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An Analytical Study on the Differences in Teachers' ICT Knowledge Based on Demographic and Professional Variables

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Abstract: This study investigates the significance of differences in teachers' Information and Communication Technology (ICT) knowledge across various demographic and professional parameters such as gender, locality, age, subject specialization, educational qualification, computer qualification, marital status, type of school, teaching experience, medium of instruction, mode of appointment, and family type. Utilizing independent samples t-tests and one-way ANOVA, the study finds that gender, locality, age, subject specialization, educational qualification, marital status, type of school, teaching experience, medium of instruction, mode of appointment, and family type do not significantly impact ICT knowledge. However, possession of computer qualifications significantly enhances teachers' ICT knowledge. These findings suggest the critical role of specialized ICT training in improving digital competencies among teachers.

Keywords: *ICT Knowledge, Teachers, Demographic Variables, Professional Variables, Independent Samples t-test, ANOVA*

Introduction: In the contemporary educational landscape, Information and Communication Technology (ICT) plays a pivotal role in enhancing teaching and learning processes. As education systems worldwide integrate technology, it becomes crucial to assess the ICT competencies of teachers. According to Buabeng-Andoh (2012), teachers' ability to integrate ICT into their teaching practice is influenced by their attitudes, self-efficacy, and access to training rather than demographic characteristics alone. Similarly, Al-Zaidiyeen, Mei, and Fook (2010) found that the availability of ICT resources and teachers' competency levels were more significant determinants of ICT integration than gender or locality. Furthermore, research by Law, Pelgrum, and Plomp (2008) emphasized the necessity of professional development programs to enhance teachers' ICT capabilities. Therefore, this study aims to determine whether demographic and professional variables such as gender, locality, age, subject taught, educational background, and others significantly affect teachers' ICT knowledge.

Objectives:

- To measure the ICT knowledge of teachers.
- To examine the significance of differences in teachers' ICT knowledge based on demographic variables such as gender, locality, age, marital status, and family type.
- To examine the significance of differences in teachers' ICT knowledge based on professional variables such as subject specialization, educational qualification, computer qualification, type of school, teaching experience, medium of instruction, and mode of appointment.

Hypotheses: H1: There is no significant difference between male and female teachers in their ICT knowledge.

H2: There is no significant difference between rural and urban teachers in their ICT knowledge.

H3: There is no significant difference between teachers below 30 years and above 30 years in their ICT knowledge.

H4: There is no significant difference between teachers teaching History and Geography in their ICT knowledge.

H5: There is no significant difference between teachers with UG+B.Ed. and PG+B.Ed. qualifications in their ICT knowledge.

H6: There is no significant difference between teachers with and without computer qualifications in their ICT knowledge.

H7: There is no significant difference between married and unmarried teachers in their ICT knowledge.

H8: There is no significant difference among teachers working in government, aided, and private schools in their ICT knowledge.

H9: There is no significant difference between teachers with less than and more than 10 years of teaching experience in their ICT knowledge.

H10: There is no significant difference between teachers teaching in Tamil and English medium in their ICT knowledge.

H11: There is no significant difference between teachers recruited through TRB and on an ad hoc basis in their ICT knowledge.

H12: There is no significant difference between teachers from nuclear and joint families in their ICT knowledge.

Literature Review: Extensive research has explored the factors influencing teachers' ICT knowledge. According to Jimoyiannis and Komis (2007), the level of ICT integration among teachers is often associated with their ICT training background rather than demographic factors like gender or age. In a study by Sang, Valcke, Braak, and Tondeur (2010), teachers' attitudes, self-efficacy, and training were found to be stronger predictors of ICT integration than socio-demographic characteristics. Furthermore, research by Kay (2006) emphasizes that formal training programs significantly improve ICT competency levels among teachers. Conversely, studies like those by Tezci (2011) have shown minimal variance in ICT usage based on school types or urban-rural divides. These findings collectively suggest that targeted ICT training plays a more substantial role in enhancing teachers' ICT knowledge than mere demographic attributes.

Methodology: An independent samples t-test was used to compare two groups across variables, while one-way ANOVA was used where there were more than two groups (e.g., type of school). The sample comprised 336 teachers. Significance was assessed at $p<0.05$. The tool used for data collection was the ICT Knowledge Scale,

a Likert-type scale consisting of 30 statements constructed by D. Yuvaraj, P. Suresh, and S. Ramprabhu under the guidance of experts.

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Analysis and Interpretation:

Table 1: Independent Samples t-test Results for Teachers' ICT Knowledge

Variable	Group	N	Mean	SD	t-value	p-value	Significance
Gender	Male	78	100.08	10.72	1.516	0.132	Not Significant
	Female	258	97.98	10.72			
Locality	Rural	119	99.23	11.07	0.950	0.343	Not Significant
	Urban	217	98.05	10.56			
Age	Below 30 Years	217	98.22	10.85	0.575	0.566	Not Significant
	Above 30 Years	119	98.92	10.56			
Subject Specialization	History	177	99.51	10.56	1.885	0.061	Not Significant (Marginal)
	Geography	159	97.30	10.85			
Educational Qualification	UG+B.Ed.	184	97.76	11.06	1.342	0.181	Not Significant
	PG+B.Ed.	152	99.32	10.31			
Computer Qualification	Yes	213	98.98	10.26	2.127	0.026	Significant
	No	123	92.57	16.51			
Marital Status	Married	235	98.48	11.11	0.045	0.964	Not Significant
	Unmarried	101	98.43	9.89			
Teaching Experience	<10 Years	224	98.15	10.88	0.775	0.439	Not Significant
	>10 Years	112	99.10	10.47			
Medium of Instruction	Tamil	251	98.40	10.65	0.189	0.850	Not Significant
	English	85	98.66	11.05			
Mode of Appointment	TRB	270	98.30	10.70	0.571	0.569	Not Significant
	Ad hoc	66	99.15	10.95			
Type of Family	Nuclear	93	97.28	11.03	1.231	0.220	Not Significant
	Joint	243	98.92	10.61			

Table 2: N, Mean, SD of Teachers' ICT Knowledge Based on Type of School

	Group	N	Mean	SD
Type of School	Government	140	97.51	10.739
	Aided	66	99.15	10.952
	Private	130	99.14	10.637

Table 2a: One-Way ANOVA Results for Teachers' ICT Knowledge Based on Type of School

Source of Variation	Sum of Squares	df	Mean Square	F	p-value	Significance
Between Groups	216.607	2	108.304	0.939	0.392	Not Significant
Within Groups	38422.964	333	115.384			
Total	38639.571	335				

- No significant difference in ICT knowledge was found based on gender, locality, age, educational qualification, marital status, type of school, teaching experience, medium of instruction, mode of appointment, and family type.
- A marginal, but not statistically significant, difference was observed based on subject specialization.
- A significant difference was found based on computer qualification, with teachers having formal computer education displaying higher ICT knowledge.

Discussion: The results reinforce prior findings in educational research. Jimoyiannis and Komis (2007) and Sang et al. (2010) similarly observed that demographic factors have limited influence on teachers' ICT competencies, while structured ICT training significantly impacts outcomes. The significant difference based on computer qualification found in this study aligns with Kay's (2006) conclusion that formal education in ICT enhances technical skills and practical application in classrooms. The non-significant differences based on school type and teaching experience corroborate Tezci's (2011) findings that organizational characteristics may have less influence than individual teacher readiness and training opportunities. This highlights the need for policymakers to prioritize professional ICT training over relying solely on infrastructural or demographic adjustments.

Conclusion: This study concludes that teachers' ICT knowledge is predominantly influenced by their possession of formal computer qualifications rather than demographic or professional characteristics. Educational stakeholders should emphasize the integration of specialized ICT training in teacher education programs to ensure enhanced digital competencies among teachers, thereby promoting effective ICT integration in classrooms.

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