Research Guru
Online Journal of Multidisciplinary Subjects (ISSN : 2349-266X)
Volume-13, Issue-1, June 2019
Impact Factor: 4.081
www.researchguru.net

A Study of ICT Competencies among Prospective Teachers in Relation to Gender and Academic Stream

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Abstract

The present study examined the ICT Competencies among prospective teachers in relation to gender and stream. The sample for the present study consisted of 100 prospective teachers selected randomly from different colleges of Education of Ambala district. For collecting the data, ICT Competencies scale developed and standardized by investigators, was used. Analysis of data was done using ANOVA (2 x 2 factorial design). The study revealed significant difference between male and female prospective teachers on ICT Competencies. The study further revealed no significant difference between science and humanities stream prospective teachers on ICT Competencies. It was also found that the interaction between Gender and Academic Stream contribute to significant difference on ICT Competencies i.e. gender and academic stream did not operate independently.

Key words: ICT competencies, Prospective teachers, Gender and Academic stream

Introduction

Today's world is globally connected through information and communication technology (ICT). We all live in technology driven era where no one can deny the importance of ICT in different fields. Teacher Education institutions are one of them. Success of education system depends upon ICT up to a great extent. We can't think about providing quality education without the use of ICT. ICT adds value to the process of learning and in the organization and management of learning institutions **(Daniel 2002)**. According to **Kozma (2005),** ICT can be used to prepare the workforce for the information society and the new global economy. In order to get the benefits of using emerging technologies in teaching and learning, it is essential that teacher education institutions assume a leadership role in the transformation of education **(Schols, 2012; Miller & Ribble, 2013)**. Prospective teachers' have to take the responsibility for providing better education and to make their students stand as nations' asset. According to **Wheeler (2001)** as a consequence, the use of ICT will not only enhance learning environments but also prepare next generation for future lives and careers. This task can be well accomplished with the collaboration of ICT in teaching learning process. So it becomes imperative to use emerging technologies by the prospective teachers in the teacher education institutions as the use of these helps in enhancing their ICT competencies.

Every person is inherited with some of the skills that are very much essential for the success with respect to a particular profession. Same is with the teaching profession.

Definitely, teachers have natural features of providing learning experiences to their students. Along with these natural features some features are acquired from the environment. ICT is also acquired from modern society that helps in enriching and making teaching learning process effective and permanent. Therefore, it becomes necessary to understand the term ICT. According to **Kumar and Saranya (2014),** ICT stand for information and communication technologies and are defined as a diverse set of technological tools and resources used to communicate, and to create, disseminate, store and manage information. Information and communication technologies are the forms of technology that are used to transmit, process, store, create, display, share or exchange information by electronic means **(The UNESCO ICT in education programme: 2007)**. ICT can be termed as set of technologies that can be used for communication, retrieval, storage and management of information. According to **Margaret Rouse (2005)** ICT (Information and Communications technology – or technologies) is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning.

ICT competencies are specific abilities for accessing computer based technologies for realizing educational objectives. ICT competencies can be considered as expertise with respect to the peripheral of digital era through which one can complete specific tasks in an efficient manner. Here ICT competencies are related to prospective teachers' expertise with respect to use of technology for making teaching learning process more interactive and effective. Therefore, it has immense importance in the field of teacher education programme.

Rationale of the Study

The present era is characterized by the 'Z generation' or the 'technology generation' students. They are not solely dependent on their teachers but they are the independent learners who use the technological gadgets to produce/create the new knowledge. They are the active participants in the teaching learning process. In order to make them the creators of knowledge or to develop in them the higher order thinking skills, the teachers need to be competent in using different ICT tools. ICT competencies are crucial for their educational as well as professional development. The teacher training institutions are responsible for imbibing teaching skills among prospective teachers. These institutions need to give importance to the ICT competencies that the prospective teachers must possess in order to make effective use of the ICT tools in their regular classroom teaching. The prospective teachers in their training institutions must know the digital teaching materials and tools available so that they can make effective use of them. The present teacher training institutions are inculcating necessary ICT skills among prospective teachers but they are not at par and lack the ICT competencies required for the 21st century prospective teachers. Various researches revealed that teacher trainees use ICT appropriately for teacher centered activities but they are not able to make effective and interactive materials for their students **(Gonda, 2016).** The competence of ICT teachers on policy, curriculum, pedagogy, technology, administration and professional development is low **(Badau & Sakiyo, 2013)**. **Reshma Ramanan (2017)** found that majority of teachers have access to broadband but the

use of ICT enabled facilities are lacking. **Johri (2015)** found lack of computer competence as a main barrier to adoption among teacher educators and teacher trainees and acceptance of ICT in teaching learning. More training is needed to the teachers for them to integrate ICT in teaching and related task assigned to them so as to uplift and enhance the quality of education of elementary public schools **(Caluza et al. 2017).** According to **Peeraer and Van Petegem, (2009)** important barriers to use of ICT in teaching and learning have been identified such as resistance to change, negative attitude towards computers, constraints on training and support, cost, and a lack of appropriate types of technology. But some other studies such as **Yusuf and Balogun (2011)** proved that majority of student teachers have positive attitude towards the use of ICT and are competent in the use of few basic ICT tools. Similarly, **Gastelu, Kiss and Domínguez (2015)** identified the level of ICT Competencies of university students from Mexico and Hungary and indicated that they express a high level of competencies in ICT. The students have a high level of competency in the use of ICT as a permanent means of learning and social communication. The would be teachers are good at ordinary abilities demonstrating basic ICT competence. They demonstrated better results in working with text, producing visual educational material, using electronic databases. (**Peciuliauskiene & Barkauskait, 2007**).

Therefore, it has become indispensable to study the ICT competencies among prospective teachers. So, in order to suggest certain measures to be implemented the investigators took up the study to find out the ICT competencies among prospective teachers.

Objectives of the Study

1. To study ICT Competencies among prospective teachers in relation to Gender.
2. To study ICT Competencies among prospective teachers in relation to Academic Stream.
3. To study the interaction between Gender and Academic Stream on ICT Competencies.

Hypotheses of the Study

1. There exists no significant difference in the ICT Competencies of Male and Female prospective teachers.
2. There exists no significant difference in the ICT Competencies of Science and Humanities stream prospective teachers.
3. There exists no significant interaction between Gender and Academic Stream on ICT Competencies.

Research Methodology

The present study is descriptive in nature. To carry out the above said exploration and to meet the objectives of the study, survey method of investigation was employed. To find out the main effect and interactional effects of different independent variables on ICT Competencies among prospective teachers, the statistical technique of 'Analysis of Variance' (2x2) factorial design was used.

Sample and Sampling Technique

The sample for the study constituted of 100 prospective teachers selected randomly from different colleges of Education of Ambala district. Among these 100 prospective teachers, 50 were male and 50 were female prospective teachers. Out of 50 male prospective teachers, 25 belong to science stream and 25 belong to humanities stream. Similarly, out of 50 female prospective teachers, 25 belong to science stream and 25 belong to humanities stream. In all, each group consisted of equal number (50 each) prospective teachers.

Tool Used

ICT Competency scale developed and standardized by the investigators, was used. The scale consisted of 38 items. These 38 items were categorized in the following four areas viz., Access to Hardware, Access to Software, Access to Internet and Integrating media with teaching learning process. Each question is scored on a Likert-type scale of 1-5 (based on these replies: "Strongly Disagree," "Disagree," "Indifferent," "Agree" and "Strongly Agree"). Overall assessment is done by total score. The total raw scores range from 38-190.

Analysis and Interpretation

Table -1

Mean of prospective teachers on ICT Competencies

Academic Stream/Gender	Mean of ICT Competencies		
	Male	Female	Total
Science	123.84	151.72	275.56
Humanities	133.12	139.28	272.4
Total	256.96	291.0	

Table-2

Summary of Two-way (2X2) Analysis of Variance for Gender and Academic Stream on ICT Competencies

Source of Variation	df	Sum of Squares (SS)	Mean Square Variance (MSV)	F-ratio	Level of Significance
Gender (A)	1	7242.01	7242.01	18.44*	Sig.
Academic Stream (B)	1	62.41	62.41	0.16	NS
Interaction (AxB)	1	2948.49	2948.49	7.51*	Sig.
Within	96	37698.08	392.68		
Total	99	47950.99			

*Significant at 0.01 level

Table 2 reveals that the calculated 'F' ratio for the main effect of gender on ICT competencies of prospective teachers, irrespective of their academic stream came out to be 18.44 which is higher than the table value at 0.01 level of significance. It implies male and female prospective teachers differ significantly on ICT Competencies. Hence the **hypothesis -1** that "there exists no significant difference between male and female prospective teachers on ICT Competencies" **is rejected**. It is interpreted from the table-1 that mean scores on ICT Competencies of female prospective teachers (291.0) is higher than male prospective teachers (256.96), it implies female prospective teachers have more ICT Competencies than male prospective teachers. These results were in contradiction with the results of **Yusuf and Balogun (2011)**. These researchers found no significant difference between male and female student teacher's attitudes and use of ICT. Similarly, **Romina, Proctor, Burnett, Glenn and Watson (2006)** proved that female teachers possess very little confidence in using ICT as compared to male teachers. **Danner and Pessu (2013)** found no significant difference in the perceived competency among students in teacher preparation programmes according to gender and academic year/level. However, there was significant difference in the perceived competency among students according to the type of computer training, with those with formal computer training perceiving themselves to be most competent in ICT skills.

The **table 2** further shows that the calculated 'F' ratio for the main effect of Academic stream on ICT Competencies, irrespective of their gender, was found to be 0.16 which is less than the table value at 0.05 level of significance. It implies that science and humanities stream prospective teachers do not differ significantly on ICT Competencies. Hence, the **hypothesis -2** that "there exists no significant difference between Science and Humanities stream prospective teachers on ICT Competencies" **is accepted**. It is further interpreted from the **table-1** that though mean scores on ICT Competencies of science stream prospective teachers (275.56) is higher than humanities stream prospective teachers (272.4) but this difference is very less or negligible. On the contrary in a study conducted by **Mahonty and Padua (2012**), it was found that level of ICT literacy varies between the science and arts teachers in higher secondary level. It was also found that the science higher secondary teachers are more ICT literate in comparison to arts higher secondary teachers. Similarly, **Sundararaj (2005)** found significant difference between arts and science B.Ed. trainees with respect to their attitude towards computer education.

Further from **table-2**, the calculated 'F' ratio for the interaction effect of gender and academic stream on ICT Competencies is found to be 7.51 which is more than the table value at 0.01 level of significance. Hence the **hypothesis-3** that "there exists no significant interaction between Gender and Academic Stream on ICT Competencies" **is rejected**. It may be concluded that gender and academic stream did not operate independently. The results were further drawn through t-test and following hypotheses were tested:

H_0 3 (a): There exists no significant difference in ICT Competencies of Male Science prospective teachers and Male Humanities prospective teachers.

H_0 3 (b): There exists no significant difference in ICT Competencies of Female Science prospective teachers and Female Humanities prospective teachers.

H_0 3 (c): There exists no significant difference in ICT Competencies of Male Science prospective teachers and Female Science prospective teachers.

H_0 3(d): There exists no significant difference in ICT Competencies of Male Humanities prospective teachers and Female Humanities prospective teachers.

H_0 3(e): There exists no significant difference in ICT Competencies of Male Science prospective teachers and Female Humanities prospective teachers.

H_0 3(f): There exists no significant difference in ICT Competencies of Male Humanities prospective teachers and Female Science prospective teachers.

To find t:

S.D. = √Mean Square of Variance (Within conditions)

= √392.68 = 19.82

$SE_D = S.D. \sqrt{1/N_1 + 1/N_2}$

$= 19.82 \sqrt{1/25 + 1/25}$

=5.55

Now for df =96 table of t-values:

t=1.99 (p=0.05), t=2.63 (p=0.01 level)

$t \times SE_D = 1.99 \times 5.55 = 11.04$

$2.63 \times 5.55 = 14.59$

So, 11.04 and 14.59 are the critical values of the mean difference to be significant at 0.05 and 0.01 level of significance.

Table: 3

t-ratios for interaction effect of Gender and Academic Stream

Combination Group	**Male (Science)**	**Male (Humanities)**	**Female (Science)**	**Female (Humanities)**
Male (Science)	-	9.28	27.88**	15.44**
Male (Humanities)	-	-	18.6**	6.16
Female (Science)	-	-	-	12.44*
Female (Humanities)	-	-	-	-

*Significant at 0.05 level

** Significant at 0.01 level

Table 3 reveals that t-ratios for most of the combination groups were found to be significant leading to following conclusions

- ICT Competencies of Male Science prospective teachers and Male Humanities prospective teachers do not differ significantly; therefore H_0 3 (a) is accepted.
- ICT Competencies of Female Science prospective teachers and Female Humanities prospective teachers differ significantly; therefore H_0 3 (b) is rejected.
- ICT Competencies of Male Science prospective teachers and Female Science prospective teachers differ significantly; therefore H_0 3 (c) is rejected.
- ICT Competencies of Male Humanities prospective teachers and Female Humanities prospective teachers do not differ significantly; therefore H_0 3(d) is accepted.
- ICT Competencies of Male Science prospective teachers and Female Humanities prospective teachers differ significantly; therefore H_0 3(e) is rejected.
- ICT Competencies of Male Humanities prospective teachers and Female Science prospective teachers differ significantly, therefore $H_0$3 (f) is rejected.

Major Findings of the Study

The major findings of the study were:

1. The study revealed significant difference between male and female prospective teachers on ICT Competencies.
2. The study further revealed no significant difference between science and humanities stream prospective teachers on ICT Competencies.
3. It was also found that the interaction between Gender and Academic Stream contribute to significant difference on ICT Competencies i.e. gender and academic stream did not operate independently.

Educational Implications

In order to function in the new world economy, students and teachers have to navigate large amount of information. They have to master new knowledge and have to accomplish task collaboratively. Educational institutions cannot ignore the importance of this ever increasing pace of technological progress and their role in building ICT empowered citizens. But only the teachers who have ICT competencies can handle this technological advancement. Thus, it became necessary to create an awareness of the possibilities of ICT among prospective teachers which will lead to their willingness to learn it and resulting in the commitment and confidence to use it. Therefore, it must be the matter of concern for all prospective teachers irrespective of their academic stream and gender to imbibe in themselves the necessary ICT competencies and play a vital role to improve the teaching learning process and make it more effective and permanent. It is responsibility of the teacher education institutions to create opportunities and facilities to promote the use of ICT so that skills required in the 21st century may be developed among the prospective teachers. The first and foremost thing that needs to be done is to develop positive attitude towards the process and products of ICT. For this purpose attempts should be made to provide exposure and develop a culture that values ICT. Different seminars and workshops should be organized and in-house training should be

provided for the integration of traditional teaching with ICT based teaching and learning programmes. Moreover, loop holes and weak areas should be identified and necessary strategies should be developed to improve them. Internet facilities should be provided to both teacher educators and prospective teachers for carrying out the task of teaching learning process. All classrooms should be well equipped with necessary infrastructure and all students should be provided with access to media laboratories whenever they want. Last but not the least, research to disseminate the effective use of technology should be promoted in teacher education institutions.

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