Technological Pedagogical Content Knowledge of Educators of Teacher Education Program Working in Colleges of Education

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Abstract: The teaching landscape is rapidly changing, the technological rise of the 21st century and widespread integration of those technologies into our society, combined with access to the internet has integrally changed teaching in just a few years. Educational technology implies a behavioural science approach to teaching and learning in that it makes use of pertinent scientific and technological methods and concepts developed in psychology, sociology, communications, linguistics and other related fields. It also attempts to incorporate the management principles of cost effectiveness and the efficient deployment and use of available resources in men and materials. Educational technology as a concept does not necessarily imply the use of machines and other items of hardware. Experience has shown that more often than not they involve such media, equipment and resources.

The purpose of the present study was to find out whether there was any significant difference between educators of teacher education program with regard to gender, subject taught and age in their TPACK and its dimensions and also to find out there was any significant influence of educators of teacher education program teaching experience in their TPACK and its dimensions. TPACK questionnaire were used for collecting the required data from the population. The major findings revealed that there was no significant influence of educators of teacher education program teaching experience in their TPACK and its dimensions.

Key Words: TPACK-Technological Pedagogical Content Knowledge, TK-Technological Knowledge, PK-Pedagogical Knowledge, CK-Content Knowledge, TPK-technological Pedagogical Knowledge, TCK-Technological Content Knowledge, PCK-Pedagogical Content Knowledge, ICT – Information and Communication Technology.

1. Introduction

The modern age of science and technology demands creative and dynamic as well as multi-dimensional and multi-media approach. It is broadly termed as "Information and Communication Technology (ICT)." A teacher should be able to incorporate the facilities of ICT in the classroom as much as possible by changing the stimulation and sustaining the attention of the students. But the use of technology and giving facts alone are not part of good teaching. Good teaching is to be kind and sympathetic. Love for teaching and students are essential. Justice and impartiality are virtues which must be cultivated for successful teaching. Teaching is a co-operative affair between the teacher and the taught. Successful teaching must create a congenial atmosphere in the classroom for mutual interaction. It may be possible through the actions, behaviour and personality of the teacher.

The growing use of educational technology in today's schools has helped to release the teacher from the routine role of information giving so that he/she can devote his/her time and effort to the more important tasks of planning, arranging and evaluating learning experiences and outcomes and of encouraging, enthusing, guiding and counseling pupils. The various technological media are used to communicate the needed factual information to pupils and they are capable of doing this perhaps more accurately and efficiently than the teacher. So today pupils acquire knowledge through the various media and behavioural changes via the teacher. Another noticeable trend is the creation of multimedia learning environments in the classroom which involve the use of variety of interrelated learning experiences.

2. Need and Significance of the Study

Competence and professional skills are the very heart of the programme of teacher education. Professional education should focus on the person as an individual who is in practice and seeks to broaden his mental, moral and emotional capacities. The person should have a sound philosophy of education, knowledge of adequate functioning of psychology along with a dynamic sociological perspective. Only such teachers will be able to relate theoretical insight to practice and to improve preparation programme. They will be effective practitioners in their profession. Teacher education seeks to develop such competencies in the prospective teachers which will make his/her a successful teacher. It tends to increase the ability of a teacher to deal with a range of individual differences.

Teachers in the 21st century must not only be familiar with the operation of instructional technologies but also with their application within the curriculum and their classroom (Eisenberg & Johnson, 1996). The technological, pedagogical, and content knowledge (TPACK) framework is a conceptual model designed to

rethink how a teacher might approach the integration of technology. Topper (2004) suggests that "for teachers to use technology in support of their teaching, and see it as a pedagogically useful tool, they must be confident and competent with the technology they are planning to use". Similarly, to the recommendations by Greenhow, Dexter and Hughes (2008), the TPACK framework helps the teacher to connect what is being taught to the way in which it is taught, with the technology used to enhance these connections. By considering the impact that technology could have on the content and its delivery, a teacher might be able to overcome different factors faced and embrace new approaches to academic success.TPACK will "emphasize the connections among technologies, curriculum content, specific approaches, demonstrating how teachers' understandthe technology, pedagogy and content can interact with each one to produce effective teaching with educational technologies" (Koehler & Mishra, 2008). So through this study, the investigator wants to find out the TPACK among educators of teacher education program working in colleges of education.

3. Statement of the Problem

Technological pedagogical content knowledgeis certainly a fruitful and skillful teaching with the assistance of innovation in technology. It is not quite the same as the knowledge of its individual components and their interactions. It rises up out of various associations among content, instructional method, innovation and contextual knowledge. So the study is entitled as ***Technological Pedagogical Content Knowledge (TPACK) ofEducators of teacher education program working in Colleges of Education.***

4. Method of the Study

The investigator has used survey method to study the technological pedagogical content knowledge of educators of teacher education program working colleges of education in Tiruchirappalli district.

5. Population of the Study

The population for the study includes the educators of teacher education program who have taken classes to bachelor of education students in the Tamilnadu Teachers Education University affiliated self-financing colleges of education located in Tiruchirappalli district.

6. Sample of the Study

The investigator used stratified random sampling technique for selecting the sample. The investigator randomly selected eleven colleges of education from those colleges of education, 136 educators of teacher education program were selected.

7. Tools Used in the Study

Technological Pedagogical Content Knowledge Scale. The scale was developed and validated by the Investigator (2019).

8. Statistical Measures of the Study

For the present study, the Investigator used the following statistical techniques.

a. Mean
b. Standard Deviation
c. 't' Test
d. Analysis of Variance
e. Regression Analysis

9. Operational Definitions of the Study

a. **Technological, Pedagogical and Content Knowledge (TPACK)**

According to this study, TPACK are a type of organizational framework for knowledge consisting of seven major domains and it supports content based technology integration in teaching process.

b. Educators of Teacher Education Program

According to this study, teacher educator's means who have taken classes to bachelor of education students in the colleges of education.

10. Objectives of the Study

1. To find out whether there is any significant difference between men and womenmen and women, taught perspective subject and pedagogy subject, age group among 30 years and below, 31-40 years and 41 years and above educators of teacher education program in their TPACK and its dimensions.
2. To find out whether there is any significant influence of educators of teacher education program having teaching experience of 5 years and below, 6-10 years and 11 years and abovein theirTPACK and its dimensions.

11. Hypotheses of the Study

1. There is no significant difference between men and women, taught perspective subject and pedagogy subject, age group among 30 years and below, 31-40 years and 41 years and above educators of teacher education program in their TPACK and its dimensions.
2. There is no significant influence of educators of teacher education program having teaching experience of 5 years and below, 6-10 years and 11 years and above in theirTPACK and its dimensions.

12. Analysis of the Study

a. Differential Analysis

Null Hypothesis - 1

There is no significant difference between men and womeneducators of teacher education program in their TPACK and its dimensions, namely, technological knowledge, pedagogical knowledge, content knowledge, technological pedagogical knowledge, technological content knowledge and pedagogical content knowledge.

Table - 1
Mean score difference between men and womeneducators of teacher education program in their TPACK and its dimensions

Dimensions of Variable	Gender	Mean	SD	't' Value	Remarks
TK	Men	26.17	5.29	0.180	**NS**
	Women	26.22	5.37		
PK	Men	31.24	5.04	2.853	**S**
	Women	33.81	5.19		
CK	Men	22.31	3.58	2.536	**S**
	Women	25.57	4.23		
TPK	Men	27.83	5.10	2.324	**S**
	Women	32.24	5.51		
TCK	Men	22.63	4.31	2.191	**S**
	Women	24.34	4.91		
PCK	Men	28.95	5.49	2.315	**S**
	Women	33.26	5.68		
TPACK	Men	31.54	5.33	2.468	**S**
	Women	34.76	4.68		

The above table shows that there was no significant difference between men and women educators of teacher education program in their TK, as the calculated 't' value of 0.180 is less than the table value of 1.96 at 5% level of significance.

But, there was significant difference between men and women educators of teacher education program in their PK, CK, TPK, TCK, PCK and TPACK, as the calculated 't' values of 2.853, 2.536, 2.324, 2.191, 2.315 and 2.468 are greater than the table value of 1.96 at 5% level of significance.

Null Hypothesis - 2

There is no significant difference between educators of teacher education program taught perspective subjects and pedagogy subjects in their TPACK and its dimensions, namely, technological knowledge, pedagogical knowledge, content knowledge, technological pedagogical knowledge, technological content knowledge and pedagogical content knowledge.

Table - 2
Mean Score difference between educators of teacher education program taught perspective subjects and pedagogy subjects in their TPACK and its dimensions

Dimensions of Variable	Subject Taught	Mean	SD	't' Value	Remarks
TK	Perspective Subjects	27.01	4.85	1.159	NS
	Pedagogy Subjects	25.03	5.74		
PK	Perspective Subjects	32.20	5.25	2.543	S
	Pedagogy Subjects	31.71	5.23		
CK	Perspective Subjects	24.84	3.85	2.410	S
	Pedagogy Subjects	23.85	4.26		
TPK	Perspective Subjects	32.15	5.33	1.734	NS
	Pedagogy Subjects	30.54	5.44		
TCK	Perspective Subjects	24.16	4.29	0.779	NS
	Pedagogy Subjects	23.42	5.26		
PCK	Perspective Subjects	32.48	4.91	2.195	S
	Pedagogy Subjects	30.35	6.21		
TPACK	Perspective Subjects	32.45	5.07	1.342	NS
	Pedagogy Subjects	31.40	4.88		

The above table shows that there was no significant difference between educators of teacher education program taught perspective subjects and pedagogy subjects in their TK, TPK, TCKand TPACK, as the

calculated 't' values of 1.159, 1.734, 0.779 and 1.342 are less than the table value of 1.96 at 5% level of significance.

But, there was significant difference between educators of teacher education program taught perspective subjects and pedagogy subjects in their PK, CK and PCK, as the calculated 't' values of 2.543, 2.410 and 2.195 are greater than the table value of 1.96 at 5% level of significance.

Null Hypothesis - 3

There is no significant difference among educators of teacher education program age group among 30 years and below, 31-40 years and 41 years and above in their TPACK and its dimensions, namely, technological knowledge, pedagogical knowledge, content knowledge, technological pedagogical knowledge, technological content knowledge and pedagogical content knowledge.

Table - 3

Mean Score difference among educators of teacher education program age group among 30 years and below, 31-40 years and 41 years and above in their TPACK and its dimensions

Dimensions of Variable	Source of variables	Sum of square	'df'	Mean score	Calculated 'F' value	Remarks
TK	Between	71.972	2	41.976	1.187	NS
	Within	3704.118	133	27.622		
PK	Between	3.167	2	1.588	1.057	NS
	Within	3492.741	133	27.758		
CK	Between	22.005	2	11.008	1.662	NS
	Within	2016.112	133	17.682		
TPK	Between	75.132	2	32.516	1.847	NS
	Within	2885.427	133	39.214		
TCK	Between	70.458	2	25.379	0.565	NS
	Within	2405.710	133	32.599		
PCK	Between	51.032	2	20.517	0.440	NS
	Within	3240.916	133	32.037		
TPACK	Between	91.106	2	45.578	1.960	NS
	Within	2250.614	133	34.593		

The above table shows that there was no significant difference among educators of teacher education program age group among 30 years and below, 31-40 years and 41 years and above in their TPACK and its dimensions, as the calculated 'F' values of 1.187, 1.057, 1.662, 1.847, 0.565, 0.440 and 1.960 are less than the table value of 3.00 at 5% level of significance.

b. Regression Analysis

Null Hypothesis - 4

There is no significant influence of educators of teacher education program having teaching experience of 5 years and below, 6-10 years and 11 years and above in their TPACK and its dimensions, namely, technological knowledge, pedagogical knowledge, content knowledge, technological pedagogical knowledge, technological content knowledge and pedagogical content knowledge..

Table 4.1.1a

Influence of educators of teacher education program having teaching experience of 5 years and below, 6-10 years and 11 years and abovein their TPACK and its dimensions- Summary

Model	R	R Square	Adjusted R Square	Std. Error
1	0.314[a]	0.092	0.049	0.8838

Table 4.1.1b

Influence of educators of teacher education program having teaching experience of 5 years and below, 6-10 years and 11 years and above in their TPACK and its dimensions – ANOVA

Model		Sum of Squares	Mean Square	F	Significance
1	Regression	11.755	1.679	2.150	NS
	Residual	115.604	.781		
	Total	127.359			

Table 4.1.1c
Influence of educators of teacher education program having teaching experience of 5 years and below, 6-10 years and 11 years and abovein their TPACK and its dimensions – Coefficients

Model	Unstandardized Coefficient		Standardized Coefficient	't'	Sig.
	B	Std. Error	Beta		
Constant	0.661	0.568		1.162	0.247
TK	0.118	0.117	0.207	1.112	0.266
PK	0.131	0.217	0.372	1.659	0.101
CK	0.141	0.125	0.268	1.701	0.091
TPK	0.114	0.124	0.175	0.626	0.533
TCK	0.112	0.122	0.158	0.544	0.587
PCK	0.147	0.118	0.374	2.411	0.017
TPACK	0.123	0.121	0.124	1.094	0.276

From the above table 4.1.1a is observed that the adjusted R Square value 0.049 indicates that 4.9% of the variance could be predicted that teaching experience of 5 years and below, 6-10 years and 11 years and above in their TPACK and its dimensionsof educators of teacher education program.

It is also inferred from the above table 4.1.1a shows that the multiple correlation co-efficient (0.092) shows that there is a low correlation found among TPACK and its dimensions and educators of teacher education program having teaching experience of 5 years and below, 6-10 years and 11 years and above.

It is learnt from the above table 4.1.1b found that the significant 'P' value 0.042 for ANOVA ('F' value= 2.150) indicates that educators of teacher education program having teaching experience of 5 years and below, 6-10 years and 11 years and above was differ in their influence on TPACK and its dimensions.

It is understood from the above table 4.1.1c is observed that the educators of teacher education program having teaching experience of 5 years and below, 6-10 years and 11 years and above was not significantly influences the TPACK and its dimensions.

13. Major Findings of the Study

1. There was no significant difference between men and women educators of teacher education program in their technological knowledge.
2. There was significant difference between men and women educators of teacher education program in their pedagogical knowledge, content knowledge, technological pedagogical knowledge, technological content knowledge, pedagogical content knowledge and technological pedagogical content knowledge.
3. There was no significant difference between educators of teacher education program taught perspective subjects and pedagogy subjects in their technological knowledge, technological pedagogical knowledge, technological content knowledge and technological pedagogical content knowledge.
4. There was significant difference between educators of teacher education program taught perspective subjects and pedagogy subjects in their pedagogical knowledge, content knowledge and pedagogical content knowledge.
5. There was no significant difference among educators of teacher education program age group among 30 years and below, 31-40 years and 40 years and above in their technological knowledge, pedagogical knowledge, content knowledge, technological pedagogical knowledge, technological content knowledge, pedagogical content knowledge and technological pedagogical content knowledge.
6. There was no significant influence of educators of teacher education program having teaching experience of 5 years and below, 6-10 years and 11 years and above in their TPACK and its dimensions.

14. Interpretation and Discussion

The 't' test results with regard to gender, demonstrated that there was no significant difference between men and women educators of teacher education program in their technological knowledge, whereas there was significant difference between men and women educators of teacher education program in their TPACK. The reason behind that,in present scenario the educators of teacher education program are familiar to fusion of technologies in their teaching. Also they equip him technologically competent and attend more conferences, faculty development programmes and webinars. The governments, educational policymakers and stakeholders are also insisting the teachers to develop their techno pedagogical skills through new innovations in their teaching learning process. The findings of the study conducted by **Piret Luik, Mere Taimalu and Reelika Suviste (2018)** concurred with this finding that the differences in perceptions of technological pedagogical content knowledge of men and women pre-service teachers. Also the finding of the study conducted by **Hosseini, Z., & Anand, K. (2013)** in accordance with the present research that there exist significant difference found between the perceptions of men and women teachers. Similarly, **Duygu Cetin-Berber and Ali RizaErdem (2015)** revealed that there was significant difference among pre-service teachers'

perceptions of the technological pedagogical content knowledge where examined across gender, program and field of experience.

On the other side the study conducted by **ShibliNaaz and ZebunNisa Khan (2018)**both men and women teachers differ in their technological knowledge, but overall technological pedagogical content knowledge of pre-service teachers had not differed on the basis of gender.Likewise, the study conducted by **Sandip Kumar and Elizabeth Gangmei (2018)** revealed that men and womeneducators of teacher education program wasfound between them no difference in their TPACK.

15. Conclusion

Today's technology advancements, educational contexts should take advantage of innovative pedagogy and digital rich tools for deeper content exploration, ease of classroom management, engagement and motivation of students in learning contexts, and generally revolutionizing the learning spaces of old to meet the learning needs of today's students. It is logical to think that classrooms equipped with chalk and erasers, fixed rows of desks, and behavioral pedagogy would have yielded to changes caused by the technological advancements; however, despite the addition of digital tools, educational practices have changed little in the global context of educating youth.

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