Music Teachers’ Perceptions of a Technology Training Model

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Article based on:

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Abstract

This study investigated whether K-12 music teachers in a Virginia school division perceived support from Instructional Technology Resource Teachers (ITRT) as an effective means of professional development for the integration of instructional technologies into music instruction. Data were analyzed to determine whether periodic collaborations with Instructional Technology Resource Teachers correlated with changes in music teacher comfort levels with technology use. Furthermore, this study examined whether the frequency or extent of the collaborations with the ITRT influenced changes in music classroom practice of technology integration. Results indicated that participants perceived that the ITRT role positively affected their comfort with technology use, as well as their increased likelihood of using technology for music instruction. Implications for music classroom practice are addressed.

Keywords

music teacher professional development, music technology, technology integration, staff development, TPACK
For more than thirty years computers and other technologies have been common instructional tools within our schools (Honey, Culp, & Spielvogel, 2005; Russell, O’Dwyer, Bebell, & Seeley, 2003). While availability and instructional integration may vary widely, as each year dawns, an increasing variety of technology tools become available to teachers and students. Varied technologies are ubiquitous facets of life in and out of the classroom, and increasingly throughout this decade we have heard the cry for digital literacy (Lankshear & Knobel, 2008), for meeting the needs of the digital native (Prensky, 2001), and for teaching twenty-first century skills in our schools (Partnership for 21st Century Skills, 2007).

Modern teachers must reflect this technological world that our students inhabit. In a meta-analysis of studies focused on technology in schools, Fadel and Lemke (2006) found a variety of reasons and purposes for the inclusion of technology in schools, ranging from improving learning and student engagement and closing the digital divide to real-world applications and 21st century skills. Previous researchers have provided evidence of improved student learning as a result of technology use, and of increased student achievement when learning with technology by demonstrating a positive correlation between computer-aided instruction and student achievement with elementary students (Christmann & Badgett, 2003). Similar significant achievement gains were shown when utilizing technology in a meta-analysis of forty years of research on technology in education (Tamim, Bernard, Borokhovski, Abrami, & Schmid, 2011). In studies such as those conducted by Ho (2004), students overwhelmingly believed that technology improved the quality of their music learning, and a majority of teachers surveyed agreed. However, this desirable outcome is not the focus of the present study.

The focus of this study remains on how to prepare music teachers to appropriately integrate technology into instruction. While there certainly exists a plethora of technology
resources available for the music classroom, there have not been an overwhelming number of studies that have focused on staff development for music technology integration. Existing studies on the use of music technology for instruction (see Bush, 2007; Jassman, 2004) do strongly underscore the desire of music teachers to participate in just such professional development.

Research on effective practice indicates that personal and sustained professional development often equates to more meaningful results in terms of classroom practice (Joyce & Showers, 1983; 1995; 2002). Yet relatively few music educators have been actively engaged in the application of instructional technology to music learning, perhaps due to a perceived lack of meaningful professional development. It is necessary to examine types of professional development available to music teachers for their effectiveness relative to their intended goals.

**Professional Development in Music Education**

Music educators have a variety of technology tools at their disposal, and researchers have focused on the need for staff development to encourage and support the effective use of them. Three decades ago, Peters (1984) discussed the need for music teachers to be trained to use the “high technology” available to the music classroom in 1984. Williams (1992) described the lack of technology expertise among college music faculty as a roadblock to empowering pre-service music teachers to meet the current needs of the classroom and society.

In the time since the Peters article, music technology for a variety of purposes has become quite prevalent. The Internet, multimedia resources, digital studios, hand-held devices, computer software for composition and ear training, and a variety of Web 2.0 tools are all readily available in many music classrooms across the country and around the world. While much of the research on technology in the music classroom has been focused on specific tools or approaches to using specific software, and while pedagogical literature abounds, there is less in terms of
research on staff development for technology integration in the music classroom. Bowles (2003) surveyed 456 music teachers to determine their professional development interests and found that 66 percent of the respondents reported that technology was their top priority. It is apparent from this and other studies that this area is of some concern for practitioners and researchers in the field. In 1999, the National Association for Music Education (formerly MENC) added an addendum to their Opportunity to Learn standards that addressed music technology. In that addendum it states, “It is also essential that all schools provide a minimal level of training for their staff and teachers, and make an effort to effectively incorporate the technology into the music curriculum” (p. 1). While staff development recommendations are included in these standards, there is currently little research on whether school divisions are addressing those identified needs.

The amount of technology resources designed specifically for music classrooms has grown exponentially (Dammers, 2013), and many music educators and their students have quickly embraced them. Dorfman (2006), researching interactions of students with computer music applications, stated that “the depth to which teachers are familiar with technology, and to which they integrate it bears direct influence on the types of learning conditions they are able to design for their students” (p. 26). To encourage that familiarity, it is necessary to implement models of support for practicing teachers. Bauer, Reese, and McAllister (2003) investigated weeklong technology workshops for music teachers to determine if such a structure is perceived as an effective model for professional development, and found an increased likelihood of technology usage due to those workshops. Other researchers concur, and seek models that provide measurable change in instructional technology integration.
Purpose and Research Questions

The purpose of this study was to determine whether K-12 music teachers in a Virginia school division perceived support from Instructional Technology Resource Teachers (ITRT) as an effective means of professional development for the integration of technologies into music instruction. The questions posed to address this were the following: (a) Does technology integration training/support provided by Instructional Technology Resource Teachers (ITRTs) influence teachers’ degree of comfort with using technology for music education? (b) Does contact with the ITRT influence teachers’ tendency to engage in certain technology-based activities/behaviors? (c) Does the frequency of contact with the ITRT increase teachers’ likelihood of integrating technology in their classrooms? (d) What elements of technology-based instruction are most and least positively affected by the ITRT training/support?

Theoretical Framework

A theoretical framework known as TPACK, which helps us conceptualize how teacher technological knowledge, pedagogical knowledge and content knowledge work together in education, guided this study. Developed by Mishra and Koehler (2006) as an extension of Shulman’s theory of Pedagogical Content Knowledge, the TPACK model\(^1\) helps to conceptualize the integration of instructional technology into the teaching and learning process. In this framework, developing an understanding of the interplay between three domains of knowledge – technology, pedagogy, and content – allows for meaningful planning for integration of technology. Within the TPACK framework, each instructional opportunity allows teachers to develop unique solutions to appropriately integrate technology while simultaneously addressing pedagogical and content needs. Morsink et al. (2011), and Figg and Jaipal Jamani (2013) have

\(^1\) For a detailed description of TPACK and a visual model of the theory, see tpack.org.
shown clear growth in technology-enhanced teaching practice as a result of TPACK-based professional development.

Pertinent to this study and the TPACK framework, Banister and Reinhardt (2011) demonstrated that job-embedded professional development using TPACK principles influence both technology integration and student achievement. In their study, 82 observations of 23 teachers determined that positive results in addressing social justice issues were evident with the infusion of technology in combination with solid content knowledge. In the present study, ITRT support was given to music teachers specific to selection, training on, and use of appropriate music technologies in support of the music content delivered (The TPACK framework).

Policy Context for the Present Study

Since 1995, the Commonwealth of Virginia Department of Education has demonstrated a commitment to technology use in Virginia’s public schools. The Virginia Standards of Learning (SOL), which include computer/technology standards, outline the commonwealth's expectations for student learning and achievement in grades K-12 in a majority of core and encore content areas. The technology standards currently reflect five areas of competency for students: (a) Basic Operations and Concepts, (b) Social and Ethical Issues, (c) Technology Research Tools, (d) Thinking Skills, Problem Solving and Decision-Making Tools, and (e) Technology Communication Tools. The Virginia legislature adopted the Technology Standards for Instructional Personnel (TSIP) in 1998 as a requirement for teacher licensure. This was intended to ensure teachers’ technology competency. The 2009 Standards of Quality of the Virginia General Assembly supported teacher training in technology: “Local school boards shall employ two full-time equivalent positions per 1,000 students in grades

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2http://www.doe.virginia.gov/testing/sol/standards_docs/computer_technology/index.shtml
kindergarten through 12, one to provide technology support and one to serve as an instructional technology resource teacher” (Virginia Standards of Quality, §§22.1-253.13:2).

The role of the ITRT is to train teachers to integrate technology tools effectively. ITRTs dedicate the majority of their time to collaboratively designing lessons, modeling strategies, supporting technology-infused classroom instruction, and conducting professional development in varied settings and across all content areas. Prior to the current study, there had been no research on the impact of the ITRT model on instructional technology use in music education, nor on changes in frequency of technology use or integration as a result of collaborations with ITRTs.

**Method**

Participants (N=14) were K-12 music teachers in a school division in Virginia whose teaching assignments were distributed across general, choral and instrumental music programs. Since no data collection instruments existed to measure the specific aspects of ITRT engagement that were of interest in this study, we developed and deployed a researcher-designed questionnaire. The questionnaire was structured with Likert-type or frequency scales for each response section. The content of the instrument was extracted from both the literature about the TPACK framework, as well as that on the specific intent and goals of the ITRT structure. The questionnaire was reviewed for validity by several experienced researchers who are familiar with issues of music education, technology integration, and professional development.

Data reflecting changes in technology integration for music instruction as a perceived outcome of ITRT collaboration were collected using an online questionnaire, which was administered four times throughout one school year. The initial administration of the questionnaire included only four sections and was used to collect baseline data. This
administration was given prior to any collaboration with the ITRT during the fall of 2010. Collaborations between participant music teachers and ITRTs began between the first and second administrations of the questionnaire. During these collaborations, ITRTs and music teachers met to discuss desired technology to be used for instruction and appropriate pedagogy for its integration. Collaborations with the ITRT were measured across three domains: planning with the ITRT, focus on music technology integration, focus on general classroom technology integration. Each subsequent administration included an additional two sections, which served to measure changes in participant responses as a result of collaborations with the ITRT. Data were analyzed using means comparison and bivariate correlations of scores at Time 1 (pre-collaboration), Time 2 (after first collaboration) Time 3 (after second collaboration) and Time 4 (after third collaboration). This procedure demonstrated whether there were differences among the four sets of scores.

**Results**

To address the first research question, “Does technology integration training/support provided by Instructional Technology Resource Teachers (ITRTs) influence teachers’ degree of comfort with using technology for music education,” means and Pearson product-moment correlations were employed to measure the extent of relationships between several of the questionnaire items as they related to comfort. As shown in Table 4, mean growth of music participants’ comfort using technology as part of professional responsibilities grew slightly over the course of the data collection period. Table 1 displays music teacher comfort with using technology as part of professional responsibilities across four administrations of the questionnaire.
Participants reported increased comfort across collaboration questionnaire administrations at Times 2, 3, and 4. To further address the first research question, a Pearson product-moment correlation (r) was used with constructed variables for music teacher comfort using technology and influence of ITRT training/support. There was a moderate, significant correlation between the two variables ($r(12) = .58$, $p < .05$), indicating that increasing levels of comfort with using technology for music education were significantly associated with ITRT training/support.

Table 1

<table>
<thead>
<tr>
<th>Music Teacher Comfort with Using Technology</th>
<th>Time 1 Mean (SD)</th>
<th>Time 2 Mean (SD)</th>
<th>Time 3 Mean (SD)</th>
<th>Time 4 Mean (SD)</th>
<th>Growth from Time 1 to Time 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 14</td>
<td>Comfort with Using Technology</td>
<td>4.14 (1.23)</td>
<td>4.43 (1.09)</td>
<td>4.79 (1.37)</td>
<td>4.79 (1.89)</td>
</tr>
</tbody>
</table>

Note. 6-point Likert-type scale: Not Comfortable at All (1), 2, 3, 4, 5, Extremely Comfortable (6).

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The constructed variable was calculated based on the participants’ responses to two groups of items on the questionnaire. One group dealt with the participants’ comfort, the other with their likelihood to integrate technology based on their collaborations with the ITRT.
In order to address the second research question, “Does contact with the ITRT influence teachers’ tendency to engage in certain technology-based activities/behaviors,” participant level of agreement responses to the statement, “I am more likely to integrate technology in my classroom than I was before working with the ITRT,” were reviewed. Distribution of participant agreement responses per questionnaire administrations, as well as mean and standard deviation data are displayed in Table 2.

A majority of participants agreed or strongly agreed with this statement. In addition, a Pearson product-moment correlation coefficient (r) was computed to assess the relationship between a constructed variable measuring music teachers’ tendency to engage in technology-based activities, and a constructed variable measuring the influence of contact with the ITRT. There was a moderate, positive correlation between the two variables ($r(12) = .56, p < .05$), indicating that the participants’ tendencies to engage in technology-based activities were significantly related to the influence of ITRT training.

Table 2

<table>
<thead>
<tr>
<th></th>
<th>N = 14</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 2</td>
<td>0.0% (0)</td>
<td>14.3% (2)</td>
<td>50.0% (7)</td>
<td>35.7% (5)</td>
<td></td>
<td>3.21 (.70)</td>
</tr>
<tr>
<td>Time 3</td>
<td>0.0% (0)</td>
<td>21.4% (3)</td>
<td>57.1% (8)</td>
<td>21.4% (3)</td>
<td></td>
<td>3.00 (.68)</td>
</tr>
<tr>
<td>Time 4</td>
<td>0.0% (0)</td>
<td>21.4% (3)</td>
<td>42.9% (6)</td>
<td>35.7% (5)</td>
<td></td>
<td>3.14 (.77)</td>
</tr>
</tbody>
</table>

Note. 4-point Likert-type scale: Strongly Disagree (1), Disagree (2), Agree (3), Strongly Agree (4).

In order to answer the third research question, “Does the frequency of contact with the ITRT increase teachers’ likelihood of integrating technology in their classrooms,” participant level of agreement with the statement, “I am more likely to integrate technology in my
classroom than I was before working with the ITRT,” participant level of agreement responses with the statement, “The more I work with the ITRT, the more likely I am to integrate technology in my classroom” were reviewed. Distribution of participant responses per questionnaire administrations, as well as mean and standard deviation are displayed in Table 3.

Table 3

<table>
<thead>
<tr>
<th>N = 14</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 2</td>
<td>0.0%</td>
<td>21.4% (3)</td>
<td>42.9% (6)</td>
<td>35.7% (5)</td>
<td>3.14 (.77)</td>
</tr>
<tr>
<td>Time 3</td>
<td>0.0%</td>
<td>14.3% (2)</td>
<td>64.3% (9)</td>
<td>21.4% (3)</td>
<td>3.07 (.62)</td>
</tr>
<tr>
<td>Time 4</td>
<td>0.0%</td>
<td>21.4% (3)</td>
<td>42.9% (6)</td>
<td>35.7% (5)</td>
<td>3.14 (.77)</td>
</tr>
</tbody>
</table>

Note. 4-point Likert-type scale: Strongly Disagree (1), Disagree (2), Agree (3), Strongly Agree (4).

The distribution of responses shows that a majority of participants agreed or strongly agreed that frequency of collaborations with the ITRT increased their likelihood of integrating technology in their classrooms.

In order to answer the fourth research question, “What elements of technology-based instruction are most and least positively affected by the ITRT training/support,” technology-based instruction was considered to be technology activities engaged in by teachers and students. A comparison of means growth and accompanying correlation strength was conducted across music teacher technology-based activities and teacher-provided technology-based activities for students. Table 4 displays mean data, growth data, and correlation data for all activities that demonstrated growth between these.
Table 4

<table>
<thead>
<tr>
<th></th>
<th>N = 14</th>
<th>Time 1 (SD)</th>
<th>Time 2 (SD)</th>
<th>Time 3 (SD)</th>
<th>Time 4 (SD)</th>
<th>Growth</th>
<th>Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students Use the Internet for Research</td>
<td></td>
<td>2.86 (2.25)</td>
<td>2.93 (2.16)</td>
<td>3.57 (2.50)</td>
<td>3.93 (2.27)</td>
<td>1.07</td>
<td>.146</td>
</tr>
<tr>
<td>Students Use Music Technology for Composing and Creating</td>
<td></td>
<td>2.29 (2.02)</td>
<td>2.54 (2.06)</td>
<td>3.21 (2.36)</td>
<td>3.00 (2.08)</td>
<td>.71</td>
<td>.341</td>
</tr>
<tr>
<td>Students Use the ITS to Aid in Learning</td>
<td></td>
<td>3.50 (2.28)</td>
<td>3.00 (2.15)</td>
<td>2.71 (2.13)</td>
<td>3.93 (2.27)</td>
<td>.43</td>
<td>.399</td>
</tr>
<tr>
<td>Students Use Computer or Web-based Applications for Presentations</td>
<td></td>
<td>2.00 (1.84)</td>
<td>2.79 (2.15)</td>
<td>3.00 (2.39)</td>
<td>2.43 (2.03)</td>
<td>.43</td>
<td>.171</td>
</tr>
<tr>
<td>Teacher Works Collaboratively with the ITRT to Plan Technology Lesson</td>
<td></td>
<td>2.07 (1.02)</td>
<td>2.14 (1.46)</td>
<td>2.14 (1.09)</td>
<td>2.50 (1.70)</td>
<td>.42</td>
<td>.612*</td>
</tr>
<tr>
<td>Teacher Designs Student Activities using Technology for Discussion</td>
<td></td>
<td>1.79 (1.67)</td>
<td>2.07 (1.81)</td>
<td>2.29 (2.05)</td>
<td>2.14 (1.75)</td>
<td>.36</td>
<td>.540*</td>
</tr>
<tr>
<td>Students Use Software or Websites to Study</td>
<td></td>
<td>2.21 (1.76)</td>
<td>2.21 (1.37)</td>
<td>2.57 (1.70)</td>
<td>2.57 (1.79)</td>
<td>.36</td>
<td>.387</td>
</tr>
<tr>
<td>Teacher Collects and Analyzes Student Data Using Technology</td>
<td></td>
<td>3.36 (1.95)</td>
<td>3.29 (2.01)</td>
<td>3.00 (2.39)</td>
<td>3.71 (2.09)</td>
<td>.36</td>
<td>.374</td>
</tr>
<tr>
<td>Teacher Uses Technology to Communicate with Students</td>
<td></td>
<td>3.79 (2.12)</td>
<td>3.64 (2.56)</td>
<td>4.00 (2.45)</td>
<td>4.14 (1.99)</td>
<td>.36</td>
<td>.223</td>
</tr>
<tr>
<td>Students Use Music Software to Learn or Practice</td>
<td></td>
<td>3.07 (2.02)</td>
<td>2.57 (1.70)</td>
<td>3.14 (2.35)</td>
<td>3.36 (2.20)</td>
<td>.29</td>
<td>.264</td>
</tr>
</tbody>
</table>
In order to identify those variables most positively affected from the data as displayed, the following criteria were employed based on visual inspection of the results:

- Correlation strength: .45 or over
- Significance: p < .05
- Growth: .14 or over
- Standard Deviation: ~ 2.00 or under, evaluated after other factors

Because a majority of response variables had fairly high (between 1 and 3) standard deviations, 2.0 SD was selected as the criterion threshold; however, it was necessary to make a
determination in context with the other criteria, identifying factors of most affected (by ITRT training/support) by allowing, in two cases, slightly higher incidences of standard deviation as long as the factor met each of the other three criteria. Based on the selected combination of factors, Table 5 displays elements of technology-based instruction most positively affected by the ITRT training/support organized by correlation strength.

It is important to note that while a majority of the three elements presented show significant growth, the growth was small, as all elements were engaged in only slightly more than once per month. These data may well be affected by the makeup of the sample (elementary and secondary music teachers), as secondary music teachers meet with students every day or every other day, while elementary music teachers meet with students only once per week. It is possible to consider the positive growth trend shown in Table 5 to be even more noteworthy in light of that schedule.

Table 5

| Elements of Technology-based Instruction Most Positively Affected by ITRT Training as Demonstrated by Mean Growth (Time 1 to Time 4) Across Activities, and Pearson Product-moment Correlations of Activities with ITRT Training Influence |
|---------------------------------|---|---|---|---|---|
|                                | Time 1 (SD) | Time 2 (SD) | Time 3 (SD) | Time 4 (SD) | Growth | Correlation Coefficient |
| Teacher Works Collaboratively with the ITRT to Plan Technology Lesson | 2.07 (1.02) | 2.14 (1.46) | 2.14 (1.09) | 2.50 (1.70) | .42    | .612*    |
| Student Use of Computer or Web-based Resources to Correspond | 2.43 (2.24) | 2.36 (1.95) | 2.00 (1.70) | 2.57 (2.10) | .14    | .578*    |
| Teacher Designs Student Activities To Discuss Ideas and Reflect on Learning Experiences | 1.79 (1.67) | 2.07 (1.81) | 2.29 (2.05) | 2.14 (1.75) | .36    | .540*    |

Note. 7-point scale: Less than once a month (1), About once a month, A few times a month, Less than once a week, About once a week, A few times per week, Daily (7). *Correlation is significant at the 0.05 level (2-tailed).
To identify the variables least positively affected by ITRT training/support, the following criteria were employed:

- Correlation Strength: .29 or under
- Significance: p > .05
- Growth: .14 or under
- Standard Deviation: ~ 2.00 or over, evaluated after other factors

As a majority of response variables had fairly high standard deviations, 2.0 SD was selected as the criterion threshold; however, it was necessary to make a determination in context with the other criteria, to identify elements least positively affected by ITRT training/support by allowing, within cases, slightly lower incidences of standard deviation as long as the element met each of the other three criteria. Table 7 displays elements of technology-based instruction that were least positively affected by the ITRT training/support organized by correlation strength.

Table 6

| Elements of Technology-based Instruction Least Positively Affected by ITRT Training as Demonstrated by Mean Growth (Time 1 to Time 4) Across Activities, and Pearson Product-moment Correlations of Activities with ITRT Training Influence |
|---|---|---|---|---|---|
| N = 14 | Time 1 (SD) | Time 2 (SD) | Time 3 (SD) | Time 4 (SD) | Growth | Correlation Strength |
| Students Use Computer Applications to Prepare Assignments | 3.43 (2.65) | 3.21 (2.69) | 3.79 (2.58) | 3.43 (2.24) | 0.00 | .235 |
| Teacher Use of Technology to Collaborate with Colleagues on Student Learning Issues | 5.29 (1.93) | 4.86 (2.35) | 4.36 (2.17) | 5.07 (1.90) | -0.22 | .232 |
| Student Use of Web-based Resources to Collaborate on Assignments | 2.14 (1.70) | 1.79 (1.31) | 1.71 (1.38) | 1.64 (1.45) | -0.50 | .189 |

Note. 7-point scale: Less than once a month (1), About once a month, A few times a month, Less than once a week, About once a week, A few times per week, Daily (7).
An opportunity to provide a description of specific music technology lessons or technology activities planned with the ITRT was made available to participants over three questionnaire administrations. This free response item provided some corroborating evidence to participant responses regarding technology-based activities and behaviors that they and their students engaged in during the course of this study. Table 8 displays music teacher responses organized into three categories: no lesson planned, lessons or activities that include music technology or music software, and lessons or activities that included instructional technology for purposes other than music instruction such as communicating with parents, creating videos, or creating materials.

Table 7

<table>
<thead>
<tr>
<th>Lesson/Activity Planned</th>
<th>Time 2</th>
<th>Time 3</th>
<th>Time 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Lesson Planned w/ITRT</td>
<td>21.4% (3)</td>
<td>28.6% (4)</td>
<td>21.4% (3)</td>
</tr>
<tr>
<td>Music Technology or Software</td>
<td>42.9% (6)</td>
<td>28.6% (4)</td>
<td>42.9% (6)</td>
</tr>
<tr>
<td>Other Instructional Technology</td>
<td>35.7% (5)</td>
<td>42.9% (6)</td>
<td>35.7% (5)</td>
</tr>
</tbody>
</table>

From these results, between 71% (n=10) and 78% (n=11) of the respondents developed either music lessons or other technology related activities with the ITRT across each of the three administrations when such collaborations occurred. From the specific descriptions provided by survey participants, some level of regular engagement in music technology lessons and technology-based activities was reported.

Discussion

This study should be interpreted only as exploratory in nature, especially due to the small sample size. We acknowledge that the sample size, as well as its non-random selection, severely limits the generalizability of the results; however, the distinct structure of the ITRT model in
Virginia dictated that such generalization not be a primary consideration of this research. We present the findings of this study in the context of the outcomes of an individual model of technology training (the ITRT model in place for these teachers) for a specific group of teachers. Other models, as well as other groups of teachers, would necessarily be examined differently. We further acknowledge that the correlation results presented in Tables 4-6 do not indicate causality, but do indicate relationships between the examined variables; however, data appeared to show that the more frequently those collaborations occurred, the more likely teachers were to integrate technology in their classrooms. This finding is consistent with findings in studies by Blocher, Armfield, Sujo-Montes, Tucker, and Willis (2011), and Parsad, Lewis, and Farris (2001). In those studies, job-embedded professional development, which allowed time for teachers to collaborate with one another, was shown to be efficacious in producing instructional change.

Analysis of the data collected for this study showed that periodic collaborations with the ITRT were positively associated with perceived changes in the likelihood of technology use by the music teacher. We determined that, based on the small sample of music teachers in this study, sustained collaborations with the ITRT did improve levels of comfort with using technology, and increase the likelihood of engaging in certain technology-related tasks. While statistically significant results were not individually obtained for many of the items analyzed in this study, participant descriptions of technology-based lessons and activities they engaged in, and the role of the ITRT in supporting those activities were consistently, positively, and sometimes significantly found throughout the study. Moderate usage and an increase in frequency of music technology and other technology-based activities were reported throughout the study, and ITRT support for those activities was positively reported as well. This study
provided an opportunity to analyze specific areas where such increases were demonstrated, and others that may be targeted in the future to potentially increase teacher use of instructional technology.

**Implications for Music Education**

Implications from this study include the possibility for greater engagement and learning opportunities for music students due to improved and more frequent use of instructional technologies provided by their teachers as a result of teacher and ITRT collaborations (see Ho, 2004; Honey et al., 2005). Opportunities for greater integration of technology-based activities that yield higher student achievement are entirely consistent with the purpose of the ITRT model. Further, the findings imply that increased comfort with technology may be related to more frequent and proficient uses of technology in the classroom, as has been suggested by previous researchers (Russell, Bebell, O’Dwyer, & O’Connor, 2003; Smith, 2006).

As with much professional development, the ultimate aim of the ITRT model is to provide support for teachers in the use of technology, and to do so purposefully in order to improve instruction to facilitate increased learning and achievement for students. Toward this end, results from this study also provide a baseline opportunity to begin exploring the value of the ITRT role in specific ways in the future, such as a purposeful focus on TPACK or other frameworks to assist in conceptualizing instructional integration of technology for music teaching.
REFERENCES


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