The Relationship of K-12 Teachers’ Technology Self-Proficiency Among Curriculum Areas and Grade Level: A Pilot Study

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Technology is in virtually every classroom, in some form, in the K-12 grade public school system. Regardless of the curriculum area or grade level, teachers use some type of technology in the classroom. Teachers use a computer software program to check attendance, enter grades for students, receive announcements and communicate with parents via electronic mail or use some type of electronic blackboard to display the lesson for all students. Technology is in the classrooms and teachers are required to use the technology regardless of the teacher’s level of technology proficiency.

Trying to prepare a pre-service teacher to learn all that is needed in the area of technology and technology integration to enter a classroom is a difficult task. However, making a teacher feel confident in his/her abilities in the area of technology is even more difficult. Technology changes rapidly. Individuals need to feel comfortable and competent in his/her environment in order to be successful.

The purpose of this pilot study was to determine the relationship between a teacher’s technology self-proficiency and the various curriculum areas and grade level taught. The Technology Proficiency Self-Assessment for 21st Century Learning was administered to a rural, public school in Texas to teachers who were currently teaching grade levels of Kindergarten to Twelfth grade. There were two specific research questions addressed through this study:

1. Is there a relationship between a teacher’s technology self-proficiency and curriculum area taught?

2. Is there a relationship between a teacher’s technology self-proficiency and grade level taught?

**Literature Review**
Teacher technology self-proficiency studies have been conducted in a plethora of educational settings. It is important for teachers to feel confident in their technological skills and have a positive attitude regarding the use of technology in order to use the technology effectively. Morales, Knezek & Christensen (2008) conducted a study administering the original TPSA to elementary and middle school teachers in Mexico City and in Dallas, Texas. The objective was to “examine self-efficacy similarities and differences for technology proficiency self-appraisals in a cross-cultural environment” (p. 126). It was found there were significant differences in mean scores between elementary teachers and middle school teachers from both Texas and Mexico in each of the four subscales, with mostly small effect sizes between school level within each country (Morales, et al., 2008). One exception in effect sizes was noted with elementary and middle school teachers in Texas. In the area of integrated applications, Morales, et al., (2008) found that middle school teachers were more highly skilled than their counterpart elementary teachers. Overall, middle school teachers in Texas rated themselves at the highest level in technology self-proficiency over the elementary teachers (Morales, et al, 2008).

Computer self-efficacy can be a determining factor in whether a teacher uses technology in the classroom. Celik and Yesilyurt (2012) believed that the computer was the main tool of computer-supported education and the perceived computer self-efficacy among teachers would play an important part in whether a teacher applied computer-supported education or not. The researchers conducted a study to “test the effect levels among the latent variables of attitude to technology, perceived computer self-efficacy, computer anxiety and the attitude toward doing computer supported education and these latent variables’ ratios to each other” (Celik & Yesilyurt, 2012, p. 148).
The participant group was comprised of 471 pre-service teachers from three different universities in different departments. Each participant was administered the Technology Attitude Scale, Perceived Computer Self-Efficacy Scale, Computer Anxiety Scale, and the Attitude Scale toward Applying Computer Supported Education instruments. Results showed significant and positive effects on each of the hypotheses that were tested.

Celik and Yesilyurt (2012) found pre-service teacher attitudes toward technology positively and significantly affected the teacher’s perceived computer self-efficacy. In other findings, positive and significant results were reported with a teacher’s attitude toward applying computer supported education and affecting computer anxiety. Combining the variables ‘teacher’s attitude towards technology’ and ‘computer anxiety’, found to have a positive effect on a teacher’s attitude toward instituting computer supported education. Significant results were also found to be in the relationship of the combination of variables ‘teacher attitude toward technology’ and ‘perceived computer self-efficacy’ affecting the teacher’s attitude toward applying computer supported education. Celik and Yesilyurt (2012) concluded “technology attitude positively and significantly affects perceived computer self-efficacy, computer anxiety and computer supported education” (p. 156). The study showed positive results if a teacher is more confident and has a higher computer self-efficacy, he/she is more likely to have a positive attitude in relation to computer-supported education. The results are similar to Orr, Allen & Poindexter’s (2000) findings in relation to how a teacher’s attitude would affect the level of implementation in a classroom.

Pre-service teachers are the future of education and technology is a major component in education. Training pre-service teachers in the area of technology is imperative to the growth of the K-12 student population. Therefore, these individuals must become adept in the functions
and integration of technology into the classroom and have the confidence levels that are needed to be successful.

Swain (2006) conducted a study with pre-service teachers to determine their self-proficiency in the area of technology. Students from the University of Florida participated in a national data collection project that was conducted at the University of North Texas Institute for the Integration of Technology into Teaching and Learning (Swain, 2006). Instruments utilized in Swain’s (2006) study consisted of the Concerns Based Adoption Model Level of Use of Technology (CBAM-LoU), Stages of Adoption of Technology (Stages), Apple Classroom of Tomorrow Instrument (ACOT), Teachers Attitudes Toward Computers (TAC) and the Technology Proficiency Self-Assessment (TPSA).

The TPSA attempted to measure the pre-service teachers level of belief in their ability to perform tasks involving “electronic e-mail, using the World Wide Web, integrated computer applications, and integrating technology into teaching” (Swain, 2006, p.44). In all four areas, the difference in means was found to be statistically significant at the .05 level with the exception of the e-mail area (Swain, 2006). The effect sizes in this area were found to indicate practical significance (Swain, 2006). Results reported from the TPSA showed the students, “growing increasingly confident in their ability to perform tasks in the areas of using e-mail, the Web, integrated applications, and in using technology in their teaching” (Swain, 2006, p. 53).

With the shift in curriculum to integration of technology, the focus in teacher education preparation courses has changed to include the skills needed in the area of information technology. It was noted by Albion (1999) that graduates needed to not only possess the skills in the use of information technology, but also believe in their ability to integrate information technology into teaching. Teacher education preparation programs struggle to develop courses
that pre-service teachers need to learn effective skills and gain the confidence that is needed when they are in the classroom. Albion’s argument was that “teachers' beliefs are a significant factor in their success at integrating technology, that self-efficacy beliefs are an important, and measurable, component of the beliefs that influence technology integration…” (Albion, 1999, p. 2). The research suggested the teachers’ felt their self-efficacy beliefs about using technology for teaching was directly related to what the teacher practiced in the classroom. Albion (2001) also reported pre-service teachers need to be encouraged to use computers more often; the frequency of use would increase individual computer self-efficacy.

**Methods**

**Research Design**

A quantitative method approach was used to conduct the study. Quantitative method approach is a procedure for “describing trends and explaining the relationship among variables found in the literature” (Creswell, 2002, p. 58). This process allows the primary investigator to compare the groups or the related variables to explain a relationship (Creswell and Clark, 2011).

The purpose of this study was to determine if there was a relationship between a teacher’s technology proficiency and curriculum area and/or if there was a relationship between a teacher’s technology proficiency and grade level. The first phase consisted of a survey given to K-12 grade teachers containing questions addressing both demographic data and a self-assessment of 21st century technology learning skills. Teachers responded as to their own perception or assessment of how confident the teacher was in being able to perform certain technological skills.

**Participants**
The sample for this study consisted of current K-12 grade teachers in a small, rural public school in Texas. The researcher sent an email request to the Superintendent of Schools, requesting permission to conduct the pilot study within the district. Upon approval from the Superintendent of Schools and acceptance by the Internal Review Board, the study was begun. Potential participants were invited via an email request sent by the Superintendent of Schools with reminder emails each week from the primary investigator.

Participation was completely voluntary. Twenty-three teachers returned Informed Consent Forms, however, only eighteen responded to the survey. All participants were reminded before completing the survey that the information was confidential and the participants could terminate the survey at any time. The Informed Consent Form is located in Appendix A.

**Method of Data Collection**

**Survey Instrument.** The Technology Proficiency Self-Assessment for 21st Century Learning (TPSA C21) was used for the study. The instrument is an adaption of the Technology Proficiency Self-Assessment (TPSA) that was originally developed in 1999 to measure four domains consisting of email, World Wide Web, integrated applications, and integrating technology into teaching (Ropp, 1999). With the rapid changes in technology, the TPSA was revised, utilizing the four domains and including 21st century technology skills, teaching with emerging technologies and emerging technology skills, to become the TPSA C21 (Mayes, Mills, Christensen & Knezek, 2012).

The survey consisted of thirty-nine questions. Formatting for questions included five demographic questions and thirty-four Likert-type scale questions. A Likert-type scale consists of a series of declarative statements (Clason & Dormody, 1994). The Likert-type scale used in this study was formatted using a 5-point scale. The measures for the 5-point Likert-type scale
included choices of “Strongly Disagree”, “Disagree”, “Undecided”, “Agree”, and “Strongly Agree”. The first five questions of the survey requested teachers for demographic information such as entering a unique identifiable number, gender, race, curriculum area, and grade level taught. The thirty-four remaining questions of the survey pertained to the level of confidence a teacher had in their use of technology. The questions asked for confidence levels in six domains, (1) email, (2) World Wide Web, (3) integrated applications, (4) teaching with technology, (5) teaching with emerging technologies, and (6) emerging technology skills.

**Quantitative Data Collection and Analysis**

Quantitative data was collected via the Technology Proficiency Self-Assessment for 21st Century Learning (TPSA C21). The online survey instrument was constructed by the primary investigator in SurveyMonkey, an online survey implementation tool. Participation was voluntary and the responses were confidential. All surveys were concealed in the online survey implementation tool and no one other than the primary investigator and supervising investigator had access to the surveys. The survey was active for a total of two weeks due to limited time constraints for completion of the study.

In the first week of the study, an email message was sent to the teachers via the Superintendent of Schools inviting the teachers to participate in the study. The Informed Consent Form was provided as an attachment to the email for teachers to begin the process if they chose to participate. The message in the email provided the participants with information as to the purpose of the study, the requirements to participate, the time schedule to respond for participation, survey completion instructions and notification of confidentiality and voluntary participation. After reading the rights of participation, the subjects who agreed to participate
completed the Informed Consent Form and submitted it to the primary investigator. The teachers who did not agree to participate did not return the Informed Consent Form.

Upon receipt of the Informed Consent Form, the primary investigator sent an email to all participants in a blind carbon copy format providing them with the link to the online survey instrument. The subjects were provided contact information in case they had questions regarding the study. Subjects were also reminded of confidentiality and the right to discontinue participation at any time during the process. At the end of a one-week period, a follow-up e-mail was sent to the teachers as a reminder of ample time to return the Informed Consent Form and the survey was still active for the teachers who had not yet completed the form. At the conclusion of the second week, the survey was closed to participants. Data was exported from SurveyMonkey into an Excel spreadsheet for the purposes of data analysis. Survey data was coded and then imported into Statistical Package for Social Sciences (SPSS) and analyzed using descriptive statistics.

**Results**

The primary investigator utilized a quantitative methods approach in the study. The purpose of the pilot study was to determine if there was relationship between a teacher’s technology self-proficiency and the various curriculum areas and grade level at a rural, public school in Texas to teachers who were currently teaching grade levels of Kindergarten to Twelfth grade. The study focused on the following research questions:

1. Is there a relationship between a teacher’s technology self-proficiency and curriculum area taught?
2. Is there a relationship between a teacher’s technology self-proficiency and grade level taught?
Quantitative Results

Data received from teachers were entered into SPSS software for data analysis. A total of 23 Informed Consent Forms were signed and returned, with 18 teachers (n=18) completing the online survey. Demographic information was collected identifying gender, ethnic background, subject area taught and grade level taught. The participants were self-designated as consisting of 13 (72.2%) female and five (27.8%) male. In regards to ethnicity, the participants fell into three groups. Sixteen (88.9%) identified as white, one (5.56%) identified as Hispanic, and one (5.56%) identified as African American.

The teachers identified the grade level and curriculum area the teacher was currently teaching. Three grade levels resulted in no reporting data: Kindergarten, fourth and sixth grades. Respondents reported two (11.11%) teaching first grade, one (5.56%) at the second grade level, one (5.56%) third grade teacher, one (5.56%) fifth grade teacher, four (22.22%) teaching seventh grade, four (22.22%) taught on the eighth grade level, 10 (55.56%) taught ninth grade, nine (50%) taught on the tenth grade level, nine (50%) taught eleventh grade, and nine (50%) teachers taught twelfth grade. Due to some of the curriculum areas, several teachers designated more than one grade level taught. These teachers teach a mixed group of students during one class period and teach more than one grade level in a particular curriculum area. Therefore, the number of grade level teachers (n=50) is greater than the number of participants completing the survey (n=18). Grade levels were combined for data analysis purposes into two levels, elementary and secondary. Kindergarten through sixth grade was designated as the elementary grade level with the secondary level consisting of seventh through twelfth grade.

Participants were asked to assess their level of confidence in 21st Century learning skills by beginning the assessment statement with “I feel confident that I could...” and then completing
the statement pertaining to a particular task or skill. Participants had varying results on how confident they felt in each skill area. The subscales were: email, World Wide Web (WWW), integrated applications, teaching with technology, teaching with emerging technology, and emerging technology skills.

Email Subscale

In the assessment of “I feel confident that I could send an email to a friend,” 18 teachers (100%) responded they strongly agreed with the statement. Two teachers (11.1%) felt strongly they were not confident in being able to successfully subscribe to a discussion list with one (5.6%) disagreeing with the statement. Only one teacher (5.6%) was undecided in his/her confidence level. The majority of the teachers, eight (44.4%), agreed they felt confident with six (33.3%) strongly agreeing they were confident in this particular skill. When asked to assess proficiency levels in the ability to create a distribution list to send an email to several people at once, teachers were more confident of their abilities. One teacher (5.6%) strongly disagreed he/she was not proficient while two (11.1%) were undecided. Eleven (61.1%) teachers felt strongly about their levels of proficiency with four (22.2%) agreeing as well. Question 9 pertained to sending a document as an attachment within an email message. Teachers were more confident in this area. There were no (0%) teachers strongly disagreeing, one (5.6%) teacher disagreed, one (5.6%) was undecided, two (11.1%) agreed, and 14 (77.8%) strongly agreed with the statement. The final question in the email subscale noted that teachers were more confident in their ability to keep copies of outgoing messages that are sent to others. None of the teachers (0%) strongly disagreed, disagreed or were undecided with two (11.1%) agreeing, and 16 (88.9%) strongly agreeing.

WWW Subscale
The WWW subscale consisted of five questions relating to a teacher’s level of proficiency using the Internet. Teachers were confident in the ability of being able to use an Internet search engine to find Web pages related to the teacher’s subject matter interests. One teacher (5.6%) strongly disagreed, none (0%) disagreed, two (11.1%) were undecided, none (0%) agreed, and 15 (83.3%) strongly agreed with the statement. Another positive confidence level of assessment was in the ability to search for and find the Smithsonian Institution Web site. None (0%) strongly disagreed, disagreed or were undecided, with three (16.7%) agreeing, and 15 (83.3%) strongly agreeing. In the area of a teacher feeling confident in creating a web page of his/her own, six (33.3%) strongly disagreed, one (5.6%) disagreed, four (22.2%) were undecided, four (22.2%) agreed, and only three (16.7%) felt strongly in his/her ability. Teachers were mostly confident in their ability to keep track of Web sites the teacher visited and able to return to the Web site later using bookmarks. Only one (5.6%) strongly disagreed with the statement while three (16.7%) agreed and 14 (77.8%) strongly agreed. The final question in the WWW subscale measured confidence levels in finding primary resources of information on the Internet that can be used in the teacher’s teaching. Six (33.3%) of the teachers agreed with the statement while 12 (66.7%) strongly agreed they were confident in this area.

Integrated Applications Subscale

The integrated applications subscale consisted of five questions. Teachers were asked to measure their level of confidence in using a spreadsheet to create a bar graph of the proportions of the different colors of M&Ms in a bag. The results were dispersed throughout the scale. Three (16.7%) of the teachers strongly disagreed with the statement, while two (11.1%) disagreed, four (22.2%) were undecided, two (11.1%) agreed, and seven (38.9%) strongly agreed with the statement. Creating a newsletter with graphics was an area distributed across all five scales with
two (11.1%) strongly disagreeing, three (16.7%) disagreeing, two (11.1%) undecided, four (22.2%) agreeing and seven (38.9%) strongly agreeing. Four (22.2%) of the teachers strongly disagreed they were able to save documents in formats so that others could read them if they have different word processing programs. In this section, none (0%) disagreed, two (11.1%) were undecided, three (16.7%) agreed, and nine (50%) strongly agreed with the statement. Being able to use the computer to create a slideshow presentation had the majority on the positive side of the Likert-scale. Thirteen (72.2%) of the teachers answered they strongly agreed with the statement, two (11.1%) agreed, with the remaining being one (5.6%) as undecided, disagreed, and strongly disagreed, respectively. Creating a database of information about important authors in a subject matter field yielded results of four (22.2%) strongly disagreeing, one (5.6%) disagreeing, four (22.2%) undecided, seven (38.9%) agreeing, and two (11.1%) strongly agreeing.

Teaching with Technology Subscale

In the teaching with technology subscale, teachers were asked five questions. The first question was if the teacher was confident in writing an essay describing how they would use technology in their classroom. None (0%) of the teachers strongly disagreed with the statement while one (5.6%) disagreed, two (11.1%) were undecided, six (33.3%) agreed and nine (50%) strongly agreed. In creating a lesson or unit that incorporates subject matter software as an integral part teachers responded with one (5.6%) strongly disagreeing, one (5.6%) disagreeing, four (22.2%) were undecided, four (22.2%) agreed and eight (44.4%) strongly agreed with the statement. Using technology to collaborate with teachers or students, who are distant from the teacher’s classroom yielded one (5.6%) strongly disagreeing, two (11.1%) disagreeing, none (0%) were undecided, eight (44.4%) agreeing and seven (38.9%) strongly agreeing. Teachers
were asked if they were able to describe five software programs or apps that the teacher would use in their classroom teaching. Two (11.1%) teachers strongly disagreed, two (11.1%) disagreed, three (16.7%) were undecided, five (27.8%) agreed, and six (33.3%) strongly agreed. Writing a plan with a budget to buy technology for the classroom was the final question in the teaching with technology subscale. Two (11.1%) of the teachers strongly disagreed, three (16.7%) disagreed, three (16.7%) were undecided, six (33.3%) agreed, and four (22.2%) strongly agreed with the statement.

**Teaching with Emerging Technologies**

The fifth subscale consisted of eight questions. The first question asked teachers if they were confident in being able to integrate mobile technologies into the teacher’s curriculum. One (5.6%) strongly disagreed, one (5.6%) disagreed, two (11.1%) were undecided, while six (33.3%) agreed, and eight (44.4%) strongly agreed. Using social media tools for instruction in the classroom such as Facebook, Twitter, etc., yielded results of two (11.1%) each strongly disagreeing, disagreeing and undecided, with seven (38.9%) agreeing, and five (27.8%) strongly agreeing. In the confidence of being able to create a wiki or blog to have students collaborate together, two (11.1%) of the teachers responded as strongly disagreeing, four (22.2%) disagreed, four (22.2%) were undecided, five (27.8%) agreed and three (16.7%) strongly agreed. Being able to use online tools to teach students from a distance resulted in three (16.7%) strongly disagreeing, three (16.7%) disagreeing, two (11.1%) undecided, seven (38.9%) agreed and three (16.7%) strongly agreed. Teachers were asked if they were confident in teaching in a one-to-one environment in which the students have their own device. Two (11.1%) of the teachers strongly disagreed, one (5.6%) disagreed, four (22.2%) were undecided, six (33.3%) agreed, and five (27.8%) strongly agreed. In the area of being able to find a way to use a smartphone in the
classroom for student responses, two (11.1%) of the teachers strongly disagreed with the statement, none (0%) disagreed, five (27.8%) were undecided, six (33.3%) teachers agreed, and five (27.8%) strongly agreed with the statement. Being confident in using mobile devices to connect to others for professional development yielded results of one (5.6%) strongly disagreeing, one (5.6%) disagreeing, three (16.7%) undecided, six (33.3%) agreed, and seven (38.9%) strongly agreed. The last question in this subscale was in relation to using mobile devices to have the students access learning activities. One (5.6%) teacher strongly disagreed with the statement, no one (0%) disagreed, two (11.1%) were undecided, nine (50%) agreed, and six (33.3%) strongly agreed he/she was confident in this area.

Emerging Technology Skills

The final subscale asked participants six questions relating to emerging technology skills. Participants were asked how confident they were in his/her ability to download and listen to podcasts/audio books. One (5.6%) responded as strongly disagreeing, with one (5.6%) teacher disagreeing with the statement. One (5.6%) teacher was undecided, three (16.7%) agreed, and 12 (66.7%) strongly agreed with the statement. In downloading and reading books, one (5.6%) responded as strongly disagreeing, while one (5.6%) participant disagreed, one (5.6%) undecided, two (11.1%) agreed, and 13 (72.2%) strongly agreed with the statement. Downloading and view streaming movies/video clips confidence levels were reported as none (0%) strongly disagreeing or disagreeing, two (11.1%) undecided, three (16.7%) agreed and 13 (72.2%) strongly agreed with the statement. Teachers felt relatively confident in their ability to send and receive text messages with two (11.1%) agreeing and 16 (88.9%) strongly agreeing. The statement of confidence levels regarding transferring photos or other data via a smartphone yielded one (5.6%) strongly disagreeing, none (0%) disagreeing, two (11.1%) undecided, two
(11.1%) agreed, and 13 (72.2%) strongly agreeing. The final question of the survey instrument asked teachers to rate their confidence levels in the teacher’s ability to save and retrieve files in a cloud-based environment. Three (16.7%) strongly disagreed with the statement, none (0%) disagreed, three (16.7%) were undecided, five (27.8%) agreed, and seven (38.9%) strongly agreed with the statement in the level of confidence.

Reliability

A questionnaire was employed to measure six different, underlying constructs consisting of email, WWW, integrated applications, teaching with technology, teaching with emerging technologies and emerging technologies skills. Data were exported into the SPSS Statistics program, a computer program that analyzes data (Creswell & Clark, 2011). To determine internal consistency, Cronbach’s coefficient alpha was used as shown in Table 1. According to DeVellis (2012), Cronbach’s coefficient alpha is a widely used measure of reliability. The 34 variables measured produced a Cronbach’s alpha of .976 with one item being excluded, resulting in 33 variables. The results reported one variable had zero or approximately zero variance and was removed from the scale. The excluded variable was “I feel confident I could send an email to a friend”. According to Cronbach’s alpha table, if the result is greater than 0.9, the internal consistency is rated as being excellent (DeVellis, 2012). This means that the results of the survey conducted had an excellent internal consistency rating which produced a reliable test.

| Table 1 |
| All Variables Reliability |

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Results

To determine if there was a relationship between the grade levels of teachers and a teacher’s technology proficiency self-assessment, the Mann-Whitney U test was conducted. According to Laerd Statistics (2013), this test is used to determine if differences exist between two groups on a continuous or ordinal dependent variable. A Mann-Whitney U test was run to determine if there were differences in each TPSA C21 variable between elementary level teachers and secondary level teachers. Median TPSA C21 scores were not statistically significantly different between elementary level teachers and secondary level teachers as noted in the following tables for each subscale area, using an exact sampling distribution for U.

Table 2

*Mann-Whitney U Test Statistics and Median Report*

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The Kruskal-Wallis H test was used to determine if there were statistically significant differences between the independent variables and dependent variables. According to Laerd Statistics (2013), the Kruskal-Wallis H test is a rank-based nonparametric test that may be used with groups of two or more independent variables to determine if there is a statistically significant relationship with a continuous or ordinal dependent variable. The dependent variables (n=34) in the study were measured on a five-point Likert scale, set as an ordinal scale. The independent variable was the curriculum area that consisted of eight different groups within the variable with one group, Physical Education, not being represented.

The "Math" (n = 4), "Science" (n = 3), "Social Studies" (n = 1), "ELA" (n = 7) "CTE" (n = 1) "Foreign Language" (n = 1), and "Fine Arts" (n = 1) groups were measured and found to be similar for all technology self-proficiency assessment areas. The individual assessment scores increased from strongly disagree (Md = 1.00) to strongly agree (Md = 5.00), but the differences were not statistically significant, excluding one area, Q10 = “I feel confident I could keep copies of outgoing messages that I send to others” with a p = .043.

It is important to note the asymptotic p value was used in this test due to the small sample size and the quantity of groups within the independent variable. According to Laerd Statistics (2013), the asymptotic p-value means that the p-value is an approximation of the true p-value but will improve as the sample size increases. It is considered acceptable or “good enough” when there are five or more participants per group in the independent variable, as in this study. Tables 3-8 show each subscale denoting the significant values measured by the Kruskal-Wallis H test for the subject areas with a df = 6. Headings were labeled according to the number associated
with the question on the TPSA C21. See Appendix B for the TPSA C21 administration survey instrument.

Table 3

*Kruskal-Wallis H Test on Email Subscale*

<table>
<thead>
<tr>
<th></th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymp. Sig.</td>
<td>1.00</td>
<td>.489</td>
<td>.426</td>
<td>.701</td>
<td>.043</td>
</tr>
</tbody>
</table>

Table 4

*Kruskal-Wallis H Test on WWW Subscale*

<table>
<thead>
<tr>
<th></th>
<th>Q11</th>
<th>Q12</th>
<th>Q13</th>
<th>Q14</th>
<th>Q15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymp. Sig.</td>
<td>.132</td>
<td>.064</td>
<td>.580</td>
<td>.160</td>
<td>.556</td>
</tr>
</tbody>
</table>

Table 5

*Kruskal-Wallis H Test on Integrated Applications Subscale*

<table>
<thead>
<tr>
<th></th>
<th>Q16</th>
<th>Q17</th>
<th>Q18</th>
<th>Q19</th>
<th>Q20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymp. Sig.</td>
<td>.463</td>
<td>.382</td>
<td>.632</td>
<td>.517</td>
<td>.714</td>
</tr>
</tbody>
</table>

Table 6

*Kruskal-Wallis H Test on Teaching with Technology Subscale*

<table>
<thead>
<tr>
<th></th>
<th>Q21</th>
<th>Q22</th>
<th>Q23</th>
<th>Q24</th>
<th>Q25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymp. Sig.</td>
<td>.302</td>
<td>.302</td>
<td>.901</td>
<td>.564</td>
<td>.715</td>
</tr>
</tbody>
</table>
Table 7

*Kruskal-Wallis H Test on Teaching with Emerging Technology Subscale*

<table>
<thead>
<tr>
<th></th>
<th>Q26</th>
<th>Q27</th>
<th>Q28</th>
<th>Q29</th>
<th>Q30</th>
<th>Q31</th>
<th>Q32</th>
<th>Q33</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymp. Sig.</td>
<td>.532</td>
<td>.541</td>
<td>.459</td>
<td>.546</td>
<td>.377</td>
<td>.317</td>
<td>.407</td>
<td>.377</td>
</tr>
</tbody>
</table>

Table 8

*Kruskal-Wallis H Test on Emerging Technology Skills Subscale*

<table>
<thead>
<tr>
<th></th>
<th>Q34</th>
<th>Q35</th>
<th>Q36</th>
<th>Q37</th>
<th>Q38</th>
<th>Q39</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymp. Sig.</td>
<td>.254</td>
<td>.293</td>
<td>.446</td>
<td>.876</td>
<td>.374</td>
<td>.217</td>
</tr>
</tbody>
</table>

**Discussion and Conclusion**

The purpose of this study was to determine the relationship between a teacher’s technology self-proficiency and the various curriculum areas and grade level. The study was conducted within a rural, public school in Texas to teachers who were currently teaching grade levels of Kindergarten to Twelfth grade. A quantitative approach using a survey created in Survey Monkey, an online instrument tool, was used to collect the data.

The two research questions that were addressed in the pilot study were:

1. Is there a relationship between a teacher’s technology self-proficiency and curriculum area taught?

2. Is there a relationship between a teacher’s technology self-proficiency and grade level taught?

Two rank-based nonparametric tests were run to determine if a relationship exists, Mann-Whitney U test and Kruskal-Wallis H. Regarding Research Question 1, the Kruskal-Wallis H test
was used and found there was no statistically significant difference between a teacher’s technology self-proficiency and curriculum area taught in all variables excluding Q10 = “I feel confident I could keep copies of outgoing messages that I send to others” resulting in \( p = .043 \). Research Question 2 was tested using the Mann-Whitney U statistical test and was found there were no statistically significant differences between a teacher’s technology self-proficiency and the grade level that was taught.

Based on previous studies, (Morales, et al., 2008), the results of this study are inconsistent in the area of middle school teachers and elementary teachers. According to Morales, et al. (2008), middle school teachers in Texas rated themselves at the highest level in technology self-proficiency over the elementary teachers. The difference could be due to the fact the pilot study data for grade levels was combined as elementary consisting of grades Kindergarten through sixth grade and secondary consisting of seventh grade through twelfth grade. The pilot study included high school teachers as part of the secondary, comparing the high school teachers with the elementary teachers. Further research should be conducted to eliminate ninth grade through twelfth grade teachers to determine if a relationship would be statistically significant, therefore, yielding consistent results with previous findings.

The study found no statistically significant differences in relation to curriculum areas or grade level with teacher’s technology self-proficiency, excluding one question in the email subscale with curriculum area. This may concur with Swain’s (2006) report that the preservice teachers were growing increasingly confident in their abilities over time. The participants in the pilot study may have become more confident in the technology proficiency, yielding different results due to their experience in the field.
In the data analysis, validation of the variables was attempted with the dependent variables in a factor analysis procedure. Due to the small sample size (n=18), the analyses were unable to produce reportable results. The factor analysis reported there were fewer than two cases, at least one variable had zero variance, and there was only one variable in the analysis resulting in no further results excluding mean and standard deviation. Future studies would need to include a larger sample size in order to produce validation.

Future studies are warranted due to limitations based on the sample size used. A larger population needs to be surveyed to produce more reliable and consistent results. Another factor that should be included in a future study would be to include a demographic question asking for age of respondent. The age of the teacher may be a variable that would show another explanation as to the confidence level of technology proficiency. Teachers who have recently graduated from a post-secondary institution may have had more training in the area of technology than teachers who have been in the field for numerous years also yielding different results.
References


Appendix A: Informed Consent Form

FACULTY/STAFF INVESTIGATOR AND ADULT SUBJECTS

University of North Texas Institutional Review Board

Informed Consent Form

Before agreeing to participate in this research study, it is important that you read and understand the following explanation of the purpose, benefits and risks of the study and how it will be conducted.

Title of Study: The Relationship of K-12 Teachers’ Technology Self-Proficiency Among Curriculum Areas and Grade Level

Investigator: Rhonda Ritter, a doctoral student in the University of North Texas (UNT) Department of Learning Technologies.

Purpose of the Study: You are being asked to participate in a research study that involves a survey to assess your technology self-proficiency in various emerging applications. The purpose of the study is to determine if there is a relationship between a teacher’s technology self-proficiency and the grade level and curriculum area that the teacher is currently teaching.

Study Procedures: You will be asked to complete the Technology Proficiency Self-Assessment for 21st Century Learning Survey that will take about 20 minutes of your time. The survey gives you the opportunity to assess your confidence in emerging technology applications.

Foreseeable Risks: No foreseeable risks are involved in this study.

Benefits to the Subjects or Others: This study is not expected to be of any direct benefit to you but the researcher hopes to learn more about the relationships between a teacher’s technology self-proficiency and the various curriculum areas and grade levels. The results may benefit the field of technology by providing insight into relationships between self-proficiency and curriculum areas to determine if a teacher who teaches in a particular content area and/or particular grade level is more confident in the use of technology. Future studies may be conducted to determine if a teacher’s technology self-proficiency indicates a higher level of technology integration.

Compensation for Participants: None

Procedures for Maintaining Confidentiality of Research Records: The survey questions are about your personal thoughts on your confidence levels of various emerging technology applications. The researcher will take all reasonable precautions to protect your confidentiality and will only use responses for educational research purposes. The confidentiality of your
individual information will be maintained in any publications or presentations regarding this study.

**Questions about the Study:** If you have any questions about the study, you may contact Rhonda Ritter at rhondaritter@my.unt.edu or the faculty advisor, Dr. Tandra Tyler-Wood, UNT Department of Learning Technologies, at tandra.tyler-wood@unt.edu.

**Review for the Protection of Participants:** This research study has been reviewed and approved by the UNT Institutional Review Board (IRB). The UNT IRB can be contacted at (940) 565-4643 with any questions regarding the rights of research subjects.

**Research Participants’ Rights:**

Your signature below indicates that you have read or have had read to you all of the above and that you confirm all of the following:

- Rhonda Ritter has explained the study to you and answered all of your questions. You have been told the possible benefits and the potential risks and/or discomforts of the study.
- You understand that you do not have to take part in this study, and your refusal to participate or your decision to withdraw will involve no penalty or loss of rights or benefits. The study personnel may choose to stop your participation at any time.
- You understand why the study is being conducted and how it will be performed.
- You understand your rights as a research participant and you voluntarily consent to participate in this study.
- You have been told you will receive a copy of this form.

______________________________
Printed Name of Participant

______________________________ Date
Signature of Participant

**For the Investigator or Designee:**

I certify that I have reviewed the contents of this form with the subject signing above. I have explained the possible benefits and the potential risks and/or discomforts of the study. It is my opinion that the participant understood the explanation.

______________________________ Date
Signature of Investigator or Designee
Appendix B: Survey Questions

Thank you for participating in the survey. Your feedback is important.

Welcome to the Technology Proficiency Self-Assessment for 21st Century Learning (TPSA C21)

* 1. Please enter the last four digits of your social security number.
* 2. With which ethnic background do you most identify?
   White
   African-American
   Hispanic
   American Indian
   Asian
   Pacific Islander
   Other
* 3. Are you male or female?
   Male
   Female
* 4. What is the grade level at which you currently teach? (Check all that apply.)
   Kindergarten
   1st Grade
   2nd Grade
   3rd Grade
   4th Grade
   5th Grade
   6th Grade
   7th Grade
   8th Grade
   9th Grade
   10th Grade
   11th Grade
   12th Grade
* 5. What is the current subject area in which you teach?
   Math
   Science
   Social Studies
   English/Language Arts
   Career & Technical Education
   Foreign Language
   Fine Arts
   Physical Education

Technology Proficiency Self-Assessment Section

In this section, assess your confidence level using technology as Strongly Disagree (SD),
Disagree (D), Undecided (U), Agree (A) or Strongly Agree (SA)

I feel confident that I could...

* 6. ...send an email to a friend.

SD  D  U  A  SA

* 7. ...subscribe to a discussion list.

SD  D  U  A  SA

* 8. ...create a distribution list to send email to several people at once.

SD  D  U  A  SA

* 9. ...send a document as an attachment to an email message.

SD  D  U  A  SA

* 10. ...keep copies of outgoing messages that I send to others.

SD  D  U  A  SA

* 11. ...use an Internet search engine (e.g., Google) to find Web pages related to my subject matter interests.

SD  D  U  A  SA

* 12. ...search for and find the Smithsonian Institution Web site.

SD  D  U  A  SA

* 13. ...create my own web page.

SD  D  U  A  SA

* 14. ...keep track of Web sites I have visited so that I can return to them later. (An example is using bookmarks).

SD  D  U  A  SA

* 15. ...find primary sources of information on the Internet that I can use in my teaching.

SD  D  U  A  SA

* 16. ...use a spreadsheet to create a bar graph of the proportions of the different colors of M&Ms in a bag.

SD  D  U  A  SA

* 17. ...create a newsletter with graphics.

SD  D  U  A  SA

* 18. ...save documents in formats so that others can read them if they have different word processing programs (e.g., saving Word, pdf, RTF, or text).

SD  D  U  A  SA

* 19. ...use the computer to create a slideshow presentation.

SD  D  U  A  SA

* 20. ...create a database of information about important authors in a subject matter field.

SD  D  U  A  SA

* 21. ...write an essay describing how I would use technology in my classroom.

SD  D  U  A  SA

* 22. ...create a lesson or unit that incorporates subject matter software as an integral part.

SD  D  U  A  SA

* 23. ...use technology to collaborate with teachers or students, who are distant from my classroom.

SD  D  U  A  SA

* 24. ...describe 5 software programs or apps that I would use in my teaching.
25. write a plan with a budget to buy technology for my classroom.
26. integrate mobile technologies into my curriculum.
27. use social media tools for instruction in the classroom. (ex. Facebook, Twitter, etc.)
28. create a wiki or blog to have my students collaborate.
29. use online tools to teach my students from a distance.
30. teach in a one-to-one environment in which the students have their own device.
31. find a way to use a smartphone in my classroom for student responses.
32. use mobile devices to connect to others for my professional development.
33. use mobile devices to have my students access learning activities.
34. download and listen to podcasts/audio books.
35. download and read e books.
36. download and view streaming movies/video clips.
37. send and receive text messages.
38. transfer photos or other data via a smartphone.
39. save and retrieve files in a cloud-based environment.

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