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Relationship between Techno-pedagogical skills and teaching competency of secondary school teachers of Bengaluru

Jalajakshi B N
Research Scholar, Department of Education, Bangalore University
Email: jalajakshi.ashok@gmail.com

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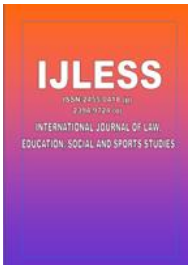


ABSTRACT

The present study investigates the relationship between techno-pedagogical skills and teaching competency of secondary school teachers in Bengaluru. Education in the 21st century demands teachers to integrate technology, pedagogy, and content effectively to enhance the learning experience. The concept of Techno-Pedagogical Content Knowledge (TPCK) highlights the necessity for teachers to possess skills that bridge content expertise, teaching strategies, and technology usage. This study utilizes a survey method to examine how secondary school teachers' techno-pedagogical skills correlate with their overall teaching competency. A sample of 220 secondary school teachers was selected using random sampling, and data was collected using two standardized tools: the Techno-Pedagogical Skill Assessment Scale by Sibichen KK and the Teaching Competency Scale by Dr. VimalVidushy. Pearson's product-moment correlation coefficient and t-tests were used for data analysis. The findings reveal a positive correlation between techno-pedagogical skills and teaching competency, indicating that teachers' proficiency in integrating technology into their teaching practices enhances their overall effectiveness. The study further shows that female teachers, science teachers, and those with less than five years of teaching experience exhibit higher techno-pedagogical skills. The results highlight the importance of incorporating technological skills into teacher training programs, emphasizing the need for ongoing professional development to effectively address the needs of 21st-century learners. The implications of the study suggest that techno-pedagogical skills enable teachers to design engaging lessons, personalize learning, and utilize innovative evaluation methods, ultimately improving teaching quality and student outcomes.

Keywords: Techno-pedagogical skills, teaching competency, secondary school teachers, technology integration, TPACK, 21st-century education.

Introduction:

Education is a multifaceted social construct that has undergone philosophical evolution and psychological development. It extends beyond mere instruction or knowledge transmission, encompassing the acquisition of practical skills. The concept of education is as ancient as humanity itself, attracting interest from diverse stakeholders including parents, educators, politicians, reformers, social workers, and religious leaders. Consequently, education has become an indispensable element of all human societies.

The success of the educational process is largely dependent on teachers, who serve as torchbearers in the learning journey. As Deepti and SeemaSirohi (2018) say, "The success of the learning process mainly depends on the ability of the teacher. Teacher is the main implementer of all educational policies. A teacher is one who shows or helps to learn how to do something or the one who guides the destiny of the students' committee to his care." This underscores the pivotal role of educators in shaping the educational experience and outcomes for their students.

To enhance the quality of education it is very imperative on the part of the teacher to inherit certain competencies. The amalgamation of knowledge and skill is perceived as competency. Teaching competency is the key to ensure that a teacher is teaching to a certain acceptable standard. "Teaching competence is those skills, concepts and attitudes needs by teacher for the act of instruction in the educational institution" (Good, 1973). A teacher need to possess teaching skills, mastery over content and positive attitude towards teaching profession, only then we can say that he or she is a competent teacher.

Teaching competency ensures that the performance of the teacher is being reflected in the performance of his or her student. It includes various dimensions like subject knowledge, pedagogy, communication skills, instructional practices, evaluation, problem-solving, professionalism, managerial skill, and many more. By attaining mastery over these skills a teacher can reach the learners most effectively.

The process of learning is being revolutionized in the 21st century and teaching is made suitable for learners' style of learning; it is a necessary on the part of the teacher to imbibe certain skills which are termed as 21st-century teaching skills. The learners of present generations have exposure unprecedented technological influence.

The educational technology can be utilized at secondary school where the secondary school teachers will be teaching the students belonging to adolescent group. The teachers will be dealing with highly volatile group of individuals. Students of this age group are very curious in nature. They are easily attracted towards distractions and technology is one such distraction for them. Adolescents use technology more for their personal use rather than academic use. But when a teacher makes use of technology for academic purposes the student's curiosity will be satisfied. A teacher has to be adept enough to manage these students with greater technology exposure and should possess necessary skills to strategically use the use technology. To integrate the technology effectivelyit needs an understanding of how ICT tools are related to the content and pedagogy part. Hence, along with content and pedagogy knowledge, it is imperative on the part of the teacher to possess technological knowledge as well. Only then he or she will be able to successfully integrate all three components; content, pedagogy and technology into classroom teaching.

Theoretical background:

Lee Shulman conceptualized the idea of pedagogical content knowledge(PCK) in the year 1986, where as, Mishra & Koehler in 2006, integrated one more important element called technology to embrace the contributions of technology to the field of teaching and termed it as Technological Pedagogical Content Knowledge that is abbreviated as TPACK. It is the knowledge required for the successful integration of technology in to the practice of teaching in the areas such as Content and Pedagogy. Hence a 21st

century teacher integrates technology into classroom teaching in order to facilitate learning, leading to upgradation in areas such as Content and Pedagogy. Andwhen teachers invite technology into their classrooms, they are inviting change in at least four areas at once. Content knowledge, pedagogical knowledge, pedagogical content knowledge, and techno-pedagogical knowledge (Koehler & Mishra, 2008)

Need and Importance of the study:

Technology has a greater impact on pedagogy; the art-science of teaching, Content; the matter to be taught (Sibichen KK, 2010). Hence the knowledge of technology is very essential to a class room teacher. Technology can promote universal access to education, render quality education, encourage the teaching fraternity towards their professional development, capable of addressing various needs of all types of learners and many more. In this regard, the impact of technology on teaching and learning is immeasurable. Mishra and Kohler combined two major elements namely Content and Pedagogy with Technology by sensing distinct contributions of technology. They were also being considerate about the importance of knowledge of technology to a class room teacher and to know its usage in pedagogy and content area.

It has become an obligation on the part of a teacher to possess techno-pedagogical skill to use technology in the process of transaction effortlessly. The techno-pedagogy skill has become the need of the hour which enables a teacher to effectively use techno-pedagogical skills to bring potential changes in the process of education.

By possessing techno-pedagogical skill a teacher can plan the lesson effectively, acquire knowledge for personal development, prepare appropriate teaching learning material, plan appropriate instructional strategy, assessment, and guide students in technology mediated environment.

This study is significant in this regard as it determines the existing relationship between techno-pedagogical skills and teaching competency of secondary school teachers.

Review of Related Literature:

Several studies have explored the role of techno-pedagogical skills in teaching effectiveness. Ngemunga and Lyonga (2018) in HTTTC Kumba, found a significant positive relationship between techno-pedagogical skills and teacher performance, Cameroon, using a multistage sampling technique and a self-made 4-point Likert scale. Yildiz, A. (2018) focused on pre-service mathematics teachers and revealed moderate levels of techno-pedagogical and critical thinking skills, based on TPACK self-efficacy and critical thinking scales. Scaria and Sumy M (2016) developed a package on blended learning to enhance the achievement of B.Edstudents and their techno-pedagogical kills, finding positive effects through a combination of qualitative and quantitative methods. Jeyaraj and Ramnath (2018) discovered moderate levels of Technological Pedagogical and Content Knowledge (TPACK) among B.Ed students, analyzed using SPSS. Boopathiraj, C. (2015)demonstrated that incorporating techno-pedagogical principles in e-learning portfolios significantly improved PG student teachers' attitudes and awareness, as shown by pre- and post-test comparisons. Thakur (2015) highlighted challenges in implementing techno-pedagogical skills in higher education, with a mixed-methods study emphasizing obstacles to adoption. Sibichen and Gopalakrishnan (2014) found no significant differences in techno-pedagogical skills across B.Ed students specializing in different subjects, whileBala and Tao (2018) revealed a significant negative relationship between techno-pedagogical competency and anxiety towards instructional aids among higher secondary teachers. Sibichen (2011) identified a significant relationship between techno-pedagogical skills and thinking skills among B.Ed students.

Several studies have examined the relationship between teaching competency and various factors among teachers. Riyameka (2018) found a significant relationship between teaching competency,

attitude, and interest in teaching among secondary school teachers, using descriptive methods and statistical tools such as t-test and correlation. Similarly, Jarrar Ahmad (2016) discovered a positive correlation between teaching competency, teaching aptitude, emotional intelligence, and adjustment in secondary school teachers. AnaleneRoxas (2015) focused on teaching competencies among mathematics professors in higher education institutions, finding that most professors were rated as "Very Satisfactory" in their competencies. Khatoon, Azeem, and Akhtar (2011) examined teaching competency at the secondary school level in Pakistan, highlighting socio-cultural challenges and the impact of professional jealousy on teaching effectiveness. Augustine (2010) found a significant positive relationship between teaching competency and teaching aptitude among student teachers, though no consistent relationship was found between academic background and teaching aptitude. Daniel and Alexander (2006) explored science teaching competency in relation to self-efficacy, finding a significant relationship between the two among primary school teachers, but no significant gender, locality, or marital status differences. Reethi Chauhan and Prathiba Gupta (2014) observed that female teachers showed higher teaching competency than male teachers at the secondary school level. Kaur and Talwar (2014) discovered a significant positive relationship between teaching competency and emotional intelligence among secondary school teachers. Kulkarni (2011) found a positive relationship between teaching competence and attitude toward teaching among B.Ed. trained teachers. Selvam (2010) found no significant difference in teaching competency and job satisfaction among high school teachers, nor between government and non-government school teachers. Lastly, Shukla (2014) revealed a very low correlation between teaching competency and job satisfaction among primary school teachers, with a higher correlation between professional commitment and job satisfaction.

Techno-pedagogical skill is most essential for a 21st century classroom teacher. It acts as scaffold for a teacher to discharge his or her duties effectively. Many studies have been conducted on techno-pedagogical skills but the investigator found out after reviewing several research reports and journals that, there are certain questions which are not answered in the previously conducted study. There are no studies which establish a relationship between techno-pedagogical skills and teaching competency of teachers. This was identified as a research gap by the investigator. The present study differs from the rest as there is no study undertaken so far which has investigated the relationship between variables like techno-pedagogical skills and teaching competency of secondary school teachers. Therefore, the present study is the first of its kind in this regard.

Objectives:

To find out the relationship between techno-pedagogical skills and teaching competency of secondary school teachers.

To find out the difference between male and female teachers of secondary school in their techno-pedagogical skills

To find out the difference between science and arts teachers of secondary school in their techno-pedagogical skills.

To find out the difference among secondary school teachers having less than 5 years of experience and more than 5 years of experience in their techno-pedagogical skills.

Hypothesis:

There is no significant relationship between techno-pedagogical skills and teaching competency of secondary school teachers

There is no significant difference in Techno-pedagogical skills among male and female teachers of secondary school.

There is no significant difference in their Techno-pedagogical skills among science and arts teachers of secondary school.

There is no significant difference in their Techno-pedagogical skills among teachers with more than 5 years of experience and less than 5 years of experience.

Methodology:

The method adopted in the present study is survey method.

Population and sample of the study:

In the present study secondary school teachers of Bengaluru are the population and through purposive sampling technique the researcher has selected 220 samples who are representatives of the population.

Tools used for collection of Data:

With the intention of analyzing the relationship between Techno-pedagogical skills and teaching competency of secondary school teachers, the researcher has used following tools,

- Techno-pedagogical skill of the secondary school teachers was measured using Techno-pedagogical skill assessment scale developed and standardized by SIBICHEN KK.
- To measure the teaching competency of secondary school teachers a standardized tool developed by Dr. VimalVidushy was used.

Design of the study:

In the present study Descriptive Survey method was adopted to know the extent of relationship existing between techno-pedagogical skills and teaching competency of secondary school teachers. Pearson product moment correlation was used as statistical technique to study the relationship between the variables. Sex, steam of education and teaching experience were taken as confounding variables. Two standardized tools were used to collect the data.

Analysis and Interpretation:

It has been already stated that the purpose of this investigation is to study the relationship between techno-pedagogical skills and teaching competency of secondary school teachers. The Techno-pedagogical skill is considered as the Independent variable and Teaching competency is the dependent variable. Hypotheses were tested by making use of Pearson's product moment coefficient of correlation and student t-test. The level of significance at 0.01 and 0.05 levels was checked against the obtained value on the basis of which the null hypothesis was accepted or an alternate hypothesis was formulated.

Ho 1: There is no significant relationship between techno-pedagogical skills and teaching competency of secondary school teachers.

The above stated hypothesis was tested using Pearson's product moment coefficient of correlation by making use of MS Excel software. The result pertaining to this hypothesis is presented in the following table.

Table-1: Coefficient of correlation between techno-pedagogical skills and teaching competency of secondary school teachers

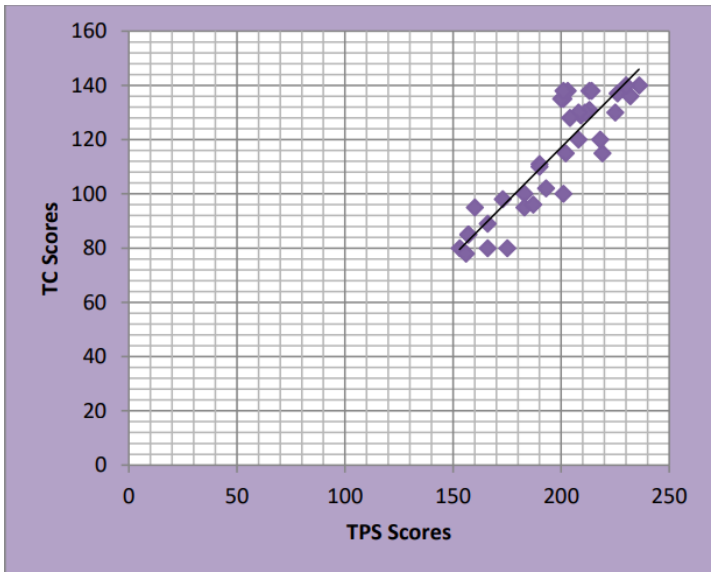
Variables	**N**	**df**	**'r' value**	**Significance**
Techno-Pedagogical skills	220	218	0.79	**
Teaching Competency	220	218		

The above table reveals that the obtained r value (0.79) is greater than the table value(0.25) for the degrees of freedom (58) at 0.01 level of significance(Table value taken from statisticssolution.com). Hence the null hypothesis stating that, "There is no significant relationship between techno-pedagogical skills and teaching competency of secondary school teachers" is rejected. And the alternate hypothesis, "There is a significant and positive relationship between techno-pedagogical skills and teaching competency of secondary school teachers" is formulated.

On the basis of above findings, it can be concluded that there is a positive relationship between techno-pedagogical skills and teaching competency of secondary school teachers. This may be due to technology is enhancing the competence of teachers because of its wide applicability in the field of education.

The following scatter plot is plotted on a MS Excel sheet by taking techno-pedagogical skills scores on x-axis and teaching competency scores on y-axis. The scatter diagram shows an uphill pattern as one move from left to right. This indicates a positive relationship between X (Techno-pedagogical skills) and Y (Teaching Competency). As the X-values increase (move right), the Y-values tend to increase (move up). This concludes that as the techno-pedagogical skills increases, the teaching competency also increases.

Graph-1: Scatter plot showing the relationship between techno-pedagogical skills and teaching competency of secondary school teachers



Ho 2: There is no significant difference in Techno-pedagogical skills among male and female teachers of secondary school.

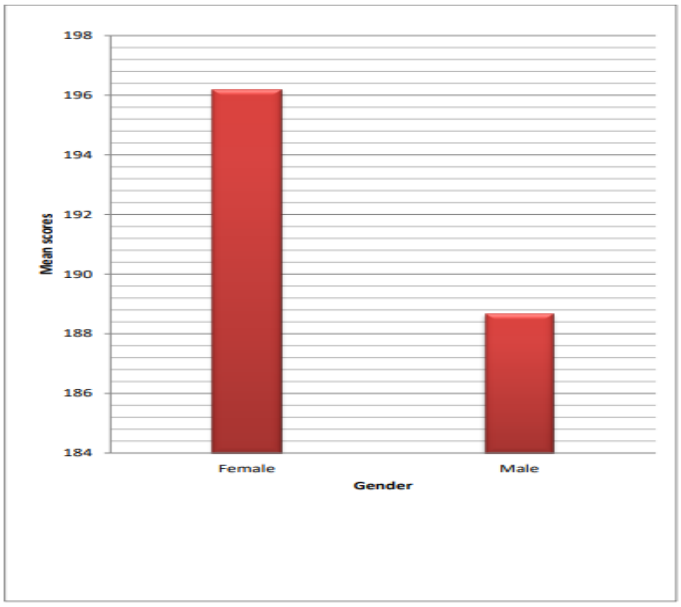
The above-mentioned hypothesis was tested using a t-test. The results related to this hypothesis are presented in the table below.

Table-2: Result of t-test among male and female secondary school teachers in their techno-pedagogical skills

Variable	Groups	N	Mean	SD	't' value	Significance level
Sex	Male	83	188.66	20.76	1.29	Not Significant
	Female	137	196.19	23.71		

The above table shows that the obtained t- value (1.29) is lesser than the table value (2.75) at 0.01 level of significance. Hence the null hypothesis "There is no significant difference in Techno-pedagogical skills among male and female teachers of secondary school" is accepted.

The table further reveals that the techno-pedagogical skills of female teachers (M=196.19) is higher than male teachers (188.66). The same is represented in the form of a graph.



Ho 3: There is no significant difference in techno-pedagogical skills among science and arts teachers of secondary school.

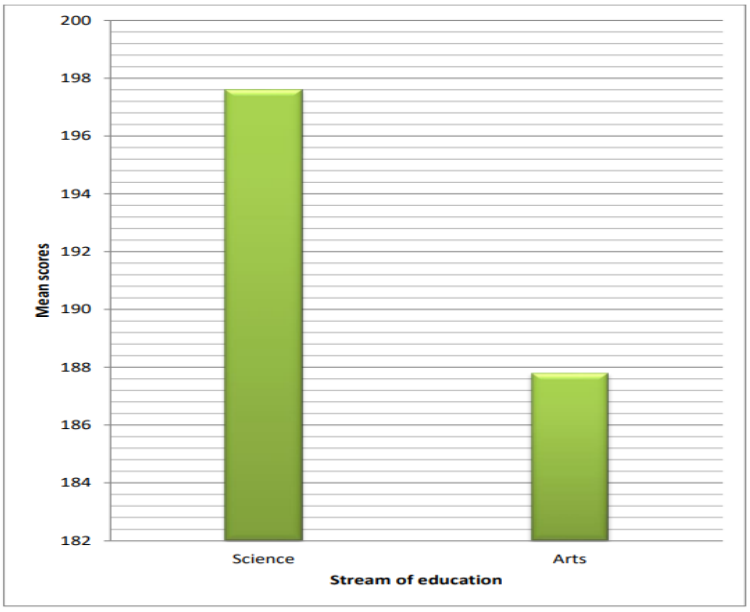
The above stated hypothesis was tested using t-test. The result pertaining to this hypothesis is presented in the following table.

Table-3: Result of t-test among science and arts secondary school teachers in their techno-pedagogical skills

Variable	Groups	N	Mean	SD	't' value	Significance level
Stream of education	Science	112	196	17.5	3.12	**
	Arts	108	188	19.31		

The above table shows that the obtained t- value 3.12 is greater than the table value (2.75) at 0.01 level of significance. Hence the null hypothesis "There is no significant difference in Techno-pedagogical skills among science and arts teachers of secondary school" is rejected. An alternate hypothesis stating "There is a significant difference in Techno-pedagogical skills among science and arts teachers of secondary school" is formulated.

The table further reveals that the techno-pedagogical skills of science teachers (M=196) is higher than arts teachers (188). The same is represented in the form of graph as shown below.



Ho 4: There is no significant difference in Techno-pedagogical skills among teachers with more than 5 years of experience and less than 5 years of experience.

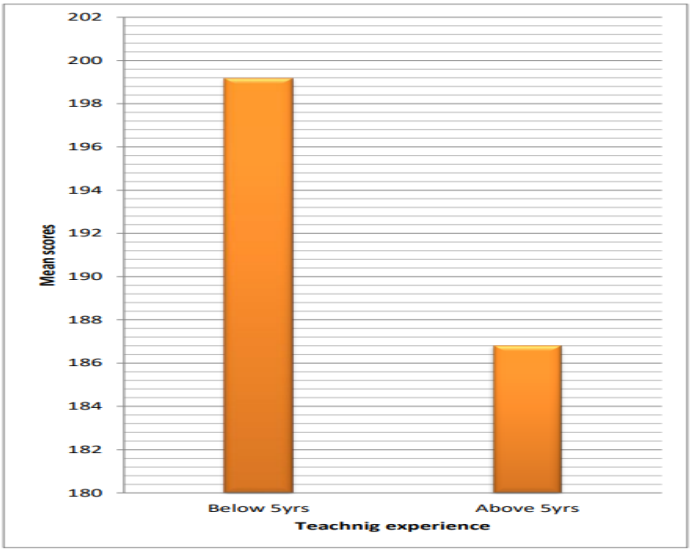
The above stated hypothesis was tested using t-test. The result pertaining to this hypothesis is presented in the following table.

Table 4: Result of t-test among teachers with more than 5 years of experience and less than 5 years of experience in their techno-pedagogical skills

Variable	Groups	N	Mean	SD	't' value	Significance level
Teaching experience	Below 5yrs	98	198	20.1	2.16	*
	Above 5yrs	122	187	18.2		

The above table shows that the obtained t- value 2.16 is greater than the table value (2.05) at 0.05 level of significance. Hence the null hypothesis "There is no significant difference in Techno-pedagogical skills among teachers with more than 5 years of experience and less than 5 years of experience" is rejected and an alternate hypothesis "There is significant difference in Techno-pedagogical skills among teachers with more than 5 years of experience and less than 5 years of experience" is formulated.

The table further reveals that the techno-pedagogical skills of teachers with below 5 years of teaching experience (M=198) is higher than the teachers with above 5 years of teaching experience (187).The same is represented in the form of graph as shown below.



Findings of the study:

The results reveal that there is a strong and positive correlation between techno-pedagogical skills and teaching competency of secondary school teachers. This may be due to the fact that technology integration in to classroom teaching has gained huge scope in recent times and teachers are becoming more aware of technology usage to assist their classroom teaching. Moreover, the rapid expansion of Information and Communication Technologies (ICTs) has transformed learners into digital natives, necessitating teachers to integrate technology into their pedagogical approaches (Akram et al., 2022). Since there are various technological resources available with easy to comprehend instructions, many teachers have acquainted themselves with using technological gadgets and software for the benefit of learners. For instance, teachers with student-centric technology activities tend to have student-centric pedagogical practices in other areas as well (Ruggiero &Mong, 2015).

Irrespective of the gender, teachers are indulging in various activities to enhance their techno-pedagogical skills. And there exists no difference in the techno-pedagogical skills of male and female teachers. Some studies found no significant gender differences in technological, pedagogical, and content knowledge (TPACK) (Li, 2023)

There is no significant difference between the techno-pedagogical skills of science and arts teachers. This may be due to the fact that in all the subjects of secondary school, teachers can select appropriate technological tool to design their lessons to make the concepts interesting, provide variety in teaching, and address the needs of students with different learning styles. By enhancing their TPACK, teachers can make more conscious, strategic, and varied choices in selecting and using learning activities and technologies, ultimately leading to more engaging and effective instruction across all secondary school subjects (Harris & Hofer, 2011). Research indicates that teachers in different subject areas use digital technologies in distinct ways to support teaching and learning, reflecting the unique conventions and expectations of each discipline (Howard et al., 2015).

The study reveals that there is a significant difference between the techno-pedagogical skills of teachers with above and below 5 years of experience. Teachers having below five years of experience have better techno-pedagogical skills compared to teachers with above five years of experience. This may be due to the fact that the teachers with below 5 years of experience have completed their teacher training program in recent years and have exposure to subjects like Information and Communication Technology and Educational Technology. It can also be due to the fact that they grew up with immense exposure to technology and find it easy to adopt it in their regular teaching practices.However, it is important to note that factors such as professional development, individual attitudes, and school

support play significant roles in teachers' technology integration, regardless of their years of experience (Bowman et al., 2020; Han et al., 2017; Peng et al., 2023).

Educational implications:

The main aim of education is to bring about desirable changes in the behavior of the learners.

- Techno-pedagogical skill assists teachers in realizing educational aims effectively.
- Teachers can carry out need analysis to introduce technologies in pedagogical sequence.
- Teachers can design their lesson plans and activities/tasks accordingly.
- Depending on the nature of the subject teachers can integrate interactive technologies to enhance the curiosity of the learners.
- With the help of techno-pedagogical skills teachers can enhance their general teaching competency.
- Techno-pedagogical skills help a classroom teacher to address the individual needs of learner and provide personalized instruction.
- Techno-pedagogical skill of a classroom teacher helps him or her to plan and adopt innovative evaluation procedure.
- Teachers with techno-pedagogical skill will be highly competent in managing the students with immense technology exposure and sensitize them about cybercrime and internet abuse.

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