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A STUDY OF EFFECTIVENESS OF TPACK (TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE) BASED SCHOOL EXPERIENCE PROGRAMME ON ACADEMIC ACHIEVEMENT OF STUDENTS AT ELEMENTARY LEVEL

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ABSTRACT

The purpose of this study was to study the Effectiveness of TPACK (Technological Pedagogical Content Knowledge) based School Experience Programme (SEP) on Academic Achievement of students at elementary level. 6 SEP schools were randomly selected and from the 6 schools, the 240 students of class 8 were randomly selected. Thestudyused randomized matched two group, post-test design as well as descriptive survey method. Data collected were analysed by Mean, S.D and paired t test. Findings showed that TPACK based SEP was effective in enhancing the academic achievement scores in social science subject of the 8th class students.

Keywords- *Pre- ServiceTeachers, Technological Pedagogical and Content Knowledge (TPACK), Academic Achievement, Students, School Experience Programme*

PRE-SERVICE TEACHER EDUCATION

Pre-service teacher education is crucial for future educators to guide student learning and execute quality lessons. Diploma in Elementary Education (D.El.Ed.) programs aim to keep educators updated on the latest findings, best practices, and trends in education, ensuring they stay up-to-date with the latest innovations.

SCHOOL EXPERIENCE PROGRAM FOR PRE-SERVICE TEACHERS

An integral part of every teacher preparation program, internships allow future educators to put what they've learned in the classroom into practice.

Objectives of School Experience program:

The School Experience Program in schools aims to provide mentorship, develop reflective practice, and prepare future educators for the classroom by fostering a supportive environment, encouraging critical thinking, and fostering a professional identity and dedication to lifelong learning.

Structure of School Experience program:

School Experience program can take many forms, with different structures needed for different institutions, aims, and partnerships between schools and universities.

Orientation is a crucial process for incoming teachers, where they learn about the school's rules, expectations, course material, and student demographics. They are paired with mentor teachers and assigned to classrooms based on their subject area, grade level, and

expertise. They gradually take on teaching responsibilities, receive constructive feedback, and develop their portfolios to showcase their progress.

SCHOOL EXPERIENCE PROGRAMME (SEP) in DELHI, DIET's.

The SEP is a 40-day program organized in three phases: 05 days in September, 20 days in October-November, and 15 days in January-February. The third phase is a rotation phase for teacher educators to provide expertise and uniformity in assessment. An orientation program for 05 days is organized by the institute.

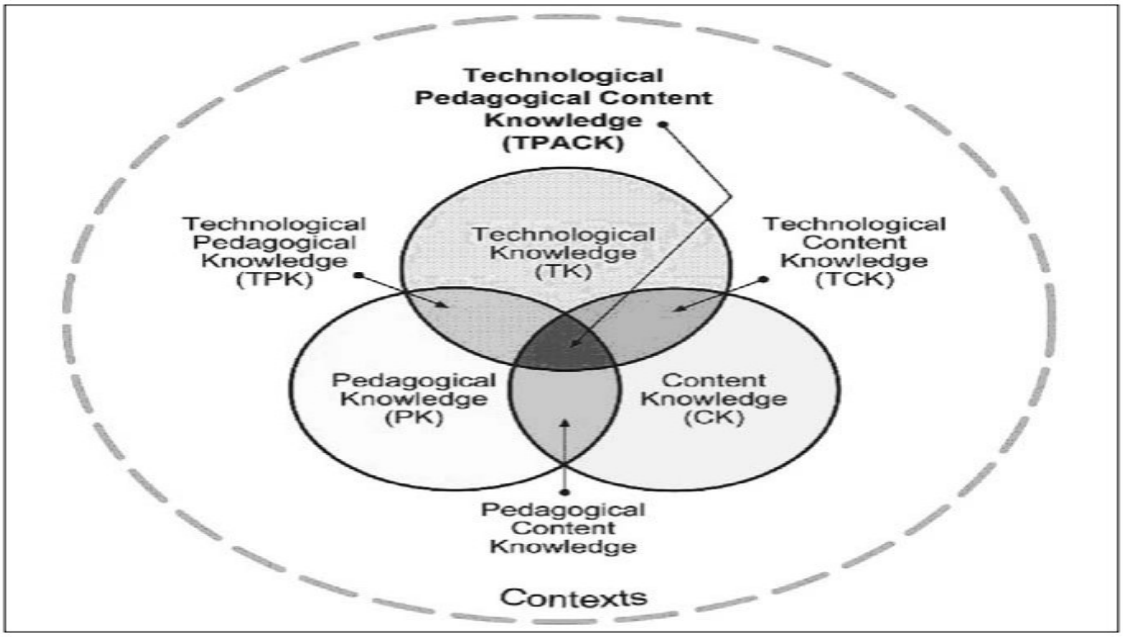
ROLE OF TECHNOLOGY IN TEACHING LEARNING PROGRAMME

The importance of technology in the classroom has increased, leading to the focus on Diploma in Elementary Education (D.El.Ed.) programs on its use. A well-rounded education requires technical knowledge (TK) and other skills, with TPACK (Technological, Pedagogical, and Content Knowledge) being crucial for effective classroom management.

TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE (TPACK)

Mishra and Koehler (2006) introduced the TPACK paradigm in education and training programs, focusing on understanding technology representation, pedagogical techniques, learning challenges, and students' prior knowledge to effectively utilize technology in education and training.

The TPACK framework aids in understanding the interconnectedness of subject matter expertise, instructional strategies, and technical resources, fostering an innate understanding of effective teaching methods. Given below Figure shows the seven subcomponents that make up the TPACK architecture.



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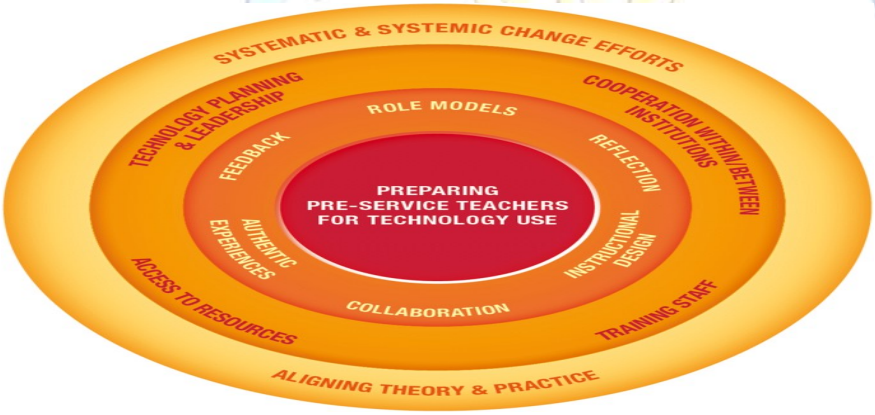
TPACK framework

1. Tech savvy: Being tech knowledgeable means being comfortable with both analog and digital tools. Analog tools include things like pencil and paper, while digital tools include things like the Internet, digital video, interactive whiteboards, and computer programs.
2. Content Knowledge (CK): Teachers should be well-versed in both the topics they intend to teach and the various pedagogical approaches used to impart that information.
3. Pedagogical knowledge (PK): Teachers require PK in order to do things like manage a classroom, assess their own performance, design engaging lessons, and monitor their students' development.
4. Pedagogical content knowledge (PCK): "Pedagogical content knowledge" refers to an understanding of best teaching practices, combining subject matter expertise with pedagogical knowledge to improve teaching methods in specific topics.
5. Technical content knowledge (TCK): TCK involves teachers using information technology to analyze data in various ways, recognizing how technology can revolutionize students' learning approaches in a specific field.
6. Technological pedagogical knowledge (TPK): One aspect of "technological pedagogical knowledge" is being aware of how technology might change the way educators teach.
7. Technological pedagogical content knowledge (TPACK): Teachers need TPACK to effectively integrate technology into their courses, understanding the interplay of CK, PK, and TK. They can share this knowledge with students through appropriate pedagogical approaches and technical resources in the classroom.

ROLE OF TPACK IN SCHOOL EXPERIENCE PROGRAM FOR PRE-SERVICE TEACHER

The TPACK framework, a key component of the School Experience Program, enables the integration of subject matter knowledge, pedagogy, and technology in classroom practice.



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EFFECTIVENESS OF TPACK FOR TEACHERS

TPACK equips future educators with strategic technology use to enhance pedagogical practices and subject learning. It helps them choose and use digital materials effectively, employ multimedia presentations, and create pedagogical plans that cater to diverse student needs and learning styles.

Internships enable future educators to integrate technology into lessons, sparking student interest and enabling differentiation of instruction, catering to students' skill levels and interests.

SIGNIFICANCE OF THE STUDY

The primary purpose of the present study was to assess the TPACK skills among pre-service teachers studying in District Institute of Education and Trainings in the State of Delhi (India). There is a need to equip pre-service teachers' education programme with the knowledge and skills required to integrate technology into the classroom. However, survey of literature suggests that no study was conducted on the effectiveness of the TPACK based school experience programme on academic achievement of students at elementary level in the district SW-B of the state Delhi.

Due to the above discussions, following statement of the study was finalised.

STATEMENT OF PROBLEM

A study of Effectiveness of TPACK based School Experience Programme on Academic Achievement of Students at Elementary Level.

RESEARCH QUESTION OF THE STUDY

1. Is there any effect of TPACK based SEP of D.El.Ed pre-service teachers on the academic achievement in social science subject of class 8^{th} students?

OBJECTIVE OF THE STUDY

In the light of the significance of the study and keeping in view of the research questions, following objectives were framed.

1. To study the effectiveness of TPACK based school experience based in terms of academic achievement of students in social science subject of class 8^{th}.

HYPOTHESIS OF THE STUDY

There is no significant difference between the post- tests mean score of students who experienced TPACK based SEP and Non TPACK based SEP.

DELIMITATION OF THE STUDY

- The study was delimited to the social science D.El.Ed. Students of 2^{nd} year of Delhi DIET Ghumanhera, South-West -B.
- The study was conducted on middle stage student (class 8^{th}).
- Standardized the academic achievement test of social science on small sample of students.

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REVIEW OF RELATED LITERATURE:

The study by **Alshehri (2012)** found that teachers highly evaluate their TPACK (Technological, Pedagogical, and Content Knowledge) and their professional preparation to integrate technology. Teachers rated their general mathematics content knowledge (CK) at 3.7, pedagogy knowledge (PK) at 4.1, technology knowledge (TK) at 3.6, pedagogical knowledge within mathematics content (PCK) at 4.4, technological knowledge within pedagogical knowledge (TPK) at 3.7, technological pedagogical and content knowledge (TPK) at 3.7, and cumulative knowledge of technology, pedagogy, and content at 3.8. Principals rated their teachers' overall effectiveness at 3.11 and their usage of technology at 2.84.

Mouza, C., Karchmer-Klein, R., Nandakumar, R., Ozden, S. Y., & Hu, L. (2014) explored an integrated pedagogical approach to enhance preservice teachers' learning on technology use and its impact on their knowledge(TPACK) and practice. Results show that participants applied their knowledge in practice, although there was variability in knowledge domain representation.

The study by Akturk and Ozturk (2019) examined the correlation between teachers' TPACK levels, students' self-efficacy, and academic achievement. It found that academic self-efficacy, influenced by teachers' TPACK levels, accounts for 12% of students' academic achievement. The impact of teachers' TPACK levels was found to be more significant than students' social and emotional self-efficacy.

The study by Lachner et al. (2021) found that pre-service teachers in TPACK-module courses acquired more TPACK than those without, and their technology-related self-efficacy and perceived support for technology integration increased. The study underscores the need for adequate support for pre-service teachers' development of technology-related professional knowledge and motivation in teacher education programs.

The study by Merono, Calderón, and Arias-Estero (2021) investigates the impact of Technological Pedagogical Content Knowledge (TPACK) model and cooperative learning (CL) on preservice teachers' perception of TPACK and academic achievement. The findings suggest that digital pedagogies based on TPACK and CL can enhance preservice teachers' TPACK and academic performance, thereby enhancing their digital competence.

The study by Chaidam and Poonputta (2022) aimed to develop lesson plans for "Weight and Measurement" of Mathematics using Problem-Based Learning on TPACK MODEL. The study found that the efficiency of the lesson plans was higher than the established criteria, and the students' learning achievement was significantly higher after using the model. Additionally, the overall satisfaction of the students with the model was high. The study highlights the potential of Problem-Based Learning on TPACK MODEL in improving students' learning outcomes.

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The study by Sintawati et al. (2022) examined the impact of Project-Based Learning (PjBL) on Teacher-Proficient Communication (TPCK) in pre-service elementary school teachers. The results showed high TPCK, and PjBL significantly improved it, indicating its potential for TPCK development.

Tanjung's (2022)research investigates the impact of the Problem Based Learning (PBL) Model and the Technological, Pedagogical, and Content Knowledge (TPACK) Approach on the historical learning outcomes of high school students.

RESEARCH METHODOLOGY

POPULATION

The population of the study constitutes all the pre-service teachers and students of elementary level from government schools of South-West B Delhi.

SAMPLE

A sample is a subset of the population that is chosen to participate in the study. Before collecting data, it becomes important to think about sampling. An accurateandre presentative sample is pre requisite for precise results.

A. Sample of school students

DIET involved 35 SEP schools of Directorate of Education of Delhi (DOE) from which 6 SEP schools were randomly selected. From the 6 schools, the 240 students of class 8 (40x6) were randomly selected. On the basis of the pre-test scores and to form the experimental and control groups using randomized block design, 190 students of class 8 were finally selected as sample for the present study.

B. **Sample of pre-service student teachers**

66 pre-service student teachers of the DIET opted for the subject teaching of social science in second year. 66 student teachers were given TTPACK (Hemant Lata Sharma and Leena Sharma) and SES (Kalia and Sahu 2012) questionnaires and used as sample of the study.

From the 6 SEP schools selected above,4 pre-service teachers were randomly selected from the 6 SEP schools. Therefore, 24 pre-service teachers were selected as another sample group for the study.

RESEARCH DESIGN

Thepresentstudyused mix method approach using both quantitative and qualitative.

Thestudyused randomized matched two group, post-test design as well as descriptive survey method.

TOOLS USED

STANDARDIZED TESTAND SELF-DEVELOPED TOOLS

1. TTPACK Scale (Sharma and Sharma 2017)
2. Socio-Economic Status Scale Kalia and Sahu (2012)
3. Academic Achievement test of social Science
4. Lesson Plan based on TPACK.

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5. Lesson Plan based on traditional teaching method

1. TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE SCALE

The researcher used the Technological Pedagogical Content Knowledge Scale (Sharma and Sharma 2017) to measure the Technological Pedagogical Content Knowledge of student teachers. The total number of items of the scale is 55. There was no time limit for administering the Technological Pedagogical content knowledge scale. Cronbach alpha of the scale is 0.976.

Scoring Procedure

The scoring system for all alternatives or responses is the same (i.e. 5, 4, 3, 2, and 1) whether the items are positive or negative. Answers are having five alternatives. If respondent provides 5, 4,3,2,1 for the 1st and 2nd 3rd4th and 5th alternative then that will be the score correspondingly.

2. SOCIO –ECONOMIC STATUS SCALE (SESS-UR)

Test Description

The investigator used the Hindi version of the socio-economic status scale (SESS) developed and standardized by Dr. Ashok K. Kaliya and Dr.Sudhir Sahu to assess the socio-economic status of the students in the study.

- Dimension 1: Socio-cultural;
- Dimension 2: Economic;
- Dimension 3: Possession of goods and services;
- Dimension 4: Health;
- Dimension 5: Educational

3.ACHIEVEMENT TEST

Validity

Validity of the test was established by conducting the content validity by the 6 experts of the field.

Reliability

The reliability of the test was found by the KR 20 formula method as 0.896 and through split half method modified by Spearman Brown prophecy formula as 0.912.

4. TPACK BASED LESSON PLAN

Social science is a crucial subject in school education, but many students find it boring. Learner-friendly pedagogy using ICT can make it interesting and engaging, connecting students to real-world situations. Technology enhances learning experiences, organizes learning, and develops skills. TPACK-based lesson plans aid in understanding social science concepts.

5. LESSON PLAN BASED ON CONVENTIONAL TEACHING METHODS

Instructional material for 8th grade social science chapters was developed using RCEM methodology, including data collection, objectives, aids, assumptions, testing, subject declaration, presentation, summary, and assignments.

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ADMINISTRATION OF THE TOOLS

Administration of the Pre- test to school students

The investigator communicated with the students to set their expectations. Pre-test (Academic achievement test) was administered to the selected sample of students of 6 SEP schools.

Administration of the TPACK and SESS to the Student Teachers

These two tools were administered to the student teachers of the DIET situated in the District SW B of Delhi. These two tools were used to control the two variables i.e. T PACK (Students teachers technological, pedagogical, and content knowledge and socio-economic status). Student teachers were given all instructions prior of the administration of test. Student teachers showed lot of interest in filing the tools.

Administration of the TPACK and NON TPACK based Lesson Plans

The study involved two groups of 95 students and 12 SEP student teachers: a control group and an experimental group. Both groups prepared 8 lesson plans on selected chapters. The experimental group was guided by the investigator, while the control group was asked to create traditional plans.

Administration of the Post –Test

After the delivery of all lesson plans, students' teachers administered the post-tests in both the groups. Post-test scores were compiled and treated with the appropriate statistical measures.

STATISTICAL TOOLS

Descriptive statistics were used todescribe the characteristics and nature of the sample or data, such as Mean and SD.The paired t test was used to determine the significance of the difference between the means of students' post-test scores and to compare the means of the pre-test scores of TPACK and SESS. Point -Biserial was used in item analysis. KR-20 correlation method for the reliability was also used followed by split half method.

ANALYSIS AND INTERPRETATIONS

Followings are the analysis and interpretations of the data based on the objectives and research question.

OBJECTIVE

To study the effectiveness of TPACK based school experience based in terms of academic achievement of students in social science subject of class 8^{th}, for which null hypothesis was farmed as under-

HYPOTHESIS

There is no significant difference between the post- tests mean scores in social science subject of eighth class students who experienced TPACK based SEP and Non TPACK based SEP.

Thestudyused randomized matched two group, post-test design.

Research design followed the given steps.

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Formation of Experimental and Control groups:

From the 6 SEP, schools, the 240 students of class 8 were randomly selected. All the students were given pre-test. All the scores of the students were arranged from highest to lower scores. Mean and S.D were calculated from the scores. On the basis of the following criteria-

1. High group: Those having scores at or above Mean+ S.D.
2. Average group: Those having scores between Mean- S.D to Mean + S.D.
3. Low group: Those having scores at or below Mean - S.D.

On the basis of the above criteria students falling in the average group were selected. So, out of 240 students 190 students were used to form the two groups. All the scores of the students were arranged from highest to lower scores and using random block design method, two groups i.e. Group-1 and Group-2 of the students were formed. After this mean, standard deviations and paired t test were calculated for both the groups.

TABLE -1

SIGNIFICANCE OF THE DIFFERENCE BETWEEN THE MEANS OF THE TWO GROUPS 1 AND 2 ON PRE-TEST SCORES

Groups	N	M	S. D	t value
1	95	18.06	3.11131.	0.237179
2	95	18.17	3.04	The value of p is .81303 The result is not significant

From the above table1, the value of the p is .81303 > at 0.05 level so, it is clear that both the groups were equal before the experimental treatment. After this, using the flip of the coin, two groups, i.e.1 & 2 were renamed as experimental and control group.

As mentioned earlier that sample of 24 pre-service teachers of 6 SEP schools were purposively selected. These 24 student teachers were given TPACK questionnaire and SES scale. Scores on the two tools were converted in to composite scores for each student teachers. (To control intervening variables, TPACK and SES). From the composite scores, two groups 1 and 2 were formed using randomized block design.

TABLE -2

SIGNIFICANCE OF THE DIFFERENCE BETWEEN THE MEANS OF THE GROUP 1 AND 2 ON TPACK AND SES COMPOSITE SCORES

Groups	N	M	S.D	t value
One	12	166.77	14.03	0.37741 The p-value is 0.707767
Two	12	165.18	13.93	The result is not significant at .05.

From the above table 2, it is clear that both the groups were equal on the means obtained from the composite scores of TPACK and SES. These two groups of student teachers were assigned to the students experimental and control groups to deliver the TPACK based lesson plan and traditional lesson plan respectively.

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FINDINGS OF THE STUDY

TABLE -3

SIGNIFICANCE OF THE DIFFERENCE BETWEEN THE POST-TEST MEAN SCORES OF THE EXPERIMENTAL AND CONTROL GROUPS

S.No.	*Groups*	*N*	*Mean*	*S.D*	*'t' value*	*P Value*	*Results*
1.	*Experimental*	*95*	*21.88*	*4.270*	*4.609*	*.00001*	*Result is significant at 0.05 and 0.01 level*
2.	*Control*	*95*	*19.45*	*3.195*			

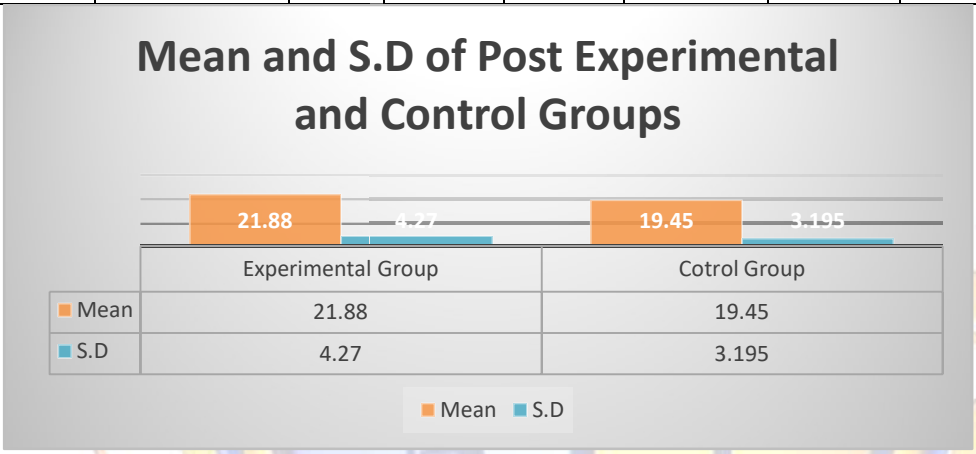

FIGURE 3 MEAN AND SD SCORES OF POST TEST RESULTS

Above mentioned table and graph provide descriptive summaries of the mean scores, standard deviations for each group.

1. Post group mean score of experimental groups is noticeably higher at 21.88 as compared to the mean score for the post control group to 19.45, t value has been found to be 4.609 and p value is .00001, showing that results are significant at both level of 0.05 and 0.01 level. Thus, the null hypothesis stated "There is no significant difference between the post- tests mean scores in social science subject of eighth class students who experienced TPACK based SEP and Non TPACK based SEP", is rejected. This shows that TPACK based SEP was effective in enhancing the academic achievement scores in social science subject of the 8th class students.

CONCLUSION

The study reveals that a school experience program based on Technological Pedagogical Content Knowledge (TPACK) significantly improves the academic achievement of elementary school students. This approach enhances the integration of technology into the educational system, creating a dynamic and engaging learning environment, and provides valuable insights into the integration of technology in education.

RECOMMENDATIONS OF THE STUDY

Based on the findings of the study on the effectiveness of a Technological Pedagogical

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Content Knowledge (TPACK) based school experience program on the academic achievement of students at the elementary level, several recommendations can be made to enhance the implementation and impact of such programs:

1. **Invest in Teacher Training and Professional Development**: Develop and implement comprehensive training programs to enhance teachers' TPACK competencies.
2. **Provide Ongoing Support and Resources**: Offer continuous support and access to resources for teachers to further develop their TPACK skills.
3. **Foster Collaboration and Sharing of Best Practices:** Encourage collaboration among educators to share experiences, exchange ideas, and learn from one another's successes and challenges in implementing TPACK-based approaches.
4. **Promote Reflective Practice**: Encourage teachers to engage in reflective practice to evaluate the effectiveness of their TPACK-based instructional strategies and make adjustments as needed.

By implementing these recommendations, educational institutions and policymakers can effectively leverage TPACK-based school experience programs to enhance student academic achievement at the elementary level and prepare students for success in the digital age.

IMPLICATIONS OF THE STUDY

For schools:

1. **Improvements in Teaching Methods**: TPACK frameworks may be utilized by educational institutions in order to modernize teaching techniques. This can be accomplished by making classes more interactive, engaging, and individualized in order to cater to the educational requirements of primary children.
2. **Chances for Professional Development**: Schools may realize the need of providing teachers with continuing chances for professional development in order to improve their TPACK abilities.
3. **Design and Innovation of the Curriculum**: Schools may re-evaluate their curriculum frameworks in order to guarantee that they are in accordance with the TPACK principles and objectives.

For teachers:

1. **Professional Growth and Development**: It is important to encourage teachers to improve their technological, pedagogical, and content knowledge, since the study emphasizes the significance of building teachers' TPACK abilities.
2. **Creative Teaching Practices**: Teachers may make use of TPACK-based techniques to develop and deliver creative and engaging lessons that are tailored to the varied educational requirements of primary school children.
3. **EnhanceConfidence and Self-Efficacy**: Teachers who take part in TPACK-based school experience programs may perceive an increase in their confidence

and self-efficacy in their ability to enhance student learning via the utilization of technology.

4. **Personalized Learning:** Teachers may utilize TPACK frameworks to personalize learning experiences for students, adjusting instruction to fit individual learning styles, preferences, and skills.
5. **Collaborative Learning Communities:**. Teachers have the opportunity to benefit from one another's experiences and work together on creative teaching initiatives when they cooperate with colleagues who have competence in TPACK.
6. **Improvements in the Outcomes of Students:** By accepting the concepts of TPACK, teachers are able to create dynamic and engaging learning environments that enable students to achieve academically. Teachers play a vital role in enabling student learning and growth, and they can do this by embracing the principles.

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