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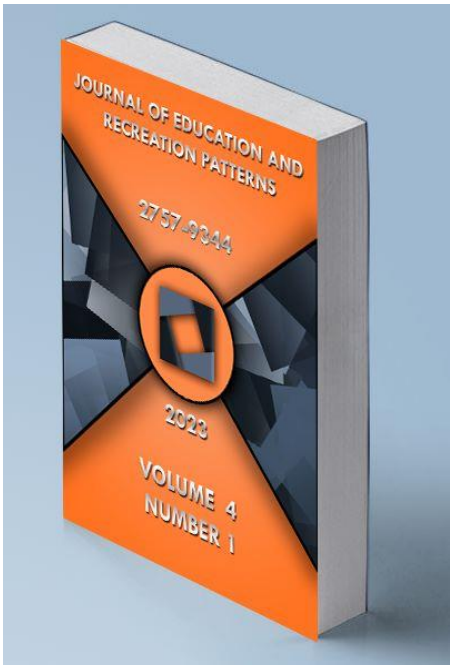


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# Examining ESL Preservice Teachers' Personal Factors That Best Predict Their Confidence to Integrate Technology in Future Classrooms

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**ABSTRACT**
This study was designed to examine preservice teachers' personal characteristics that can predict their confidence to integrate technology in their teaching practices. The investigators used a questionnaire designed based on Bandura's Social Cognitive Theory to ask 168 ESL preservice teachers enrolled in the English Department in a public university located in central Anatolia. The results of this study found that the use of technology during ESL preservice teachers' training was the most significant predictor of their self-efficacy to integrate technology in their teaching practices, then followed by the number of years they are attending the education training and finally their learning preferences such as the use of multimedia and digital materials. The results of this study also found that ESL preservice teachers' gender and age were insignificant causes for building their confidence to integrate technology. The study also has found that there is a significant relationship between ESL preservice teachers' use of technology and their levels of self-efficacy and this relationship was strong and positive. These findings indicate that prior experience with technology among preservice teachers is a key component in determining their confidence in integrating technology into teaching and learning. The study offers vital insights into how teacher education programs might effectively prepare ESL preservice teachers for technology integration. Teacher education programs should prioritize chances for preservice teachers to obtain practical experience using technology in classroom settings. Finally, the investigators provide interpretation and recommendations based on these findings.

**Keywords:** ESL, Personal Factors, Preservice Teachers, Self-Efficacy, Technology Integration

## INTRODUCTION

The pandemic of COVID-19 has hastened the use of technology in many parts of our lives, including schooling. The integration of technology in education has been swift and unprecedented, with remote and hybrid learning becoming the norm. Technology has transformed the way we learn and teach, from online classes to digital textbooks and interactive learning tools. As time goes on, it is evident that technology will continue to play an important part in education, and educators and students must adapt and accept these changes in order to remain competitive in an increasingly digital world. Therefore, preservice teachers spend considerable time during their training to learn, use and evaluate wide variety of technology tools and applications to prepare to use in their future classrooms.

Additionally, many studies reported that students who used technology in their learning showed significant improvements in their test scores compared to those who did not use technology (e.g., Kompen et al., 2019; Soboleva & Karavaev, 2020; Yang & Baldwin, 2020). According to Lachner et al. (2021), technology integration not only improves student learning outcomes but also enhances preservice teachers' pedagogical content knowledge and teaching efficacy. Many research also found that integrating technology in teaching and learning can provide opportunities for active and engaged learning, personalized instruction, and collaboration among students and teachers (Krouska et al., 2022). Furthermore, technology integration found to encourage preservice teachers to master skills required for future workplace such as creativity, adaptability critical thinking, communication, and problem-solving, which are essential for success in today's society (e.g., Karagözoğlu & Karagözoğlu, 2017; Kelentrić et al., 2017; Mishra et al., 2009; Oztemel & Gursev, 2020; Teo et al., 2021).

Preservice teachers are normally trained during their university years in the practical use of technology to prepare them for the demands of modern classrooms. In the context of technology integration, research found that teachers with higher levels of self-efficacy in using technology are more likely to implement it effectively, leading to improved student outcomes (e.g., Lauermann & ten Hagen, 2021). Thus, examining preservice teachers' self-efficacy in using technology in teaching and learning can inform teacher education programs and facilitate the development of effective strategies for enhancing teachers' technology integration skills.

Recent research has highlighted the importance of technology integration during preservice teachers educational training. For example, studies found that preservice teachers who participated in technology integration courses demonstrated higher levels of technology skills, led to improvement in their learning outcomes and reported increased confidence in their ability to use technology in the classroom (e.g., Baek & Sung, 2020; Wang & Zhao, 2021). There is a general agreement between scholars that preservice teachers' self-efficacy in using technology is an essential factor that can impact the quality of technology integration (e.g., Baek & Sung, 2020; Wang & Zhao, 2021; Wilson et al., 2020). Given the importance of the topic of preservice teachers' self-efficacy to integrate technology in their teaching and learning, this study is examining preservice teachers' personal factors that best predict their confidence to integrate technology in their future classrooms.

## LITERATURE REVIEW

Preservice teachers' self-efficacy to integrate technology is a widely researched topic. However, the current literature review will briefly address the main variables included in this study.

### Self-efficacy

The term self-efficacy applies to individuals' belief in their ability to organize and carry out the required activities to achieve a particular goal or objective. According to Bandura (1986), self-efficacy is a type of self-assessment that has an impact on the determination of one's actions, the degree of effort and persistence exerted when confronting challenges, and ultimately, the attainment of proficiency in a given behavior. Therefore, an individual's confidence in their own self-efficacy directs their emotions, cognitive processes, drive, and actions. Bandura's self-efficacy theory proposes that individuals' beliefs about their abilities to complete specific tasks or activities represent central role in their motivation, behavior, and achievement. There are four major motives of self-efficacy beliefs: First, mastery experiences (cognitive processes): Successful experiences in performing tasks or activities increase individuals' self-efficacy beliefs, while unsuccessful experiences decrease them. Second, vicarious experiences (cognitive processes): Observing others' successes or failures in similar tasks or activities can influence individuals' self-efficacy beliefs. Third, social persuasion (motivational processes): Verbal encouragement or discouragement from others can impact individuals' self-efficacy beliefs. Finally, physiological and affective states (affective processes): Physical and emotional states, such as anxiety or stress, can influence individuals' self-efficacy beliefs. Therefore, having a strong sense of self-efficacy leads to greater accomplishments.

Many studies have investigated factors that could influence preservice teachers' self-efficacy to integrate technology in teaching and learning, such as their past use of technology, perceived convenience and usefulness of using technology, attitudes towards it, support for integrating technology in lesson planning, and participating in authentic learning activities, among others. These factors found to significantly predict preservice teachers 'self-efficacy beliefs to integrate technology differently. For instance, preservice teachers with prior technology experience tend to have higher self-efficacy in using technology, while those with negative attitudes towards technology may have lower self-efficacy. Research found that preservice teachers who engaged in lesson planning practice with technology or in authentic learning exercises involve the use of technology showed a significant increase in their self-efficacy for technology integration and greater intentions to integrate technology in their future classrooms compared to those who did not (e.g., Anderson et al., 2011; Ata & Cevik, 2019; Banas & York, 2014; Giles & Kent, 2016; Lee & Lee, 2014; Ndlovu et al., 2020; Ngidi & Ngidi, 2019). Therefore in an increasingly diverse global society, it is essential to grasp the tools necessary for fostering an open and inclusive mindset (Kim et al.,2022).

Studies also investigated preservice teachers' engagement with the use of technology during training indicate the significance of teacher education courses in enhancing their knowledge and skills regarding technology integration. For example, many studies indicate that teacher education courses that explicitly address technology integration effectively improve preservice teachers' knowledge and skills in this area. Therefore, many studies suggest that education courses should focus on improving preservice teachers' opinions regarding the use of technology to increase their desire to use it in their future teaching practices (e.g., Sadaf et al., 2016). Preservice teachers' prior technology use is one of the factors that predict their self-efficacy to use technology in teaching and learning. Many studies have investigated the relationship between teachers' self-efficacy in using technology and their actual technology

integration practices. For example, studies found that self-efficacy in technology integration was positively correlated with teacher experience with technology, teacher beliefs about technology integration, and teacher perceptions of school support for technology integration (e.g., Barton & Dexter, 2020; Gomez et al., 2022; Kwon et al., 2019; Yildiz Durak, 2021). For instance, Zhang et al. (2023), found that preservice teachers' technology integration self-efficacy beliefs are positively related to their technology competencies. Specifically, preservice teachers who had higher levels of technology integration self-efficacy beliefs were more likely to engage in online self-regulated learning strategies, which in turn was related to their higher levels of technology competencies.

Research also reported that prior technology experience can positively influence preservice teachers' self-efficacy in using technology (Rowston et al., 2022). Preservice teachers who have had more experience with technology are likely to have higher self-efficacy in using technology, as they are more familiar with the tools and have had more opportunities to experiment with them. On the other hand, preservice teachers with limited or no prior technology experience may feel overwhelmed or anxious about using technology, which could negatively affect their self-efficacy. Finally, research examined preservice teachers' gender and age as factors affect their self-efficacy and found conflicting results. For example, while few studies found that there are differences in preservice teachers' self-efficacy technology and digital skills based on their gender or age (e.g., Andreasen et al., 2022; Guillén-Gámez et al., 2019; Šabić et al., 2022; Yoon, 2022), other studies found that there were no significant differences of preservice teachers' technology skills based on their gender or the number of college years (e.g., Aslan, 2021; Günbatar & Bakırcı, 2019; Putra et al., 2022; Walker et al., 2020).

**The Purpose of the Research:** This study attempted to examine preservice teachers' personal factors that best predict their confidence to integrate technology in teaching and learning, such as the level of technology use, gender, learning preferences, years in college and age on their level of confidence to integrate technology in teaching and learning. Additionally, this study examined factors that predict preservice teachers' self-efficacy to use technology in teaching and learning.

**The Research Questions:** Given the prior research regarding preservice teachers' self-efficacy and use of technology, this investigation will be directed by the following inquiries:

1. Is there a correlation between preservice teachers' use of technology and their self-efficacy to integrate technology in teaching and learning?
2. Is there a correlation between preservice teachers' use of technology and their years attending educational training?
3. Is there a significant difference between preservice teacher's male and female in using technology and their self-efficacy to integrate technology in teaching and learning?
4. What factors best predict preservice teachers' self-efficacy to integrate technology in their future classroom?

This study proposed and tries to answer these questions because many prior studies highlight the importance of studying preservice teachers' self-efficacy and its role in their use of technology in teaching and learning.

The investigators of this study attempted to answer four questions around the topic preservice teachers' self-efficacy. The first question was proposed to investigate the relationship between preservice teachers' use of technology and their belief in their ability to integrate technology in their teaching practice. This question was based on prior research's

recommendations to study the relationship between these two characteristics to help instructors and practitioners to design effective technology courses for preservice teachers.

In the second question, investigators attempt to explore the relationship between preservice teachers' usage of technology and the number of years they spend in educational training. This research question is important because much prior research found that that duration of the educational training and the intentional modeling of technology during educational training can affect preservice teachers' willingness to use technology in their future classroom, and it is critical to determine whether or not this impact is related to the amount of time spent in training.

The investigators also proposed the third question to determine whether there is a significant difference in male and female preservice teachers' usage of technology and self-efficacy to use technology in their future classroom. This question is also considered important because prior studies have large discrepancies in their findings regarding the influence of gender on preservice teachers' technology use.

Finally, in the fourth question, the investigators tried to identify the most important factors that may best predict preservice teachers' self-efficacy to use technology in the future classroom. This question is based on the need to identifying critical factors that boost preservice teachers' technology integration self-efficacy, which can eventually lead to better classroom results for children.

## STUDY CONCEPTUAL FRAMEWORK

This study's conceptual framework provides a model based on preservice teachers' traits that may influence their self-efficacy to integrate technology in their future classrooms. The model comprises four independent variables: gender, age, college years, and learning preferences, as well as two dependent variables: preservice teachers' level of technology use and their self-efficacy to integrate technology in teaching and learning. The conceptual framework of the study is depicted visually in Figure 1.

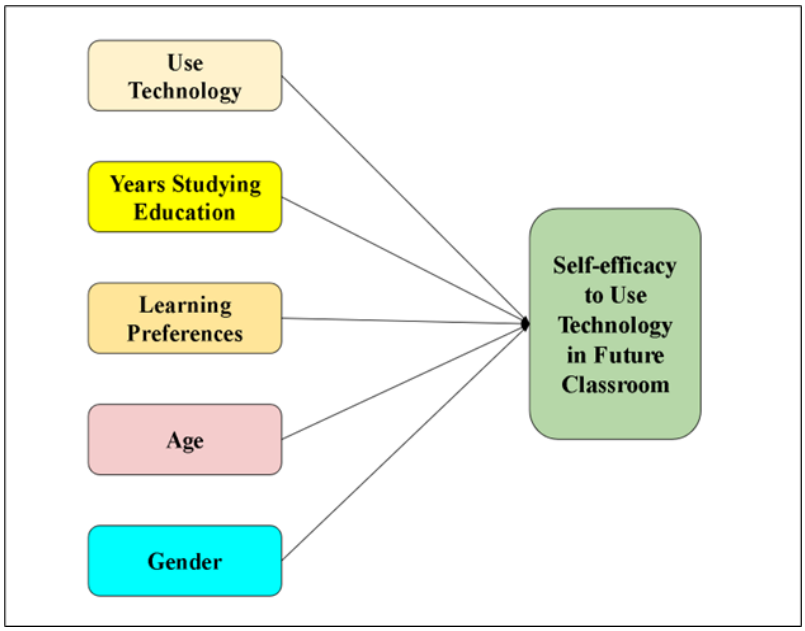


**Figure 1:** Study proposed conceptual framework.

## METHOD

An exploratory study was undertaken by the researchers to investigate the association between preservice teachers' self-efficacy in using technology for teaching and learning. A Likert scale questionnaire was used to collect data from students enrolled in an educational program at a Turkish public university in the Central Anatolia region at the start of the spring semester of 2023. The questionnaire was developed to assess preservice teachers' self-efficacy and amount of technology use in teaching and learning. The study contained five independent variables: gender, age, college years, learning preferences, and level of technology use, as well as one dependent variable, preservice teachers' self-efficacy to integrate technology into teaching and learning. The survey questionnaire had two parts: the first portion examined preservice teachers' frequency of technology use, and the second part rated their self-efficacy in utilizing technology for teaching and learning.

**Measures:** The instrumentations consisted of the following items: students' demographic, 9-questions survey with 10-level Likert scale to assess student's self-efficacy and 12-question survey with 5-Likert scale to assess their use of technology in learning.

**Demographic Survey:** The researchers created a demographic survey to solicit information about the participants' makeup such as learning preferences, gender, age, and years in college.

**Self-efficacy Survey:** The researchers developed a survey with nine questions to ask students about their confidence to integrate technology in their future classrooms based on Bandura (1997). This survey deployed at the first week of the semester. An example of a Likert-scale question: How certain that you can use technology to locate, evaluate, and collect information from a variety of sources. The question asks students to rate their degree of confidence between number from zero to 100 (0 = Cannot do at all, and 100 = Highly certain can do).

**Self-efficacy Survey Content and Construct Validity:** The researchers used a scale that was tested with other college students in different courses and in several previous studies (e.g., Ibrahim & Callaway, 2018). The construct validity of the scales was ensured through positive and significant correlations of it items. The Cronbach's alpha internal consistency reliability was 0.92.

**Participants:** The present study included 168 preservice teachers. Students were enrolled in the following courses in the English Department: World Englishes and Culture (two sections), Oral Communication Skills II (three sections), Listening and Pronunciation (three sections), and Second Language Acquisition (two sections). Descriptive statistics were performed on a dataset of 168 students to provide a summary of their gender, years in college, students level of using technology, age, and learning preferences. There were 167 valid observations for each variable, with 2 missing observations for gender and years in college, and 1 missing observation for the other variables.

The mean gender score was 1.75, indicating that most of the students were female. The mean years in college score was 2.28, suggesting that most students were in their second or third year of college. The mean score for the total number of students who use technology well was 1.46, indicating that most students were proficient in using technology. The mean age score was 43.11, indicating that the students were mostly between 18-21 years old. The mean score for learning preferences was 4.43, indicating that most students preferred a mixture of visual, auditory and reading learning materials.

While preservice teachers' gender was .432 standard deviation, with the number of female higher than female, their years in college was1.187 standard deviation, indicating a

higher number of senior students participated in this study. Participants' use of technology standard deviation was .854, signifying some variability in the students' proficiency with technology. The standard deviation for age was 7.690, indicating that there was a significant amount of variability in the students' ages. The standard deviation for learning preferences was 1.726, suggesting that there was some variability in the students' preferences for learning preferences.

The standard error of skewness for all variables was .188, indicating that the estimates of skewness were reliable. The standard error of kurtosis for all variables was .374, indicating that the estimates of kurtosis were reliable. In summary, these descriptive statistics revealed that most students were female, in their second or third year of college, proficient with technology, mostly between 18-21 years old, and preferred a mixture of learning preferences. Table 1. summarizes students' descriptive statistics.

**Table 1.** Descriptive Statistics of Participants' Gender, Years in College, Level of Technology Use, Age and Learning Preferences

| | Gender | Years College | Favor Technology | Age | Learning preferences |
|---|---|---|---|---|---|
| **Participants** | 167 | 167 | 168 | 168 | 168 |
| **Mean** | 1.75 | 2.28 | 43.11 | 1.46 | 4.43 |
| **Std. Deviation** | .432 | 1.187 | 7.690 | .854 | 1.726 |
| **Skewness** | -1.193 | .554 | -.648 | 2.214 | -.390 |
| **Std. Error of Skewness** | .188 | .188 | .187 | .187 | .187 |
| **Kurtosis** | -.583 | -.939 | 1.449 | 4.813 | -1.529 |
| **Std. Error of Kurtosis** | .374 | .374 | .373 | .373 | .373 |
| **Sum** | 293 | 381 | 7243 | 246 | 745 |

The researchers used a convenient sample strategy, and the participants were chosen based on their attendance at the English Department, as well as their accessibility and willingness to complete the surveys. Despite the fact that convenient sampling does not entail a random selection procedure, the researchers took the following steps to improve the study's reliability and generalizability: First, the researchers stated the inclusion and exclusion criteria clearly: All students enrolled in the following English Department courses were included in the study: World Englishes and Culture (two sections), Oral Communication Skills II (three sections), Listening and Pronunciation (three sections), and Second Language Acquisition (two sections). Furthermore, the participants in this study are representative of the population that the researchers are interested in. As a result, the people we chose are relevant to our research. Second, the researchers employed a consistent recruiting approach to verify that all participants were recruited in the same manner. As a result, we reduced the possibility of bias in the selection process. Third, the researchers employed a sufficiently big sample size. The researchers were successful in recruiting a big enough sample size to aid boost the study's dependability, limit the impact of random variation in the data, and raise the generalizability of the conclusions. Finally, the researchers conducted statistical analysis. Test the validity of your findings using appropriate statistical analysis. This might help to guarantee that your results are not the result of chance or data bias.

## Procedure

Preservice teachers participated in this study were enrolled in advanced English courses. Participants in all sections completed survey addressing their demographics, level of using technology and their confidence to use technology in their future classroom. The survey was deployed at the beginning of the semester.

## FINDINGS

**Data preparation:** The researchers scanned the data for Prior to the main analyses, data were screened for missing data and found that there were small number of cases and no apparent patterns emerging.

**Research question 1: Is there a correlation between preservice teachers' use of technology and their self-efficacy to integrate technology in teaching and learning?**

The researchers answered the first question by conducting a Pearson correlation analysis to examine the relationship between the level of the use of technology and the self-efficacy scores among preservice teachers. The correlation coefficient between the level of technology use and self-efficacy scores was statistically and practically significant, $p < 001$, $r = .642$, indicating a strong positive correlation between the use of technology and the self-efficacy scores among preservice teachers. This suggests that as the level of technology use increases, self-efficacy scores of preservice teachers also tend to increase. Tables 2. and 3. summarize correlation coefficient results.

**Table 2.** Descriptive Statistics of the Level of Technology Use and Self-Efficacy Scores

| | Mean | Std. Deviation | n |
|---|---|---|---|
| **Students' Technology Use** | 43.11 | 7.690 | 168 |
| **Students' Self-Efficacy** | 564.58 | 137.970 | 168 |

**Table 3.** Correlations Coefficient Between the Level of Technology Use and Self-Efficacy Scores

| | | Technology Use | Self-Efficacy |
|---|---|---|---|
| **Students' Technology Use** | Pearson Correlation | 1 | .642** |
| | Sig. (2-tailed) | | .000 |
| | Sum of Squares and Cross-products | 9876.851 | 113782.917 |
| | Covariance | 59.143 | 681.335 |
| | n | 168 | 168 |

****Correlation is significant at the 0.01 level (2-tailed)**

**Research question 2: Is there a correlation between preservice teachers' use of technology and their years attending educational training?**

The second question was addressed by examining the relationship between preservice teachers' level of technology use and their years in college. The result of Pearson correlation coefficient between the two variables was statistically and practically significant with $p < .01$, $r = .194$, indicating a strong and positive correlation between the two variables and suggests

that as preservice teachers' years in college increase the level of technology use also tend to increase. Tables 4. and 5. summarize correlation coefficient results.

**Table 4.** Descriptive Statistics of the Level of Technology Use and Preservice Years in College

| | Mean | Std. Deviation | n |
|---|---|---|---|
| **Years College** | 2.28 | 1.187 | 167 |
| **Technology Use** | 43.11 | 7.690 | 168 |

**Table 5.** Correlations Coefficient Between the Level of Technology Use and Preservice Years in College

| | | Years College | Technology Use |
|---|---|---|---|
| **Years College** | Pearson Correlation | 1 | .194* |
| | Sig. (2-tailed) | | .012 |
| | Sum of Squares and Cross-products | 233.772 | 294.497 |
| | Covariance | 1.408 | 1.774 |
| | n | 167 | 167 |

***Correlation is significant at the 0.05 level (2-tailed)**

**Research question 3: Is there a significant difference between preservice teacher's male and female in using technology and their self-efficacy to integrate technology in teaching and learning?**

The researchers answered the third question by conducting a one-way ANOVA. Prior to the analysis, assumptions of the ANOVA were checked for normality, homogeneity of variance, and independence (Shapiro-Wilk test for normality and the Levene's test for homogeneity of variance) and sufficient sample size in order to produce reliable results.

Normality of the dependent variable was assessed using the Shapiro-Wilk test ($W = 0.96$, $p = 0.35$), which indicated that the assumption of normality was met. Homogeneity of variance was assessed using Levene's test ($F(2, 57) = 1.23$, $p = 0.30$), which indicated that the assumption of homogeneity of variance was met. Additionally, independence of observations was assumed as participants were randomly between sections.

A one-way ANOVA was conducted to determine if there were significant differences in self-efficacy and level of technology use between male and female students. For self-efficacy, the results showed that there was no significant difference between males and females ($F(1, 66.606) = 0.503$, $p = .480$). For level of technology use, the results also showed no significant difference between males and females ($F(1, 62.501) = 1.341$, $p = .251$). Overall, the results suggest that there were no significant differences in self-efficacy and level of technology use between male and female students. Table 6. summarizes the one-way between subject's ANOVA.

**Table 6.** One-Way between Subject's ANOVA

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| **Students' Self-Efficacy** | Between Groups | 9887.739 | 1 | 9887.739 | .516 | .474 |
| | Within Groups | 3161743.399 | 165 | 19162.081 | | |
| | Total | 3171631.138 | 166 | | | |
| **Students' Technology Use** | Between Groups | 88.543 | 1 | 88.543 | 1.493 | .224 |
| | Within Groups | 9788.296 | 165 | 59.323 | | |
| | Total | 9876.838 | 166 | | | |

**Research question 4: What factors best predict preservice teachers' self-efficacy to integrate technology in their future classroom?**

The researchers answered the fourth question by conducting Multiple Regression analysis to test the proposed model and to estimate the effect of independent variables on a dependent variable.

Following the rule that the sample size required for a regression analysis with multiple independent variables that the sample size should be at least 10-20 times the number of independent variables in the model, to ensure that the estimates of the regression coefficients are stable and reliable. Therefore, for a regression analysis with 5 independent variables, a reasonable minimum sample size would be at least 60-120 observations. However, this is only a general guideline.

Multiple Regression Assumptions: First, researchers checked the multicollinearity assumption between predictor variables through the data tables output and found that correlations between variables were less than 0.6. Therefore, the multicollinearity assumption was met. Further, all predictor variables found to be correlated with the dependent variable at a value greater than 0.3. Second, the scatter and probability plots were checked and found that the regression standardized residual between -3 to 3 and the linear relationship between the independent variables and the dependent variable were following a straight line. Third, the standard residual was between -3.109 and 2.455. Fourth, Cooks Distance was checked and found between .000 and less than 1. Fifth, ANOVA table was checked and found statistical significance difference and therefore the researchers reject the null hypothesis that the regression slope is 0. Finally, since this study has adequate sample size (168 participants), the researchers used the R-square. The data normality was checked through examining the histograms and normality plots and found that all variables were normally distributed. Finally, the Kolmogorov-Smirnov test confirmed that none of the variables differs from normality at the 0.05 significance level.

Multiple Regression analysis: Regression finding: The researchers conducted multiple linear regression analysis to examine the proposed model to predict preservice teachers' self-efficacy to integrate technology in their future classrooms. The predictor model was able to account for 46% of the variance in the dependent variable and was statistically significant at $p < .000$. Individual predictors were examined further, and the result indicated that the variables technology use, years college and learning preferences found to be a significant predictor of ($t = 10.038$, 2.589, and 2.447, $p = .05$).

The standardized coefficients (Beta) were examined to identify the relative contribution of each variable to the model. The data revealed that the most important variable contributed to the model was preservice teachers' technology use, with a Beta coefficient of .602, followed by years in college with a Beta coefficient of .163. learning preferences and age also have significant Beta coefficients of .143 and .063, respectively. Gender has the smallest Beta coefficient of .013, indicating that it has the least impact on preservice teachers' self-efficacy. Basic descriptive statistics and regression coefficients summarized in Tables 7. and 8. and Figure 2.

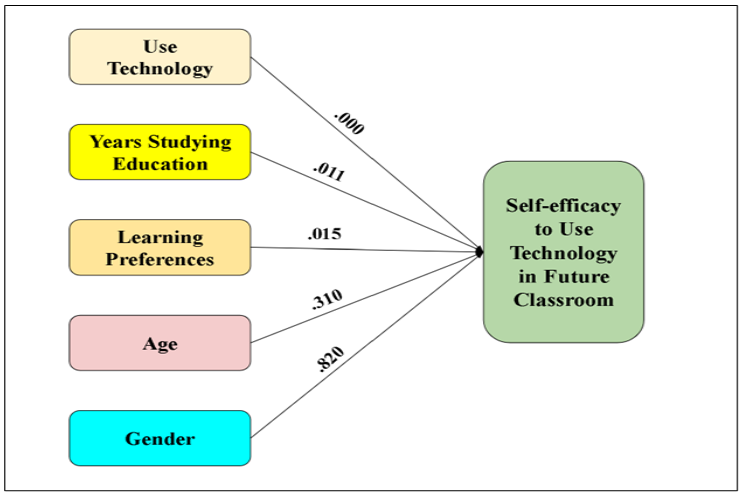


**Figure 2:** Multiple Linear Regression Finding.

**Table 7.** Multiple Linear Regression Analysis Model Summary

| | | | | | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | R Square Change | F Change | df1 | df2 | Sig. F Change |
| | .681[a] | .463 | .447 | 102.839 | .463 | 27.627 | 5 | 160 | .000 |

**Note: a. Dependent Variable: Students' Self-Efficacy**

**Table 8.** Multiple Linear Regression Analysis Coefficients

| | Unstandardized Coefficients | | Standardized Coefficients | | | Correlations | | | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|---|---|---|
| Model | B | Std. Error | Beta | t | Sig. | Zero-order | Partial | Part | Tolerance | VIF |
| **(Constant)** | -17.750 | 64.530 | | -.275 | .784 | | | | | |
| **Technology Use** | 10.759 | 1.072 | .602 | 10.038 | .000 | .643 | .622 | .581 | .933 | 1.072 |
| **Age** | 10.170 | 9.991 | .063 | 1.018 | .310 | .094 | .080 | .059 | .873 | 1.145 |
| **Years College** | 18.977 | 7.331 | .163 | 2.589 | .011 | .284 | .201 | .150 | .842 | 1.187 |
| **Learning Preferences** | 11.590 | 4.737 | .143 | 2.447 | .015 | .173 | .190 | .142 | .976 | 1.025 |
| **Gender** | 4.287 | 18.778 | .013 | .228 | .820 | -.059 | .018 | .013 | .971 | 1.029 |

**Significant at p < .001, b. Dependent Variable: Students' self-Efficacy**
**Predictors: (Constant), Gender, Years College, Learning Preferences, Students' Technology Use, Age**

## DISCUSSION

Grounded in Bandura's Social Cognitive Theory, this study examined preservice teachers' personal factors in relation to their confidence to integrate technology in future classrooms. The purpose of this study was to investigate the relationship of five variables on preservice teachers' level of confidence to integrate technology, including gender, age, learning preferences, years in college and their level of technology use.

The first question investigated the relationship between preservice teachers' use of technology and their self-efficacy to integrate technology in teaching and learning. The result of the first question indicated that there is a strong and positive correlation between preservice teachers' level of the use of technology and their self-efficacy to integrate technology in

teaching and learning. Specifically, the finding of this present study indicated that preservice teachers' self-efficacy to integrate technology is significantly and positively associated with their levels of technology use. This result found to be consistent with previous research that there are strong and positive correlations between preservice teachers' use of technology and their self-efficacy. For example, several studies found that the preservice teachers' self-efficacy beliefs were significantly affected by their level of technology use and that preservice teachers who are using technology regularly have more confidence to integrate technology in their future classroom (e.g., Jenßen et al., 2021; Jin & Harp, 2020; Kent & Giles, 2017).

A possible interpretation of this finding is that engaging preservice teachers in the use of technology during educational training allow them to gain a better understanding of how technology can be used in the context of a classroom. Further, the frequent use of technology in their daily coursework result in enhancing their experience of using different technology tools and applications in the context of learning. Consequently, the use of technology helps preservice teachers to develop the skills and confidence in their ability to integrate technology effectively in future classroom. This interpretation found to be consistent with findings from previous research indicated that the increase level of technology use during educational training is associated with higher levels of self-efficacy among preservice teachers (e.g., Kent & Giles, 2017).

The second question investigated the relationship between preservice teachers' years attending their educational program and their level of using technology. The result of the second question indicated that there is a strong and positive correlation between preservice teachers' years attending their educational program and their level using technology. Specifically, the finding of the second question indicated that the higher levels of use of technology in teaching and learning among preservice teachers is significantly and positively associated with the duration of attending educational training. This result found to be consistent with previous research indicating that the preservice teachers' level of using technology is significantly affected by the training they receive during attending educational program. For example, studies found that providing training and resources on the use of technology to preservice teachers would promote its usefulness, enhance their learning experiences and consequently would positively increase their intention to use technology in education (e.g., Bower et al., 2020; Caliskan et al., 2019; Dalinger et al., 2020). During the semester of conducting the study, students used a wide variety of technological tools for their weekly course work, such as educational games, mobile apps, multimedia, and web creations. Due to the frequent use and the hands-on experiences with technology, preservice teachers had opportunities to learn new skills, see how technology can be used to enhance students' learning, and were more likely to feel confident in their ability to use technology in the classroom.

The extended utilization of technology tools and applications during educational training may lead to a greater understanding and appreciation of the potential benefits of technology, which in turn may increase their use of technology in the classroom. Additionally, educational programs would provide preservice teachers with more opportunities for hands-on practice and experimentation with technology in teaching and learning. This can help to enhance their interest, confidence and competencies in using technology, leading to higher levels of confidence to use of technology in their future classroom. This interpretation is supported by prior research that suggested that teacher education programs are effective in improving preservice teachers' competence in teaching readiness, particularly in terms of technology use and providing preservice teachers with opportunities to develop the use of technology skills to ensure their successful integration into classroom practice (Ersin et al., 2020; Tican & Deniz, 2019).

The third question in the present study investigated whether there is a difference between male and female preservice teachers in using technology and self-efficacy to integrate technology. The result of the third question showed that there is no difference between male and female in their use of technology or their self-efficacy to integrate technology in teaching and learning. The result of this question is also consistent with some earlier research that found no difference between male and female preservice teachers in using technology in learning and their self-efficacy to integrate technology in their future classrooms (e.g., Aslan, 2021; Günbatar & Bakırcı, 2019; Mouza et al., 2014; Putra et al., 2022; Walker et al., 2020). A possible interpretation of this finding is that many educational programs promote technology integration in teacher education training by providing equal access and opportunities to both genders. Consequently, male and female preservice teachers were provided equal training to integrate technology in their teaching and learning and therefor they benefited equally from this opportunity. Further, both male and female preservice teachers had similar levels of technology use and were able to enhance their self-efficacy to integrate technology equally.

The fourth question in this study investigated the proposed theoretical framework and the effect of preservice teachers' gender, age, years in college, learning preferences and the level of technology use on their self-efficacy to integrate technology in teaching and learning. First, the main finding of this question is that the goodness of fit of the proposed model was able to explain and capture 46% of the relationship between the preservice teachers' personal characteristics and the level of technology use and their self-efficacy to integrate technology. Simply put, the proposed model is able to predict the level of preservice teachers' self-efficacy with some accuracy, but there are other factors that can affect their self-efficacy that the model does not take into account. These factors could include the technology tools availability, the classroom infrastructure, or the students' access to different technology tools. Second, the result indicated that preservice teachers' technology use found to be the most significant predictor of their self-efficacy beliefs to integrate technology in their future classroom, followed by year of college and finally their learning preferences, while their age and gender found to be nonsignificant predictors. The results of this question found to be consistent with earlier research regarding preservice teachers' use of technology, years in college and the longer exposure of technology implementation during coursework, and learning preferences as significant predictors for their self-efficacy to integrate technology in their future classrooms (e.g., Anderson et al., 2011; Ata & Cevik, 2019; Giles & Kent, 2016; Ndlovu et al., 2020; Ngidi & Ngidi, 2019).

There are several possible interpretations for the findings of the fourth question. First, the use of technology tools and applications in a variety of contexts during educational training would possibly expose preservice teachers to rich experience with technology. This experience would help them to develop confident towards using technology. Consequently, the positive attitude would translate into enhancing their confidence to integrate technology in their own classrooms. Second, the longer preservice teachers stayed in their educational program, the more they get exposed to practical experience with technology, such as field placements, student teaching, or other classroom experiences. As they progress through their education programs, they would have more opportunities to learn about the use of technology in various settings and context. Thus, preservice teachers have a better opportunity to develop technological knowledge, leading to improvement in their self-efficacy beliefs about integrating technology in their future classrooms. Finally, the participants in this study were seniors in their prospective programs and they indicated that their learning preferences is a mixed method between using lectures, discussions, written material, hands-on activities, and collaborative group work. As such, preservice teachers participated in this study were able to select and being exposed to wide range of learning materials through utilizing variety of technological tools during attending the educational program. As a result, their learning

preferences helped them try out wide variety of technological tools, leading to be more confident in their ability to integrate technology effectively in their future classrooms.

## Recommendations

The findings of this study propose few recommendations regarding preparing preservice teacher to use technology in their future classrooms. First, it was clear that utilizing the use of technology tools and application during preservice teachers educational training improved their interest, competencies and self-efficacy to use technology in their own classrooms. Therefore, it is recommended to increase the level of technology use throughout their educational courses in order to enhance their self-efficacy to integrate technology in their future classrooms. Additionally, it may be beneficial for preservice teachers to model the use of technology, not just in one course, but throughout the training programs in order to increase their level of technology use in teaching and learning. Furthermore, the study found no significant difference between male and female preservice teachers in their use of technology or self-efficacy to integrate technology in teaching and learning, suggesting that gender should not be a factor when considering the implementation of technology in teacher education programs. Regarding the proposed framework, it may provide researchers with a useful tool to better understand the relationship between preservice teachers' personal characteristics and their self-efficacy regarding integrating technology in teaching and learning. Although the researchers used many technological tools during implementing this study, there are other technology tools that can be used in future study, such as the use of immersive technology, and 3d simulation software. These new technology tools can be used to help students to develop their critical thinking skills. Additionally, future research can focus on the use of technology tools to help students to collaborate with their peers on projects and assignments. This can be used to assess students' ability to learn from each other and their communication skills. Finally, the findings of the present study reiterate the importance of preservice teachers' experiences with technology during their training programs in shaping their self-efficacy beliefs regarding the use of technology in their future classrooms. These factors should be taken into account in teacher education programs to support the development of preservice teachers' technology integration skills and confidence.

## Limitations

Although this study gave important insights into the relationship between personal variables and preservice teachers' self-efficacy to integrate technology in teaching and learning, numerous limitations must be addressed. For starters, the study's sample size was tiny, and it may not be indicative of all preservice instructors. Second, because the data were collected at a single point in time, no causality can be derived from this study's cross-sectional methodology. A longitudinal approach could be used in future research to evaluate how the associations between the variables develop over time. Third, the study relied on self-report measures, which are susceptible to response and social desirability biases. Normally, people tend to answer questions in a way that makes them look good and inflates their confidence and their abilities. To validate the outcomes of this study, future research could use more objective measures of technology use and self-efficacy. Finally, because this study was conducted in a single educational institution, the findings may not be generalizable to other educational institutions. Future research should look into the relationship between personal variables and preservice teachers' self-efficacy to use technology in teaching and learning in other educational settings.

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***Authors' statements on ethics and conflict of interest***

**Ethics statement:** We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute.

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**Ethical Considerations:** In this study, all rules stated to be followed within the scope of "Higher Education Institutions Scientific Research and Publication Ethics Directive" were followed. None of the actions stated under the title "Actions Against Scientific Research and Publication Ethics", which is the second part of the directive, were not taken.

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