Use of Educational Technology and Professional Development in Public Schools in the United States

EDTC810- Assessment 4

Daniel Ward

New Jersey City University

Introduction

Student success relies on teacher's effectiveness in the classroom. Many educational institutions offer professional development opportunities to faculty to ensure that resources, such as educational technologies, are being used at their highest potential and are utilized properly. Effective use of educational technologies are likely to increase student academic performance (Johnson, et al., 2016).

The adoption of educational technologies and the participation in professional development related to technology may be related to the years of professional service or dependent the academic discipline which is being taught by educators (Bakir, 2015). Educational technologies, if properly implemented, can positively affect the student learning experience and outcomes of students in all disciplines (Lei, 2015).

This study examines the adoption of educational technology-related professional development and the use of educational technologies in classrooms of various disciplines in K-12 schools in the United States in the 2008-2009 academic year. The results will provide school districts, throughout the United States, with data on which disciplines are not utilizing educational technologies and where to focus professional development efforts in the future. The study also determines the use of educational technologies by educators with varying years of professional service in education and their main teaching areas.

Data Set

The data used for this study was provided by the National Center of Education Statistics (2009). Specifically, the "Teachers' Use of Educational Technology in U.S. Public Schools: 2009" report was used to analyze the adoption of technologies and the correlation to technology-related professional development opportunities and educators' years of professional service in the classroom and main areas of teaching assignments. Data was collected for this report in the

2008-2009 academic year from 3,159 K-12 educators across the United States (National Center of Education Statistics, 2009). The data is provided in *Appendix A.*

Variables

In 2009 the National Center of Education Statistics reported on specific data related to teachers' use of educational technology in U.S. public schools within the 2008-2009 academic year (National Center of Education Statistics, 2009). The full report included 99 variables. The purpose of this report is to analyze the statistics pertaining to the relationship of students' use of educational technology in the classroom and hours spent by teachers in professional development for educational technologies with teachers' academic discipline and years of teaching experience. Therefore, four variables were included in this analysis.

Two of the four variables in this analysis are categorical variables. These categorical variables are: (1) main teaching assignment and (2) years of teaching.

There are five values associated with the main teaching assignment variable:

1: General Education

2: Mathematics/Computer Science/Science

3: English/Foreign Languages/Social Sciences/Social Studies

4: Special Education/ESL

5: Arts/Health Education

There are four values associated with the years of teaching categorical variable:

1: 3 or fewer years

2: 4 to 9 years

3: 10 to 19 years

4: 20 or more years

Two quantitative variables exist in addition to the two categorical variables. The two quantitative variables include: (1) a rating of the students use educational technology and (2) the amount of hours spent, by teachers, in professional development for educational technology in a 12-month period. The "rating of the students use educational technology" variable consisted of five possible values:

1: Not Applicable

2: Never

3: Rarely

4: Sometimes

5: Often

The "amount of hours spent, by teachers, in professional development for educational technology in a 12-month period" variable consisted of five possible values:

1: 0 hours

2: 1-8 hours

3: 9-16 hours

4: 17-32 hours

5: 33 hours or more

An insight on the survey respondents' areas of discipline can be observed by examining the main teaching assignments of the respondents. The breakdown of main teaching assignments are as follows: 32.61% of respondents taught General Education courses, 23.3% of respondents taught English/Foreign Languages/Social Sciences/Social Studies, 20.2% of respondents taught

Mathematics/Computer Science/Science, 14.3% of respondents taught Arts/Health Education and 9.59% of respondents taught Special Education/ESL (see *Figure 1*).

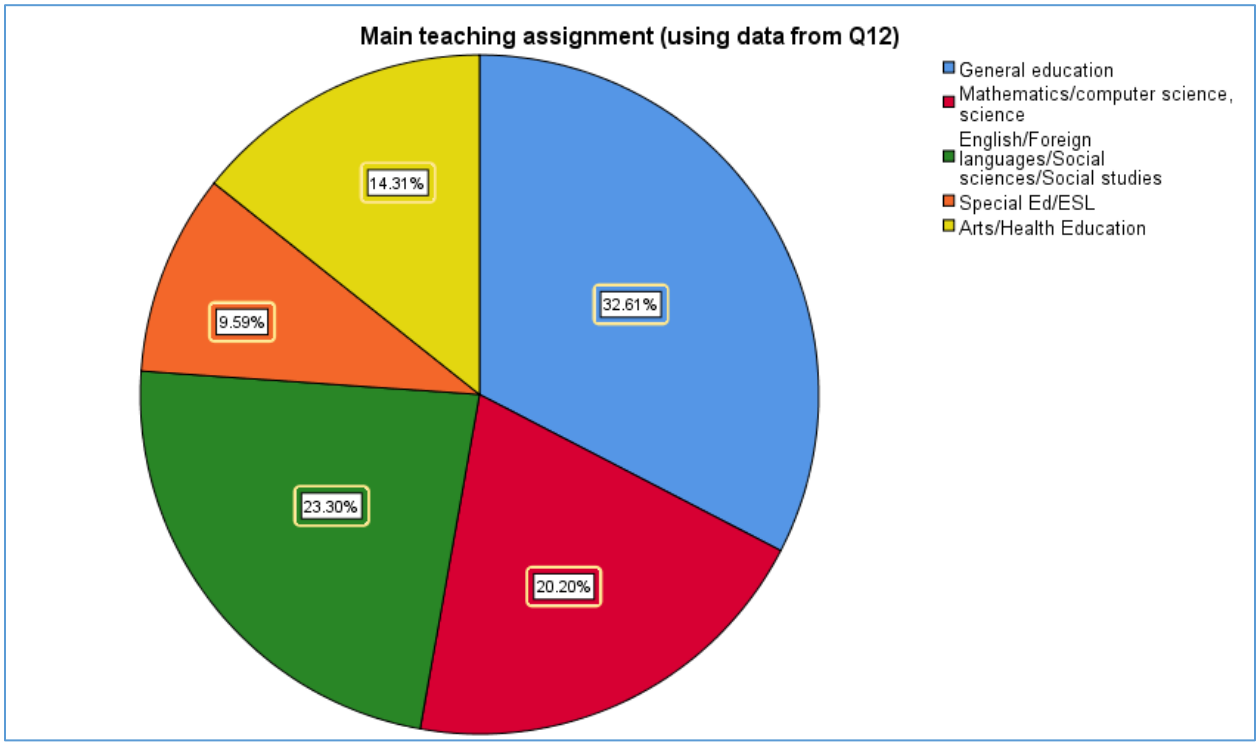


Figure 1: Main Teaching Assignments, 2009

In order to provide an additional insight on the survey respondents, an analysis of the years of teaching experience can be observed. The breakdown of main teaching assignments are as follows: 31.09% of respondents taught for 10 to 19 years, 27.57% of respondents taught for 20 or more years, 26.67% of respondents taught for 4 to 9 years, and 15.07% of respondents taught for 3 or fewer years (see *Figure 2*).

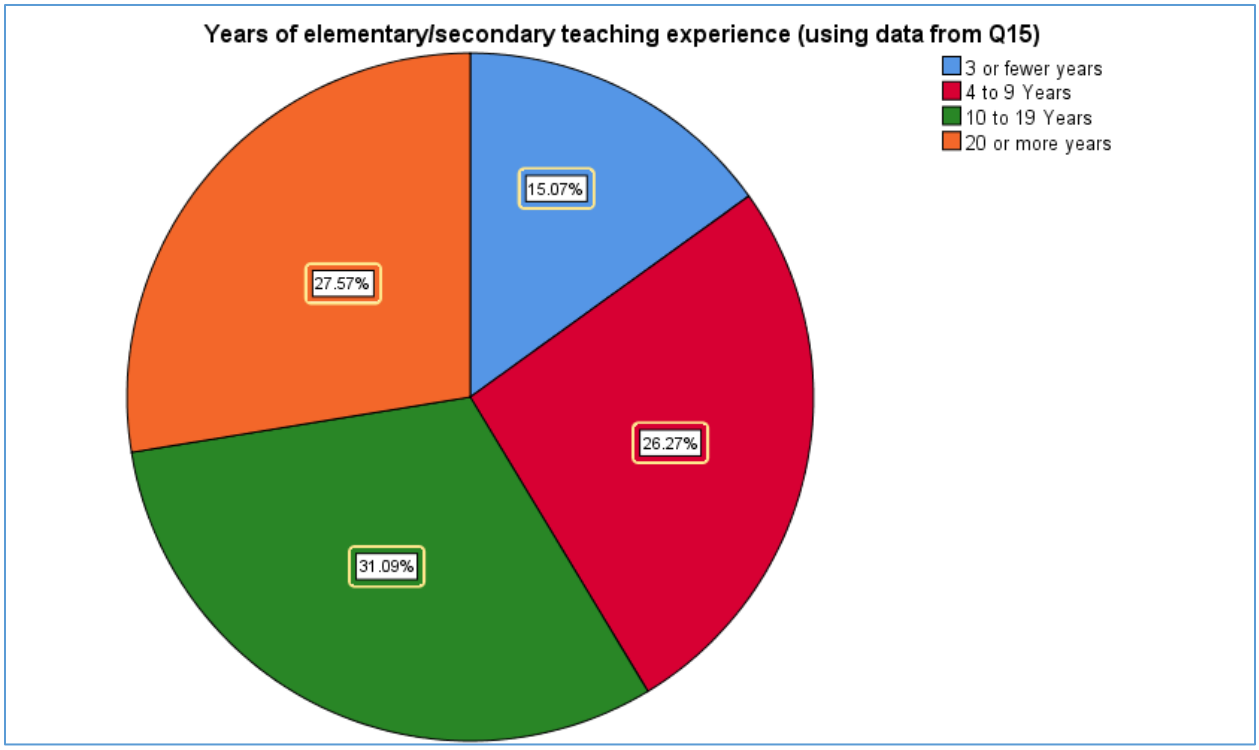


Figure 2: Years of Elementary/Secondary Teaching Experience, 2009

Observing the frequencies of respondents' years of teaching experience and main teaching assignments provide a larger picture of the sample of respondents. As seen in *Table 1*, majority of respondents (58.7%) have taught for more than 10 years. As seen in *Table 2*, majority of the respondents (32.6%) taught General Education courses.

Years of elementary/secondary teaching experience (using data from Q15)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3 or fewer years	476	15.1	15.1	15.1
	4 to 9 Years	830	26.3	26.3	41.3
	10 to 19 Years	982	31.1	31.1	72.4
	20 or more years	871	27.6	27.6	100.0
	Total	3159	100.0	100.0	

Table 1: Frequencies of Years of Teaching Experience, 2009

Main teaching assignment (using data from Q12)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	General education	1030	32.6	32.6	32.6
	Mathematics/computer science, science	638	20.2	20.2	52.8
	English/Foreign languages/Social sciences/Social studies	736	23.3	23.3	76.1
	Special Ed/ESL	303	9.6	9.6	85.7
	Arts/Health Education	452	14.3	14.3	100.0
	Total	3159	100.0	100.0	

Table 2: Main Teaching Assignments, 2009

Model 1:

Students' Use of Technology and Professional Development Hours Spent Based on Teachers' Academic Discipline

The researcher analyzed whether the specific main teaching assignments of respondents predicted the students use of technology to design and produce a product and the hours spent in professional development for educational technology use. In a multiple linear regression analysis, the main teaching assignment was the dependent variable and the hours spent in professional development for educational technology and the level of student use of technology were the independent variables.

As seen in *Table 3*, respondents included teachers who taught General Education (N = 1030), Mathematics/Computer Science/Science (N = 638), English/Foreign Language/Social Sciences/Social Studies (N = 736), Special Education/ESL (N = 303) and Arts/Health Education

(N = 452). The total number of respondents was 3159 (N = 3159). The largest academic area was General Education with a group mean of 1.83 (the average rating of students use of technology was based on the following Likert scale: 1: Not Applicable, 2: Never, 3: Rarely, 4: Sometimes, 5: Often). The mean for all groups was 1.99 (M = 1.99).

An ANOVA test was conducted in order to determine the difference between main teaching assignments and the students' use of educational technologies. The test resulted in a strong difference in main teaching assignment means and students' use of educational technologies, $F(4, 3154) = 15.0$. The p-value ($p = .000$) is significant which indicated that one main teaching assignment category was different than other categories. Since the p-value is .000 ($p < .05$) the null hypothesis is rejected, in other words, the main teaching assignment categories are not equal.

The ANOVA test determined the difference between main teaching assignments and the number of hours spent in professional development for educational technology. The test resulted in strong similarities in main teaching assignment means and number of hours spent in professional development for educational technology, $F(4, 3154) = 1.34$. The p-value ($p = .253$) is not significant which indicated that one or more main teaching assignment category was similar to other categories. Since the p-value is .253 ($p > .05$) the null hypothesis is not rejected, in other words the main teaching assignment categories are similar.

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	General education	1030	1.83	.848	.026	1.78	1.88	1	5
	Mathematics/computer science, science	638	2.03	.894	.035	1.96	2.10	1	5
	English/Foreign languages/Social sciences/Social studies	736	2.06	1.053	.039	1.98	2.14	1	5
	Special Ed/ESL	303	1.96	.879	.051	1.86	2.06	1	5
	Arts/Health Education	452	2.23	1.203	.057	2.11	2.34	1	5
	Total	3159	1.99	.976	.017	1.96	2.03	1	5
During last 12 months, hours spent in professional development for educational technology	General education	1030	2.39	1.011	.032	2.33	2.46	1	5
	Mathematics/computer science, science	638	2.44	1.060	.042	2.36	2.52	1	5
	English/Foreign languages/Social sciences/Social studies	736	2.41	1.060	.039	2.34	2.49	1	5
	Special Ed/ESL	303	2.47	1.009	.058	2.35	2.58	1	5
	Arts/Health Education	452	2.52	1.103	.052	2.42	2.62	1	5
	Total	3159	2.43	1.046	.019	2.40	2.47	1	5

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	Between Groups	56.151	4	14.038	15.005	.000
	Within Groups	2950.735	3154	.936		
	Total	3006.886	3158			
During last 12 months, hours spent in professional development for educational technology	Between Groups	5.856	4	1.464	1.338	.253
	Within Groups	3449.867	3154	1.094		
	Total	3455.723	3158			

Table 3: ANOVA Test for Student Use of Technology and Teaching Assignments

As seen in *Table 4*, an LSD Post Hoc comparison test was conducted because the null hypothesis was rejected. General Education teaching assignments produced a significant p-value with Mathematics/Computer Science/Science (p = .000), English/Foreign Languages/Social Sciences/Social Studies (p = .000), Special Education/ESL (p = .041) and Arts/Health Education (p = .000). Mathematics/Computer Science/Science teaching assignments produced a significant p-value with General Education (p = .000) and Arts/Health Education (p = .001). English/Foreign Languages/Social Sciences/Social Studies teaching assignments produced a significant p-value with Arts/Health Education (p = .004). Special Education/ESL teaching

assignments produced a significant p-value with Arts/Health Education ($p = .000$). The LSD post hoc tests results indicated that the previously mentioned are significantly different from each other. Mathematics/Computer Science/Science teaching assignments produced a p-value greater than .05 ($p > .05$) with English/Foreign Languages/Social Sciences/Social Studies ($p = .569$) and Special Education/ESL ($p = .293$). English/Foreign Languages/Social Sciences/Social Studies teaching assignments produced a p-value greater than .05 ($p > .05$) with Special Education/ESL ($p = .127$). These teaching assignment categories are significantly different from each other when considering the teachers' main teaching assignment and the student use of technology.

The LSD Post Hoc comparison test compared the teaching assignment categories with the hours spent in professional development for educational technology. General Education teaching assignments produced a significant p-value with Arts/Health Education ($p = .030$). This LSD post hoc tests result indicated that the previously mentioned are significantly different from each other. All of main teaching assignment categories produced a p-value greater than .05 ($p > .05$). These teaching assignment categories are significantly different from each other when considering the hours of professional development.

LSD

Dependent Variable	(I) Main teaching assignment (using data from Q12)	(J) Main teaching assignment (using data from Q12)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	General education	Mathematics/computer science, science	-.200*	.049	.000	-.30	-.10
		English/Foreign languages/Social sciences/Social studies	-.230*	.047	.000	-.32	-.14
		Special Ed/ESL	-.129*	.063	.041	-.25	-.01
		Arts/Health Education	-.395*	.055	.000	-.50	-.29
	Mathematics/computer science, science	General education	.200*	.049	.000	.10	.30
		English/Foreign languages/Social sciences/Social studies	-.030	.052	.569	-.13	.07
		Special Ed/ESL	.071	.067	.293	-.06	.20
		Arts/Health Education	-.194*	.059	.001	-.31	-.08
	English/Foreign languages/Social sciences/Social studies	General education	.230*	.047	.000	.14	.32
		Mathematics/computer science, science	.030	.052	.569	-.07	.13
		Special Ed/ESL	.101	.066	.127	-.03	.23
		Arts/Health Education	-.165*	.058	.004	-.28	-.05
	Special Ed/ESL	General education	.129*	.063	.041	.01	.25
		Mathematics/computer science, science	-.071	.067	.293	-.20	.06
		English/Foreign languages/Social sciences/Social studies	-.101	.066	.127	-.23	.03
		Arts/Health Education	-.265*	.072	.000	-.41	-.12
	Arts/Health Education	General education	.395*	.055	.000	.29	.50
		Mathematics/computer science, science	.194*	.059	.001	.08	.31
		English/Foreign languages/Social sciences/Social studies	.165*	.058	.004	.05	.28
		Special Ed/ESL	.265*	.072	.000	.12	.41

During last 12 months, hours spent in professional development for educational technology	General education	Mathematics/computer science, science	-.046	.053	.380	-.15	.06
		English/Foreign languages/Social sciences/Social studies	-.019	.050	.709	-.12	.08
		Special Ed/ESL	-.074	.068	.276	-.21	.06
		Arts/Health Education	-.128*	.059	.030	-.24	-.01
	Mathematics/computer science, science	General education	.046	.053	.380	-.06	.15
		English/Foreign languages/Social sciences/Social studies	.027	.057	.628	-.08	.14
		Special Ed/ESL	-.028	.073	.699	-.17	.11
		Arts/Health Education	-.082	.064	.204	-.21	.04
	English/Foreign languages/Social sciences/Social studies	General education	.019	.050	.709	-.08	.12
		Mathematics/computer science, science	-.027	.057	.628	-.14	.08
		Special Ed/ESL	-.056	.071	.436	-.20	.08
		Arts/Health Education	-.109	.062	.081	-.23	.01
	Special Ed/ESL	General education	.074	.068	.276	-.06	.21
		Mathematics/computer science, science	.028	.073	.699	-.11	.17
		English/Foreign languages/Social sciences/Social studies	.056	.071	.436	-.08	.20
		Arts/Health Education	-.053	.078	.491	-.21	.10
	Arts/Health Education	General education	.128*	.059	.030	.01	.24
		Mathematics/computer science, science	.082	.064	.204	-.04	.21
		English/Foreign languages/Social sciences/Social studies	.109	.062	.081	-.01	.23
		Special Ed/ESL	.053	.078	.491	-.10	.21

*. The mean difference is significant at the 0.05 level.

Table 4: LSD Post Hoc Test Comparing Teaching Assignments

Regression

For Model 1, the R Square of .014 explains that there is 1.4% variance. As seen in the ANOVA table (see *Table 5*), there was a statistical significance of .000 ($p < .05$), therefore, the null hypothesis, that this model cannot predict the outcome, is rejected.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.120[a]	.014	.014	1.388

a. Predictors: (Constant), During last 12 months, hours spent in professional development for educational technology, Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	88.624	2	44.312	23.014	.000[b]
	Residual	6076.646	3156	1.925		
	Total	6165.271	3158			

a. Dependent Variable: Main teaching assignment (using data from Q12)

b. Predictors: (Constant), During last 12 months, hours spent in professional development for educational technology, Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)

Table 5: ANOVA for Model 1

As seen in the coefficients table below (see *Table 6*), the teacher's main teaching assignment contributes to the students' use of educational technology. The significance value is below .05, which indicates that variable makes a significant contribution. The main teaching assignment does not, however, contribute to the hours spent in professional development as the significance value is .34, well above the .05 threshold.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.141	.075		28.517	.000
	Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	.166	.026	.116	6.468	.000
	During last 12 months, hours spent in professional development for educational technology	.023	.024	.017	.959	.337

a. Dependent Variable: Main teaching assignment (using data from Q12)

Table 6: Coefficients Significance Levels and Betas for Model 1

Correlation

A correlation analysis was conducted in order to determine if relationships existed between the teachers' main teaching assignment, students' use of technology to design and produce a product and the hours spent in professional development for educational technology (Salkind, 2017). The Pearson Correlation determined that weak correlations existed between all three variables. A Pearson correlation result within .80 and 1.0 would indicate a very strong relationship (Salkind, 2017). As seen in *Table 7*, the highest correlation was between the students' use of technology and the hours spent in professional development which result was .164, far below the threshold of a very strong relationship. Therefore, there are very weak correlations between the three variables.

Correlations

		Main teaching assignment (using data from Q12)	Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	During last 12 months, hours spent in professional development for educational technology
Pearson Correlation	Main teaching assignment (using data from Q12)	1.000	.119	.036
	Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	.119	1.000	.164
	During last 12 months, hours spent in professional development for educational technology	.036	.164	1.000
Sig. (1-tailed)	Main teaching assignment (using data from Q12)	.	.000	.021
	Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	.000	.	.000
	During last 12 months, hours spent in professional development for educational technology	.021	.000	.

Table 7: Pearson Correlation Results for Main Teaching Assignment, Students Use of Technology and Hours Spent in Professional Development

As seen in the Coefficients table below (see *Table 8*), the collinearity was well above .10 (at .973) therefore, there is no multi-collinearity. Also, the VIF value is below 10 (at 1.028) so there additional evidence that there was no multi-collinearity.

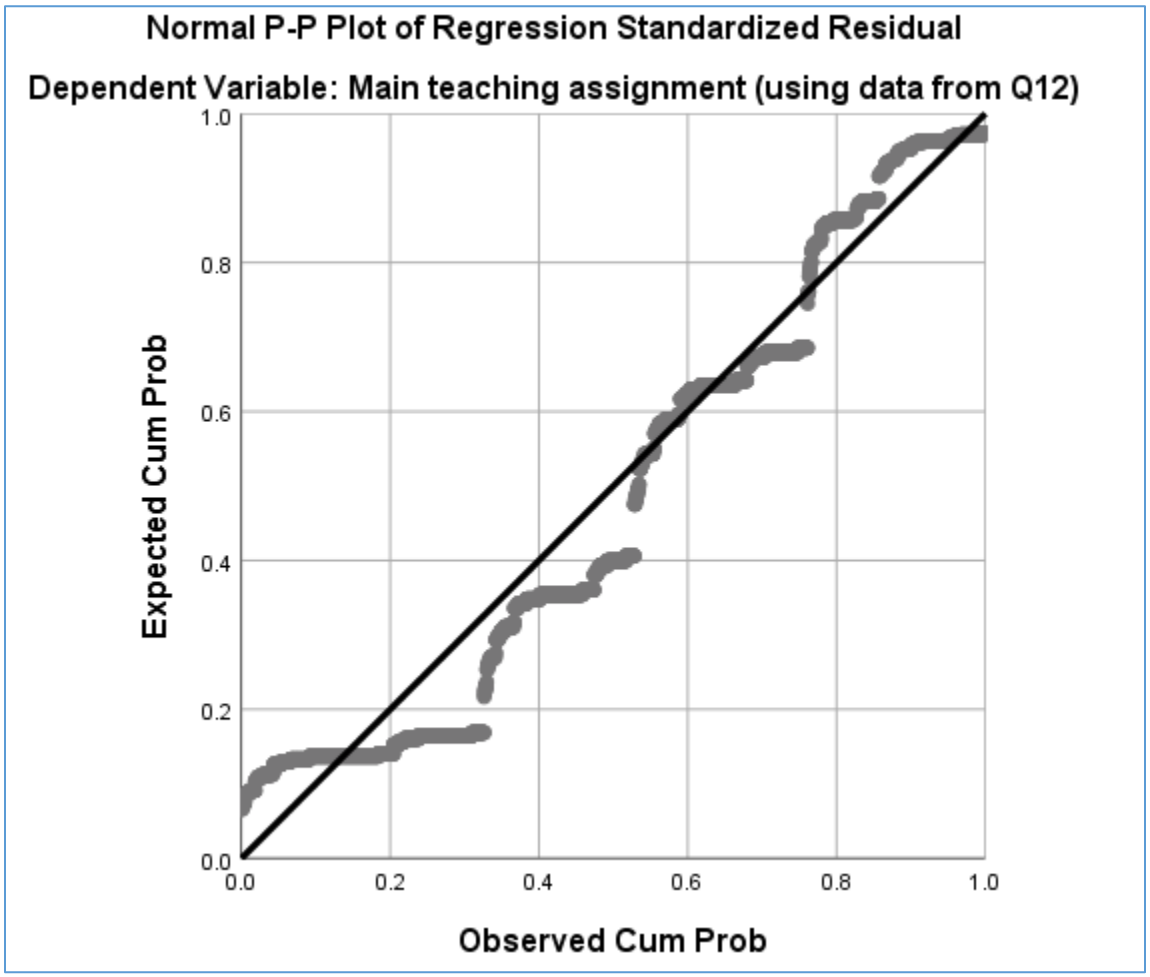
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.141	.075		28.517	.000	1.994	2.289					
	Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	.166	.026	.116	6.468	.000	.116	.216	.119	.114	.114	.973	1.028
	During last 12 months, hours spent in professional development for educational technology	.023	.024	.017	.959	.337	-.024	.070	.036	.017	.017	.973	1.028

a. Dependent Variable: Main teaching assignment (using data from Q12)

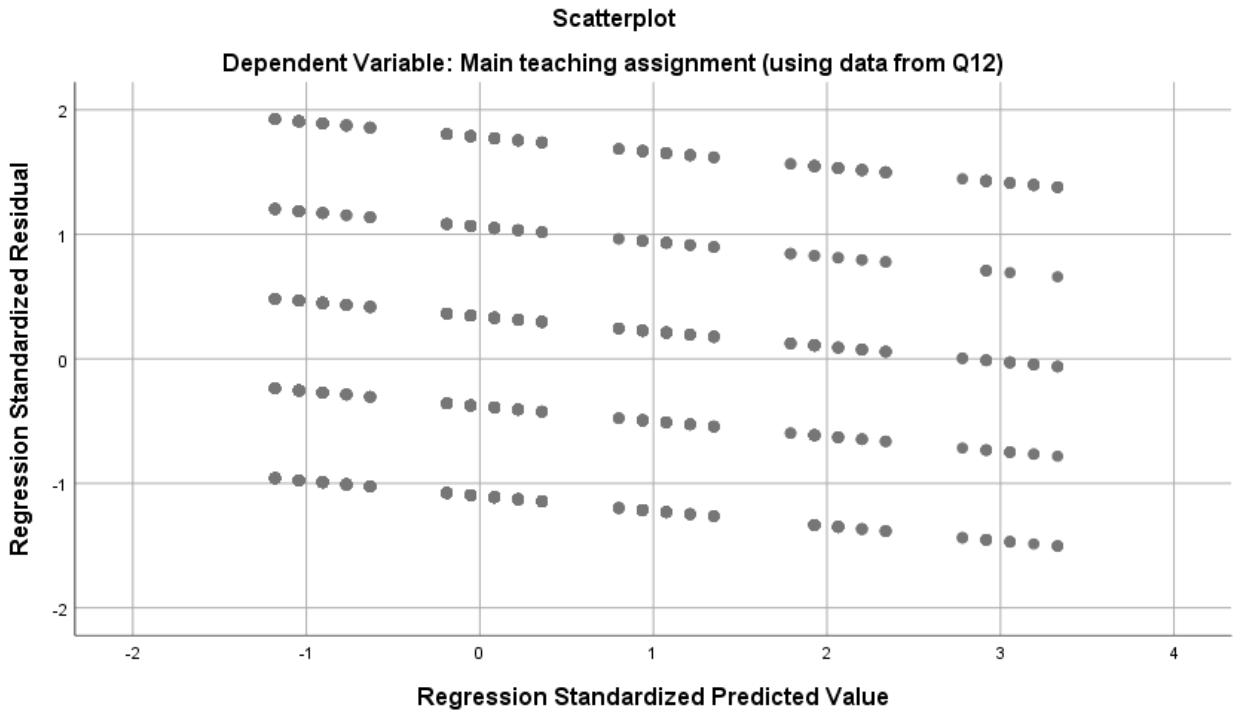
Table 8: Coefficients Table for Model 1

As seen in *Graph 1* below, normal probability is seen, thus, indicating an adequate fit for linearity. Below, there was not major deviation from the line of best-fit. It appeared that there is no deviation from normality.



Graph 1: Normal P-P Plot for Model 1

As seen in the scatterplot in *Graph 2*, there is a rectangular distribution, therefore, the assumption of linearity has been met. Outliers were not present as there was no standardized residual below -3.5 or above 3.5. This graph indicates normality in the model. Both *Graph 1* and *Graph 2* provide similar results, therefore, the researcher determined that the model indicates that linearity is met.



Graph 2: Scatterplot for Model 1

Model 2: Students' Use of Technology Based on Teachers' Years of Teaching

The researcher analyzed whether the years of teaching experience of respondents predicted the students use of technology to design and produce a product and the hours spent in professional development for educational technology use. In a multiple linear regression analysis, the years of teaching experience was the dependent variable and the level of student use of educational technologies and the amount of hours the teachers spent in professional development were the independent variables.

As seen in *Table 9*, respondents included teachers who taught for 3 or fewer years (N = 476), 4 to 9 years (N = 830), 10 to 19 years (N = 982), and 20 or more years (N = 871). The total number of respondents was 3159 (N = 3159). The largest group was 10 to 19 years with a group mean of 2.02 (the average rating of students use of technology based on the following Likert scale: 1: Not Applicable, 2: Never, 3: Rarely, 4: Sometimes, 5: Often). The mean for all groups was 1.99 (M = 1.99).

An ANOVA test was conducted in order to determine the difference between years of teaching experience and the students' use of educational technologies as well as the difference between years of teaching experience and the hours spent in professional development for educational technology. The test resulted in a weak difference in years of experience group means and students' use of educational technologies, $F(3, 3155) = 1.99$. The p-value ($p = .113$) is not significant which indicated that one group of years of teaching experience category was not different from other categories. Since the p-value is .113 ($p > .05$) the null hypothesis is not rejected, in other words, the years of teaching experience categories are similar.

The ANOVA test resulted in a weak difference in years of experience group means and the hours spent in professional development for educational technology, F(3, 3155) = .92. The p-value (p = .430) is not significant which indicated that one or more group of years of teaching experience category was not different from other categories. Since the p-value is .430 (p > .05) the null hypothesis is not rejected, in other words, the years of teaching experience categories are similar.

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	3 or fewer years	476	1.90	.915	.042	1.81	1.98	1	5
	4 to 9 Years	830	1.99	.987	.034	1.93	2.06	1	5
	10 to 19 Years	982	2.02	.977	.031	1.96	2.08	1	5
	20 or more years	871	2.02	.994	.034	1.95	2.08	1	5
	Total	3159	1.99	.976	.017	1.96	2.03	1	5
During last 12 months, hours spent in professional development for educational technology	3 or fewer years	476	2.37	1.028	.047	2.27	2.46	1	5
	4 to 9 Years	830	2.43	1.057	.037	2.35	2.50	1	5
	10 to 19 Years	982	2.45	1.041	.033	2.39	2.52	1	5
	20 or more years	871	2.46	1.051	.036	2.39	2.53	1	5
	Total	3159	2.43	1.046	.019	2.40	2.47	1	5

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	Between Groups	5.691	3	1.897	1.994	.113
	Within Groups	3001.195	3155	.951		
	Total	3006.886	3158			
During last 12 months, hours spent in professional development for educational technology	Between Groups	3.022	3	1.007	.921	.430
	Within Groups	3452.701	3155	1.094		
	Total	3455.723	3158			

Table 9: Model 2 ANOVA Test for Student Use of Technology and Teaching Assignments

A post hoc Bonferroni test was conducted since null hypothesis was not rejected in Model 2. As seen in *Table 10*, you can see that all independent variables were not significant in

comparison to all independent variables. A significance level below .05 would suggest a significant difference among independent variables in relation to the dependent variables (students' use of educational technology and hours spent in professional development).

Multiple Comparisons

Bonferroni

Dependent Variable	(I) Years of elementary/secondary teaching experience (using data from Q15)	(J) Years of elementary/secondary teaching experience (using data from Q15)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	3 or fewer years	4 to 9 Years	-.096	.056	.528	-.24	.05
		10 to 19 Years	-.125	.054	.129	-.27	.02
		20 or more years	-.119	.056	.194	-.27	.03
	4 to 9 Years	3 or fewer years	.096	.056	.528	-.05	.24
		10 to 19 Years	-.030	.046	1.000	-.15	.09
		20 or more years	-.023	.047	1.000	-.15	.10
	10 to 19 Years	3 or fewer years	.125	.054	.129	-.02	.27
		4 to 9 Years	.030	.046	1.000	-.09	.15
		20 or more years	.006	.045	1.000	-.11	.13
	20 or more years	3 or fewer years	.119	.056	.194	-.03	.27
		4 to 9 Years	.023	.047	1.000	-.10	.15
		10 to 19 Years	-.006	.045	1.000	-.13	.11
During last 12 months, hours spent in professional development for educational technology	3 or fewer years	4 to 9 Years	-.061	.060	1.000	-.22	.10
		10 to 19 Years	-.086	.058	.859	-.24	.07
		20 or more years	-.091	.060	.753	-.25	.07
	4 to 9 Years	3 or fewer years	.061	.060	1.000	-.10	.22
		10 to 19 Years	-.025	.049	1.000	-.15	.11
		20 or more years	-.030	.051	1.000	-.16	.10
	10 to 19 Years	3 or fewer years	.086	.058	.859	-.07	.24
		4 to 9 Years	.025	.049	1.000	-.11	.15
		20 or more years	-.006	.049	1.000	-.13	.12
	20 or more years	3 or fewer years	.091	.060	.753	-.07	.25
		4 to 9 Years	.030	.051	1.000	-.10	.16
		10 to 19 Years	.006	.049	1.000	-.12	.13

Table 10: Post Hoc Bonferroni Test for Model 2

Regression

For this model, the R Square of .002 explains that there is .2% variance. As seen in the ANOVA table (see *Table 11*), there was a statistical significance of .067 ($p > .05$), therefore, the null hypothesis, that this model cannot predict the outcome, is not rejected.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.041[a]	.002	.001	1.028

a. Predictors: (Constant), During last 12 months, hours spent in professional development for educational technology, Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.709	2	2.855	2.700	.067[b]
	Residual	3336.574	3156	1.057		
	Total	3342.284	3158			

a. Dependent Variable: Years of elementary/secondary teaching experience (using data from Q15)

b. Predictors: (Constant), During last 12 months, hours spent in professional development for educational technology, Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)

Table 11: ANOVA for Model 2

As seen in the coefficients table below (see *Table 12*), the teachers' years of teaching experience does not contributes to the students' use of educational technology nor the teachers' hours spent in professional development. The main teaching assignment does not contribute to the students' use of educational technology as the significance value is .08 ($p > .05$). The main teaching assignment does not contribute to the hours spent in professional development for educational technology as the significance value is .23 ($p > .05$).

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.593	.056		46.602	.000	2.484	2.702					
	Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	.034	.019	.032	1.773	.076	-.004	.071	.035	.032	.032	.973	1.028
	During last 12 months, hours spent in professional development for educational technology	.021	.018	.021	1.191	.234	-.014	.056	.027	.021	.021	.973	1.028

a. Dependent Variable: Years of elementary/secondary teaching experience (using data from Q15)

Table 12: Coefficients Table for Model 2

Correlations

A correlation analysis was conducted in order to determine if relationships existed between the teachers' years of teaching experience, students' use of technology to design and produce a product and the hours spent in professional development for educational technology (Salkind, 2017). The Pearson Correlation determined that weak correlations existed between all three variables. A Pearson correlation result within .80 and 1.0 would indicate a very strong relationship (Salkind, 2017). As seen in *Table 13*, the highest correlation was between the students' use of technology and the hours spent in professional development which had a result of .164, far below the threshold of a very strong relationship. Therefore, there were very weak correlations between the three variables.

Correlations

		Years of elementary/secondary teaching experience (using data from Q15)	Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	During last 12 months, hours spent in professional development for educational technology
Pearson Correlation	Years of elementary/secondary teaching experience (using data from Q15)	1.000	.035	.027
	Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	.035	1.000	.164
	During last 12 months, hours spent in professional development for educational technology	.027	.164	1.000
Sig. (1-tailed)	Years of elementary/secondary teaching experience (using data from Q15)	.	.023	.067
	Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	.023	.	.000
	During last 12 months, hours spent in professional development for educational technology	.067	.000	.

Table 13: Pearson Correlation Results for Years of Teaching Experience, Students Use of Technology and Hours Spent in Professional Development

As seen in the Coefficients table below (see *Table 14*) the collinearity was well above .10 (at .973) therefore, there was no multi-collinearity. Also, the VIF value was below 10 (at 1.028) so there is additional evidence that there was no multi-collinearity.

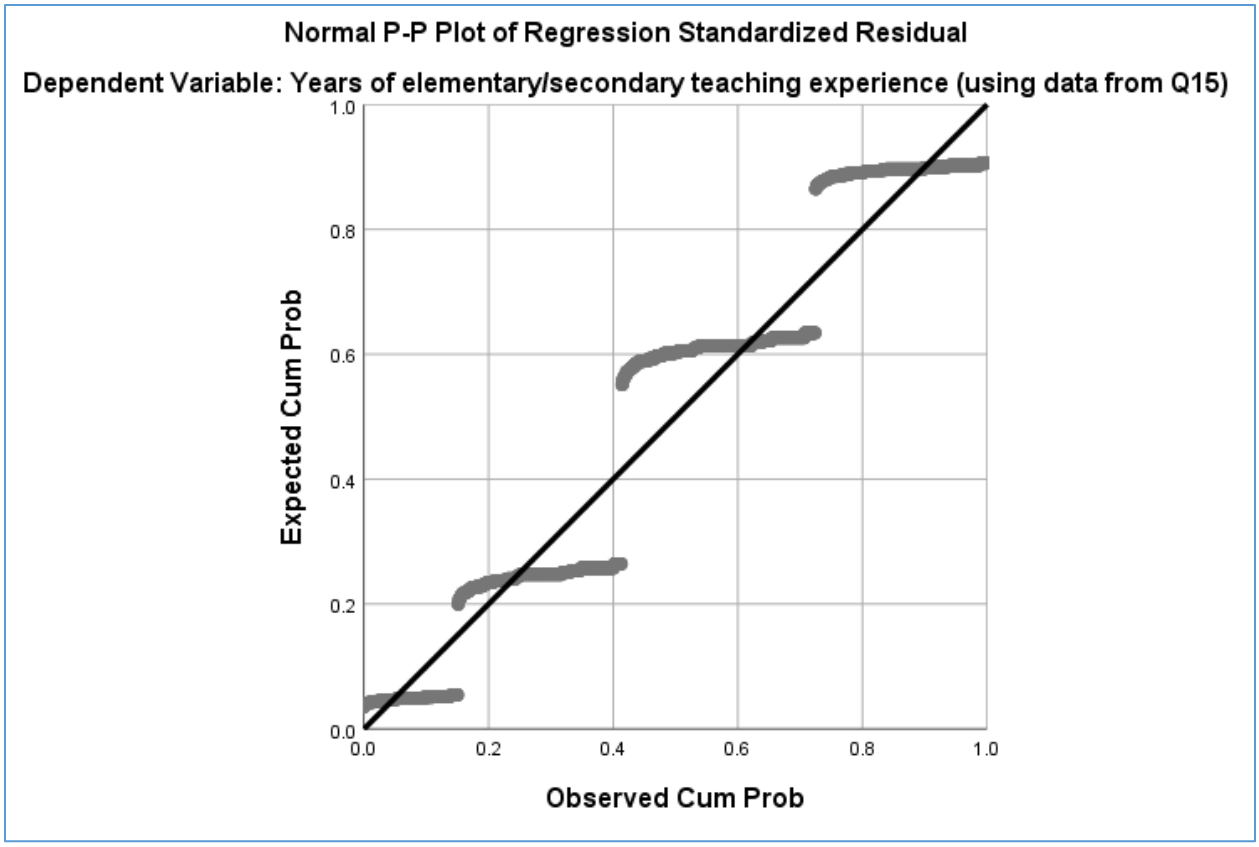
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.593	.056		46.602	.000	2.484	2.702					
	Students use educational technology to: design and produce a product (e.g., computer-aided manufacturing)	.034	.019	.032	1.773	.076	-.004	.071	.035	.032	.032	.973	1.028
	During last 12 months, hours spent in professional development for educational technology	.021	.018	.021	1.191	.234	-.014	.056	.027	.021	.021	.973	1.028

a. Dependent Variable: Years of elementary/secondary teaching experience (using data from Q15)

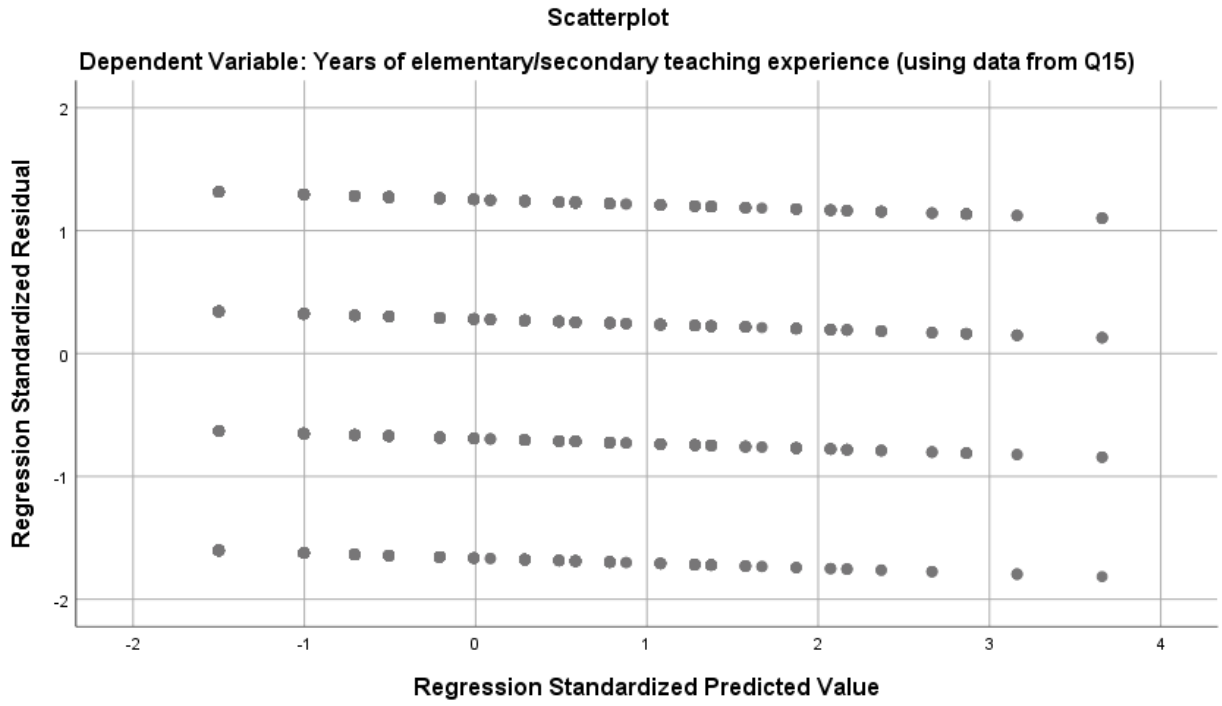
Table 14: Coefficients Table for Model 2

As seen in *Graph 3* below, normal probability is not seen, thus, indicating a weak fit for linearity. There was a major deviation from the line of best-fit. It appeared that there was deviation from normality.



Graph 3: Normal P-P Plot of Regression for Model 2

The scatterplot, seen in *Graph 4*, displays a rectangular shape with all dots appearing within the -3.5 and 3.5 threshold. This graph indicates normality in the model. Graph 1 and Graph 2 provide different results, therefore, the researcher determined that the model indicates that linearity is not met.



Graph 4: Scatterplot for Model 2

Summary

The research and statistical analysis provided results and outcomes in reference to students' use of technology and professional development hours spent by teachers based on teachers' academic discipline (Model 1). The ANOVA test determined a strong difference in main teaching assignment means and students' use of educational technologies. There was a strong correlation with teachers, whose main teaching assignment was General Education, and a higher use of educational technologies by students. The ANOVA test also determined strong similarities in main teaching assignment means and number of hours spent in professional development for educational technology, therefore, strong correlations with the main teaching assignments and hours spent in professional development by teachers did not exist.

The research and statistical analysis also provided results and outcomes in reference to students' use of technology and professional development hours spent by teachers based on teachers' years of teaching experience (Model 2). The tests resulted in a weak difference in years of experience group means and students' use of educational technologies and a weak difference in years of experience group means and the hours spent in professional development for educational technology. Therefore, correlations did not exist amongst teachers' years of teaching experience and their students' use of educational technology in the classroom and the amount of hours they spent in professional development.

References

Bakir, N. (2015). An exploration of contemporary realities of technology and teacher education: Lessons learned. *Journal of Digital Learning in Teacher Education*, *31*(3), 117-130.

Johnson, L., Becker, S. A., Cummins, M., Estrada, V., Freeman, A., & Hall, C. (2016). *NMC horizon report: 2016 higher education edition* (pp. 1-50). The New Media Consortium.

Lei, J. (2010). Quantity versus quality: A new approach to examine the relationship between technology use and student outcomes. *British Journal of Educational Technology*, *41*(3), 455-472.

Salkind, N. J. (2017). *Statistics for People Who (Think They) Hate Statistics* (6th ed.). Thousand Oaks, CA: Sage Publications.

Teachers' Use of Educational Technology in U.S. Public Schools: 2009. National Center for Education Statistics: Retrieved from: https://nces.ed.gov/pubs2010/2010040.pdf

Appendix A

Data Set

Google Drive Link:
https://drive.google.com/open?id=14M4crI2Qrziz0rdZtKc6Ew_WshWZYLR8