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## Role of effective teaching in learning as moderated by ICT facility in Higher Education in India

**Dr. Manisha Sharma**

Assistant Professor, Department of Management,  
Gautam Buddha University  
Greater Noida (India)

[manisha@gmail.com](mailto:manisha@gmail.com)

**Ms. Toran Kapoor**

Assistant Professor, I.T.S Engineering College,  
Greater Noida- 201308,  
India.

[torankapoor.ash@its.edu.in](mailto:torankapoor.ash@its.edu.in)

### Abstract:

*The current research is an attempt to understand the role of Information and Communication Technology in effective teaching and enhanced learning among higher education fraternity. The study is based on primary data collected through a sample size of 424 units consisting of 212 students and 212 teachers from universities located in NCR, India. Hierarchical Regression analysis has been used to measure the moderating effect of technological facility on teaching and learning on the teachers and the students. The study was conducted in Delhi NCR, India and leaves the scope for further research in higher education across the globe.*

### 1. Introduction: Evolution of Technology in Indian Education System

Indian education system, amongst world's prominent, has been reviewed and sought through academic papers, case studies and renowned books. The Indian education system is facing unprecedented changes. Economic and demographic changes have led to transformation in the system. Persistent shortage of teaching staff, low quality of teaching, outdated and rigid syllabi and pedagogy, irresponsible faculty and separation of research and teaching are few of the issues that Indian education system has been facing. Emphasis should be given for strengthening existing institutions. The higher educationists have to be reorganized and remodeled: funded, leadership and direction, quality assurance, accountability, relationships with industry, global alliance and the approach to teaching and research need to be focused.

Technology, today, is progressing at a fast pace and the rate of change is such that one does not get to experience the same aspect of technology twice in couple of years as it becomes obsolete by that time. Within the past decade, technology has entirely altered the ways we learn, interact and virtually 'experience' things. Technology has also brought a paradigm shift in the approaches towards learning and education. Teaching and instructional aids today include the use of power point presentations, instructional DVD's, computer graphics, animated videos etc. Govindasamy (2002) and Khan (2000) pointed out that Classroom Technology consists of compilation of various software, hardware and, processes that expedite learning and teaching

and thus positively influence the learner's attitude and functioning. These technological changes have forced universities to resort in unique and innovative methods that at times challenge the conventional perceptions as how education should be imparted to students.

*Ebijuwa (2005)* defined Information and Communication Technology (ICT) as tools used for compilation, managing, processing, storage, broadcasting, and distribution of information. With advances in ICT, electronic information resources such as e-books, e-journals, cloud storage, online databases, OPAC (Online Public Access Catalog), and the Internet have propelled the world into a Gen era. Not a single organization can completely rely on conventional printed material to accomplish successfully and proficiently. *Manochehri and Young (2006)* considered technology to expedite project-based, cooperative, interdisciplinary, and thematic learning. Empowering learning environments with technology give students' choice in their learning so that they can solve the problems with ease of correctional and rebuilding methods available through its application. This enables learning to become simpler and increases students' inventive thinking (e.g., problem solving, creativity) and makes them independent decision-makers. The power to undo and recreate inspires the learners in experimenting with the newer aspects of problem solving.

Latest technological progressions have provided educationalists and learners with innovative devices to assist in-class teaching and homework. *Sandholtz et al. (1997)* proposed that within an organized setup, technology in education has the potential to alter education in a progressive manner. Learners used ICT as a channel to gather, consolidate and evaluate data; to enhance presentations; to conduct simulations and to solve intricate problems. These alternate ways of expressing knowledge led to rise in self-esteem of these students, rise in status among their educators and their equals. Hence, education in digital space led to enhanced learning experience mainly due to opening up of student's environment (*Mun & Hwang, 2003*).

The responsibilities of faculty members within the academy have been reshaped and redefined by the integration of ICT into the academic workplace (*Baldwin 1998; Schuster and Finkelstein 2006*). The research guided by *Sandholtz et al. (1997)* on the Apple Classrooms of Tomorrow (ACOT) over a ten-year timeframe indicated transformations in educator and learner exchanges. Teacher peer sharing increased as teachers and students sought assistance from each another. Teachers teamed and operated across disciplines. Teachers and students demonstrated mastery over technology and they integrated numerous types of media into curriculum and assignments. Scholars who were provided with technology-rich learning environments performed good on standardized tests and they were also evolving themselves with diverse competencies that were not regularly measured.

*Negroponte, Resnick, and Cassell (1997)* proposed that ICT enabled learners to become enthusiastic and independent learners. ICT permits new knowledge-building communities in which students and teachers cooperate and learn from each other. ICT allows students to take charge of their own learning through direct exploration, expression, and experience. This shifted the learner's concern from "being trained" to "learning" and the teacher's role from "expert" to "mentor".

Effective teaching is when teaching completely accomplishes the learning objectives and results in peak learning experiences. Also, learning is a process not the product that involves all those experiences and training of an individual, which helps the individual modify his behavior and prepare himself to take necessary action in unpredictable situations. It is the teacher's ability to produce higher than expected results in students. Efficient teachers are believed to contribute towards positive academic, attitudinal, and social outcomes. Based on the modern advances in pedagogy, education has become more than an activity that preserves valued knowledge and skills by transmitting it to students. Universities now concentrate on employing and holding back high-grade teachers and expediting better-quality academic processes to yield improved school effectiveness (Heck, 2009).

## 2. Theoretical Framework and Hypotheses Generation

Technology offers innovative ways of teaching and learning and has transformed the approach to student learning. Technology in education also provides lot of opportunities that would else be hard to substitute. Wilson (2001) visualized ICT as contributing numerous opportunities to enrich educational experiences, magnify academic prospects, and progress towards critical employment proficiencies. The enhanced ability to communicate with experts augments learners' knowledge acquiring process (Bransford, Brown, & Cocking, 2000). In cases where learning experience is more relevant to the student, there is an increased level of individual student acceptance for information systems.

ICT has been recognized as a tool that permits access to extensive range of information, especially as it has become significant for scholarly communication through the construction of numerous e-journals and teaching resources (Leong & Hawamdeh 1999; Koubek & Jandl 2000; Thelwall 2002; Rajab & Baqain 2005). ICT has the potential to accelerate students' learning and improve teaching (Kazu & Yavulzalp, 2008; Kirschner & Woperies, 2003). Sharma (2009) classified E-learning resources to comprise of journals, e-mail, research reports, and bibliographic databases while Ibrahim (2004) included online library and catalogues. E-journals were considered to be most used array of accessible electronic resources (Omotayo, 2010, Thanuskodi, 2010, Sharma, 2009; Borrego, 2007; and Ibrahim (2004) have all reported that. Tenopir (2003) analyzed that in academic field, electronic resources have been promptly adopted although the conduct varies according to the discipline. Zakaria, Watson & Edwards (2010) did a research on the usage of Web 2.0 technology by Malaysian students that showed students preferred using e-mail to disseminate and share digital contents while they preferred to use search engines for information acquiring with respect to education rather than asking friends or teachers. Technology has the potential to provide innovative educational opportunities (Hughes, 2005) by restructuring learners' cognitive processes and problem solving behaviors (Pea, 1985).

Educators must have a technology-supported pedagogy knowledge and skills base to integrate technology into their teaching (Hughes, 2005).

Technology suggests novel techniques of teaching and learning that has changed the approach to students' learning. Technology also provides different opportunities that would else be difficult to generate. Manocheri et.al (2006) suggested that ICT accelerates project-based, cooperative, interdisciplinary, and thematic learning. ICT has the potential to improve teaching and expedite students' learning (Kazu&Yavulzalp, 2008; Kirschner&Woperies, 2003). Students who used multimedia equipment's were more enthusiastic to use e-learning tools and accomplished superior course performance (Romanov and Nevgi, 2007).

### **2.1. Teachers' attribute/traits**

Anna & Fredriksen (2015) compared the methods of working with pedagogical capital of teachers and mentors in education. They identified three dimensions of pedagogical capital- an experience content dimension, an analysis dimension and an acting dimension

Teacher's qualifications, principal's and headmistress's training, principal's experience as a principal, as an assistant principal, and as a teacher formerly in schools were considerably related to school proficiency growth over time, dependent upon school context (Bowers & White, 2014). Kapoor & Sharma (2013) suggested that teaching pedagogy and teaching proficiency were relevant factors to enhance learning among university students.

Cheng (2012) suggested teachers' knowledge retrieval, sharing and utilization were identified as the predictive factors for individual learning capacity and organization learning capacity. Seezink & Poell (2010) suggested that teachers are struggling to get their daily teaching repertoire inline with latest ideas on competence-based education.

Teaching processes were positively related to achievement levels of students (Heck, 2009).

The teachers should know the affordances and limitations of various technologies and how particular technologies might support their own teaching practices and curricular goals. They should also know the proper use of technologies (Zhao et.al, 2002).

The subject-matter knowledge was found to be an important factor in teacher effectiveness (Darling-Hammond, 2000).

Cheng (1996) proposed a speculative framework of total teacher effectiveness, which focused on quality of the teachers' competences that contributed to the quality of the teachers' performance. Further, quality of teacher's performance contributed to the quality of the students' learning experience and then to the quality of the students' learning outcomes.

### **2.2 Information and Communication (ICT) in education**

Plan Ceibal (use of ICT) can promote digital literacy and improve the quality of education. It has the potential to change traditional teaching methods and behavioral patterns (Cardellino & Leiringer, 2014). Deficiencies and inadequacies in ICT resources and facilities were reported and suggestion for upgrading software and hardware were given (Al-Daihani, 2011). The school responded to ICT. There was a radical change in relatively short period. Meticulous planning, training, and inspiration to stakeholders (i.e. pupils, teachers and parents) were identified as significant element in its successful application (Ali & Proctor, 2005). Makori

et.al (2013) from their study concluded that the graduates from Kenyan universities lacked the desired technological knowledge, proficiencies and abilities vital in the contemporary information environment such as web technologies, information programming skills, software development, distributed systems, virtual libraries and digital information systems. Institutes need to review their curriculum and provide ICT education and training which addresses the requirements and demands of the existing job market and performance requirements.

Thomas & Thomas (2012) suggested that despite the innovative efforts of the Open University in modeling distance and blended learning, adoption of such models in the business school context has been quite slow. Face-to-face learning has been observed to be of higher quality than on-line learning approaches. Technologies were used to enrich face-to-face learning.

Poon (2012) found that for both teachers and students, blended learning (combination of face-to-face learning and online learning) gives greater flexibility in terms of learning style and learning pace. Blended learning encouragingly improved students' experience and enhanced their engagement with adoption of a wide range of delivery methods. Face-to-face interaction with students is essential, as students need encouragement and on-going support from academics.

Kapoor & Sharma (2013) suggested that teaching could be more effective with appropriate use of ICT to enrich learning among university students. Teo et.al (2012) observed variables that described students' positive and negative experiences of group work and connect country of residence with the perception of generic skills development and self-reported satisfaction with group work. Findings suggested that students' country of residence had a significant influence on reporting of generic skill development and experience of group work. Self-reported improvement in generic skills after group work assessment was associated with reporting of fewer negative and more positive aspects of working in groups. Also, Riebe et.al (2010) emphasized the applicability of explicitly teaching team skills to positively enhance the student experience in a unique generic skills programme. Luke & Hogarth (2011) examined the effect of short video tutorials among post-graduate accounting students, as a method of helping students develop and enhance independent learning skills. It was inferred that with the help of video tutorial, students have become independent learner. Thus, this gives positive indications to educators, employers, and professional accounting bodies; who had acknowledged the need for skill development in accounting graduates.

Eynon (2005) suggested that access to various online resources was the most common purpose of ICTs in education. Academics' were motivated to use ICTs since it enhanced the educational experience for their students. ICT has also compensated for the recent changes in higher education, such as the rise in student numbers and demand for flexible learning opportunities; and personal interest and enjoyment.

This study is grounded in the literature concerning attributes of teaching faculty –

their teaching pedagogy, their teaching proficiency, their knowledge and competence, use of technology by teachers, their attitudes toward technology, their adoption of innovations etc.

With the help of literature review, following hypotheses can be proposed.

H1: Teaching Pedagogy would be positively related to students' learning.

H2: Teaching proficiency would be positively related to students' learning.

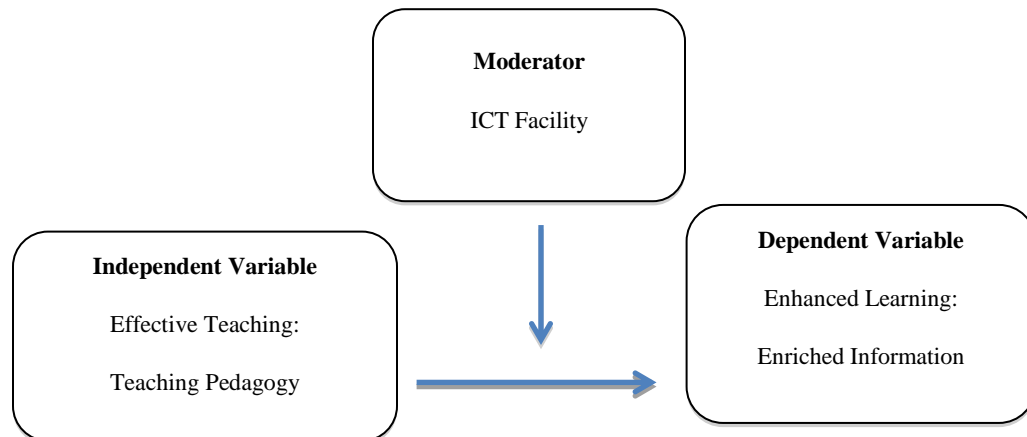
H3: Teacher's knowledge would be positively related to students' learning.

H4: Teacher's competence would be positively related to students' learning.

H5: ICT facility would have mediating effect on learning

### 3. Research Framework

The final research framework is presented below (Figure 1). This article seeks to examine whether ICT (Information and Communication Technology) has a moderating impact on effective teaching leading to enhance students' learning. The main research question thus can be restated as 'Does ICT moderate the effectiveness of teaching to enhanced learning experience?'



**Figure 1: Research Framework**

**Source: Prepared by authors**

In this study, two separate questionnaires developed by Kapoor and Sharma (2013) was administered on the survey participants. Hence for the purpose of data collection, questionnaires were distributed among 250 students and 250 teachers from universities situated at NCR (National Capital Region), India using simple random sampling. Due to non-responsive error, total 424 (212 students and 212 teachers) responses were taken into consideration for further analysis.

#### 4. Data Analysis and discussion:

To understand the impact of the moderating variable- ICT facility on effective teaching leading to enhanced learning experience, the moderating hierarchical regression analysis has been used. The analysis is conducted in three steps (refer table 5). Initially one Effective Teaching (ET) variable, for example Teaching Pedagogy (ET1) is entered into the regression. Then, the moderating variable (ICT facility) factor is entered as a block. Finally, the interaction term of ET1 and with the moderator is entered as a block. Moderation can be observed when interaction terms account for significant incremental variances in the dependent variable step wise. If the interaction increases the value of variation in the dependent variable, then there is indication to support the hypothesis that there is a significant moderating effect of ICT facility on the Enhanced Learning (EL) of students.

Table 3 shows that Effective Teaching (ET) by faculty members positively impacts learning of students'. ICT facility also positively impacts learning of the students. It further presents the results for the interaction effects between ET and ICT facility. The interaction term of ET and ICT facility has a significant (at  $\alpha=0.01$ ) positive beta for Enhanced Learning (EL). Thus, proceeding further for stepwise regression analysis.

Table 4 shows that Teaching pedagogy of faculty members positively impacts learning of students'. ICT facility also positively impacts learning of the students but the values are not significant. It further presents the results for the interaction effects between ET1 and ICT facility. The interaction term of ET1 and ICT facility has a significant (at  $\alpha=0.01$ ) positive beta for EL1 (Enriched Information), EL2 (Superior Knowledge), EL3 (Resourceful Learning) and EL4 (Skill Development).

Table 5 shows that Teaching proficiency of faculty members positively impacts learning of students'. ICT facility also positively impacts learning of the students but the values are not significant. It further presents the results for the interaction effects between ET2 and ICT facility. The interaction term of ET2 and ICT facility has a significant (at  $\alpha=0.01$ ) positive beta for EL1 (Enriched Information), EL2 (Superior Knowledge), EL3 (Resourceful Learning) and EL4 (Skill Development).

Table 6 shows that Teacher's knowledge positively impacts learning of students. ICT facility also positively impacts learning of the students but the values are not significant. It further presents the results for the interaction effects between ET3 and ICT facility. The interaction term of ET3 and ICT facility has a significant (at  $\alpha=0.01$ ) positive beta for EL1 (Enriched Information), EL2 (Superior Knowledge), EL3 (Resourceful Learning) and EL4 (Skill Development).

Table 7 shows that Teacher's competence positively impacts learning of students'. ICT facility also positively impacts learning of the students but the values are not significant. It further presents the results for the interaction effects between ET4 and ICT facility. The interaction term of ET4 and ICT facility has a significant (at  $\alpha=0.01$ ) positive beta for EL1



(Enriched Information), EL2 (Superior Knowledge), EL3 (Resourceful Learning) and EL4 (Skill Development).

**Table 3: Hierarchical Regression with ET (Effective Teaching) and EL (Enhanced Learning)**

	Steps	Variables Entered	B	Std. Error	Beta	DV
Model 1	Step 1	ET	.675**	.040	.755	EL
	Step 2	ICT facility	.216**	.071	.135	EL
	Step 3	ET x ICT	.686**	.040	.768	EL

Source: prepared by the authors

\*\*p< 0.01, NS: Not Significant

**Table 4: Hierarchical Regression with ET1 (Teaching Pedagogy)**

	Steps	Variables Entered	B	Std. Error	Beta	DV
Model 1	Step 1	ET 1	.340**	.061	.358	EL 1
	Step 2	ICT facility	.014**	.041	.022	EL 1
	Step 3	ET 1 x ICT	.342**	.062	.361	EL 1
Model 2	Step 1	ET 1	.360**	.067	.347	EL 2
	Step 2	ICT facility	.139**	.044	.204	EL 2
	Step 3	ET 1 x ICT	.385**	.066	.371	EL 2
Model 3	Step 1	ET 1	.496**	.060	.498	EL 3
	Step 2	ICT facility	.041 NS	.040	.063	EL 3
	Step 3	ET 1 x ICT	.504**	.060	.505	EL 3
Model 4	Step 1	ET 1	.506**	.064	.480	EL 4
	Step 2	ICT facility	.048 NS	.042	.069	EL 4
	Step 3	ET 1 x ICT	.515**	.064	.489	EL 4

Source: prepared by the authors

\*\*p< 0.01, NS: Not Significant

**Table 5: Hierarchical Regression with ET2 (Teaching Proficiency)**

	Steps	Variables Entered	B	Std. Error	Beta	DV
Model 1	Step 1	ET 2	.398**	.058	.429	EL 1
	Step 2	ICT facility	-0.009	.039	-0.015	EL 1
	Step 3	ET 2 x ICT	.398**	.058	.429	EL 1
Model 2	Step 1	ET 2	.530**	.060	.521	EL 2
	Step 2	ICT facility	.114**	.040	.167	EL 2
	Step 3	ET 2 x ICT	.533**	.059	.523	EL 2
Model 3	Step 1	ET 2	.515**	.057	.527	EL 3
	Step 2	ICT facility	.007 NS	.039	.010	EL 3
	Step 3	ET 2 x ICT	.515**	.057	.527	EL 3
Model 4	Step 1	ET 2	.503**	.062	.488	EL 4
	Step 2	ICT facility	.012 NS	.042	.018	EL 4
	Step 3	ET 2 x ICT	.504**	.062	.488	EL 4

Source: prepared by the authors

Notes: \*\* $p < 0.01$ , NS: Not Significant

**Table 6: Hierarchical Regression with ET3 (Teachers Knowledge)**

	Steps	Variables Entered	B	Std. Error	Beta	DV
Model 1	Step 1	ET 3	.359**	.058	.394	EL 1
	Step 2	ICT facility	.010 NS	.040	.017	EL 1
	Step 3	ET 3 x ICT	.361**	.058	.396	EL 1
Model 2	Step 1	ET 3	.507**	.060	.506	EL 2
	Step 2	ICT facility	.143**	.040	.210	EL 2
	Step 3	ET 3 x ICT	.527**	.058	.526	EL 2
Model 3	Step 1	ET 3	.548**	.054	.571	EL 3

	Step 2	ICT facility	.038 NS	.037	.058	EL 3
	Step 3	ET 3 x ICT	.553**	.055	.577	EL 3
Model 4	Step 1	ET 3	.527**	.060	.520	EL 4
	Step 2	ICT facility	.042 NS	.041	.061	EL 4
	Step 3	ET 3 x ICT	.533**	.060	.526	EL 4

Source: prepared by the authors

\*\*p< 0.01, NS: Not Significant

**Table 7: Hierarchical Regression with ET4 (Teachers Competence)**

	Steps	Variables Entered	B	Std. Error	Beta	DV
Model 1	Step 1	ET 4	.342**	.061	.363	EL 1
	Step 2	ICT facility	.011 NS	.040	.018	EL 1
	Step 3	ET 4 x ICT	.344**	.061	.364	EL 1
Model 2	Step 1	ET 4	.451**	.064	.436	EL 2
	Step 2	ICT facility	.142**	.042	.208	EL 2
	Step 3	ET 4 x ICT	.474**	.063	.458	EL 2
Model 3	Step 1	ET 4	.456**	.061	.459	EL 3
	Step 2	ICT facility	.034NS	.040	.052	EL 3
	Step 3	ET 4 x ICT	.461**	.061	.465	EL 3
Model 4	Step 1	ET 4	.542**	.062	.516	EL 4
	Step 2	ICT facility	.046 NS	.041	.066	EL 4
	Step 3	ET 4 x ICT	.549**	.062	.523	EL 4

Source: prepared by the authors

\*\*p< 0.01, NS: Not Significant

From the above findings it can be concluded that teaching is more effective with use of ICT in higher education. Learning of the students enhanced with use of ICT along with different teaching variables.

## 5. Conclusion and Future Research Implications:

This research throws light and captures the essence of effective use of ICT in enhanced learning. It can be concluded that the communication between the students and teachers improved with use of ICT. With Educational technologies, students found their learning deepened and performances enhanced. Teachers perceived change in their teaching pedagogy. ICTs must be envisioned as a tool to improve their efficiency within multiple development programs. This paper can offer assistance to university administrators, faculty members, and others involved in the educational process. Educational changes and innovations with the agreement and support of school heads and teachers tend to have a greater chance of succeeding (Cheung & Wong, 2011). Training students for real life situations in this technological diverse world requires making the teachers and students of the universities realize that technology is an efficacious tool for enhanced learning experience. Thus would encourage both to embrace emerging technology to heighten the opportunity of the learning in the limited time period of their course work. Capturing and imbibing of the images through the use of ICT for faster and retentive learning may further encourage the educationists to include wider topics in the scope of learning that were otherwise considered beyond capacity for the given learning stage. This may bring about a change in the scope and level of educational courses that can be considered with respect to time limitations. Technological changes have forced universities to respond in unique and innovative ways that at times challenge the conventional perceptions about how education should be conveyed. The universities, thus, can focus on the important factors in their curriculum.

Teachers reported increased plagiarism with use of ICT while students found ICT as tool that facilitates editing. Teachers also discovered that students were less inattentive in classroom since relevant study material was easily available on Internet. Teaching faculty also identified decline in critical thinking and analysis of the students. These conclusions can further be hypothesized for future researches.

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