

Technological Pedagogical Content Knowledge of Science Teachers at Higher Secondary Stage in Covid Era

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INTRODUCTION

Every change society takes a long time. Throughout last two decades the use of technology in teaching learning process has been going through a lot of changes worldwide. Now a day everyone is using technology in their day today life. But when it comes to teaching-learning process, it has become a big headache for teachers to learn and integrate technology in classroom. There are instances that now a day's government policies are interested and ready to invest in order to integrate technology on classroom but most of the teachers are not interested to learn new practices and change their traditional instruction method which they are used to throughout many years. The novice teachers are may be considered to have more technological knowledge comparatively to experienced teachers. Only use of instructional technology is not enough the teacher needs to have a clear idea of the subject matter and pedagogical knowledge.

Agyei and Voogt (2012) has stated that using technology in classroom is should be considered as a mean not an end of the process. The research indicates that the acquired teaching years or experience has nothing to do in the TPACK of the teachers.

TPACK is an emerging concept since last two decade and many governmental policies and educational plans has been adopted in order to enhance the technological integration in the classroom. But still the practice is not enough as the contribution of such polices did not noticeable in present day practice. Government has provide so much thing such as smart board, PC and may other instructional materials to the classroom.

STATEMENT OF THE PROBLEM

The entitle of the present study is the Technological Pedagogical Content Knowledge of Science Teachers at Higher Secondary Stage in Covid era.

OBJECTIVES OF THE STUDY

Based on the above rationale and research gap the following objectives have been formulated:

1. To study the Technological Pedagogical Content Knowledge of Science Teachers at Higher Secondary stage
2. To study the of Technological Pedagogical Content Knowledge of science teachers at higher secondary stage with reference to their teaching experiences
3. To find out the differences in higher secondary science teachers' Technological Pedagogical Content Knowledge with reference to their gender

HYPOTHESES OF THE STUDY

1. There is no significant difference in the technological pedagogical content knowledge mean scores of novice and experienced science teachers at higher secondary stage.
2. There is no significant difference exists in the technological pedagogical content knowledge mean scores of male and female science teachers at higher secondary stage.

METHODOLOGY

The present investigation was undertaken by using normative survey method. The survey method gathers data from a relatively large number of cases at a particular time.

SAMPLE OF THE STUDY

For this study 20 Higher Secondary schools were selected by using lottery method through simple random sampling technique. In these 254 Higher school Teachers who were present on the specific day have been consider for this study utilizing the cluster sampling technique.

TOOLS

TPACK is based on the effectiveness of the teacher to efficiently integrate three factors such as technology, content and teaching learning process. A Likert scale and an observation checklist have been adapted by the researcher in order to collect the required data.

Some items have not been adopted from the above tools as they will not contribute data towards the proposed study.

Here, the researcher has adapted a Likert scale having 32 statements under 7 domains. The survey adopted a 5-point Likert scale that asks teachers to assess their own knowledge in each of the domains in the TPACK framework. The required data has been collected from respondents by visiting the concerned sites physically. In order to evaluate teachers own knowledge in each of the domains, the teachers has ranked their response based on a 5 point rating scale.

STATISTICAL TECHNIQUES

The data collected from higher secondary stage teachers through observation checklist analyzed by using statistical techniques like t-test and percentage table.

ANALYSIS OF DATA

Hypothesis 1 states, “There is no significant difference in the technological pedagogical content knowledge mean scores of novice and experienced science teachers at higher secondary stage.”

In order to test this hypothesis table 1.1 has been prepared on the basis of the data collected through Likert scale which represents the number of teachers (N) mean score(M), SD, calculated t-value, table t-value, df and the level of significance of the novice and experienced science teachers of higher secondary stage.

TABLE 1.1: Significant difference in the TPACK of Novice and Experienced Science Teachers

Teaching Experience	Number of Teachers (N)	Mean	SD	Calculated t-value	Table t-value	df	Level of significance
Novice Teachers	128	135	15.39	1.34	1.97	200	0.05
Experienced Teachers	74	132	15.26				

It is clear from table 4.1 that the number of novice and experienced teachers from whom the data collected are 128 and 74 respectively. The mean score of the novice and experienced teachers are 135 and 132 respectively followed by the SD which is 15.39 and 15.26. The calculated t-value is 1.34 whereas the table t-value at 0.05 level of significance and 200 df is 1.97. To test this hypothesis table 1.1 has been prepared on the basis of the data collected through the observation checklist, which represents the number of teachers (N), mean score (M), SD, calculated t-value, table t-value, df and the level of significance of the novice and experienced science teachers of higher secondary stage.

TABLE 1.2 : Significant difference in the TPACK of Novice and Experienced Science Teachers

Teaching Experience	Number of Teachers (N)	Mean	SD	Calculated t-value	Table t-value	df	Level of significance
Novice Teachers	19	69.31	2.86	1.60	2.03	31	0.05
Experienced Teachers	14	70.96	3.02				

It is clear from table 1.2 that the number of the novice and experienced teachers from whom the data collected were 19 and 14 respectively. The mean score of the novice and experienced teachers are 69.31 and 70.96 respectively followed by the SD which is 2.86 and 3.02. The calculated t-value is 1.60, whereas the table t-value at 0.05 level of significance and 31 df is 2.03.

ANALYSIS OF HYPOTHESIS 2

Hypothesis 2 states, “There is no significant difference exists in the technological pedagogical content knowledge mean scores of male and female science teachers at higher secondary stage.”

To test this hypothesis, the researcher has collected data through two different tools such as, Likert scale and observation checklist.

In order to test this hypothesis table 2.2 has been prepared on the basis of the data collected through Likert scale which represents the number of teachers (N) mean score (M), SD, calculated t-value, table t-value, DF and the level of significance of the male and female science teachers of higher secondary stage.

Table 2.1 Significant difference in the TPACK of Male and Female Science Teachers

Gender	Number of Teachers (N)	Mean	SD	Calculated t-value	Table t-value	df	Level of significance
Male Teachers	114	134.12	16.11	0.46	1.97	200	0.05
Female Teachers	88	135	10.74				

It is clear from table 2.1 that the number of male and female teachers from whom the data collected are 114 and 88 respectively. The mean score of the male and female teachers are 134.12 and 135 respectively followed by the SD which is 16.11 and 10.74. The calculated t-value is 0.46 whereas the table t-value at 0.05 level of significance and 200 df is 1.97.

To test this hypothesis table 2.1 has been prepared on the basis of the data collected through the observation checklist, which represents the number of teachers (N), mean score (M), SD, calculated t-value, table t-value, df and the level of significance of the male and female science teachers of higher secondary stage.

Table 2.2 Significant difference in the TPACK of Male and Female Science Teachers

Gender	Number of	Mean	SD	Calculated t-	Table t-	df	Level of significance

	Teachers (N)			value	value		
Male Teachers	17	25.31	25.9 5	1.79	2.03	31	0.0 5
Female Teachers	16	70.81	2.9				

It is clear from table 2.2 that the number of the male and female teachers from whom the data collected are 17 and 16 respectively. The mean scores of the male and female teachers are 25.31 and 70.81 respectively followed by the SD which is 25.95 and 2.9. The calculated t-value is 1.79, whereas the table t-value at 0.05 level of significance and 31 df is 2.03.

Findings of the study

After interpreting the data carefully, the researcher gave some suggestion and recommendations. The final step of research needs critical thinking, analyzing and summarizing the collected data what has been interpreted in the previous steps and comparing them with the previously stated hypotheses. Based on analysis and interpretation of the collected data following conclusions have been drawn:

1. The study revealed that in, objective 1 states “To study the Technological Pedagogical Content Knowledge of Science Teachers at Higher Secondary stage”. It is clear from the data collected through Likert scale that, the average percentages of responses are 0%, 6.21%, 24.09%, 32.84% and 36.87% for strongly disagree, disagree, neither agree nor disagree, agree and strongly agree respectively. Here strongly disagree has the minimum of 0% average where strongly agree has the maximum average which is 36.87%. And the data collected through observation checklist shows that, the average percentages of responses collected through observation checklist are 0%, 4.75%, 32.81%, 31.8% and 30.62% for strongly disagree, disagree, neither agree nor disagree, agree and strongly agree respectively. Here strongly disagree has the minimum of 0% average where neither agree nor disagree has the maximum average which is 30.62%.

In the data collected through both the tools, average 0% response came in strongly disagree. In the response of disagree Likert scale shows its 6.21% where observation checklist shows its 4.75% response in average. In the response of neither agree nor disagree Likert scale shows its 24.09% where observation checklist shows its 32.82% response in average. In the response of agree Likert scale shows its 32.84% where observation checklist shows its 31.8% response in average. In the response of strongly agree Likert scale shows its 36.87% where observation checklist shows its 30.62% response in average.

2. The study revealed that, Hypothesis 1 states “There is no significant difference in the technological pedagogical content knowledge mean scores of novice and experienced teachers.” As the data collected through Likert scale states that the calculated t-value (1.43) is less than the table t-value (1.97)

$$1.43 < 1.97$$

So, the null hypothesis got accepted as the calculate t-value is less than the table t-value. On the other hand, the data collected through observation checklist states that the calculated t-value (1.60) is less than the table t-value (2.03).

$$1.60 < 2.03$$

So, the null hypothesis got accepted as the calculate t-value is less than the table t-value.

Data collected through both the tools conveys the same result.

Recommendations

The purpose of research is not just collecting data, interpreting data and drawing conclusions but also to make the research meaningful and useful, it is essential that the investigator puts forward recommendations which may help in bringing changes in the existing system. This study would help to provide information for classroom teachers and concerned authorities to enhance teacher efficacy of Secondary school teachers. In the light of the above findings, the investigator recommends the following things:

- 1) In-service training should be conducted for teachers to improve their technological and pedagogical efficacy.
- 2) Private schools should pay due salaries to teachers to maintain the dignity of profession by not exploring them with more work and less salaries.
- 3) It is recommended that organizational climate should fulfill the needs and aspirations of teaching professionals so that they can serve the society to their best.
- 4) Schools should arrange more and more in-service course for teachers for updating their teaching skills to improve their efficiency in teaching.
- 5) Government should modify the existing policies to make provisions for the quality and standard of the organization.

Suggestions for Further Research

Findings from this study suggest the following recommendations for future research:

1. Another study can be done to replicate this study but with larger populations, especially more experienced teachers, to confirm or deny the findings in this study.
2. A case study can be done on teachers to find out the problems in integrating technology with pedagogy and subject matter.
3. Replicate this study by categorizing the sample teachers into age groups rather than teaching experience.

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