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Computer Self-Efficacy as a Predictor of University Teachers' Perceived Use of ICT in Teaching and Research: Evidence from Public Sector Universities in Punjab, Pakistan

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Abstract

The need for the confidence of faculty members in computers and information and communication technology (ICT) for teaching and research in the University are growing. This paper aims to find out the relationship between the computer self-efficacy of teachers (CSE) and their perceived use of ICT in teaching (PTS) and research (PRS) by administering a questionnaire on primary data to 15 public sector universities of Punjab province in Pakistan with 923 teachers. A quantitative and correlational survey design was used in the study and the computer self-efficacy scale (CSE) used was adapted from Murphy (1989) and added with questions that measure perceived teaching and research use of ICT (overall Cronbach's alpha = 0.98). The outcomes show that teachers' computer self-efficacy and perceived ICT use in teaching and in research is moderate (Some Confidence) on a five-point scale with means of 3.42, 2.99 and 2.97 respectively. Pearson correlation revealed that perceived ICT use in teaching is moderately and positively correlated with perceived ICT use in research (r = .573) as well as strong positive correlation between computer self-efficacy and perceived ICT use in teaching (r = .798) and perceived ICT use in research (r = .782). Factors that were discovered to be significantly related to self-efficacy and ICT uses were younger age, higher teaching experience, ICT training, gender, discipline, computer ownership and use of laptop computers. The findings of this research work reaffirm computer

SE as a vital and malleable factor of effective instruction and research in the HE level using ICT and offer practical guidelines for faculty-development planners.

Keywords: *computer self-efficacy; ICT; teaching skills; research skills; higher education; Pakistan; Bandura*

1. Introduction

Computers and information and communication technology (ICT) have become vital to the life of the University today, in nearly all aspects of academic learning, data analysis and scientific publication etc. The effectiveness of the use of these tools by the teachers is not related to the availability of the hardware and software, but rather on the confidence of the teachers in their ability in using these tools. This self-perception of self-efficacy has been described by Bandura (1986) as a person's decision about his or her own ability to organize and execute the actions needed to produce the desired outcome and by Compeau and Higgins (1995) as people's self-assurance that they can use the computer to perform a task or activity successfully (computer self-efficacy, or CSE). Self-efficacy beliefs are known to affect efforts made, persistence in facing challenges, and the tasks undertaken (Bandura, 1986) and hence have been studied extensively in the technology adoption literature as a proximal determinant of actual use of – and persistence in overcoming challenges to – ICT.

For university teachers it matters twice, because they are expected to be competent with ICT in order to help them perform their duties in the classroom and because they are expected to be competent with ICT in order to produce research that is increasingly dependent on them. Many of the studies that examine teacher technology use, however have been conducted with school teachers or pre-service teachers in North American and European settings, and less frequently examined the use and integration of technology for classroom purposes and research. Very little evidence exists from higher-education systems in South Asia, the context in which the building and use of technology, and access to training varies widely from the west, and gender gaps are a fact of life.

The aim of the study in this paper is to fill this gap by conducting interviews with the public sector university teachers in Punjab, Pakistan. The data was sourced from a larger study in the doctoral dissertation that explored the correlation between computer self-efficacy, perceived teaching skills, and perceived research skills of 923 University teachers (Rashid, 2021). This paper does not try to duplicate the overall thesis of the study, but instead, it focuses on examining and elaborating in detail the empirical question that served as the core of this study: The relationship between teachers' computer self-efficacy and the perceived use of ICT in teaching and in research is analyzed, followed by the descriptive findings, the demographic comparisons, and the recommendations of the study itself.

1.1 Statement of the Problem

Although the government has invested a great deal in computer science laboratories, internet, learning-management systems at all public universities of Pakistan, teachers are not confident enough in using it, and consequently not confident enough in the extent they use it in their teaching and research practice. There is limited research on how teachers' computer self-efficacy is associated with their perceived use of the ICT in the two academic areas of interest and there are limited indications of which demographic and professional factors might explain the difference in perceived use of the ICT

seen. This link is essential for universities to be able to develop effective evidence-based training programmes for ICTs and not generic ones.

1.2 Objectives of the Study

- To find out what is computer self-efficacy of university teachers in using ICT.
- To find out the relationship between teachers' computer self-efficacy and the perceived computer use in teachers' teaching skills.
- To determine the relationship between teacher's computer self-efficacy and teacher's perception of the use of ICT in research skill.
- To determine the interaction of demographic and professional factors that account for meaningful variations in teachers' use of ICT.
- To provide actionable suggestions for strengthening teaching and research with the use of ICT in Higher Education.

1.3 Research Questions

- RQ1: What is the level of computer self-efficacy of teachers with respect to using ICT?
- RQ2: What is the association between teachers' computer SE and the teachers' perceived computer use in teaching skills?
- RQ3: How are the teachers' computer self-efficacy and perceived use of ICT in research skills correlated?
- RQ4: What significant differences exist with respect to levels of teachers' computer self-efficacy and ICT use across demographic groups?
- RQ5: What is the combination of variables that accounts for the large variability in teachers in terms of the use of ICT?

1.4 Significance of the Study

Once a clear and quantified understanding of the relationship between self-efficacy and its prediction of ICT use in teaching versus research is achieved, the University administration, Higher Education Commission (HEC) of Pakistan and faculty-development planners can focus their training efforts where they will make the greatest difference: on increasing teaching staff members' self-efficacy rather than just providing them with hardware. The results are also applicable to teacher preparation programs and to similar higher education systems in the broader South Asian context with similar challenges in access to and quality of infrastructure and gender equity.

2. Review of Literature

2.1 Attitude towards computing and computer self-efficacy.

Bandura's (1986) social cognitive theory offers a definition of self-efficacy as the belief in one's ability that shapes goals, effort, and persistence in attaining goals. Compeau and Higgins (1995) operationalized this construct in computing, and suggested that CSE embodies an individual's self-perception of his or her capability to utilize a computer to perform a task, and of course influences expectations for future computer experiences. A later study found that those people who believe themselves to be competent computer users expect positive outcomes with the use of technology and are more likely to persist with technology, whereas those who have low CSE expect negative outcomes and are less likely to persist with technology (Shapiro & Oliver, 1993).

2.2 Computer Self-Efficacy and Teaching

There is a large amount of research that correlates teachers' CSE with the use of technology in the classroom. Research conducted by Marcinkiewicz (1994) revealed a correlation between personal innovativeness and self-capability in computer use among elementary teachers; and Albion (2001) discovered that CSE was one of the key factors in teachers' computer use patterns. Similarly, Ertmer and Ottenbreit-Leftwich (2010) and McCormick and Ayers (2009) have suggested that self-efficacy is a more important factor than the technical knowledge alone in determining if teachers will use ICT in the classroom. Torkzadeh and Van Dyke (2002) also demonstrated the trainability of CSE across different starting points of teachers, emphasizing the construct's malleability.

2.3 Computer Self-Efficacy and Research Productivity

In contrast to teaching, the CSE–research relationship has been less direct and explicit – the idea is that one would expect to see an increase in confidence in utilizing databases, statistical software, reference managers, and online scholarly communication tools, and these activities to translate into increased and more effective utilization of ICTs for the research process. This paper tests the direct connection between academics' self-efficacy for teaching and their self-efficacy for research with their respective motivations in each domain as suggested by Bailey (1999) which indicated that both are related but are empirically distinguishable outcomes of a common efficacy belief.

2.4 Computer self-efficacy across the lifespan

There is an inconsistent picture across contexts in terms of predictors of CSE. There are some studies that report higher CSE among younger teachers and those who are trained in ICT (Embi, 2007; Hirschbuhl, 1996) and other studies that do not report any age effect (Bandura, 1995; Inan & Lowther, 2010). Gender differences also come into question, as several studies have indicated that male teachers report higher CSE than do female teachers (Simsek, 2011; Torkzadeh & Van Dyke, 2002), while others have found that there was no significant difference between the scores of male and female teachers (Teo et al., 2008; Lee et al., 1991). This is an inconsistency across settings and this is a justification to collect context-specific evidence like that reported here for the context of public universities in Punjab.

3. Methodology

3.1 Research Design

The study design was a non-experimental, quantitative, correlational and comparative survey design (Creswell, 2009; McMillan, 2006) suitable for describing the strength of association between computer self-efficacy and perceived ICT use with no manipulation of any variables.

3.2 Population and Sample

The population included teachers in the nineteen public sector universities in Punjab, Pakistan; the four universities for women were not included as male researchers' access was limited, giving a total of 5,927 teachers in the fifteen universities. Based on Shavelson (1996), who recommended that a sample of approximately 900 be used for adequate statistical power (.80–.90), a total of 1,176 questionnaires (20% of the population) were proportionally allocated to each university based on the number of teachers in each university. Stratified random sampling was used to distribute the questionnaires. 923 teachers (16.4%) provided valid responses.

Table 1. Demographic Characteristics of the Sample (N = 923)

Demographic	**Category**	**n**	**%**
Gender	Male	555	60.1
	Female	368	39.9
Designation	Lecturer	436	47.2
	Assistant Professor	361	39.1
	Associate Professor	112	12.1
	Professor	14	1.5
Academic Discipline	Science	421	45.6
	Humanities & Social Sciences	502	54.4
Received ICT Training	Yes	793	85.9
	No	130	14.1
Owns a Computer	Yes	892	96.6
	No	31	3.4
Type of Computer Used	Desktop	54	5.9
	Laptop	869	94.1

The sample is mostly male (77.8%), junior in designation (lecturers and assistant professors, combined, 86.3%), and mostly trained in ICT, and Laptop as compared to Desktops were used extensively, which is relevant to the demographic comparisons as made in Section 4.4.

3.3 Instrumentation

The data were gathered using a questionnaire consisting of 55 items with 10 being demographic items and 45 being Likert-type items that were taken from the Computer Self-Efficacy Scale (Murphy, Coover, & Owen, 1989) with modifications added specifically for this study. Twenty-eight items assessed computer self-efficacy (CSE), seven items assessed perceived use of ICT in teaching (PTS) and ten items assessed perceived use of ICT in research (PRS).

3.4 Validity and Reliability

Consent of content validity of the items was obtained from a panel of experts, education and education-psychology in Bahauddin Zakariya University, Multan who checked the items for their compatibility with the three target constructs. The internal consistency was very high across all: overall Cronbach's alpha was 0.98, for CSE (45 items) it was 0.97, for PTS (7 items) it was 0.92 and for PRS (10 items) it was 0.93. The alpha for items ranged from 0.88 to 0.97. A pilot administration with 45 respondents was administered to make minor wording changes and followed by the main survey.

3.5 Data collection and analysis

The questionnaire was distributed personally at one university, and by mail at the remaining fourteen, with the approval of the universities. The data were analysed with SPSS 21 and Statistix 8.1. The analyses conducted to address the Research Question 1 were means and standard deviations, analyses conducted to address the Research Question 2 were Pearson product-moment correlation across demographic subgroups (α = .05), analyses conducted to address the Research Question 3 were Pearson product-moment correlation across demographic subgroups (α = .05), and analyses conducted to address the Research Question 4 and 5 were independent-samples z-tests across demographic subgroups (α = .05).

4. Results

4.1 Levels of Computer Self-Efficacy and Perceived ICT Use

Table 2. Mean Scores for Computer Self-Efficacy, Perceived ICT Use in Teaching, and Perceived ICT Use in Research

Variable	Mean	SD	N
Computer Self-Efficacy (CSE)	3.42	.21	923
Perceived Use of ICT in Teaching (PTS)	2.99	.02	923
Perceived Use of ICT in Research (PRS)	2.97	.01	923

All three components are in the middle (Some Confidence) of the five-point scale. This could reflect the teachers' higher mean score in computer self-efficacy (M = 3.42) than in perceived use of ICT in teaching (M = 2.99) and in research (M = 2.97) and suggests that the teachers were more confident in terms of their capability that in terms of facilitating the use of ICT in teaching and research practice, as is well documented in the literature when it comes to the gap between having a capability belief and translating it into classroom behaviour or research practice.

4.2 Computer Self-Efficacy and Perceived Use of ICT in Teaching

Table 3. Correlation Between Computer Self-Efficacy and Perceived ICT Use in Teaching

	PTS (Pearson r)	N
Computer Self-Efficacy (CSE)	.798**	923

The Pearson correlation coefficient was .798, which is a high positive correlation between teachers' computer self-efficacy and their perceived use of ICT in classroom instruction: teachers' high in computer self-efficacy have significantly high perceived use of ICT in classroom instruction. This directly answers the 2nd research question and 2nd research objective of the research.

4.3 Computer Self-Efficacy and Perceived Use of ICT in Research

Table 4. Correlation Between Computer Self-Efficacy and Perceived ICT Use in Research

	PRS (Pearson r)	N
Computer Self-Efficacy (CSE)	.782**	923

A strong positive correlation (r = .782) was observed between computer self-efficacy and perceived use of ICT in research which answered Research Question 3 and provided support to Objective 3. The correlation between CSE and PRS is not significantly lower (.782), than the correlation between CSE and PTS (.798) which indicates that self-efficacy plays almost the same role in the use of ICTs in research as it does in the use of ICTs in teaching.

Table 5. Correlation Between Perceived ICT Use in Teaching and Perceived ICT Use in Research

	PRS (Pearson r)	**N**
Perceived ICT Use in Teaching (PTS)	.573**	923

Perceived use of ICTs in teaching and in research were also moderately highly correlated r = .573 with each other which is less correlated than with CSE. The pattern indicates that the use of ICT in teaching is related to the use of ICT in other but not completely explained by the other and partially explained by computer self-efficacy which is an underlying behaviour construct.

4.4 Demographic Differences in Computer Self-Efficacy and ICT Use

Independent-samples z-tests (α = .05) were performed across nine demographic and professional variables with statistically significant differences in the groups for CSE, PTS and PRS for most of the variables. The differences in the pattern are summarised below in Table 6.

Table 6. Summary of Demographic Differences in CSE, PTS and PRS

Variable	**Group with Higher CSE / ICT Use**	**Notable Pattern**
Age	Younger teachers (23–27 yrs)	CSE mean ranged 3.21–3.97 across age bands; younger teachers consistently more confident
Teaching experience	Most experienced teachers (31–35 yrs)	CSE mean ranged 3.30–3.79; more experienced teachers more confident
Years of ICT use	Longest ICT users (26–30 yrs)	CSE mean ranged 3.27–3.80
Designation	Senior faculty (Professors)	Highest designation reported greatest confidence
ICT training	Trained teachers	Training associated with higher CSE, PTS and PRS
Gender	Male teachers	Higher CSE and PRS; PTS roughly equal across genders
Teaching discipline	Humanities & Social Sciences (PTS, PRS); near-equal on CSE	Discipline affected ICT-use outcomes more than base CSE

Variable	Group with Higher CSE / ICT Use	Notable Pattern
Computer ownership	Owners of a computer	Ownership associated with higher CSE, PTS and PRS
Type of computer used	Laptop users	Laptop users scored higher than desktop users on all three variables

These comparisons are used to answer Research Questions 4 and 5 (which is part of Research Question 1-3) and all the comparisons together provide a meaningful explanation of the factors that make the difference between teachers in terms of computer self-efficacy and perceived use of ICTs, of which two are more easily actionable: designation and ICT training.

5. Discussion

- The high but nearly equivalent correlation between computer self-efficacy and the perceived use of ICT in both teaching (r = .798) and research (r = .782) activities found in this paper are consistent with numerous previous studies that indicate that self-efficacy is a strong, more immediate, determinant of actual technology use than is technological knowledge (Ertmer & Ottenbreit-Leftwich, 2010; McCormick & Ayers, 2009). It is also similar to that of Compeau and Higgins (1995) who have determined that CSE beliefs influence the expectations individuals have of and their involvement with computing technology, and Albion (2001) who identified CSE as a significant influence on teachers' uses of computers.
- The discovery that CSE correlates nearly as well with research-related ICT use as with teaching-related ICT use is an interesting addition to a literature that typically studied classroom technology integration alone. It posits that the same set of interventions found to work in the teaching of technology (i.e. structured, hands-on learning as opposed to a single orientation session as described by Torkzadeh & Van Dyke (2002)) might be useful in building competencies or skills in research related ICTs, including database searching, use of statistical software, scholarly communication online, etc.
- The fact that overall confidence levels are only at "Some Confidence", even though 85.9% of the sample report prior training in ICTs, and 96.6% own a computer, suggests that access and even nominal training is not enough to build confidence to “High”. This is in line with Hirschbuhl and Bayesian's (1994) argument that faculty training must be substantive and ongoing, and Faseyitan's (1996) observation that only confident and competent users are those most likely to continue to invest effort in learning new software — a positive feedback cycle that a low-confidence faculty may not be able to enter without conscious institutional support.
- The demographic pattern (younger more confident male versus more experienced more confident female teachers) is similar to what has been found in several other settings (Embi, 2007; Simsek, 2011; Torkzadeh & Van Dyke, 2002; but not all (Teo et al., 2008; Gorder, 2008; Bandura, 1995)), indicating that the relationship between CSE and the demographic correlates is context-dependent even when the relationship between CSE and the use of ICTs seems strong across settings. The fact that the gender gap identified here and a close to universal computer ownership were not matched by a near-universal confidence gap also indicates that, in this case,

there is a significant additional marginal benefit to be gained from specific training for female and junior faculty that would not be gained from further distribution of machines (96.6% ownership).

6. Conclusion

In this paper, the authors aimed to determine the relationship between computer self-efficacy and teachers' perception of the use of ICT in teaching and in research with a large scale of sample (N=923) of public-sector university teachers in Punjab, Pakistan. The evidence is clear: computer self-efficacy is a strong, consistent (positive) predictor in both domains, teaching-ICT use and research-ICT use, and both of these behaviours are weakly correlated with each other, that is, r = .573, which means that, rather than one behaviour driving the other, self-efficacy is the common denominator between them. However, confidence levels are not high, but vary systematically across the sample based on age, experience, training status, gender, discipline, computer ownership, and device type. Thus, the direct and most generalizable way of enhancing the performance of teaching and research at the higher-education level through the use of ICTs is to raise teachers' computer self-efficacy, especially for less experienced, untrained and female teachers.

7. Recommendations

- Following these observations, the following observations are offered for use by higher-education planners, higher-education administrators, and faculty-development units:
- Incorporate incremental mastery tasks and peer mentoring by high-confidence teachers and supervised practice into the design of ICT training, as a means of building self-efficacy not delivering a range of isolated technical skills via one-off orientation sessions.
- Focus training on teachers of low self-efficacy, especially newly appointed teachers, female teachers, and teachers with no training in ICT to address the highest levels of access-to-confidence gap.
- The CSE–research and CSE–teaching correlations were very similar, in addition to classroom technology, extend training explicitly to the more research related ICT skills (reference management, statistical and analysis software, online scholarly databases and collaboration tools).
- Encourage access to personal computing technology, particularly laptops, since self-efficacy and the use of ICTs is correlated with their possession (96.6% of respondents own one, although this still does not mean they have the skills to use it successfully).
- Recommend universities and Higher Education Commission to establish continuous and discipline-oriented training programs as there was difference in patterns of ICT use, but it was not found to be related to the baseline self-efficacy of faculty in the Humanities and Social Sciences and Natural Sciences.
- Implement incentive systems which incentivize and encourage the use of ICTs in teaching and research to make it a habit.
- Establish regular evaluations of teachers' computer self-efficacy and the use of ICT, as technology will keep developing and the instruments and its outcomes will need adjustments in the future.
- The study has limitations that could be addressed in future research. There are limitations to this study that could be explored in subsequent research.

- As this study was conducted in public sector universities of Punjab, women universities were not included in the study, which is a limitation in the generalisability of the findings on the teachers of all the universities in Pakistan. Additionally, because both self-efficacy and ICT use are self-reported and self-assessment is assessed using a cross-sectional design, the results presented here reflect association, rather than a causal relationship, between self-efficacy and use of ICTs. As recommended in the parent thesis (Rashid, 2021), future studies could be extended to women's universities as well as to private sector institutions, look at the interaction over the years, or conduct pre/post-study comparisons to examine the parallel relationship between computer self-efficacy and computer anxiety among teachers, students, and administration at different levels of education.

References

Albion, P. R. (2001). Some factors in the development of self-efficacy beliefs for computer use among teacher education students. Journal of Technology and Teacher Education, 9(3), 321-347.

Bailey, J. G. (1999). Academics' motivation and self-efficacy for teaching and research. Higher Education Research & Development, 18(3), 343-359.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Prentice-Hall.

Bandura, A. (1995). Self-efficacy in changing societies. Cambridge University Press.

Bandura, A. (1997). Self-efficacy: The exercise of control. W. H. Freeman.

Compeau, D., & Higgins, C. (1995). Computer self-efficacy: Development of a measure and initial test. MIS Quarterly, 19, 189-211.

Creswell, J. (2009). Research design: Qualitative, quantitative, and mixed methods approaches. Sage.

Embi, R. (2007). Faculty computer self-efficacy at a Malaysian university (unpublished study, as cited in Rashid, 2021).

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. Journal of Research on Technology in Education, 42(3), 255-284.

Faseyitan, S. O. (1996). Factors influencing the adoption of computer technology among university faculty (as cited in Rashid, 2021).

Gorder, L. M. (2008). A study of teacher perceptions of instructional technology integration in the classroom. Delta Pi Epsilon Journal, 50(2), 63-76.

Hirschbuhl, J. J. (1996). Encouraging faculty use of instructional technology (as cited in Rashid, 2021).

Marcinkiewicz, H. R. (1994). Computers and teachers: Factors influencing computer use in the classroom. Journal of Research on Computing in Education, 26(2), 220-237.

McCormick, J., & Ayres, P. L. (2009). Teacher self-efficacy and its relation to ICT use in classroom teaching and research. (as cited in Rashid, 2021).

McMillan, J. H. (2006). Educational research: Fundamentals for the consumer. Pearson.

Murphy, C. A., Coover, D., & Owen, S. V. (1989). Development and validation of the Computer Self-Efficacy Scale. Educational and Psychological Measurement, 49(4), 893-899.

Rashid, M. (2021). Relationship among computer self-efficacy, teaching and research skills of teachers at higher education level [Ph.D. thesis, Bahauddin Zakariya University, Multan].

Shapiro, S., & Oliver, R. (1993). Self-efficacy and computer use among teachers (as cited in Rashid, 2021).

Simsek, A. (2011). The relationship between computer anxiety and computer self-efficacy. Contemporary Educational Technology, 2(3), 177-187.

Teo, T., Lee, C. B., & Chai, C. S. (2008). Understanding pre-service teachers' computer attitudes: Applying and extending the technology acceptance model. Journal of Computer Assisted Learning, 24(2), 128-143.

Torkzadeh, G., & Van Dyke, T. P. (2002). Effects of training on Internet self-efficacy and computer user attitudes. Computers in Human Behavior, 18(5), 479-494.