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Technology Proficiency and Practices in the 21st Century among Teachers: Basis for Capability Training Program

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Abstract

Aim: This research determined the relationship between technology proficiency and practices of the 21st century skills categorized as learning and innovation skills, information, media, and technology skills, and life and career skills among public elementary school teachers.

Methodology: This study used a descriptive-correlational design using surveys to determine the relationship between the variables. It was conducted at the eleven elementary schools in the Public Schools District of Cauayan II Cluster 3 of the Schools Division Office of Negros Occidental in SY 2023 – 2024 with 94 respondents. The probability proportional to size sampling was used to determine the sample schools and stratified random sampling was used to determine the respondents.

Results: Findings revealed that the respondents have an approaching proficiency level in technology and have high level of practices of information, media, and technology and life and career skills, but moderate level of practices of learning and innovation skills; no significant differences were found in respondents' technology proficiency and practices of the 21st century skills between profile variables; and show moderate significant relationship between technology proficiency and practices of the 21st century skills.

Conclusion: The perception of teachers on technology use improves the quality of learning and productivity and can bridge the digital divide between various demographic strata. The school administrators may assist and provide teachers with opportunities and training to integrate technology into classroom teaching to provide an opportunity to improve technology proficiency and target technology skills that are beneficial to them. Future research on teacher's technology proficiency and practices in the 21st century skills in larger samples is also recommended.

Keywords: technology proficiency; 21st century teaching practices; learning and innovation skills; information, media; and technology skills; life and career skills

INTRODUCTION

The Department of Information and Communications Technology (DICT) in the Philippines is dedicated to incorporating ICT into the teaching and learning process. ICT is crucial for the growth of students' motivation, abilities, and involvement in order to facilitate learning, according to Dela Fuente and Biñas (2020). In order to include ICT into their teaching, teachers must become more knowledgeable about it.

Globally, educational systems are implementing new technologies to use ICT in the classrooms. Technology proficiency enables teachers to identify and explore a wide variety of technological tools and devices in order to determine and select those that best respond to teaching and learning contents (Saad & Sankaran, 2020). Having said, technology use in education is having a significant impact on students' learning.

In Education Links (2020), the USAID Education Policy recognizes that "incorporating relevant information and communication technologies (ICTs) in education interventions can enhance teacher training and coaching that enable teachers to strengthen educational systems and programs. Moreover, the teaching-learning process in an ICT-enhanced curriculum correspond to the concepts of the Basic Elementary Competencies (BEC), according to the DepEd



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ICT4E Strategic Plan (Department of Education, 2021) that demand hands-on learning, interactive, value-laden, integrative, and learning application in real-world settings.

However, the teachers were not assessed appropriately based on their technology competence and 21st century teaching practices. The poor competence of teachers in technology makes technology integration in the classroom rather difficult and complicated (Akram, et al. (2022). This is true in the context of the school district of Cauayan II Cluster 3 where the ICT competence of teachers create a downward effect on their 21st century teaching practices. Hence, this research aimed to evaluate teachers' technological proficiency and how it relates to 21st century classroom practices that were used as inputs for teacher capability training program.

Objectives

This research determined the relationship between technology proficiency and practices of the 21st century skills among teachers in the District of Cauayan Cluster 3 in the Schools Division of Negros Occidental in the School Year 2023-2024.

This study sought to answer the following specific inquiries:

- 1) What is the profile of the respondents in terms of:
 - a) Sex;
 - b) Age;
 - c) Highest education attained; and
 - d) Number of years in teaching?
- 2) What is the respondent's level of technology proficiency when grouped according to the abovementioned profile variables?
- 3) What is the respondent's level of practices in the 21st century skills in terms of learning and innovation skills; information, media, and technology skills; and life and career skills when grouped according to the abovementioned profile variables?
- 4) Is there a significant difference in the respondent's level of technology proficiency when grouped according to the aforementioned profile variables?
- 5) Is there a significant difference in the respondent's level of practices in the 21st century skills in terms of learning and innovation skills; information, media, and technology skills; and life and career skills when grouped according to the aforementioned profile variables?
- 6) Is there a significant relationship between respondent's level of technology proficiency and practices in the 21st century skills in terms of learning and innovation skills; information, media, and technology skills; and life and career skills?
- 7) What teacher's capability training program can be designed out of the findings of the study?

Hypotheses

Given the stated research problem, the following hypotheses were tested on 0.05 level of significance:

Hypothesis 1: There is no significant difference in the respondent's level of technology proficiency when grouped according to the aforementioned profile variables.

Hypothesis 2: There is no significant difference in the respondent's level of practices in the 21st century skills in terms of learning and innovation skills, information, media, and technology skills, and life and career skills and when grouped according to the aforementioned profile variables.

Hypothesis 3: There is no significant relationship between respondent's level of technology proficiency and practices in the 21st century skills in terms of learning and innovation skills; information, media, and technology skills; and life and career skills.

METHODS

Research Design

The present study utilized a descriptive-correlational research design using a survey method.



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Population and Sampling

The respondents of the study were the public elementary school teachers in the District of Cauayan Cluster 3 in school year 2023-2024. Two-stage sampling using stratified and systematic sampling was used in determining the 94 respondents out 206 elementary teachers.

Instrument

The adapted-type questionnaires were used and was subjected to validity testing by the experts and reliability test using Cronbach’s alpha. A validity rating of 4.48 was established. Using Cronbach alpha, it reported acceptable reliability results of 0.94 and 0.96 respectively.

Data Collection

The survey was conducted in a face-to-face mode. The study’s goal and all research conduct protocols were followed in the collection, reading, and analysis of the data.

Treatment of the Data

The data gathered were statistically treated using a frequency count, percentage distribution, mean and standard deviation, One-way Analysis of Variance (ANOVA), and Pearson’s correlation.

Ethical Considerations

The respondents were informed that their participation in the study was voluntary since they had the option to not be directly involved in its execution. Additionally, they were informed that any information acquired from them would be kept private and utilized solely for the investigation.

RESULTS AND DISCUSSION

The results reveal that majority (83.0%) of the respondents are female. This supports the contention that is commonly recognized worldwide as causing concern that teaching continues to be an increasingly feminized profession.

In terms of age generation, majority (59.6%) of the respondents are millennials. This means that majority of the elementary school teachers in the public school district (PSD) of Cauayan II Cluster 3 were born between 1989 to 2004 or at the age range 20 – 39 years old.

When grouped by educational attainment, the result shows that majority (68.1%) of the respondents’ highest education attained was bachelor’s degree which means these respondents are still at the entry level qualification standards.

The profiling of the respondents finally shows that most number (38.3%) of the respondents were already 7-10 years in the teaching service.

Level of Technology Proficiency (TP)

The mean and standard deviation analysis were run to determine the respondents’ level of technology proficiency when grouped according to profile variables.

Table 1
 Level of Technology Proficiency Grouped according to Profile Variables

Profile of Respondents		Mean	SD	Descriptive Interpretation
Sex	Male	3.38	0.52	Approaching Proficiency
	Female	3.29	0.49	Approaching Proficiency
Age	Baby boomers	3.18	0.45	Approaching Proficiency
	Generation X	3.22	0.44	Approaching Proficiency
	Millennial	3.37	0.52	Approaching Proficiency
Highest Education Attained	Bachelor's Degree	3.31	0.49	Approaching Proficiency
	Master's Degree	3.30	0.48	Approaching Proficiency
Number of Years in Teaching	3 years or less	3.36	0.48	Approaching Proficiency
	4-6 years	3.24	0.54	Approaching Proficiency
	7-10 years	3.35	0.49	Approaching Proficiency



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	11 years or more	3.24	0.51	Approaching Proficiency
Mean		3.31	0.490	Approaching Proficiency

- 4.50 – 5.00 *Advance*
- 3.50 – 4.49 *Proficient*
- 2.50 – 3.49 *Approaching Proficiency*
- 1.50 – 2.49 *Developing*
- 1.00 – 1.49 *Beginning*

The result reveals that male teachers' (M=3.38, SD=0.52) level of technology proficiency is almost the same with that of female teachers' (M=3.29, SD=0.49) level of technology proficiency and are at the approaching proficiency level. This result implies that male and female elementary teachers in the PSD of Cauayan Cluster 3 have the same level of proficiency in technology. This result however, was contrasted by Danko et al (2020) showing that technology and ICT tools proficiency are more frequent among female teachers than male teachers.

The result also reveals that millennials (M=3.37, SD=0.52) have higher level of proficiency in technology than baby boomers (M=3.18, SD=0.45) and generation X teachers (M=3.22, SD=0.44) and are at the approaching proficiency level. This result implies that teachers coming from different age generations vary in their technology proficiencies. The results from Woods et al (2021) explained that while individual differences certainly exist, the types of technology and opportunities for engaging with technology are largely a shared experience and differ among generations. Thus, teachers from different generations may foster different values, attitudes, and beliefs (Poláková & Klímová, 2019) which impact the use of technology in teaching practices.

The result further reveals that teachers with who completed bachelor's degree (M=3.31, SD=0.49) in education have almost the same technology proficiency with teachers who completed master's degree (M=3.30, SD=0.48) in education and are at the approaching proficiency level. This means that elementary teachers in the PSD of Cauayan Cluster 3 have the same level of technology proficiency regardless of educational attainment. This was supported by Eskici and Cayak (2023) who showed no differences according to teachers' gender and education level among teachers' technology proficiencies.

Finally, the result in table 2 reveals that teachers with 3 years or less in the service have higher technology proficiency than those who are 4-6 years (M=3.24, SD=0.54), 7-10 years (M=3.35, SD=0.49, and 11 years or more (M=3.24, SD=0.51) though all teachers from this category scored approaching proficiency level which means that the elementary teachers differ in their technology proficiency favoring those who are with three years or less in the service. Erdin and Uzun (2022) showed that the teachers' gender, age, years of teaching experience do not affect their perceived technology proficiency.

Overall, the elementary teachers in this current study showed an approaching proficiency level in technology proficiency (M=3.31, SD=0.490) which implies that the technology proficiency of elementary teachers still needs to upgrade their technological competence. This was supported by Biales (2021) who showed that half of teachers in the study have shown average technological proficiency and can only attain the various technological skills through extensive seminars, trainings, and workshops specifically in the troubleshooting software or hardware issues for them to acquire the basic knowledge that helps them more proficient in the use of technology.

Level of Practices in the 21st Century

The mean and standard deviation analysis was also run to determine the respondents' level of practices in the 21st century skills and was measured through their level of Learning and Innovation Skills (LInS), Information, Media, and Technology skills (IMTS), and Life and Career Skills (LCS).

Table 2A
 Level of LInS Grouped according to Profile Variables

Profile of Respondents		Mean	SD	Descriptive Interpretation
Sex	Male	3.24	0.40	Moderately Practiced
	Female	3.21	0.39	Moderately Practiced
Age	Baby boomers	3.11	0.34	Moderately Practiced
	Generation X	3.16	0.36	Moderately Practiced



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	Millennial	3.27	0.41	Moderately Practiced
Highest Education Attained	Bachelor's Degree	3.24	0.39	Moderately Practiced
	Master's Degree	3.19	0.39	Moderately Practiced
Number of Years in Teaching	3 years or less	3.16	0.41	Moderately Practiced
	4-6 years	3.21	0.45	Moderately Practiced
	7-10 years	3.28	0.39	Moderately Practiced
	11 years or more	3.21	0.38	Moderately Practiced
Mean		3.22	0.39	Moderately Practiced
4.50 – 5.00		Very Highly Practiced		
3.50 – 4.49		Highly Practiced		
2.50 – 3.49		Moderately Practiced		
1.50 – 2.49		Less Practiced		
1.00 – 1.49		Not Practiced at All		

In terms of learning and innovation skills (LInS), though both moderately practiced, male teachers (M=3.24, SD=0.40) have a little bit higher technology proficiency than female teachers (M=3.21, SD=0.39). This implies that both male and female elementary teachers have moderate practices in learning and innovation skills. The findings of Apandi & Razak (2023) showed no significant difference between male and female teachers in innovation skills since it is relevant in the current situation to measure the competency of teachers to cope with changes in the country's education system.

In similar view, millennial teachers (M=3.27, SD=0.41) have higher learning and innovation skills when compared to baby boomers (M=3.11, SD=0.34) and generation X teachers (M=3.16, SD=0.36) though all of the respondents have moderately practice learning and innovation skills. Romanes & Veniegas (2018) supported this result showing significant differences between the boomers, generation X, and millennial teacher-respondents in terms of teaching and learning and creativity and innovation skills.

Moreover, the result shows that teachers having attained bachelor's degree of education (M=3.24, SD=0.39) have higher learning and innovation skills when compared to teachers who have attained master's degree in education (M=3.19, SD=0.39). Orak and Julide (2021) similarly showed that teachers were in short of theoretical and conceptual knowledge regarding 21st century learning and innovation skills, though they were excited to boost them up in the classrooms regardless of educational attainment.

Lastly, this current research finds out that teachers have with 7-10 years in service (M=3.28, SD=0.39) have scored higher practices in learning and innovation skills than those of 3 years or less (M=3.16, SD=0.41), 4-6 years (M=3.21, SD=0.45), and 11 years or more (M=3.21, SD=0.38). This means that the long elementary teachers are in the service, the more teachers can create an innovative teaching practice in the field of teaching. In support to this result. Fuentes-Abeledo, et al. (2020) posits that teacher training along with in-service professional development and experiential learning acquired through occupational practice enable teachers to acquire creativity and innovation skills.

In general, the result reveals that the respondents have perceived to have moderately practiced learning and innovation skills (M = 3.22, SD = 0.392). This result implies that teachers have moderate practices of the learning and innovation skills. This result was supported by Ligan and Tacadena (2022) who showed that oftentimes the teachers practiced the 21st century learning and innovations skills such as critical thinking, problem solving, and creativity and innovation in their school which connotes that teachers able to analyze, evaluate proposition, and able to make judgement and decisions.

The high level of learning and innovation skills also resulted to teachers' high level of critical thinking skills. When students have built strong foundations of skills for learning, specifically collaboration and communication from teachers with high level of critical thinking skills, they will be able to instill learning through critical thinking (Hitchcock, 2018). This will enable students to apply skills towards reaching a goal and ask questions to get there.



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This current research also able to assess the level of information, media, and technology (IMT) skills of the elementary teachers in the public school district of Cauayan Cluster 3 when grouped according to sex, age generation, educational attainment, and years in service.

Table 2B
Level of IMT Skills Grouped according to Profile Variables

Profile of Respondents		Mean	SD	Descriptive Interpretation
Sex	Male	3.75	0.74	Highly Practiced
	Female	3.35	0.58	Moderately Practiced
Age	Baby boomers	3.50	0.65	Highly Practiced
	Generation X	3.52	0.63	Highly Practiced
	Millennial	3.54	0.60	Highly Practiced
Highest Education Attained	Bachelor's Degree	3.52	0.59	Highly Practiced
	Master's Degree	3.55	0.43	Highly Practiced
Number of Years in Teaching	3 years or less	3.59	0.68	Highly Practiced
	4-6 years	3.23	0.13	Moderately Practiced
	7-10 years	3.56	0.63	Highly Practiced
	11 years or more	3.49	0.59	Moderately Practiced
Mean		3.53	0.61	Highly Practiced

4.50 – 5.00 *Very Highly Practiced*
 3.50 – 4.49 *Highly Practiced*
 2.50 – 3.49 *Moderately Practiced*
 1.50 – 2.49 *Less Practiced*
 1.00 – 1.49 *Not Practiced at All*

The result reveals that male elementary teachers (M=3.75, SD=0.74) have highly practiced information, media, and technology skills than female elementary teachers (M=3.35, SD=0.58). Gebhardt et al (2019) reveal that female teachers using technology effectively provide a role model for young women at school, however female teachers are less likely to be using computers personally than their male counterparts.

On the other hand, though millennial elementary school teachers (M=3.54, SD=0.60) scored the higher mean than baby boomers (M=3.50, SD=0.65) and generation X elementary teachers (M=3.52, SD=0.63), the IMT skills was highly practiced. Marrero-Galvan et al (2023) found a generational clash between migrants and digital natives in the use and understanding of IMTs in the teaching task across the different teaching generations and in a generational diversity within the educational centers, however, this difference between teachers is also a condition that facilitates exchange between teachers of different generations such that junior teachers help veteran teachers in the use of IMTs and veteran teachers provide the expertise that new recruits lack.

This current research also found that though elementary teachers with master's degree (M=3.55, SD=0.43) scored higher than those teachers who attained bachelor's degree (M=3.52, SD=0.59), both categories have high practices of IMT skills. In support, Paciente (2022) found out that the level of teachers' knowledge, attitude, and skills on IMT were very high and knowledge and attitude of IMT skills varies between educational attainment but no variation was found on IMT skills. This means that the high level of IMT skills is the same between educational attainment of teachers which supports the result of this current study.

The result further reveals that elementary teachers who are 3 years or less (M=3.59, SD=0.68) and 7-10 years (M=3.56, SD=0.63) in the service have high level of IMT skills while those teachers with 4-6 years (M=3.23, SD=0.13) and 11 years or more (M=3.49, SD=0.59) have moderate level of practices of IMT skills. This implies that



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levels of practices of IMT skills varies across years in service rendered by teachers in the Department of Education. This was supported by Paciente (2022) who found out that the level of teachers' skills on IMT were very high and varies across length of service.

In general, the respondents have highly practiced information, media, and technology skills ($M = 3.53$, $SD = 0.609$). This implies that teachers have highly practiced IMT skills in classrooms such as the ability to access to an abundance of information and adapt to the rapid changes in technology tools. Boholano (2018) supported these results showing that teachers possessed very high IMT skills and acknowledge the 21st century role of modern technology in teaching and learning and using technology as tool in research as essential in the 21st century undertakings. Thus, IMT skills have been very useful in the teaching-learning process. Boholano (2018) also acknowledge the effective use of technology enables the teachers to facilitate and adjust their instructional strategies to optimize students' learning.

This research was also able to establish the level of life and career skills (LCS) of elementary teachers in connection to their 21st century teaching practices.

Table 2C
Level of LCS Grouped according to Profile Variables

Profile of Respondents		Mean	SD	Descriptive Interpretation
Sex	Male	3.91	0.82	Highly Practiced
	Female	3.56	0.72	Highly Practiced
Age	Baby boomers	3.51	0.82	Highly Practiced
	Generation X	3.59	0.77	Highly Practiced
	Millennial	3.66	0.73	Highly Practiced
Highest Education Attained	Bachelor's Degree	3.52	0.59	Highly Practiced
	Master's Degree	3.55	0.43	Highly Practiced
Number of Years in Teaching	3 years or less	3.64	0.84	Highly Practiced
	4-6 years	3.24	0.43	Moderately Practiced
	7-10 years	3.71	0.75	Highly Practiced
	11 years or more	3.58	0.72	Highly Practiced
Mean		3.62	0.74	Highly Practiced

4.50 – 5.00 *Very Highly Practiced*
 3.50 – 4.49 *Highly Practiced*
 2.50 – 3.49 *Moderately Practiced*
 1.50 – 2.49 *Less Practiced*
 1.00 – 1.49 *Not Practiced at All*

The result reveals that the level of LCS practices of elementary teachers is high and male teachers scored higher mean ($M=3.91$, $SD=0.82$) than their female ($M=3.56$, $SD=0.72$) counterparts. This means that male elementary school teachers have higher LCS practices than female teachers. Jugovic, et al. (2022) argues that regardless of gender, teachers were primarily motivated by the intrinsic and social utility values of teaching, however, gender differences imply the importance of the role of social factors in men's choice of this career such that low status of the teaching profession.

This current research also reveals that the level of LCS practices of elementary teachers is high when grouped according to age generation since as evidence in the means of the categories such that baby boomers ($M=3.51$, $SD=0.82$), generation X ($M=3.59$, $SD=0.77$), and millennial ($M=3.66$, $SD=0.73$) scored almost the same means. This



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result implies that no variation was found in the level of LCS practices of elementary teachers when grouped according to age generation.

However, Mikuskova (2023) disputed this result by presenting evidence that there were significant generational differences in professional competencies but no differences in motivation for the teaching profession. Mikuskova (2023) also presented that baby boomers were also knowledge-oriented, while generations X and Y are goal-oriented and generation Z also preferred a managerial style. Further, Mikuskova (2023) showed that baby boomers were best in self-reflection and the realization of teaching while generations X and Y were best in self-reflection and maintaining a positive classroom climate, and generation Z was good in the realization of teaching.

Moreover, this current research shows that both the elementary teachers with Bachelor's Degree (M=3.52, SD=0.59) and Master's Degree (M=3.55, SD=0.43) have high level of LCS practices. This result implies that no variation was found in the level of LCS when grouped according to teachers' educational attainment. According to Kuluglo (2022), educational attainment of teachers can help teach 21st century skills such that teachers with higher educational attainment have higher life and career competence, including pedagogical, professional, personality, and social competency, to effectively implement 21st century teaching and learning.

Furthermore, this research also found out that elementary teachers with 3 years or less (M=3.64, SD=0.84), 7-10 years (M=3.71, SD=0.75), and 11 years or more (M=3.58, SD =0.72) have higher LCS practices than those 4-6 years (M=3.24, SD=0.43) in the service. This means that there is a variation found in the LCS practices of elementary teachers with respect to their number of years in service. Cronin et al (2022) showed that teachers with more than ten years in the service have higher key life skills developed through teamwork, communication, leadership, and resilience; strategies for life skills development such as explicit and implicit learning, teachable moments, and role modelling; and the transferability of life skills to other domains such as schoolwork and home life.

Finally, the result reveals that the elementary teachers have high level of LCS practices (M = 3.62, SD = 0.743). This implies that teachers widely recognized that teaching as a profession requires both a set of academic skills and a set of life skills. Life skills for teachers, according to Parmar (2022), include but are not limited to organization, communication, financial planning, time management, and empathy. These four life skills can all be applied to situations within the classroom so that students have a better chance at success.

In addition, Ramones (2022) emphasized that life skills for all teachers create a change of holistic perspective in the success in a teaching career, and more importantly in real-life management. Life skills of an individual teacher made him to reflect his own academic performance by assessing his everyday life in how he thinks, how he acts, and how he imparts knowledge to his students and to the people that surround his environment. Thus, with life skills, these made teachers design a balance of knowledge, attitude, and skills that will be effectively imparted to students as the teacher performs his duties and responsibilities.

Differences in Technology Proficiency between Profile Variables

The One-way Analysis of Variance (One-way ANOVA) was run to determine the significant differences in respondents' technology proficiency when grouped according to profile variables such as sex, age generation, highest educational attainment, and years in service set at 5% level of significance.

Table 3
Differences in Technology Proficiency between Profile Variables

Profile Variables	F value	p-value	Interpretation	Decision
Sex	0.39	0.53	Not Significant	Failed to Reject H ₀
Age Generation	1.29	0.28	Not Significant	Failed to Reject H ₀
Highest Educational Attainment	0.03	0.96	Not Significant	Failed to Reject H ₀
Number of Years in Teaching	0.36	0.78	Not Significant	Failed to Reject H ₀



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The result shows that the technology proficiency has no statistically significant difference when grouped according to respondent's sex, $F(1, 92) = 0.398, p = 0.530$. This implies that technology proficiency is equally likely the same between male and female teachers. Similar finding was observed by Qazi et al (2022) who uncovered a small and positive, yet not significant, effect size in favor of males. The analyses of Schlebusch (2018) showed that female and male teachers' experiences, dispositions, and uses of technology indicate that any differences are small and inconsistent across countries such that female and male teachers in schools do not appear to differ greatly in the extent of their pedagogical use of technology. Female teachers using technology effectively provide a role model for young women at school, however previous studies have shown that female teachers are less likely to be using computers personally than their male counterparts (Gebhardt et al, 2019). While teachers are encouraged to integrate technology into their teaching, there is evidence that the effectiveness of this integration depends to a large extent on teachers' preparedness to do so, which is directly related to their confidence and knowledge in using technology, as well as their beliefs about the value of technology in education.

The result also reveals no significant difference in technology proficiency between age generation, $F(2, 91) = 1.294, p = 0.279$. This result implies that technology proficiency is the same across age generation of teachers. The results from Kerzic et al (2021) supported this finding who showed that age is not a factor in instructional technology use, although some age-related differences appear in teachers' personal technology uses. However, contrasting results is presented by Hallewell-Haslwanter et al (2022) who showed that there are differences against younger and older teachers with respect to their perceived expertise with technology in the classroom. This is crucial since teachers in the Department of Education (DepEd) are encourage to become experts in technology use and these biases may influence whether the future educational landscape with respect to the implementation of K-12 Curriculum meet the needs and wishes of all groups or increase the digital divide.

Moreover, according to Polat, et al. (2019) study, baby boomer teachers are regarded to use technology ineffectively while millennial teachers effectively use it. Contrarily, according to Poláková & Klimová (2019), baby boomers believed that the adaptations needed to incorporate new teaching strategies and tools in the classroom will be well-suited to their work habits. In terms of generation X teachers. Poláková & Klimová (2019) reported that this age generation respect their ability to make their own judgments and that the idea of implementing new technology, such as mobile devices, in the classroom may be a move that wouldn't reduce their degree of effectiveness. However, millennial teachers may be impacted by their personal choice who are renowned for preferring technological tools, frequently lack the advanced skills necessary for effective technology adoption (Poláková & Klimová, 2019).

The results in table 4 further shows no statistically significant difference in technology proficiency when grouped according to respondents' highest educational attainment, $F(1, 92) = 0.003, p = 0.956$. This means that technology proficiency of teachers is the same regardless of highest education attained. This finding corroborates with the finding of Dela Fuente and Biñas (2020) who revealed that teachers' technology competence in different skill-set is intermediate and the highest educational attainment has no significant effect to the technology competence of teachers. Same result was presented by Isorena and Malangen (2022) who showed no significant difference on the level of technology competency of teachers when grouped according to highest education attained. The finding of this current research indicates that digital divide is not prevalent among different levels of educational qualification of teachers.

The result in table 4 finally reveals no significant difference in respondents' technology proficiency when grouped according to number of years in the service, $F(2, 91) = 0.357, p = 0.784$. This means that no variations were found in technology proficiency in terms of teachers' number of years in the teaching profession. The result of Espinosa & Panares (2023) agrees with the findings of this current research showing no discernible difference between younger in-service teachers and older in-service teachers in terms of their technology competencies. However, a cross-analysis conducted by Baytar et al (2023) highlighted significant difference in terms of competence in technology use when grouped according to teaching experience. Hence, these variations in competence in technology in terms of teacher's teaching experience creates a gap to be resolve since in the current digital age, the integration of technology into teaching practices has become a determining factor in learning quality.



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Differences in Practices of 21st Century Skills between Profile Variables

The One-way ANOVA was further run to determine the significant differences in respondents' level of 21st century practices of the 21st century skills categorized according to learning and innovation skills; information, media, and technology skills; and life and career skills when grouped according to respondents' profile variables such as sex, age generation, highest educational attainment, and years in service set at 5% level of significance.

Table 4
Differences in Practices of 21st Century Skills between Profile Variables

Profile Variables	Test Statistic	Practices of 21st Century Skills		
		LInS	IMTS	LCS
Sex	<i>F - value</i>	0.08	2.58	2.98
	<i>p-value</i>	0.85	0.11	0.09
	Conclusion	<i>Not Significant</i>	<i>Not Significant</i>	<i>Not Significant</i>
	Decision	<i>Failed to Reject H₀</i>	<i>Failed to Reject H₀</i>	<i>Failed to Reject H₀</i>
Age Generation	<i>F - value</i>	1.23	0.03	0.25
	<i>p-value</i>	0.29	0.97	0.78
	Conclusion	<i>Not Significant</i>	<i>Not Significant</i>	<i>Not Significant</i>
	Decision	<i>Failed to Reject H₀</i>	<i>Failed to Reject H₀</i>	<i>Failed to Reject H₀</i>
Highest Educational Attainment	<i>F - value</i>	0.42	0.06	0.01
	<i>p-value</i>	0.52	0.80	0.98
	Conclusion	<i>Not Significant</i>	<i>Not Significant</i>	<i>Not Significant</i>
	Decision	<i>Failed to Reject H₀</i>	<i>Failed to Reject H₀</i>	<i>Failed to Reject H₀</i>
Number of Years in Teaching	<i>F - value</i>	0.45	0.55	0.62
	<i>p-value</i>	0.72	0.65	0.61
	Conclusion	<i>Not Significant</i>	<i>Not Significant</i>	<i>Not Significant</i>
	Decision	<i>Failed to Reject H₀</i>	<i>Failed to Reject H₀</i>	<i>Failed to Reject H₀</i>

The results show no significant differences in respondents' practices in learning and innovation skills when grouped according to as sex ($F = 0.037$, $p = 0.848$), age generation ($F = 1.225$, $p = 0.299$), highest educational attainment ($F = 0.420$, $p = 0.519$), and years in service ($F = 0.448$, $p = 0.719$). This implies that there are no discernable variations are found in teachers' practices of learning and innovation skills with respect to sex, age, teaching qualifications, and teaching experiences. The finding of Apandi and Razak (2023) show that there is no significant difference between male and female teachers in creativity and innovation as both aspects are relevant in the current situation to measure the competency of teachers to cope with changes in the country's education system. In terms of generational groups of teachers, Romanes and Veniegas (2018) showed that boomers used the 21st century learning and innovation skills more profoundly than the younger teachers, however, no significant differences among the generational groups of teachers were found among 21st century learning and innovation skills.

In terms of educational attainment, Prayoga et al (2020) showed that teachers, regardless of education attained have successfully integrated learning and innovation skills in their objectives and activities in lesson plans and taught the students using the plan, however, the teachers faced problems especially in choosing appropriate materials for their students who are in different levels of abilities. In terms of teaching experience, the research of Artacho et al (2020) indicates that experienced teachers with specialized competency training, such as digital literacy, plays an instrumental role in encouraging pedagogical innovation since enhancement in teaching abilities through professional development not only augments teachers' skill sets but also invigorates their creative potential. The authors acknowledged that the advantages of training attended through experience in the field encompass knowledge acquisition, the nurturing of collaboration, the cultivation of inventive thought, and the development of problem-solving abilities, all of which are vital components of teaching innovation.

The results also show that the respondents' practices of the 21st century skills in terms of information, media, and technology skills do not have a statistically significant differences when grouped according to sex ($F = 2.583$, $p = 0.111$), age generation ($F = 0.027$, $p = 0.974$), highest educational attainment ($F = 0.062$, $p = 0.804$), and teaching



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experience ($F = 0.548$, $p = 0.650$). These results imply that practices of the 21st century skills in terms of information, media, and technology skills are equally likely the same regardless of the teachers' profile in this study. In terms of sex profile, Islahi (2019) also found no gender specific differences in attitude towards information technology and technology proficiency. However, Adeoye (2023) presented contrasting results showing that a significant difference exists in the number of male teachers that possess laptop devices and possess more digital skills compared to their female counterpart. Based on these results, it can be concluded that the effective use of technology in classrooms should be expected from all teachers irrespective of their gender. In terms of age generation, Woods et al (2021) asserted that one factor that may impact perceptions of technology self-efficacy is a person's age or, as often categorized, generation in which they were born. The results of the study of Woods et al (2021) proved this argument demonstrating that gender and generation are statistically significant predictors of technology proficiency, which contrasted the result of this current research. Thus, teachers from different generations may foster different values, attitudes, and beliefs (Poláková & Klímová, 2019) which may, in turn, impact the extent to which they feel comfortable with and choose to use technology in teaching practices.

In terms of educational attainment, research shows contrasting findings from this current investigation. Eskici and Cayak (2023) reported that teachers' technology proficiencies and their ability to integrate technology into their lessons did not show statistically significant differences according to teachers' gender, professional seniority and education level. However, both the technology proficiency of the teachers and the level of integrating technology into their lessons showed statistically significant differences according to their educational status (Eskici & Cayak, 2023). These differences in both variables were significantly higher for teachers with graduate education than those with undergraduate education. In terms of years in service, the result from Ada and Altay (2022) showed that there is no substantial difference between the teachers with different levels of teaching experience while using technology and pedagogical skills in classrooms. The findings of Kalra (2018) however show that novice teachers have a positive attitude towards the use of technology in their classroom as compared to their experienced peers and the novice teacher makes use of more technology-related materials and activities when compared to their more experienced counterpart. In a similar vein, Ada and Altay (2022) demonstrated that while novice teachers faced external challenges like technological difficulties, some experienced educators faced internal challenges including a lack of proficiency with technology. Therefore, this current research underlined that preservice and in-service training in technology-enhanced teaching pedagogies and fundamental technical competencies should be provided to teachers and candidates for teachers.

The results also show no significant differences in respondents' practices of the 21st century skills in terms of life and career skills when grouped according to sex ($F = 2.976$, $p = 0.088$), age generation ($F = 0.246$, $p = 0.782$), highest educational attainment ($F = 0.001$, $p = 0.976$), and number of years in the service ($F = 0.618$, $p = 0.605$). These results imply that there are no discernable variations found in practices of life and career skills when grouped according to teachers' profile included in this research. In terms of sex, while men tend to be employed in professions related to engineering and technology, women find their place in professions dedicated to childcare, elderly care and healthcare, with many such professions being considered exclusively female. This is associated with traditional concepts of masculinity and femininity that result in a gender division of occupations about which decisions are usually made during upbringing and schooling (Eccles & Wigfield, 2020). Studies indicate that women's interest in teaching occurs somewhat earlier in life compared to men's (Davids & Waghid, 2020) and that boys are less likely to aspire to work as teachers (Han et al., 2020). Thus, such understanding of the profession proved detrimental to the motivation of men to pursue a teaching career.

In similar context, the research of Jugovic, et al. (2022) showed more interesting results. The authors reported that the perceptions of teaching as a career show that both men and women perceive this profession as more demanding than the returns it provides. Jugovic, et al. (2022) went on to report that gender difference was statistically significant regarding task demand such that women were more likely than men to perceive teaching as emotionally demanding and as a profession that requires expertise and highly specialized knowledge while there was no gender difference for task return, and both genders disagreed that teaching career would offer a high social status or a good salary. Results for the last two factors showed that male and female teachers were equally (and rather highly) satisfied with teaching as their career choice.



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In terms of generational profile, Mikuskova (2023) showed more profound contrasting findings. The main finding of the study of Mikuskova (2023) was that there were significant generational differences in professional competencies but no differences in motivation for the teaching profession. On the other hand, Mikuskova (2023) showed that Baby Boomers were knowledge-oriented, Generations X and Y were goal-oriented, and Generation Z preferred a managerial style. From didactic competencies, Mikuskova (2023) showed that Baby Boomers were best in self-reflection and the realization of teaching; Generations X and Y were best in self-reflection and maintaining a positive classroom climate, and Generation Z was good in the realization of teaching.

In terms of educational attainment and years in service, previous research also showed contrasting results. Abun, et al. (2021) found that the life and career skills of teachers was high and there is a correlation between educational attainment and the length of work experience and life and career skills. Abun et al (2021) also found that there is a significant difference in life and career skills based on educational attainment and the length of work experience. This result suggests that the educational attainment and the length of work experience improves the life and career skills of teachers to achieve most of their goals, accomplish a difficult task, obtain outcomes that are important to them, succeed at most any endeavor, and overcome many challenges in the job. Teachers should have the necessary competences, including pedagogical, professional, personality, and social competency, to effectively implement 21st century learning (Kuloglu, 2022). Therefore, teachers' educational attainment and their own mastery of 21st century skills are crucial in teaching these skills to students.

Relationship between Technology Proficiency and Practices of 21st Century Skills

The Pearson Product Moment Correlation was run to determine the significant relationship between respondents' technology proficiency and practices of the 21st century in terms of learning and innovation skills; information, media and technology skills; and life and career skills set at 5% level of significance.

Table 5
Technology Proficiency and Practices of the 21st Century

Variable	Test Statistic	Practices of 21st Century Skills		
		LInS	IMT Skills	LCS
Technology Proficiency	<i>r - value</i>	0.57	0.43	0.53
	<i>p - value</i>	0.00	0.00	0.00
	Description	Moderate	Moderate	Moderate
	Conclusion	Significant	Significant	Significant
	Decision	Reject H_0	Reject H_0	Reject H_0

The results reveal a moderate and significant relationship between respondents' technology proficiency and learning and innovation skills, $r = 0.573$, $p = 0.000$. This result implies that there is a moderate link between teachers' technology proficiency and learning and innovation skills. The research of Dominadoa (2020) supported the result of this current research showing a highly significant relationship between 21st century skills in terms of learning and innovation and technology skills of the teachers. Briones (2019) explained that technology provides teachers and students with access to numerous educational resources that encourage creativity, important thinking, communication, and collaboration. Dominadoa (2020) added that the 21st century and technology skills are noticeably since they promote inclusion and the development of digital literacy skills, extend and gain knowledge beyond the text – and beyond the study room walls, and ultimately expose students and teachers to new online international communities. This proves that enhancing teachers' learning and innovation 21st century skills and technology skills will improve teachers' and students' classroom collaborative experience.

The results also show moderate significant relationship between information, media, and technology skills and teachers' technology proficiency, $r = 0.425$, $p = 0.000$. This implies that the proficiency of teachers in technology contributes and influences their information, media, and technology skills. Similarly, Garson & Garson (2023) established a significant and strong relationship between the technological profile of teachers and their digital literacy



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which is also significantly and strongly correlated with self-efficacy. Garzon and Garzon (2023) concluded that the technological profile of teachers influences their digital literacy level. Thus, it can be deduced that teachers with high digital literacy skills increase their self-efficacy in technology integration. Supporting further this finding, a study by Hatlevik and Hatlevik (2018) revealed a positive correlation between teachers' ICT self-efficacy and their integration of ICT into teaching. This implies that teachers with higher ICT self-efficacy are more inclined to incorporate ICT into their teaching practices. On the other hand, Aslan (2021) asserted that teachers are expected to possess digital literacy and high self-efficacy, given that 21st-century Generation Z learners are deeply entrenched in the digital age, which is an irreversible reality for them. Thus, teachers with solid digital literacy and self-efficacy comprehend the pivotal role of technological tools in blended learning, enabling them to address and overcome the challenges encountered.

Furthermore, Sailer, et al. (2021) found significant relationships with self-assessed technology-related teaching skills with the cognitive engagement level of the learning activities the teacher initiates. Thus, teachers' self-assessed skills and attitudes in technology are related to frequency of technology use. It can be deduced that technology proficiency of teachers opens up diverse opportunities for both students and teachers. But merely being equipped with digital technology does not mean that students and teachers are able to use it effectively for learning and teaching. For that to happen, teachers need basic digital skills, such as skills to understand, evaluate, and communicate with digital technology in daily routines. Beyond basic technological skills, certain types of knowledge related to digital technology, instruction, and teaching content are assumed to be necessary for teachers when teaching with technology.

Conclusions

This research concluded that the approaching proficiency level on technology by the teachers shows that there is a need to upgrade their skills in information, communication, and technology to meet the demands of 21st century education. This research also concludes that the perception of teachers on technology use in the classroom not only helps in the teaching and learning process, but can also provide better access to educational resources, improve the quality of learning, improve teachers' productivity and can act as an effective tool to bridge the digital divide between various demographic strata. This research further concludes that improving the effectiveness of the 21st century practices of teachers have to contain responsibility for the welfare of students, teachers themselves, and society that require close attention to a couple of measures while teachers can be more proficient in technology and upskill themselves since this is the demand of 21st century learning. Finally, the findings of this current research drew several management implications that may help the teachers to realize the need for trainings and pre-training development plans, and learning sessions to help teachers to be more aware of how they will manifest technological skills and capabilities in the school.

Recommendations

School administrators in the Department of Education may assist and provide instructional personnel and staff with opportunities and training to integrate technology into classroom teaching to provide an opportunity to view the results of their teacher technology proficiency and target technology skills that are beneficial to them. Elementary school teachers to be reflective in their teaching practice and be made aware of the importance of technology proficiency and to develop skills in the 21st century practices for them to be equipped with knowledge, skills and values that are appropriate for ICT-based pedagogical purposes in the future. Professional development facilitators, teacher organizations, and other practitioners in surrounding districts to reevaluate their technology and curriculum may plan to improve the quality and effectiveness of instruction in using educational technology. Future researchers are also encouraged to conduct similar studies on the relationship between teacher's technology proficiency and practices in the 21st century skills.

Proposed Capability Training Program for Teachers

This is the proposed training program for teachers' 21st century and technology skills. The public-school teachers play a vast function in the development of teaching and getting to know the process.



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Rationale:

- In the 21st century society, true learning requires being able to use new technologies, not simply to enhance the ability to memorize and repeat facts, but to gather, organize and evaluate information to solve problems and innovate practical ideas in real-world settings.
- The use of Information and Communications Technologies (ICT) as a learning tool within meaningful contexts of learning has been identified and emphasized as a significant priority as mandated in Department of Education (DepEd) Order 42 series of 2017 or the Philippine Professional Standards for Teachers.
- This training framework will adapt the Technological Pedagogical Content Knowledge (originally TPCK, now known as TPACK) to describe an integrated framework to clarify the critical parameters relating to technology integration in classroom settings, namely Content, Pedagogy, and Technology.
- This framework, built upon Shulman's (1986) work describing Pedagogical Content Knowledge (PCK), does not consider the three key elements above in isolation, but rather in the complex relationships system they define.
- TPACK allows teachers, researchers, and teacher educators to move beyond oversimplified approaches that treat technology as an "add-on" instead to focus upon the connections among technology, content, and pedagogy as they play out in classroom contexts.

Objectives:

The overall purpose of this program is to enhance participants' representations of TPACK. Specifically, there were four distinct objectives to this approach:

Curriculum Components	Learning Strategies	No. of hours	Success Indicator
Introduction to basic technical skills on using ICT tools in education	Practical training, learning by doing, collaboration	8 hours	Increased ICT competence
Introduction to student-centered pedagogical approaches	Classroom presentation, practical training, discussion, collaboration	8 hours	Enhanced pedagogical approach
Introduction to students' pre-existing knowledge misconceptions and learning barriers.	Classroom presentation, discussion, teacher practical knowledge, selected papers from the literature	8 hours	Resolved misconceptions and cognitive conflicts
Use of ICT-based existing educative curriculum materials	Educative curriculum materials; debate and collaboration	8 hours	Enhanced skills in using ICT-based curriculum materials
Discussion on specific software and their uses as cognitive tools.	Grounding learning in classroom, practice and collaboration	8 hours	Enhanced student learning
Design and development of complete learning using various ICT tools	Learning by design	8 hours	Designed learning episodes using ICT tools
Revision of the developed lesson materials based on feedback.	Feedback; debating with colleagues, educators' comments	8 hours	Revised ICT-based lesson plan
Experimental teaching using their own lesson materials	Classroom demonstration	8 hours	Enhanced skills in using the designed lesson materials.



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