IN-SERVICE TEACHERS' EXTENT OF TECHNOLOGY INTEGRATION IN TEACHING:AN INQUIRY

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Abstract

The purpose of this study was to examine and conduct a pairwise correlation on technological pedagogical topic knowledge, in-service teachers' exposure to technology, the level of technology integration into teaching, and their knowledge, abilities, and attitudes regarding technology usage in teaching. The correlational research design was the best fit for this research study since it allowed the researcher to assess the differences between variables. A total of 188 in-service teachers participated in the study. Female teachers were shown to be more creative than male teachers in establishing new and distinctive approaches for using ICT-assisted lecture presentations, as well as having a strong dedication to encouraging learners' success. Furthermore, public school instructors have better levels of proficiency in the use of technology and instructional materials to support their teaching than their private school counterparts. This research also shows that the participants' field of specialization and school type are both important factors of the amount of technology brought into the classroom.

Keyword: in service teachers, technology integration, technological content

Introduction

TPACK framework is widely utilized in educational research to assess and measure the efficiency of technology integration in the teaching processes. The components or domains mentioned in the TPACK model, and their interactions help educators see and understand what factors should be considered to maximize the engagement of technology in teaching-learning processes.

Santos and Castro (2021) assessed the TPACK of pre-service teachers in different public schools around Bulacan through evaluation by cooperating teachers and interview to pre-service teachers and their supervisors. The finding suggests that pre-service teachers have *'strong knowledge'* in the seven elements of TPACK. Among the variables, TPACK applications were primarily influenced by TPK and TCK. On the other hand, the result of the study conducted by Liuk et al. (2017) indicated that pre-service teachers lack pedagogical knowledge, but they perceived that they were good at integrating technology into their teaching. Additionally, their study revealed that the perception of teachers differed with gender, age, and curricula.

Abbitt (2011) in a study of in-service teachers showed that technological pedagogical knowledge was among variables predicting technology integration self-efficacy. Bakac and Ozen (2017) concluded that there was an increase in instructional technology and material design self-

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efficacy belief levels linked to TPCK competency. In this situation, the TPCK-based lesson design process was a significant factor in the development of TPCK competency (Gokdas & Torun, 2017; Jang & Chen, 2010).

In a study conducted to assess the perceptions of in-service teachers on techno-pedagogical education in Turkey, teachers generally regard themselves at a moderate level and were found to have positive perception towards technology. It was also discovered that there was a positive correlation between in-service teachers' techno-pedagogical educational competency and perception towards technology and educational technologies. The results also infer that these competency and perception had significant contributions in preparing information-communication technologies based on different classroom activities (Incik & Akay, 2017).

Aside from these findings, Chai et al. (2017) stated that teachers' beliefs about learning and design capacities changed along with their TPACK value. Hence, if the design dimension among competencies was considered appropriate to organize technological possibilities in the teaching-learning process (Kabakci-Yurdakul et al., 2012), their adaptation to technology integration self-efficacy became undeniable. In another point of view, the results of this study showed that in-service teachers were aware of the importance of benefiting from technological opportunities in the design process of educational activities.

Statement of the Problem

This study aimed to assess and conduct a pairwise correlation on the technological pedagogical content knowledge, the extent of exposure of in-service teachers to technology, the extent of technology integration to teaching, and their knowledge, skills, and attitudes towards technology use in teaching.

Specifically, it sought to answer the following questions:

1. Is there a significant difference on the level of knowledge of the participants on technology when grouped according to profile variables?
2. To what extent do participants integrate technology in teaching?
3. Is there a significant difference on the participants' extent of technology integration in teaching when they grouped according to profile variables?

Hypotheses

Based on the problems raised in this study, the following hypotheses were tested at a 0.05 level of significance:

1. There is no significant difference on the level of knowledge of participants on technology when they are grouped according to profile variables.
2. There is no significant difference on the participants' extent of integration of technology in teaching when are they grouped according to profile variables.

Research Method

For this research study, the correlational research design was the most appropriate because it allowed the researcher to evaluate the differences between variables. In accordance with the research design, the level of knowledge, the level of abilities in technology use, the extent of technology integration, and the attitudes toward technology integration of in-service teachers were examined from a variety of angles. The study included a total of 188 in-service teachers. They were asked to rate their level of exposure to technology, level of skills in technology use, level of technological pedagogical content knowledge, level of technology integration in teaching, and attitudes toward technology integration. The results of the study were used to inform future research. The results of the survey were used to construct a training program for in-service teachers, which was implemented in the following year.

Obtaining the relevant information from participants was accomplished by use of a questionnaire. The ideas of technologies, pedagogies, and content that were explored in the literature study were covered in the questionnaire.

Using a questionnaire, in-service teachers were asked about their use of technology in the classroom. Chi-Square. In this study, we looked at whether there was a statistically significant difference between the participants' extent of technology exposure, level of skills in technology use, level of technological pedagogical and content knowledge, extent of technology integration in teaching, and attitudes toward technology integration when they were divided into groups based on their profile characteristics. To evaluate whether there was a statistically significant difference between participants' levels of knowledge on technology integration in teaching and each of the following variables, this statistical method was employed.

1. extent of exposure to technology
2. level of skills on technology use
3. extent of use of technology integration
4. attitudes towards technology use in teaching

Discussion of Findings and Results

Significant Difference in the Participants' Level of Technological Pedagogical Content Knowledge When Grouped According to Profile Variables

Table 1 Chi-Square Test Analysis on the Significant Difference in the Participants' Level of Technological Knowledge When They are Grouped According to their Profile Variables

Grouping Variables	χ^2 Value	df	P-value	Decision at ∫=0.05
Age	16.59	18	0.55	Accept Ho
Sex	8.00	3	0.04*	Reject Ho
Course/Program	7.61	3	0.06	Accept Ho
Field of Specialization	36.16	27	0.11	Accept Ho
Position/Rank	5.91	6	0.43	Accept Ho
Highest Educational Attainment	20.56	12	0.07	Accept Ho
School type	13.98	3	0.03*	Reject Ho
Years in teaching	13.80	15	0.54	Accept Ho
Trainings related to technology	11.31	9	0.25	Accept Ho

**Significant level at 0.05*

The Chi-square test was used to examine whether or not there was a statistically significant difference in the level of technological expertise of in-service instructors across profile factors. The

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probability values of 0.55, 0.06, 0.11, 0.43, 0.07, 0.54, and 0.25, all of which are greater than 0.05, suggest that the null hypothesis should be accepted as a result of the data. The data show that there is no statistically significant difference in the level of technological knowledge of in-service teachers when they are grouped according to age, course/program, field of specialization, position/rank, highest educational attainment, years of teaching experience, and technology-related training among those who are in the profession. It appears from the findings that when participants are categorized according to the profile characteristics, their level of technological expertise does not differ considerably from one another. However, when in-service teachers are divided into groups based on their gender and school type, the table reveals a statistically significant difference in their level of technological knowledge, with associated probability values of 0.04 and 0.03, respectively, in the level of technological knowledge. This conclusion implies that the level of technology expertise of in-service teachers varies depending on their gender and the type of school they work in. The next table has a more in-depth discussion of this outcome.

Table 2. Contingency Table on the Chi-Square Test Results on the Significant Difference on the Participants' Level of Technological Knowledge When Grouped According to Sex

Grouping Variables / Level of Knowledge	Sex		χ^2 Value	df	PV	Decision at ∫=0.05
	Male	Female				
Very High	7 (14.89)	21 (14.89)	8.00	3	0.04	Reject Ho
High	32 (68.09)	96 (68.09)				
Low	3 (6.38)	21 (14.89)				
Very Low	5 (10.64)	3 (2.13)				
Total	47	141				
Mean	2.87	3.62				

Table 2 depicts the contingency table, which provides the specifics of the Chi-Square test on the participants' degree of technological expertise when they are divided into two groups based on their sexual orientation. The probability value of 0.04, which is lower than the level of significance of 0.05, suggests that there is a statistically significant difference between gender groups in terms of their level of technological expertise. The majority of female participants have a high level of knowledge, which is followed by those who have a very high level of knowledge, both of whom have the same percentage of 14.89 percent. The vast majority of male participants possess a high degree of knowledge, with 14.89 percent possessing a very high level of expertise. Female participants demonstrated a higher level of technological knowledge than male participants, according to the overall mean for the level of technological knowledge across sexe. Female participants were found to be more educated and confident in their use of technology in the classroom than male participants, according to the results of this study (Wright, 2016). Compared to male teachers, female instructors have greater knowledge and capacity to use, develop, and produce a variety of technologies, technical tools, and associated resources for teaching (Kahveci, 2010; Kirkpatrick & Cuban, 2013; Li & Kirkup, 2007; Shashaani & Khalili, 2001; & Kaino, 2008). Female teachers were found to be more creative in developing new and unique methods in applying ICT-assisted lecture presentations as well as in having a strong commitment to promoting learners' success than male teachers, according to one study (Chi, Yeh, & Wu, 2014). Furthermore, a study revealed that teachers' technology knowledge has positively influenced their teaching effectiveness with the provision of technology materials and tools (Ayob, Hussain, & Majid, 2013; Craft, 2001; Hosseinnia, 2017; Khodabakhshzadeh, Hosseinnia, Moghadam, & Ahmadi, 2018; Richards & Jones, 2015).

Table 3. Contingency Table on the Chi-Square Test Results on the Significant Difference on the Participants' Level of Technological Knowledge When Grouped According to School Type

Grouping Variables / Level of Knowledge	School Type		χ^2 Value	*df*	*PV*	*Decision at* α*=0.05*
	Private	Public				
Very High	8 (10.67)	20 (17.70)	13.98	3	0.03	Reject Ho
High	61 (81.33)	83 (73.46)				
Low	1 (1.33)	7 (6.19)				
Very Low	5 (6.67)	3 (2.65)				
Total	75	113				
Mean	2.32	3.06				

Table 3 provides additional information on the 0.03 p-value that was acquired and is represented in the preceding table, as well as additional information on the sample size. When participants are divided into groups based on the type of school they attend, this score suggests that their level of technological knowledge differs greatly. According to the percentages, the majority of private-school teacher-participants have a "high" level of technology knowledge, whilst the majority of public-school teacher-participants have a "high" level of technological knowledge. It appears that public-school instructors have a higher level of technology expertise than private-school teachers, based on the average mean of the data. A study conducted by Kurt (2015) supports this conclusion, since it discovered that public-school teachers are better educated about the use of instructional technology and other technical resources in the classroom than their counterparts in private-school environments.

As previously stated by Kay (2006), Wozney et al. (2006), and Sandholtz and Reilly (2017), public school teachers possess higher levels of expertise about the use of technology and instructional resources to support their teaching than their counterparts in private schools.

Table 4. Chi-Square Test Analysis on the Significant Difference in the Participants' Level of Technological Content Knowledge When They are Grouped According to their Profile Variables

Grouping Variables	χ^2 Value	df	P-value	Decision at ∫=0.05
Age	23.64	18	0.16	Accept Ho
Sex	1.64	3	0.65	Accept Ho
Course/Program	7.34	3	0.06	Accept Ho
Field of Specialization	30.55	27	0.29	Accept Ho
Position/Rank	6.27	6	0.39	Accept Ho
Highest Educational Attainment	14.18	12	0.28	Accept Ho
School type	6.68	3	0.08	Accept Ho
Years in Teaching	14.85	15	0.46	Accept Ho
Trainings Attended	10.78	18	0.90	Accept Ho

**Significant level at 0.05*

Using the data in the table, the probability values obtained are 0.16, 0.65, 0.06, 0.29, 0.39, 0.28, 0.08, 0.46, and 0.90, which are all greater than the threshold for statistical significance of 0.05. As a result, the null hypothesis is rejected. These results indicate that when participants are divided into groups based on their profile factors, there is no statistically significant difference in their degree of technological subject understanding.
This finding further implies that people's levels of technological content knowledge vary depending on their age, gender, course/program, field of specialization, position/rank, highest educational attainment, school type, years of teaching experience, and technology-related trainings they have received in the past.

Table 5. Chi-Square Test Analysis on the Significant Difference in the Participants' Level of Technological Pedagogical Knowledge When They are Grouped According to their Profile Variables

Grouping Variables	χ^2 Value	df	P-value	Decision at ∫=0.05
Age	16.30	18	0.57	Accept Ho

Sex	2.14	3	0.54	Accept Ho
Course/Program	6.18	3	0.10	Accept Ho
Field of Specialization	33.54	27	0.18	Accept Ho
Position/Rank	5.55	6	0.47	Accept Ho
Highest Educational Attainment	15.88	12	0.19	Accept Ho
School type	16.84	3	0.00*	Reject Ho
Years in Teaching	18.10	15	0.25	Accept Ho
Trainings Attended	11.16	9	0.26	Accept Ho

**Significant level at 0.05*

As demonstrated in Table 5, when profile variables are grouped together, the probability values are larger than 0.05 level of significance, with the exception of the school type grouping scheme, which gave a probability value of 0.00 level of significance. The findings indicate that there is no statistically significant difference in the level of technological pedagogical knowledge among participants when they are divided into groups based on age, gender, course/program, field of specialization, position/rank, highest educational attainment, and years of teaching experience. However, when the students are divided into groups based on their school type, there is a statistically significant difference. With the exception of the school type, none of the variables have an effect on the participants' level of technological pedagogical expertise.

Table 6. Contingency Table on the Chi-Square Test Results on the Significant Difference on the Participants' Level of Technological Pedagogical Knowledge When Grouped According to School Type

Grouping Variables / Level of Knowledge	School Type		χ^2 Value	df	PV	Decision at ∫=0.05
	Private	Public				
Very High	7 (9.33)	24 (21.23)	16.84	3	0.00	Reject Ho
High	36 (48.00)	70 (61.96)				
Low	23 (30.67)	15 (13.27)				
Very Low	9 (12.00)	4 (3.54)				
Total	75	113				
Mean	2.41	3.42				

Table 6 provides further information on the obtained P-value of 0.00, which is represented in the preceding table and is further discussed in Table 7. This indicates that when participants are divided into groups based on the sort of school they attend, their level of technology pedagogical expertise changes dramatically. As shown in the table, the vast majority of private school teacher-participants (48.00 percent) have a "high" level of pedagogical knowledge, followed by 24.23 percent who have a "very high" level of pedagogical knowledge, and four percent who have a "very low" level of pedagogical knowledge. While the majority of public-school teacher participants (61.96 percent) have a "high" level of technological pedagogical knowledge, 24 percent (21.23 percent) have a "very high" level of technological pedagogical knowledge, followed by four percent (3.54 percent) who have a "very low" level of technological pedagogical knowledge. Participants from public schools have a higher level of technological subject understanding than participants from private schools, according to the overall mean of the study. This suggests that participants who are public school teachers are extremely educated in the use of various tactics and approaches that combine pedagogy and content.

Based on the research conducted by Hill and Uribe-Florez (2020), both private and public-school teachers possess a wide range of knowledge in the application of various pedagogical approaches and technology-assisted tools that would allow students to learn concepts and subject matter with a greater depth of understanding.

Table 7. Chi-Square Test Analysis on the Significant Difference in the Participants' Level of Technological Pedagogical Content Knowledge When They are Grouped According to their Profile Variables

Grouping Variables	χ^2 Value	df	P-value	Decision at ∫=0.05
Age	12.94	12	0.37	Accept Ho
Sex	0.51	2	0.77	Accept Ho
Course/Program	2.64	2	0.26	Accept Ho
Field of Specialization	18.95	18	0.39	Accept Ho
Position/Rank	3.67	4	0.45	Accept Ho
Highest Educational Attainment	10.51	8	0.23	Accept Ho
School type	1.39	2	0.49	Accept Ho
Years in Teaching	13.17	10	0.21	Accept Ho
Trainings Attended	10.88	12	0.53	Accept Ho

**Significant level at 0.05*

The following table shows the results of a chi-square analysis of the participants' degree of technological pedagogical subject understanding after they have been divided into groups based on their profile factors: From the statistics, it can be determined that the probability values for each of the six options are 0.37, 0.77, 0.26, 0.39, 0.45, 0.23, 0.49, 0.21, and 0.53 for each of the six possibilities. As a result, the null hypothesis is ruled out of the running. Moreover, this finding shows that there is no statistically significant difference in the participants' level of technical pedagogical topic understanding when they are divided into groups based on their profile traits, which is consistent with the findings. In other words, students' levels of technological pedagogical content knowledge vary depending on their age, gender, course/program, field of specialization, position/rank, highest educational attainment, school type, number of years spent in the classroom, and participation in technology-related training programs.

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Participants' Extent of Technology Integration in Teaching

Table 8. Extent of Technology Integration in Teaching

Indicators	Mean	Descriptive Interpretation
1. I utilize technology for lesson motivation.	3.09	Great Extent
2. I utilize technology for organizing class discussions.	3.19	Great Extent
3. I encode my daily lesson plan using Microsoft word.	3.10	Great Extent
4. I use technology and assessment software in teaching.	3.06	Great Extent
5. I utilize technology for teaching demonstrations.	3.19	Great Extent
6. I make my lessons more interesting to stimulate student learning by using technology and assessment tools in teaching.	3.01	Great Extent
7. I utilize technology for lesson presentations.	3.10	Great Extent
8. I utilize technology for organizing work and keeping student records.	3.11	Great Extent
9. I use video and audio clips as instructional material for teaching.	3.09	Great Extent
10. I can motivate my students to participate in technology-based projects.	3.07	Great Extent
11. I attend various training and seminars related to technology and assessment needed in my teaching career.	2.95	Great Extent
12. I integrate technology that will allow me to increase the quality of my work and sense of accomplishment in my teaching.	3.13	Great Extent
13. I regularly incorporate the use of technology in my lessons and discussions.	3.04	Great Extent
14. I use technology as a meaningful part of my teaching.	3.09	Great Extent
Categorical Mean	3.08	Great Extent

Table 8 shows the extent to which participants have integrated technology into their classrooms. The findings reveal that all items were evaluated to a "great extent" by the participants, with an overall mean score of 3.08. It appears from the findings that teachers incorporate technology into the teaching-learning process to a significant degree. Consequently, teachers are incorporating technology into their classrooms, notably in the areas of lesson preparation; assessment and evaluation; record keeping; as well as other instructional activities.

Teacher perceptions of technology integration in the content areas and other subjects aligned with the TPACK competencies improved, according to a study, as a result of technological advancements, pedagogical innovations, content knowledge, and the extent to which teachers were exposed to technology (Unal, 2013).

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This study connotes that teachers are extensively exposed to the usage of digital tools in their classrooms and that they undertake assessment activities and other instructional tasks using these tools.

Significant Difference in the Extent of Technology Integration of Participants When Grouped According to Profile Variables

Table 9. Chi-Square Test Analysis on the Significant Difference in the Participants' Extent of Technology Integration When They are Grouped According to their Profile Variables

Grouping Variables	χ^2 Value	df	P-value	Decision at ∫=0.05
Age	20.58	18	0.30	Accept Ho
Sex	0.92	2	0.63	Accept Ho
Course/Program	0.28	2	0.86	Accept Ho
Field of Specialization	36.34	18	0.00*	Reject Ho
Position/Rank	1.40	4	0.84	Accept Ho
Highest Educational Attainment	14.55	8	0.06	Accept Ho
School type	8.17	2	0.01*	Reject Ho
Years in teaching	15.35	10	0.42	Accept Ho
Trainings related to technology	13.00	12	0.16	Accept Ho

**Significant level at 0.05*

Table 9 illustrates the results of a chi-square test to determine whether or not there is a statistically significant difference in the extent to which participants have integrated technology when they are categorized according to profile factors. If a probability value between 0.00 and 0.01 is found, this implies that the null hypothesis has been rejected. They indicate that when participants are divided into groups based on their field of specialization and school type, there is a statistically significant difference in the amount to which they have integrated technology. When participants are compared based on the following grouping variables: age, gender, course/program, position/rank, highest educational attainment, years of teaching experience, and technology-related trainings, the obtained probability values of 0.30, 0.63, 0.86, 0.84, 0.06, 0.42, and 0.16 indicate acceptance of the null hypothesis. Therefore, when individuals are grouped according to the profile factors indicated above, there is no significant difference in their level of technological integration. This finding also demonstrates that the participants' field of specialization and school type are both major determinants in the diversity in the amount to which technology is integrated into the classroom, according to the findings.

Conclusion and Recommendation

The teachers' great extent of integration in teaching implies that teachers use technology tools in teaching.

The teachers' favorable attitude towards technology integration is an indicator that the use of technology tools can increase quality instructional outputs and a sense of accomplishment in teaching.

The Cagayan State University Central Administration could continue to provide support systems to encourage teachers to attend in seminars, training, and conferences to sustain the high level of knowledge and skills of teachers towards teaching and learning.

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