in increasing students' creativity.

In the under research study, researchers had not only perceived the positive effects of technology in teaching and learning at higher educational level but also concluded its flaws and reasons for not using technological-based resources when they are easily available to their desk.

Methodology

Sampling

During 2009-10, there were 132 (i.e., 73 Public Sector and 59 Private Sector) universities in seven different regions of Pakistan (HEC, Pakistan, 2010). Out of these seven regions, Punjab (having 40, including 22 Public Sector and 18 Private Sector universities) was delimited to achieve the objectives of the study. The reasons of delimiting Punjab region were that the researchers themselves were offering their services in one of the sampled universities. Thus, other sampled universities were in approach which facilitated the visits to collect

required data by researchers themselves and 30% of the universities of the Pakistan were located in Punjab only.

All 18 (45%) of private universities of Punjab were dropped from the list of 40 universities because of the limited number of students, and the variety of different and technical disciplines offered by different universities. Out of 22 (55%) Public sector universities of Punjab; 8 (36%) universities were included in the study on the basis of random sampling technique. All male and female teachers from all teaching departments of different disciplines of sampled universities constituted the population of the study. After the selection of the universities, different teaching departments of Pure Sciences, Social Sciences and Languages were included in the study on the basis of random sampling technique. However, teachers of each department were selected on the basis of 'availability' in their departments. Permission was sought from head of departments of each university in advance to the researchers for the said purpose.

Questionnaire

The questionnaire comprised of two main parts. Part-1 of the questionnaire was related to teachers' demographic information i.e., university and department name, sex, designation and professional qualifications. While, 14 different open ended statements related to common teaching and learning activities in which computer and related technologies used by teachers were included in Part-2 of the questionnaire. It was required to tick or encircle on 'Yes' or 'No' for the given teaching activity. If teachers respond to 'Yes' for that statement then they were required to give at least one or two of its possible benefits and flaws; and also describe in one or two sentences the possible effects of using computer and related technology for that particular activity. And if they select 'No' then give possible reasons for not using computer or related technologies to accomplish that activity. Following example demonstrated the format of the Part-2:

"Possible Uses of Computer in Teaching - Learning Situations: (if you are using computer in any of the following situations then select **Y** for **YES** and **N** for **NO** and if **N** then give its **Reason** in at least one word or sentence, please.)

Teaching-Learning Situations	**Benefits*/Flaws****	**How is the Students affected from the Benefits/Flaws**
I. Preparing notes/lectures with help of computer	**Y**	B*:
		F**:
	N	Reason:

Other statements or activities included in Part-2 of the questionnaire were about constructing question papers online, using multimedia in lectures, simulating the real world problems, email assignments to the students, online marking of the assignments, online marking of the answer sheets after exams, preparing students results online, declaring classroom tests' results online, keeping students quizzes' and

tests' marks in computer spreadsheet, using e-mail to send or receive marks and/or feedback to/from students, online assessment (i.e., Computer Assisted Assessment (CAA)), and providing students any software or web link related to their subjects.

To assess the validity, the questionnaire was piloted among 5 randomly selected teachers of 3 different departments from each of the universities A and D. Responses, views, and difficulties to complete the questionnaire from thirty teachers including 18 male and 12 females, were collected and recorded instantly by the researchers themselves and then thoroughly discussed with the experts. It was decided to include simple phrases at the end of the questionnaire to describe technical terms such as CAA, Online Assessment and spreadsheets to make the questionnaires self-explanatory. The final draft of the questionnaire was sent to the six different experts in the field of Education and Assessment for validating the instructions and necessary amendments.

Response Rate and Analysis

The questionnaire was administered among 450 teachers, out of which 336 (81%) were collected successfully after completion. Therefore, the resultant sample consisted of 336 teachers. To calculate and analyze the limitations and perceptions of possible or actual effects of technology, the data was classified demographically. Following percentages were observed in the result of such classification: male (186, 55%); female (150, 45%); University A (63, 19%); University B (26, 8%), University C (21, 6%), University D (58, 17%); University E (79, 26%); University F (13, 4%); University G (25, 7%); University H (51, 15%); Department of Biology (15, 5%); Department of Business and Administration (35, 10%); Department of Chemistry (28, 8%); Department of Commerce (24, 7%); Department of Computer Sciences and Information Technology (CS & IT) (39, 12%); Department of Economics (27, 8%); Department of Education (50, 15%); Department of English (28, 8%); Department of Mathematics (44, 13%); Department of Physics (26, 8%); Department of Psychology (20, 6%); Lecturers (208, 62%); Assistant Professor (90, 27%), Associate Professor (26, 8%); Professor (12, 4%); Post Graduates (144, 43%); Master of Philosophy (M. Phil./M. S.) (116, 35%); and Doctor of Philosophy (Ph. D.) (76, 23%). Further, common statements were combined in the form of groups and simple percentages were applied to draw results and conclusion of collected data.

Results

In this section, maximum and minimum percentages indicated the limitations of applications of technology demographically; where maximum percentage means maximum utilization of technology in teaching and learning and minimum percentages showed minimum applications of technological resources due to least interest, non availability and/or un-skilled teachers to use these resources in sampled universities of Punjab.

It was depicted from the results (Table 1) that maximum 90% overall teachers were constructing their question papers online and minimum 6% were assessing their students online. Maximum 77% male and 71% female teachers were preparing their notes/ lectures online while minimum 11% male and 9% female teachers were marking students' answer sheets online.

When data were classified university-wise (Table 2), it was found from the results that maximum 92% teachers from Universities A and

B, 91% from University C, 74% from University D, 94% from University E, 100% from University F, 84% from University G and 98% teachers from university H were utilizing technology to construct question papers online. While, minimum 5%, 10%, 2% and 4% teachers from Universities A, C, D and H respectively were marking answer sheets online; 4% from University B were assigning projects online and saving a record of students' previous and current results online; 20% teachers from University E were assessing students online; 4% teachers from University F were facilitating their students by providing CDs and/or web links related to their course content; and 8% teachers from University G were assessing their students online. And 100% teachers from University B encircled "NO" for marking answer sheets online, declaring results and assessing students online. Similarly, 100% teachers from Universities A, D, F and H were not utilizing technology to assess their students online.

By department-wise distribution of data (Table 3), it was analyzed that 93% teachers from Biology, 97% from Business and Administration, 89% from Chemistry, 86% from Commerce, 97% from CS & IT, 82% from Economics, 84% from Education, 89% from English, 96% from Mathematics, 100% from Physics and 65% teachers from Psychology were constructing question papers online. Similarly, 97% teachers of CS & IT were delivering multimedia-based lectures. On the other hand minimum percentages showed that 20% teachers from Biology and 11% teachers from English were using e-mail resource to distribute assignments among their students; 20% teachers from Biology, 9% from Business & Administration, 8% from Commerce and 2% teachers from Mathematics were marking assignments online; 9% teachers from Business & Administration, 4% from Chemistry, 7% from Economics, 11% from English, 23% from Physics and 5% from teachers Psychology were found to mark answer sheets online; 11% teachers from English did not allow their students to send/receive feedback online; and minimum or no responses from overall teachers of all departments were found in 7th statement of the questionnaire.

By dispensing data designation-wise (i.e., job title), it was depicted from the results (Table 4) that maximum 90% Lecturers, 91% Assistant Professors, 86% Associate Professors and 100% Professors were constructing question papers online. Minimum percentages showed that 5% Lecturers and 8% Assistant, Associate and Professors were interested in assessing their students online.

By classifying data qualification-wise (Table 5), it was calculated from teachers' responses that 93% Post Graduates, 85% M. Phil and 95% Ph. Ds were found to prepare question papers online. While, minimum percentages showed that 10% Post Graduates and 4% M. Phil and Ph. Ds were assessing their students online.

As described in the part of '*Questionnaire'* of this study that teachers were required to write at least one or two of the benefits or flaws and effects on students of utilizing technology in given situations related to teaching and learning, which was experienced or observed by themselves in their teaching profession. And they were also required to write one or two of the reasons for not using or utilizing technological resources. These parts of the questionnaire were important to investigate the perceptions of utilizations of technology in teaching and learning process. But researchers were able to collect few responses from teachers for completing their courses in time, students'

assessments, departmental assignments, and personal engagements. The responses or phrases of each part were combined and analyzed to perceive the effects of technology on teaching and learning. Due to few responses, it was difficult to distribute or analyze these responses demographically; therefore, total percentages of overall responses were calculated only and displayed in Table 6, 7 and 8 respectively.

Discussion and Conclusion

The basic purpose of this study was to investigate the limitations and perceptions of the possible or actual effects of technology on teaching and learning in the universities of Punjab, Pakistan. Generally, it was found that ICTs were being used by the teachers from different universities of Punjab in teaching and learning process in different modes; such as preparing lectures and notes online; constructing question papers on computer; preparing and analyzing students' results online to assess and improve teaching and learning; and using multimedia as an aid in instructions. High percentages of teachers showed the maximum limits of applications of technology in terms of constructing question papers and preparing lectures/notes online. And limited numbers of teachers were found to be using email to allocate assignments or send or receive feedback to or from students and marking or assessing online. By keeping these findings in mind following conclusions were made on the basis of results:

- Overall sampled teachers were constructing question papers online.
- Comparatively male teachers were taking help from computer and related technologies to enrich their lectures/notes than to female teachers.
- Typed question papers were found as a compulsory activity for the teachers of University F by their administrators.
- All teachers from all Physics departments of eight sampled universities of Punjab found it more beneficial for students to type question papers than to write by hand.
- Comparatively highly designated teachers i.e., Professors, experienced in their career that typed question papers were better and more sophisticated attitude.
- And comparatively highly qualified teachers i.e., Ph. Ds also believe that typed question papers may have more positive effect on students during test than to hand written paper.

The sampled teachers found it more beneficial (Table 6) to prepare lectures/notes online in terms of re-usability, easy to update or modify and easy to concentrate on a single topic during lecture, which ultimately save teachers time, less lecture and more students centered learning as compared to those who had no and/or hand written record of their previous lectures or notes. In case of constructing question papers online teachers found it easy to access previously saved question papers which minimizes the chances of repeating questions in consecutive tests/assessments, saves time to format question papers each time and students could also have model questions and paper format for their examinations. It is universally accepted that using A.V. aids in classrooms develop students' interest and motivate them towards learning. Multimedia-based lectures helped to improve students' attendance and understanding which ultimately improve their GPA or grades in examinations.

While some of the samples teachers do not agree

that technological-based teaching and learning is beneficial in all the ways we use it in the classroom. It was concluded from teachers remarks (Table 7 & 8), 'when we use technology excessively we become dependent to that'. For example, if we continuously provide prepared notes or hand outs to our students, then their book reading habits and self confidence may be affected. The teachers who did not use technology; for example, emailing or online assessment or analyzing students' results; because such trends have not yet developed or such facilities were not available to them (i.e., multimedia availability in departments, sufficient number of computers for online assessment). In certain cases they were not trained to use technology in that form; and some times it was not compulsory for teachers to perform that activity by using computer for example (in simple words) preparing award lists by hand or analyzing data to compare students performance. It is up to teachers' personal interest, whether he/she was required to improve their professional practices. Social effects and practices could not be ignored in terms of emailing assignments or feedback to or from students. It was concluded from the results that lecturers or Post Graduates and M. Phils were utilizing technology to their maximum extent and their seniors weren't. That didn't mean, they were not interested in utilizing technology professionally that might be due to non-provision of technological based trainings or resources, when they were gaining their professional experiences. Moreover, professors and senior teachers have had their stenos and P. As. for typographical work.

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Appendix

Table 1
Percentages of the Male and Female Teachers who Responded 'YES'

S. No.	Statements	Frequency	Female	Male	Total
1	Preparing notes/lectures with help of computer.	*f*	106	143	249
		%	70.7% *	76.9% **	74.1% ***
2	Typing question papers with the help of computer.	*f*	132	170	302
		%	88.0%	91.4%	89.9%
3	Delivering the lectures by using multimedia.	*f*	74	100	174
		%	49.3%	53.8%	51.8%
4	Simulating the real world problems.	*f*	54	80	134
		%	36.0%	43.0%	39.9%
5	Email assignments to the students.	*f*	43	59	102
		%	28.7%	31.7%	30.4%
6	Marking assignments online.	*f*	25	38	63
		%	16.7%	20.4%	18.8%
7	Marking the answer sheets online (e.g., OMR).	*f*	14	20	34
		%	9.3%	10.8%	10.1%
8	Preparing students' results online.	*f*	77	99	176
		%	51.3%	53.2%	52.4%
9	Analyzing students marks online.	*f*	72	89	161
		%	48.0%	47.8%	47.9%
10	Declaring students' result online.	*f*	24	47	71
		%	16.0%	25.3%	21.1%
11	Preparing a database of students' result online.	*f*	62	92	154
		%	41.3%	49.5%	45.8%
12	Use of email to send or receive feedback to/from students.	*f*	24	39	63
		%	16.0%	21.0%	18.8%
13	Constructing and administering the paper directly on computer.	*f*	9	12	21
		%	6.0%	6.5%	6.3%
14	Providing students any CD-based or Web-based interactive exercises.	*f*	59	70	129
		%	39.3%	37.6%	38.4%

* % ages for Female è out of 150
** % ages for Male è out of 186
*** % ages for Total è out of 336

Table 2
Percentages of Overall Teachers from Different Universities who Responded 'Yes'

*S. No.		Uni. A	Uni. B	Uni. C	Uni. D	Uni. E	Uni. F	Uni. G	Uni. H
1	*f*	51	14	11	42	68	12	19	32
	%	81.0% *[1]	53.8% *[2]	52.4% *[3]	72.4% *[4]	86.1% *[5]	92.3 *[6]	76.0% *[7]	62.7% *[8]
2	*f*	58	24	19	43	74	13	21	50
	%	92.1%	92.3%	90.5%	74.1%	93.7%	100.0%	84.0%	98.0%
3	*f*	35	9	12	28	49	7	10	24
	%	55.6%	34.6%	57.1%	48.3%	62.0%	53.8%	40.0%	47.1%
4	*f*	28	5	15	15	40	5	12	14
	%	44.4%	19.2%	71.4%	25.9%	50.6%	38.5%	48.0%	27.5%
5	*f*	20	1	10	10	35	5	8	13
	%	31.7%	3.8%	47.6%	17.2%	44.3%	3.5	32.0%	25.5%
6	*f*	16	3	5	4	25	4	2	4
	%	25.4%	11.5%	23.8%	6.9%	31.6%	30.8%	8.0%	7.8%
7	*f*	3	-	2	1	23	2	1	2
	%	4.8%	-	9.5%	1.7%	29.1%	15.4%	4.0%	3.9%
8	*f*	43	4	9	17	59	10	12	22
	%	68.3%	15.4%	42.9%	29.3%	74.7%	76.9%	48.0%	43.1%

*S. No.		Uni. A	Uni. B	Uni. C	Uni. D	Uni. E	Uni. F	Uni. G	Uni. H
9	*f*	29	3	10	17	52	8	14	28
	%	46.0%	11.5%	47.6%	29.3%	65.8%	61.5%	56.0%	54.9%
10	*f*	15	-	4	4	30	6	6	6
	%	23.8%	-	19.0%	6.9%	38.0%	46.2%	24.0%	11.8%
11	*f*	33	1	14	18	51	10	16	11
	%	52.4%	3.8%	66.7%	31.0%	64.6%	76.9%	64.0%	21.6%
12	*f*	16	-	6	5	24	4	4	4
	%	25.4%	-	28.6%	8.6%	30.4%	30.8%	16.0%	7.8%
13	*f*	-	-	3	-	16	-	2	-
	%	-	-	14.3%	-	20.3%	-	8.0%	-
14	*f*	33	7	11	17	26	5	7	23
	%	52.4%	26.9%	52.4%	29.3%	32.9%	3.5%	28.0%	45.1%

* S. No. for Statement Number
*1 %ages for Uni. (University) A è out of 63
*2 %ages for Uni. (University) B è out of 26
*3 %ages for Uni. (University) C è out of 21
*4 %ages for Uni. (University) D è out of 58
*5 %ages for Uni. (University) E è out of 79
*6 %ages for Uni. (University) F è out of 13
*7 %ages for Uni. (University) G è out of 25
*8 %ages for Uni. (University) H è out of 51

Table 3
Percentages of Overall Teachers from Different Departments who Responded 'Yes'

* S. No.		BIO	B&Admin.	Chem.	Comm.	CS&IT	Eco.	Edu.	Eng.	Math	Phy	Psy.
1	*f*	13	31	22	18	37	17	34	20	23	22	12
	%	86.7% *1	88.6% *2	78.6% *3	75.0% *4	94.9% *5	63.0% *6	68.0% *7	71.4% *8	52.3% *9	84.6% *10	60.0% *11
2	*f*	14	34	25	21	38	22	42	25	42	26	13
	%	93.3%	97.1%	89.3%	87.5%	97.4%	81.5%	84.0%	89.3%	95.5%	100.0%	65.0%
3	*f*	8	23	13	12	38	14	23	11	5	20	7
	%	53.3%	65.7%	46.4%	50.0%	97.4%	51.9%	46.0%	39.3%	11.4%	76.9%	35.0%
4	*f*	4	11	13	10	33	14	18	8	4	14	5
	%	26.7%	31.4%	46.4%	41.7%	84.6%	51.9%	36.0%	28.6%	9.1%	53.8%	25.0%
5	*f*	3	11	7	10	31	8	10	3	5	12	2
	%	20.0%	31.4%	25.0%	41.7%	79.5%	29.6%	20.0%	10.7%	11.4%	46.2%	10.0%
6	*f*	3	3	4	2	21	6	9	3	1	8	3
	%	20.0%	8.6%	14.3%	8.3%	53.8%	22.2%	18.0%	10.7%	2.3%	30.8%	15.0%
7	*f*	2	3	1	6	4	2	5	3	1	6	1
	%	13.3%	8.6%	3.6%	25.0%	10.3%	7.4%	10.0%	10.7%	2.3%	23.1%	5.0%
8	*f*	10	18	15	15	29	14	22	10	24	12	7
	%	66.7%	51.4%	53.6%	62.5%	74.4%	51.9%	44.0%	35.7%	54.5%	46.2%	35.0%
9	*f*	10	14	16	14	24	8	22	8	26	16	3
	%	66.7%	40.0%	57.1%	58.3%	61.5%	29.6%	44.0%	28.6%	59.1%	61.5%	15.0%
10	*f*	5	7	4	9	11	6	3	5	7	11	3
	%	33.3%	20.0%	14.3%	37.5%	28.2%	22.2%	6.0%	17.9%	15.9%	42.3%	15.0%
11	*f*	10	17	12	12	25	10	16	5	24	17	6
	%	66.7%	48.6%	42.9%	50.0%	64.1%	37.0%	32.0%	17.9%	54.5%	65.4%	30.0%
12	*f*	5	6	5	9	12	4	4	3	4	9	2
	%	33.3%	17.1%	17.9%	37.5%	30.8%	14.8%	8.0%	10.7%	9.1%	34.6%	10.0%
13	*f*	3	3	-	-	3	3	1	-	-	7	1
	%	20.0%	8.6%	-	-	7.7%	11.1%	2.0%	-	-	26.9%	5.0%
14	*f*	7	18	7	6	24	10	11	4	19	17	6
	%	46.7%	51.4%	25.0%	25.0%	61.5%	37.0%	22.0%	14.3%	43.2%	65.4%	30.0%

* S. No. for Statement Number
*[1] %ages for BIO (Biology) ➔ out of 15
*[2] %ages for B&Admin. (Business & Administration) ➔ out of 35
*[3] %ages for Chem. (Chemistry) ➔ out of 28
*[4] %ages of Comm. (Commerce) ➔ out of 24
*[5] %ages of CS&IT (Computer Sciences and Information Technology) ➔ out of 39
*[6] %ages of Eco. (Economics) ➔ out of 27
*[7] %ages of Edu. (Education) ➔ out of 50
*[8] %ages of Eng. (English) ➔ out of 28
*[9] %ages of Math (Mathematics) ➔ out of 44
*[10] %ages of Phy. (Physics) ➔ out of 26
*[11] %ages of Psy. (Psychology) ➔ out of 20

Table 4:
Designation-wise Percentages of Overall Teachers who Responded 'Yes'

S. No.	Frequency	Lecturers	Assistant Professors	Associate Professors	Professors
1	*f*	155	65	20	9
	%	74.5% *	72.2% **	76.9% ***	75.0% ****
2	*f*	185	82	23	12
	%	88.9%	91.1%	88.5%	100.0%
3	*f*	109	45	16	4
	%	52.4%	50.0%	61.5%	33.3%

S. No.	Frequency	Lecturers	Assistant Professors	Associate Professors	Professors
4	*f*	86	36	8	4
	%	41.3%	40.0%	30.8%	33.3%
5	*f*	62	32	5	3
	%	29.8%	35.6%	19.2%	25.0%
6	*f*	38	17	6	2
	%	18.3%	18.9%	23.1%	16.7%
7	*f*	24	7	2	1
	%	11.5%	7.8%	7.7%	8.3%
8	*f*	111	46	14	5
	%	53.4%	51.1%	53.8%	41.7%
9	*f*	92	49	11	9
	%	44.2%	54.4%	42.3%	75.0%
10	*f*	42	17	8	4
	%	20.2%	18.9%	30.8%	33.3%
11	*f*	95	41	11	7
	%	45.7%	45.6%	42.3%	58.3%
12	*f*	37	15	7	4
	%	17.8%	16.7%	26.9%	33.3%
13	*f*	11	7	2	1
	%	5.3%	7.8%	7.7%	8.3%
14	*f*	72	38	10	9
	%	34.6%	42.2%	38.5%	75.0%

* %ages for Lecturers ➔ out of 208
** %ages for Assistant Professors ➔ out of 90
*** %ages for Associate Professors ➔ out of 26
**** %ages for Professors ➔ out of 12

Table 5
Qualification-wise Percentages of Overall Teachers who Responded 'Yes'

S. No.	Frequency	Post Graduates	M. Phil	Ph. D.
1	*f*	94	109	46
	%	81.0% *	75.7% **	60.5% ***
2	*f*	108	122	72
	%	93.1%	84.7%	94.7%
3	*f*	67	75	32
	%	57.8%	52.1%	42.1%
4	*f*	46	56	32
	%	39.7%	38.9%	42.1%
5	*f*	38	43	21
	%	32.8%	29.9%	27.6%
6	*f*	23	24	16
	%	19.8%	16.7%	21.1%
7	*f*	15	10	9
	%	12.9%	6.9%	11.8%
8	*f*	65	67	44
	%	56.0%	46.5%	57.9%
9	*f*	67	53	41
	%	57.8%	36.8%	53.9%
10	*f*	34	19	18
	%	29.3%	13.2%	23.7%
11	*f*	63	59	32
	%	54.3%	41.0%	42.1%
12	*f*	24	23	16
	%	20.7%	16.0%	21.1%
13	*f*	12	6	3
	%	10.3%	4.2%	3.9%
14	*f*	52	50	27
	%	44.8%	34.7%	35.5%

* %ages for Post Graduates ➔ out of 144
** %ages for M. Phil ➔ out of 116
*** %ages for Ph. Ds ➔ out of 76

Table 6
'Benefits' of Technology in Teaching & Learning as Perceived by Teachers

Sr. No.	Benefits	Female (n)	Male (n)	Total (%age) *
1.	***Preparing lectures/notes online.***			
a.	Re-usability of lectures, once prepares	16	12	11.25%
b.	Easy to update and/or modify the content.	12	14	10.45%
c.	Easy to concentrate on a single topic during lecture.	10	13	9.24%

Sr. No.	Benefits	Female (n)	Male (n)	Total (%age) *
2.	***Constructing question papers online.***			
a.	Easy to access previous question papers.	13	15	9.28%
b.	Minimizes mistakes in online construction.	16	10	8.61%
c.	Legible for students.	15	9	7.95%
3.	***Using multimedia as an aid.***			
a.	Students take more interest.	8	9	9.78%
b.	Assist teacher to deliver content effectively.	8	6	8.05%
c.	Easy to explain diagrams.	7	6	7.48%
4.	***Simulating the real world problems.***			
a.	Helpful to explain logic in programming (IT).	9	7	11.95%
b.	Helpful in solving complicated problems through diagrams and models.	8	6	10.45 %
c.	Easy to invite students for discussion.	4	5	6.72%
5.	***E-mail assignments to the students.***			
a.	Save time of both teacher and student.	8	6	13.73%
b.	Helpful for the students at long distance.	5	7	11.77%
c.	Improve teacher student communication	5	5	9.81%
6.	***Marking assignments online.***			
a.	Saves time of both teachers and students.	4	7	17.47%
b.	Possible to give timely feedback.	2	5	11.12%
c.	Easy to check – either at home, office or any other place.	3	3	9.53%
7.	***Automated marking for answer sheets.***			
a.	Unbiased results.	5	7	35.3%
b.	Easy to prepare results.	4	4	23.53%
c.	Accurate results.	0	6	17.65%
8.	***Preparing students result online.***			
a.	Result prepared in short time.	12	15	15.35%
b.	Easy to sort e.g., name-wise or roll number wise or marks wise etc	14	13	15.35%
c.	Minimize clerical mistakes.	10	14	13.64%
9.	***Analyzing students' marks.***			
a.	Fastest, easiest and detail format of result is possible.	3	6	12.68%
b.	Quick go through all marks.	5	3	11.27%
c.	Easy way to rank students.	5	2	9.86%
10.	***Declaring results online.***			
a.	Easy to access.	5	6	15.5%
b.	Saves time in preparing and displaying results.	5	5	14.09%
c.	Quick and open access to results & assessment progress.	3	3	8.46%
11.	***Using e-mail to send/receive feedback to/from students.***			
a.	Improve communication.	7	8	23.81%
b.	Students can submit their assignments within time.	6	6	19.05%
c.	Students like this method.	4	6	15.88%
12.	***Online assessment.***			
a.	Saves time to prepare and display results.	5	4	42.86%
b.	Saves time of marking answer sheets.	2	3	23.81%
c.	Comprehensive evaluation is possible through this method.	1	0	4.77%
13.	***Providing CDs or web links.***			
a.	Helpful for them to access more information to prepare notes.	14	16	23.26%
b.	To update their knowledge at their own pace.	10	8	13.96%
c.	Facilitate and guide them to access latest material.	6	7	10.08%

* Total (%) – Out of 336 Teachers that Responded YES for the Given Statement

Table 7

'Flaws' of Technology in Teaching & Learning as Perceived by Teachers

Sr. No	Flaws	Female (n)	Male (n)	Total (%age) *
1.	***Preparing lectures/notes online.***			
a.	Spoon feeding to students.	5	10	6.03%
b.	Sometimes difficult for students to follow and understand.	3	9	4.82%
c.	Reduced book reading habit.	6	5	4.42%
2.	***Constructing question papers online.***			
a.	Security risk.	14	12	10.45%
b.	Takes time to type a well formatted paper.	5	13	7.23%
c.	Backup of papers makes teacher lazy.	6	9	6.03%
3.	***Using multimedia as an aid.***			
a.	Not equally useful in each subject.	10	14	13.8%
b.	Potentially makes teacher lazy.	11	10	12.07%
c.	Takes time prepare a good presentation.	11	9	11.5%
4.	***Simulating the real world problems.***			
	-	-	-	-
5.	***E-mail assignments to the students.***			
a.	Problematic for those students who have no facility of net at their home	6	8	13.73%
b.	Difficult in case of huge number of students	5	7	11.77%
c.	Problematic for those students who are not trained to use computer	6	6	11.77%
6.	***Marking assignments online.***			
	-	-	-	-
7.	***Automated marking for answer sheets.***			
	-	-	-	-

Sr. No	Flaws	Female (n)	Male (n)	Total (%age) *
8.	***Preparing students result online.***			
	-	-	-	-
9.	***Analyzing students' marks.***			
	-	-	-	-
10.	***Declaring results online.***			
a.	All students have no access to net at their home.	7	7	19.72%
b.	Chances of illegal activities.	5	4	12.68%
c.	Privacy violence.	2	5	9.86%
11.	***Using e-mail to send/receive feedback to/from students.***			
a.	Not possible to satisfy students for their queries	10	23	52.39%
b.	Time consuming task	8	6	22.23%
12.	***Online assessment.***			
	-	-	-	-
13.	***Providing CDs or web links.***			
	-	-	-	-

Total (%) – Out of 336 Teachers that Responded YES for the Given Statement

Table 8

'Reasons' for not using Technology in Teaching & Learning as Stated by Teachers

Sr. No.	Reasons	Female (n)	Male (n)	Total (%age) *
1.	***Preparing lectures/notes online.***			
a.	I can't because I am a slow typist.	9	6	17.25%
b.	Prefer to follow reference books.	8	4	13.8%
c.	Due to nature of the subject	6	4	11.5%
2.	***Constructing question papers online.***			
a.	Power failure creates problems.	5	6	32.36%
b.	We always type our question papers because now it's compulsory from university.	4	1	14.71%
c.	Clerk in department are available to type.	2	3	14.71%
3.	***Using multimedia as an aid.***			
a.	Multimedia facility not available.	12	12	14.82%
b.	Strongly recommend oral lectures, because students get more in oral lectures	10	10	12.35%
c.	Not trained to use.	9	9	11.12%
4.	***Simulating the real world problems.***			
a.	Multimedia not available	6	10	6.94%
b.	Students become confused.	7	8	5.95%
c.	Power failure, waste time in class.	5	9	4.96%
5.	***E-mail assignments to the students.***			
a.	Not yet common approach in our universities.	6	12	5.99%
b.	Majority of the students may not have facility of computer or net.	4	8	5.13%
c.	Recommend to announce in class.	5	7	4.28%
6.	***Marking assignments online.***			
a.	Difficult to work on computer for long time.	18	10	10.26%
b.	Prefer to check manually.	11	12	8.43%
c.	Not possible in case of huge number of students.	16	18	5.13%
7.	***Automated marking for answer sheets.***			
a.	No such system available.	21	22	14.24%
b.	If possible or available, will be very beneficial in many respects.	5	18	7.62%
c.	Our examination system is not advanced.	14	8	7.29%
8.	***Preparing students result online.***			
a.	We are required to prepare results on award sheets manually.	25	32	35.63%
9.	***Analyzing students' marks.***			
a.	Not compulsory, it's up to teachers' personal interest.	26	30	21.14%
b.	Not required.	20	25	16.99%
c.	Our examination system is not very advance or interested in detail feedback	9	10	7.17%
10.	***Declaring results online.***			
a.	Examination cell duty.	19	20	14.72%
b.	Its administrative issue.	17	16	12.46%
c.	At departmental level, we display results on notice board, but on net it was admin block duty.	8	12	7.55%
11.	***Using e-mail to send/receive feedback to/from students.***			
a.	Not very common approach in our setup.	10	12	8.06%
b.	Difficult to send feedback to all students separately.	7	8	5.5%
c.	Some students have no facility of net.	7	8	5.5%
12.	***Online assessment.***			
a.	We usually take tests/papers of programming languages or packages, in which question paper is in hard copy form	14	11	7.94%
b.	Facility Not Available.	13	10	7.31%
c.	Not yet popular in our setup.	12	11	7.31%
13.	***Providing CDs or web links.***			
a.	Students are more advanced than their teachers.	20	26	22.23%
b.	Reference books are enough for them.	14	18	15.46%
c.	No time to find relevant links for students.	7	15	10.63%

* Total (%) – Out of 336 Teachers that Responded YES for the Given Statement