An Exploration of the Use of and the Attitudes Toward Technology Among Fourth and Fifth Grade Band and Orchestra Teachers, Students, and their Parents

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Abstract

The purpose of this study was to determine what technologies are used in fourth- and fifth-grade instrumental music and to examine factors that influence the attitudes of teachers, students, and their parents toward the use of those technologies. Two researcher-designed questionnaires, the *Technology in Music Usage Questionnaire* (TMUQ) and the *Technology in Music Attitude Questionnaire* (TMAQ), were administered to a sample of teachers, students, and parents associated with first-year elementary instrumental music in a large, American Midwest urban school district. Results indicated that while most teachers use technology in class (87.0%), it is generally only used up to a third of the class period (75.0%). Although all participants were found to have positive attitudes toward using technology, results of a one-way ANOVA revealed a significant difference between the attitude scores of teachers and students. Based on the results of the study, teacher selection of technologies should be individualized and voluntary. Professional development is necessary for teachers to become familiar with available resources and best practices for implementation. Future studies are needed to investigate whether the use of technology influences student achievement or motivation for participation in elementary instrumental music.

Keywords: technology, music education, attitude, instrumental music

An Exploration of the Use of and the Attitudes Toward Technology Among Fourth and Fifth Grade Band and Orchestra Teachers, Students, and their Parents

Music educators are increasingly relying on various types of technology to facilitate the instruction and assessment of instrumental students both in class and for practice at home. Software, Internet-based programs and resources, and hardware such as computers, tablets, laptops, and mobile devices are becoming more prevalent and accessible in instrumental music settings. In addition, studies have shown that incorporating technology in the classroom can increase the learning, achievement and motivation of students (Yu, et al., 2010; Purcell, 2011). Music teachers use technology to facilitate multiple methods of learning, save valuable class time, and extend the reach of the instructor beyond the classroom walls—such as in practice and remote learning environments.

However, while popular materials such as the assessment software, SmartMusic, contain a growing volume of repertoire geared toward the young instrumental student and appear to be readily available, it is uncertain whether teachers working with students who are in the beginning stages of learning to play their instruments are in fact applying and using these technologies as intended (Webster, 2011). The actual use of such widely available technologies appears to vary considerably from teacher to teacher (Tucker, 2016). Schools are increasingly allocating funds for the acquisition and application of technology for all subjects, so it is important to decipher how those involved with technology perceive its use. Furthermore, it is estimated that the use of technologies such as social networking, online services, and tablet computers in music settings will continue to increase in the future (Criswell, 2010).

The first year of instrumental music study may be the most critical for students in terms of building motivation to continue with the program, retention, and developing quality technique

and routines. Moore (2009) suggested that students in elementary ensembles, such as band and orchestra, face challenges that students in middle and high school environments do not. Limited rehearsal space, pull-out schedules where students meet less frequently for shorter periods of time, the difficulty of learning a new instrument, and the complex teaching assignments and schedules of instructors are examples of some of the hurdles that may be unique to elementary instrumental students. Those who decide to quit participating in instrumental music during the early stages may do so because of loss of interest or lack of parental support (Boyle et al., 1995). Scheduling conflicts, peer relationships, and classroom management concerns are also potential hazards for retention (Poliniak, 2012). Because it may already be a difficult challenge for many students to learn to play an instrument, do students and teachers feel the use of supportive technology helps or hinders students' musical growth during this crucial time period? Are teachers given adequate training in the use of classroom technologies and are they in turn providing adequate training for their students to be able to use the technologies? Because parents are such important factors in the early musical development of students, do they feel comfortable providing technological assistance for students who may be asked to use technology at home in practice or remote learning environments?

According to Alexiou-Ray et al. (2003), "attitudes of students, school personnel, and parents toward technology use within schools are an important and often overlooked component of successful curriculum integration of technology" (p. 58). Although there are a growing number of technological resources available for young instrumental students, it may be beneficial to know what resources teachers of first-year instrumental band and orchestra are using in class and are assigning for use at home. Teachers' attitudes regarding technology use for first-year students may be a factor affecting these instructional decisions. In addition, it may be

important to determine the attitudes of first-year students regarding assigned technology to see if it is creating the desired interest or effect. Also, because teachers heavily rely upon parental support to maximize the effectiveness of at-home practice, it is important to determine the attitudes of the parents toward the assigned technology. Finally, by determining the relationship of attitudes toward technology use among teachers, students, and parents, music educators can use this information to guide the selection and use of technologies in first-year instrumental music settings, ultimately increasing the potential for their students to succeed.

The purpose of this study was to determine what technologies are being used in fourth- and fifth-grade instrumental music settings and to examine factors that influence the attitudes of teachers, students, and their parents toward the use of those technologies. In the current project, music technology refers to the "tools and techniques for music production, performance, education, and research" (Rees, 2012, p. 154). Rees (2012) proposed that this working definition could be used across time and trends. See Table 1 below for a list of technologies, categorized as software, hardware, and online resources, considered for the purposes of this study.

The following research questions were addressed:

1. What kinds of technologies are used in fourth- and fifth-grade band and orchestra in class and outside of class and to what extent?
2. To what extent do performance expectancies, effort expectancies, social influences, facilitating conditions and teachers' experience contribute to one's attitude toward technology in fourth- and fifth-grade band and orchestra?
3. Are there any statistically significant differences in attitude among teachers, students, and parents toward using technology in fourth- and fifth-grade band and orchestra?

4. Is there a statistically significant relationship between attitude toward technology and use of technology and if so, what is the nature and strength of the relationship?

Theory

The theoretical framework used in this study emerged from a combination of factors resulting from the experiences and observations of the researcher working in the field of music education, particularly as an elementary instrumental band instructor, as well as from the *Unified Theory of Acceptance and Use of Technology* (UTAUT) developed by Venkatesh et al. (2003). Because the UTAUT considers the use of technology by adults in the workplace, the model was adapted for this study in order to reflect the use of technology for instrumental music instruction in an educational setting by adults as well as elementary aged students. The research model used in this study can be found in Figure 1.

Performance expectancy is the degree to which an individual believes that using the technology can help attain gains in job performance (Venkatesh et al., 2003). In terms of instrumental music, performance expectancy is the degree to which an individual believes that using the technology for band or orchestra can help the student attain gains in music performance and learning. This may influence one's attitude toward the use of classroom technology (Shen & Chuang, 2010).

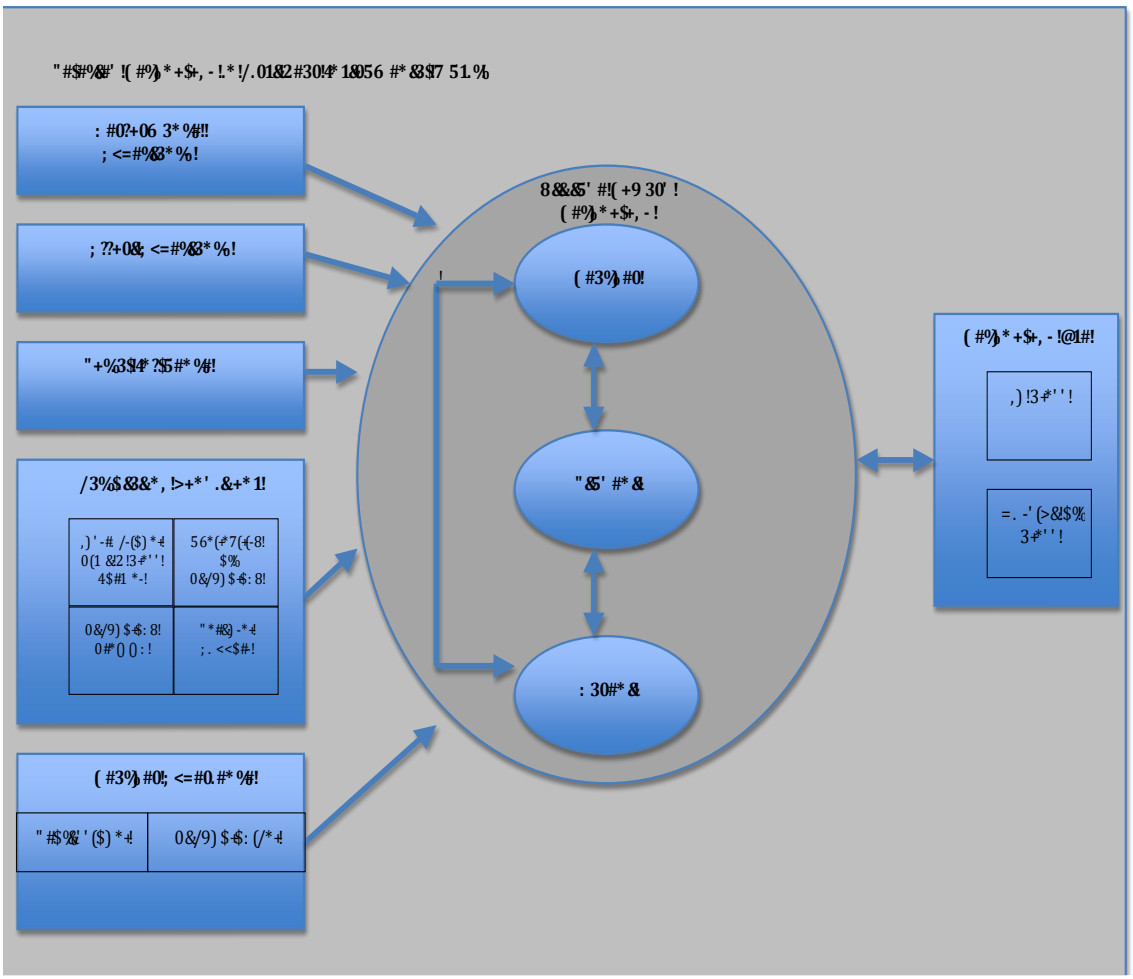
Effort expectancy is the degree of ease associated with the use of the technology, or the perceived ease of use (Venkatesh et al., 2003). Self-efficacy, enjoyment, and anxiety also contribute to effort expectancy and may impact one's attitude toward using technology for instrumental music (Celik & Yesilyurt, 2013; Shen & Chuang, 2010).

Social influence is the degree to which an individual perceives that "important others" believe that he or she should use the technology (Venkatesh et al., 2003). Important others in this

study included administrators, colleagues, teachers, parents, students, or peers. Social influences also consist of voluntariness of use, or whether one determines the use to be mandatory or voluntary. In addition, social influences in a school setting may impact one's perception of the usefulness of technology. If important others believe the individual should use the technology, then its use may seem more beneficial. For example, if a student believes that his parents and teacher expect him to use the technology when practicing at home, he may perceive using the technology to be a useful tool that will help him to become a better musician.

Figure 1

Research Model of Attitude Toward Technology Use in First-Year Instrumental Music



A *facilitating condition* is the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the technology, or the perception of external control (Venkatesh et al., 2003). Facilitating conditions in instrumental music settings include instructional time and class format, availability of technology, training and professional development, and parental support.

Based on the nature of this particular inquiry, experience was divided into two separate components. First, experience represents the number of years the music instructor has been teaching professionally. Rohaan et al. (2012) found that teachers' self-efficacy, subject matter knowledge, and pedagogical content knowledge, all of which can be improved with teaching experience, strongly influence their attitudes toward technology. Music teachers were asked to indicate on the questionnaire how many years of professional teaching experience they had acquired as well as how many years of professional teaching experience they had working in a first-year instrumental music setting.

Experience also represents the teacher's number of years working with technology. Those who have more past and current experience working with technologies may be more comfortable with their use and have more favorable attitudes towards using them than those whose experiences are limited. The teacher's number of years of technological experience was addressed separately because it is typically the teacher who is responsible for selecting the technology to be used in instructional settings. The teacher's technological experience, therefore, may have an influence on the attitudes of students and parents as well. Rohaan et al. (2012) suggested that the teacher's technological knowledge affects students' ability to learn the technology. It was assumed that students and parents have had minimal to no experience working with technologies that are used for the purposes of instrumental music instruction, so

the number of years of technological experience acquired by students and parents was not addressed.

Factors that may impact one's attitude toward using technology in a school instrumental music environment but were not considered in the scope of this study include gender and age. Many researchers have determined a need to consider the relationship between gender and attitudes towards technology and have generated mixed results. For younger students, Colley et al. (1997) found no differences in attitude among males and females. Webster (2011) concluded that more studies are needed in order to consider the issue of gender and technology as it relates to music education.

Literature Review

There is scant literature on the attitudes of late elementary- or middle school-aged students and their parents toward technology integration in beginning instrumental music settings. Alexiou-Ray et al. (2003) state that "much of the research done on technology integration assumes that once appropriate technological tools are in place in the classroom, students, teachers, and parents will overwhelmingly support the change toward a technologically based curriculum" (p. 58). Yet faced with the primary challenge of learning to play a new instrument, teachers, students, and parents may or may not feel as inclined to take on the additional process of learning new facets of technology. The aim of this study was to fill the gap in the literature related to the attitudes of teachers, students, and parents toward technology use in first-year instrumental music settings.

Much existing literature regarding technology in music teaching and learning focuses on composition and creativity, motivation and participation, performance, the technological tools available for use in the music classroom, and attitudes toward using technology in music

education. For the purposes of this study, the latter two categories were of particular interest and are addressed below.

Technological Tools and Availability

Many music educators may have difficulty finding technology for use in the classroom due to challenges such as a lack of equipment and resources, lack of sufficient training, and the high cost of technology (Gall, 2013; Webster, 2002). However, despite obstacles, access to technology in music education settings is rising. Lebler (2012) wrote that the Internet's capability to provide easy access to information is significant because students no longer see their teachers as a primary source of information necessary for their learning. Teachers have often reported a desire to acquire more experience and training in instructional technology for use in their classrooms (Webster, 2002). Bauer (2001) claimed that while student attitudes toward technology in music class are generally positive, their attitudes vary depending on the availability of technology at home as well as their past experiences with using technology. A study of fifth- and sixth-grade elementary school students found that students enjoy playing video games on a regular basis at home and most believe video games should be used in music education (Lesser, 2019). However, current educational games would need to be perceived by students as equally entertaining as video games that are designed commercially in order for them to be effective learning tools. Crow (2006) wrote that technology does not always engage or motivate students because the processes and outcomes are often perceived to be distant from students' musical lives and lacking in musical authenticity.

When music educators use technology, it is often for the purposes of administrative tasks (Jassman, 2004; Ohlenbusch, 2001; Taylor & Deal, 2000), assessment, and far less often, pedagogical aids (Lebler, 2012; Webster, 2002). Although the majority of established research

strongly supports the use of music technology in the schools (Webster, 2002), some argue against the effectiveness of technology in enhancing the learning process (Conlon & Simpson, 2003; Convery, 2009; Treadway, 2001).

Teachers who are able to persevere through difficulties acquiring technology have explored using various tools in their lessons including videoconferencing programs such as Skype, podcasts, handheld devices, online resources, and software applications such as SmartMusic. Kruse et al. (2013) examined the benefits and challenges of providing lessons via Skype in order to determine the feasibility of distance learning in music. Benefits include a natural feel to lessons, an evolution of imagination and enthusiasm, and the mastering of equipment and music. However, challenges with using Skype for lessons include technological complications that hinder instruction as well as literal and figurative disconnectedness.

Bolden (2013) wrote that the use of podcasts in music education settings provides expanded opportunities for student learning. Bolden (2013) concluded that student production of podcasts yields benefits such as opportunities for active music listening, enhanced reflection, self-expression, enriched communication, increased self-knowledge, and creativity. Carlisle (2014) found that handheld devices can enrich the instructional approaches of elementary general music education students. Handheld technology, Carlisle (2014) concluded, can provide feedback to students as well as enrich students' experiences with musical instruments.

While most studies on the use of SmartMusic in educational settings reveal that participants have positive attitudes toward the technology, mixed results have been reported regarding the effectiveness of the software. Repp (1999), for example, found that applied vocal students and their teachers had positive attitudes toward using SmartMusic, but that they preferred to use it outside of class rather than during lessons. Glenn and Fitzgerald (2002)

reported an improvement in the overall levels of musicianship among applied music students who used SmartMusic. In a study of three middle school band classrooms, Tucker (2016) found that the actual use of SmartMusic varies among teachers; however, because students enjoyed using the program, the self-efficacy of teachers improved. Finally, while Glenn (2000) suggested that students enjoy using SmartMusic and feel its use contributes to their musicianship, no significant differences were found between experimental and control groups when comparing whether or not applied students used the software.

Attitudes Toward Music Technology

Teacher Attitudes

Amidst a time of rapid change and growth in education, music educators are increasingly seeing the need to upgrade their technological skills and practices (Ho, 2004). However, while technology has long been present in music outside the walls of the classroom, many music educators have not embraced the full potential of technology for music teaching and learning (Rees, 2012). One reason for music educators' hesitancy to better incorporate technology is their lack of experience using technology in their own educational training. Those educators who do use technology may have had to learn how to do so on their own (Doherty, 2019; Rees, 2012).

Ecoff (2007) suggests that the most important aspect of improving the technological skills of teachers is the attitude they have toward the music technology. Doherty (2019) found an increase in the self-efficacy of music teachers who use technology in their instruction. A survey of undergraduate music majors examined their attitudes toward using music technology as well as the practices of their former high school music teachers regarding technology use in the classroom (Meltzer, 2001). Questionnaire results indicated that while students seem comfortable using technology in general, they have limited understanding of and experience with using music

technology specifically. Recommendations are offered for the professional development and training of in-service teachers.

Student Attitudes

Students are experiencing high levels of engagement with technology in other facets of their lives, creating the need for teachers to make use of students' comfort with technology in order to enhance their learning experiences (Lebler, 2012). Research generally shows students have positive attitudes toward using technology in educational environments (Airy & Parr, 2001; Webster, 2002) and that students prefer to generate their work using technology rather than traditional materials (Armstrong, 2014; Hwang et al., 2013). While Webster (2002) indicated that the need for technology serves to enable students to engage and improve in music, he also warned against teaching technology in a musical environment as the end goal. The effectiveness of the music technology, he claimed, depends on the context in which it is used, the teacher, and the instructional use of the technology.

Parent Attitudes

If teachers assign work to be done at home using technology that is easily understood and manageable by the parents, they will likely be better able to assist their children in completing the assignments and may have a more positive attitude toward using technology for music learning. Kinney (2010) found that family structure was a significant predictor of enrollment decisions for middle school band students. In addition, students from two-parent or two-guardian homes were more likely to persist in band (Kinney, 2010). Some also suggest that parental support may help retain students in the program (Poliniak, 2012). Furthermore, it was found that students who decide to quit participating in instrumental music during the early stages might do so because of loss of interest or lack of parental support (Boyle et al., 1995). Lin et al. (2012)

claimed that technology training for parents and students can build confidence and comprehension for both parties. There is a lack of literature concerning the attitudes of parents toward technology in instrumental music settings, as well as the relationship among teachers, students, and parents toward the use of technology in beginning band and orchestra.

Methodology

Subjects

Teachers, students, and parents associated with fourth- and fifth-grade band and orchestra in a large, American Midwestern urban school district were the participants in this study. Teachers included those who are responsible for the instrumental music education of elementary school students. Students were in fourth and fifth grade, approximately nine to eleven years old, and were active participants in band or orchestra in an elementary school setting for the first time. The parents in this study were the parents or legal guardians of first-year instrumental music students enrolled in the district.

Because there was a combined total of 25 teachers working with beginning band and orchestra students in the district, a convenience sample of all elementary instrumental music teachers received the survey in order to reduce error and achieve a high response rate of teachers to include in the study. The population of students and parents for this study included all students involved in first-year instrumental band and orchestra as well as one parent of each student. Participating teachers distributed the questionnaire to a convenience sample of all fourth and fifth graders known to be participating in first-year instrumental music. Upon completion of the study, 23 instrumental music teachers (92.0% response rate), 224 students (55.2% response rate), and 222 parents (54.7% response rate) responded for a total of 469 participants.

Equipment and Materials

The researcher examined a variety of surveys from existing research on technology attitudes in order to develop the survey instruments used for this study.[1] Because there was not an existing survey at the time of this study that could adequately be used to answer the research questions, the researcher chose to design new survey instruments.

Teacher participants completed the *Technology in Music Usage Questionnaire* (TMUQ) (Appendix A). Comprised of ten questions, the TMUQ provides an inventory of what technologies are used in first-year band and orchestra settings, describes to what extent technology is used in those settings, and determines the years of experience teachers have with using technology for instrumental music.

All participants completed the *Technology in Music Attitude Questionnaire* (TMAQ) (Appendices A-C). The TMAQ is comprised of the same number of questions (25) that were answered by each group of participants (teachers, students, and parents) and contains a five-point numerical rating scale to facilitate a comparison among the groups. While the researcher designed both questionnaires, constructs and items were influenced by the *Unified Theory of Acceptance and Use of Technology* (Venkatesh et al., 2003). Constructs are defined in the Theory section above.

Assessment of the Survey Instruments

The final stage of constructing the survey consisted of assessing the instruments' validity and reliability. In order to measure the accuracy of the survey by testing its content validity, the

[1] These included the Faculty Members Technology Use Scale (Agbatogun, 2013), the Children's Attitude Toward Technology Scale (CATS) (Frantom et al., 2002), the Computer Attitude Scale for Secondary Students (CASS) (Jones & Clark, 1994), the revised Computer Attitude Scale for Secondary Students (Smalley et al., 2001), Teachers' Attitudes Toward Information Technology (TAT) (Knezek et al., 1998), and Factors Affecting Teachers Teaching with Technology (SFA-T3), Part Four: Computer Attitudes (Papanastasiou & Angeli, 2008).

researcher reviewed the related literature, examined existing questionnaires that gathered data similar to the information needed for the current study, and modeled survey items after previously existing questions. A panel of experts, including five university professors in music education, two doctoral students in music education, six in-service music educators, and one elementary school administrator, reviewed the questionnaires. Members of the panel received an instrument assessment form, a description of survey constructs and items, and the survey questionnaires, and provided feedback that could improve the design of the instruments. In addition, panel members commented on the length of the survey, layout, formatting, and visual appeal to establish face validity. Suggestions made by the panel of experts led to the final versions of the questionnaires.

Prior to distribution of the survey, a small group of teachers, students, and parents that were not included in the sample for the research study participated in a pilot test.
All of the pilot test participants thought the visual design and layout were appealing, professional, and easy to follow. Participants also said that the survey took them about five to seven minutes to complete and most would prefer to take the survey in an online format. However, requirements of the participating school district in this study mandated that the surveys be taken via paper format rather than electronically.

A calculation of Cronbach's coefficient alpha measured the consistency and reproducibility of the data. This reflected how well the different items in the survey varied together when applied to each group of respondents. After collecting data for the pilot study, the estimated reliability coefficient for the survey was 0.897, indicating a high value of the instrument for individual measurement and diagnosis (Leonhard & House, 1972).

Procedure

The researcher's institutional review board, as well as the school district surveyed, granted approval to conduct the study. As per the requirements of the participating school district, teacher participants received coded paper copies of the questionnaires at a faculty meeting. Teachers received three sets of questionnaires: one for themselves to complete, as well as two packets containing parent and student questionnaires which they were asked to distribute to a convenience sample of students and associated parents. The researcher did not have access to class rosters or the names and contact information of students or parents. Students and parents received all of their materials in the same envelope to facilitate the distribution and return of the surveys to and from school. By distributing and returning all materials for students and parents in one envelope, child assent was matched with parental consent to ensure permission was received. Completing and returning the surveys to the school of the participant implied consent. This also linked student and parent responses with their corresponding teacher in order to determine the relationship of attitudes and technology use among teachers, students, and parents. The researcher collected all completed questionnaires from the district office.

Results

Research Question 1

Teachers completed the TMUQ. Descriptive statistics were calculated and reported in frequency distributions. The technologies most used in class by teachers (n = 23) assigned to first-year band and orchestra include: laptops (87.0%), supplemental materials (DVD/CD) included with method books (82.6%), and iTunes (56.5%) (Table 1).

Table 1

Distribution of Technologies in First-Year Instrumental Music

Technology Classification	Currently Use In Class (%)	Would Like to Use in Class (%)	Currently Assign for Practice (%)	Would Like to Assign for Practice (%)
Software				
SmartMusic	8 (34.8)	5 (21.7)	__	5 (21.7)
Interactive Practice Studio (IPS)	__	1 (4.4)	__	__
Interactive Pyware Assessment System (iPAS)	__	__	__	__
Finale	11 (47.8)	6 (26.1)	__	3 (13.0)
Sibelius	1 (4.4)	1 (4.4)	__	__
GarageBand	5 (21.7)	5 (21.7)	__	2 (8.7)
iTunes	13 (56.5)	1 (4.4)	__	1 (4.4)
Supplemental DVD/CD in Method Book	19 (82.6)	1 (4.4)	9 (39.1)	1 (4.4)
Other	3 (13.0)	__	1 (4.4)	1 (4.4)
Hardware				
Computer	8 (34.8)	1 (4.4)	1 (4.4)	1 (4.4)
Laptop	20 (87.0)	2 (8.7)	__	1 (4.4)
Tablet	1 (4.4)	16 (69.6)	__	2 (8.7)
Digital Music Player	8 (34.8)	3 (13.0)	__	__
Interactive White Board	__	5 (21.7)	__	__
Smart Phone/Cell Phone	9 (39.1)	3 (13.0)	1 (4.4)	2 (8.7)
Other	2 (8.7)	__	__	__

Online Resources				
Noteflight	__	1 (4.4)	__	1 (4.4)
MuseScore	1 (4.4)	2 (8.7)	__	2 (8.7)
Audacity	1 (4.4)	4 (17.4)	__	3 (13.0)
Social Media	__	2 (8.7)	__	__
Class Website	1 (4.4)	4 (17.4)	__	__
Other	__	1 (4.4)	__	1 (4.4)

Note: Teacher n = 23.

Less than half of teacher respondents indicated assigning technology for practice outside of class, with method book supplemental materials contributing to the highest percentage of technologies assigned (39.1%). A majority of teachers indicated that they would like to be able to use tablets in class if given the opportunity (69.6%), while a negligible number of teachers wished to be able to use other technologies for outside practice. Of the 20 teachers who indicated they used technology in class, 15 reported spending an average of one to nine minutes per 30-minute class period using technology, 4 indicated spending between ten and 19 minutes using technology, and one teacher reported spending more than 20 minutes using technology per class (Table 2).

Because technology is generally used for less than a third of each class period, the actual time spent in use is still relatively small, consistent with other findings (Agbatogun, 2013; Armstrong, 2014; Blackwell et al., 2013; Özel, 2014). A majority of teachers (69.6%) did not expect students to use any technology when practicing outside of class.

Table 2

Distribution of the Use of Technology in First-Year Instrumental Music

Extent of Use	Frequency (%)
Use of technology	
1. Technology used in class AND assigned for practice.	3 (13.0)
2. Technology used in class but NOT assigned for practice.	17 (73.9)
3. Technology assigned for practice but NOT used in class.	1 (4.4)
4. Technology NEITHER used in class NOR assigned for practice.	2 (8.7)
Average minutes per class spent using technology	
No class time with technology	3 (13.0)
1-9 minutes	15 (65.2)
10-19 minutes	4 (17.4)
20 minutes or more	1 (4.4)
Average minutes per week of expected student practice using technology	
No expected practice with technology	16 (69.6)
1-9 minutes	1 (4.4)
10-19 minutes	2 (8.7)
20 minutes or more	4 (17.4)
Technology is primarily used for:	
Lesson Delivery	5 (21.7)
Student Interaction	3 (13.0)
Both Lesson Delivery & Student Interaction	12 (52.2)
Other	1 (4.4)
Technology Not Used	2 (8.7)
Purpose served by technology:	
Assessment	13 (56.5)
Recording	13 (56.5)
Accompaniment	15 (65.2)
Games	2 (8.7)
Composition/Arrangement	9 (39.1)
Visual Display of Notation	5 (21.7)
Listening	11 (47.8)
Other	3 (13.0)

Note: Teacher n = 23.

When technology was used, it was mostly for accompaniment (65.2%), assessment (56.5%), and recordings (56.5%) (Tables 2–3). Although students may be involved in listening to recordings of pieces or playing along with accompaniment, the data suggest the use of technology is mostly driven by the teacher with fewer opportunities for student interaction with the technology. Similarly, other research suggests educators typically use technology for administrative tasks and, less often, as pedagogical aids (Jassman, 2004; Lebler, 2012; Ohlenbusch, 2001; Taylor & Deal, 2000; Webster, 2002).

Table 3

Distribution of Reasons Given for Why Teachers Use Technology in First-Year Instrumental Music

Response	In-Class Frequency (%)	Assign for Practice Frequency (%)
It helps me reach my teaching goals.	15 (65.2)	1 (4.4)
It helps my students reach their performance goals.	14 (60.9)	10 (43.5)
It saves me time.	2 (8.7)	1 (4.4)
Technology is readily available.	7 (30.4)	5 (21.7)
Using technology is a requirement.	1 (4.4)	0 (0.0)
Using technology is inexpensive.	1 (4.4)	1 (4.4)
I am knowledgeable about using technology.	8 (34.8)	1 (4.4)
Using technology is easy.	3 (13.0)	1 (4.4)
Technology is useful in beginning instrumental music.	10 (43.5)	6 (26.1)
There is enough parental support to use technology.	2 (8.7)	4 (17.4)
Other	1 (4.4)	2 (8.7)

Note: Teacher n = 23.

When teachers were asked why they do not use technology, the top responses were lack of time (39.1%), difficulty in traveling among school locations (26.1%), and a complicated class schedule (17.4%) (Table 4).

Table 4

Distribution of Reasons Given for Why Teachers Do Not Use Technology in First-Year Instrumental Music

Response	In-Class Frequency (%)	Assign for Practice Frequency (%)
There is not enough time.	9 (39.1)	1 (4.4)
The lesson schedule does not allow for me to incorporate technology.	4 (17.4)	0 (0.0)
I have to travel between buildings, so using technology is difficult.	6 (26.1)	0 (0.0)
Technology is not readily available.	1 (4.4)	2 (8.7)
Using technology is not a requirement.	2 (8.7)	0 (0.0)
Technology is too expensive.	2 (8.7)	0 (0.0)
I don't know enough about using technology.	3 (13.0)	3 (13.0)
Using technology is too difficult.	0 (0.0)	0 (0.0)
Technology is not useful in beginning instrumental music.	0 (0.0)	0 (0.0)
There is not enough parental support to use technology.	1 (4.4)	4 (17.4)
Other	2 (8.7)	1 (4.4)

Note: Teacher n = 23.

Similarly, Doherty (2019) found that music teachers primarily learn about new technology and how to implement it outside of school hours. In addition, some music teachers do

not use technology because of a lack of availability of an appropriate device, lack of knowledge, and not enough planning or instructional time (Fulcher, 2017). Inadequate time during the school day to plan for technology integration may be a deterrent against its use.

Research Question 2

All participants were asked to complete the 25-item TMAQ (Appendices A-C). Attitude served as the dependent variable for this study and was measured via five survey items. Independent variables (predictors) consisted of performance expectancies, effort expectancies, social influences, and facilitating conditions, measured via subsequent survey items. Additional independent variables included years of professional teaching experience and years of teachers' technological experience, both measured by teacher responses in the TMUQ (see Table 5).

Table 5

Summary of Descriptive Results on TMAQ for Teachers, Students, and Parents

GROUP		Attitude	Performance	Effort	Social	Facilitating
Teacher	Mean	4.1623	3.8109	3.4065	3.3457	2.6014
	N	23	23	23	23	23
	Std. Deviation	.60095	.65556	.69614	.54724	.75797
Student	Mean	3.7548	3.3459	3.6712	3.6943	3.5133
	N	224	221	224	222	221
	Std. Deviation	.99218	.91340	.88411	.92501	.90585
Parents	Mean	3.9092	3.5995	3.9477	3.4833	3.3545
	N	220	219	219	218	220
	Std. Deviation	.73485	.79900	.63509	.86281	.96556
Total	Mean	3.8476	3.4890	3.7881	3.5776	3.3928
	N	467	463	466	463	464
	Std. Deviation	.86760	.86008	.78273	.88693	.94706

Note. Items were based on a five-point numerical rating scale; 1 indicates "Strongly Disagree" and 5 indicates "Strongly Agree."

After ensuring assumptions were met, data were analyzed using multilevel (hierarchical) linear modeling (MLM). Three models were developed, one for each group of participants (teachers, students, parents), with two levels per model. Each model was a mixed effects model

where the intercepts and slopes were fixed components and error accounted for the random components. The first full model constructed for teacher participants (Table 6) examined the degree of relationship between the dependent variable (teacher attitude) and the following independent variables: (1) teacher performance expectancies, (2) teacher effort expectancies, (3) teacher social influences, (4) teacher facilitating conditions, (5) student attitude, (6) parent attitude, (7) teaching experience of teacher, and (8) technological experience of teacher.

Table 6

Solution for Fixed Effects for Teacher Multilevel Model (MLM)

Effect	Estimate	Std. Error	DF	t Value	Pr > |t|
Intercept	1.9774	0.3881	193	5.10	< 0.0001
Teacher Performance	0.06932	0.05890	193	1.18	0.2407
Teacher Effort	0.2615	0.06867	193	3.81	0.0002*
Teacher Social	0.1161	0.06046	193	1.92	0.0563
Teacher Facilitating	0.1667	0.0587	193	3.28	0.0012*
Student Attitude	-0.00438	0.02798	193	-0.16	0.8758
Parent Attitude	0.01019	0.03861	193	0.26	0.7922
Teaching Experience	-0.00492	0.004094	193	-1.20	0.2304
Technological Experience	0.02634	0.004960	193	5.31	<0.0001*

Note: * $p < .05$

Two additional models were similarly constructed such that both student (Table 7) and parent attitudes (Table 8) were dependent variables.

Table 7

Solution for Fixed Effects for Student Multilevel Model (MLM)

Effect	Estimate	Std. Error	DF	t Value	Pr > |t|
Intercept	1.9543	0.7173	187	2.72	0.0070
Student Performance	0.4404	0.07379	187	5.97	<0.0001*
Student Effort	0.2318	0.07356	187	3.15	0.0019*
Student Social	-0.1039	0.06443	187	-1.61	0.1085
Student Facilitating	0.1052	0.06089	187	1.73	0.0856
Parent Attitude	0.1148	0.06884	187	1.67	0.0970
Teacher Attitude	-0.2220	0.1155	187	-1.92	0.0561
Teaching Experience	-0.00820	0.005593	187	-1.47	0.1443
Technological Experience	0.01200	0.007841	187	1.53	0.1277

Note: * $p < .05$

Results indicated that effort expectancies ($p = 0.0002$), facilitating conditions ($p = 0.0012$), and the technological experience of the teacher ($p < 0.0001$) significantly contributed to teacher attitude toward technology. Additionally, performance expectancies ($p < 0.0001$) and effort expectancies ($p = 0.0019$) significantly contributed to student attitude toward technology use. Finally, performance expectancies ($p < 0.0001$) and effort expectancies ($p < 0.0001$) significantly contributed to parent attitude toward technology use in first-year instrumental music settings. Effort expectancies were significant contributors to the attitudes of all groups of participants. No significant contributions to attitude were found among the predictors of social influences, the attitudes of other groups, or years of professional teaching experience of the teacher.

Table 8

Solution for Fixed Effects for Parent Multilevel Model (MLM)

Effect	Estimate	Std. Error	DF	t Value	Pr>|t|

Intercept	0.6504	0.4693	190	1.39	0.1674
Parent Performance	0.4129	0.04925	190	8.38	<0.0001*
Parent Effort	0.3989	0.06624	190	6.02	<0.0001*
Parent Social	-0.01368	0.04147	190	-0.33	0.7419
Parent Facilitating	0.03310	0.04032	190	0.82	0.4127
Student Attitude	0.06571	0.03519	190	1.87	0.0634
Teacher Attitude	-0.02392	0.08049	190	0.30	0.7667
Teaching Experience	-0.00255	0.003938	190	-0.65	0.5184
Technological Experience	0.00501	0.005629	190	0.98	0.3297

Note: * $p < .05$

Research Question 3

A one-way, between-subjects analysis of variance (ANOVA) was conducted. Attitude scores (items 1-5) from the TMAQ served as the dependent variable. The group to which participants belonged served as the independent variable with three levels: (a) teachers, (b) students, and (c) parents. Analysis of the data revealed that the attitudes of first-year instrumental music teachers (M = 4.2, SD = 0.6), students (M =3.8, SD = 1.0), and parents (M = 3.9, SD = 0.7) are generally positive towards using technology in band and orchestra. An ANOVA test (Table 9) showed significant difference among the three groups of participants, $F(2,464)$ = 3.383, p = 0.035. The effect size calculated using eta squared was 0.01, indicating a small effect.

Table 9

ANOVA Summary Table of Attitude Scores of Teachers, Students, and Parents

Source	SS	df	MS	F	Sig.
Between Groups	5.042	2	2.521	3.383	* 0.035

Within Groups	345.732	464	0.745
Total	350.774	466	

Note: * $p < .05$

Fisher's Least Significant Difference (LSD) post-hoc test provided insight into where the significant differences occurred specifically. Results suggested a significant difference between the attitude scores of teachers and students, $p = 0.032$, 95% CI [0.0361, 0.7789]. No significant differences occurred between the attitudes of teachers and parents or parents and students.

Research Question 4

A series of bivariate correlations helped to answer the final research question using results from the TMUQ and TMAQ. First, a comparison was made between the overall mean attitude of all participants combined ($M = 3.84$, $SD = 0.86$) with the average number of minutes teachers use technology during class ($M = 8.64$, $SD = 13.23$) (Table 10).

Next, a comparison was made between the overall mean attitude ($M = 3.84$, $SD = 0.86$) with the average number of minutes teachers assign technology for use outside of class ($M = 5.00$, $SD = 4.74$) (Table 11).

According to the data, no statistically significant linear relationship exists between the overall attitude of participants toward technology use and the reported time spent using technology in class ($r = 0.022$ and $r^2 = 0.000484$) or the amount of time technology is assigned for practice outside of class ($r = 0.012$ and $r^2 = 0.000144$). Examination of scatter plots confirmed no evidence of a linear relationship.

Table 10

Correlation Between Overall Attitude Toward Technology Use and Average Minutes of Technology Use In Class

		Overall Attitude	Average Minutes of Technology Use In Class
Overall Attitude	Pearson Correlation	1	.022
	Sig. (2-tailed)		.648
	N	467	452
Average Minutes of Technology Use In Class	Pearson Correlation	.022	1
	Sig. (2-tailed)	.648	
	N	452	453

Table 11

Correlation Between Overall Attitude Toward Technology Use and Average Number of Minutes of Assigned Practice Using Technology

		Overall Attitude	Average Minutes of Assigned Practice Using Technology
Overall Attitude	Pearson Correlation	1	.012
	Sig. (2-tailed)		.793
	N	467	452
Average Minutes of Assigned Practice Using Technology	Pearson Correlation	.012	1
	Sig. (2-tailed)	.793	
	N	452	453

Further analysis revealed a positive, medium-sized relationship between teacher attitude toward technology use and time spent using technology in class ($r = 0.351$ and $r^2 = 0.123201$) as well as between teacher attitude and the amount of time teachers expect students to practice outside of class ($r = 0.358$ and $r^2 = 0.128164$). The trend identified in this study is supported by other research that revealed positive relationships between the attitudes of teachers and technology use (Avidov-Ungar & Eshet-Alkakay, 2011; Naaz, 2012). However, because all

correlation coefficients were less than their associated critical values, perhaps because of the small sample size of teachers, the decision was made to conclude that the correlation coefficients were not statistically different from zero.

Discussion

The teachers' responses from the TMUQ (see Table 1 above) suggest that there has not been much growth in the use of technology among music educators. Recent updates in some method books, such as the *Tradition of Excellence*, include the additions of DVDs, accompaniment recordings, Interactive Practice Studio applications, interactive whiteboard capabilities, and SmartMusic support to enhance the technological features offered. However, no teachers reported using Interactive Practice Studio or interactive whiteboards in class or for practice. While about a third of teachers reported using SmartMusic in class, no teachers assign it for practice at home. Therefore, it appears as though the most advanced technological features of the method books are not being used to their full potential.

Of the three groups of participants, teachers scored highest in the areas of attitude and performance expectancies and lowest in effort expectancies, social influences, and facilitating conditions. This suggests that teachers have the most interest and believe most strongly in the usefulness of technology for instrumental music instruction. Although teacher scores on effort expectancy were positive, teachers perceived the use of technology to be least easy among the groups surveyed. Also, while the use of technology is not mandatory, teachers have the strongest sense of social influence over their decision to use technology.

Examination of data analyzed for all participants revealed that effort expectancies significantly predicted the attitudes of teachers, students, and parents. This is the only construct found to be a significant predictor for all groups of respondents. In each case, the greater the

perceived ease of use of the technology, the greater the attitude toward using technology. Therefore, in order for technology to be viewed favorably in elementary instrumental music settings, it must be easy to use. The finding that effort expectancies significantly predict teacher and student attitudes is supported by existing literature (Celik & Yesilyurt, 2013; Shen & Chuang, 2010). However, discoveries concerning the contribution of effort expectancies to teacher attitude run contrary to teacher responses in the TMUQ. Only 13.0% of teachers reported that technology is easy to use in class and 4.4% of teachers said it is easy to use in practice environments (Table 3). Perhaps while teachers have positive effort expectancies, implying that the technologies themselves are easy to use, there are other factors at play that make the implementation of technologies in actuality difficult to accomplish.

Student and parent attitudes toward technology use appear to increase with rises in performance expectancy, or perceived usefulness. Existing literature supports that performance expectancies significantly contribute to student attitude (Shen & Chuang, 2010). Of the constructs measured, average scores for students on performance expectancies were the lowest of the three groups studied, although they were still considered positive. It may be that students do not have as high of an understanding of how the use of technology can help them attain gains in instrumental performance. For both students and parents, it may help improve their attitudes toward incorporating technology if teachers can reinforce how its use can provide advantages in performance and practice.

The construct of facilitating conditions also significantly predicted teacher attitude toward using technology. Teacher scores on facilitating conditions averaged less than 3.0, indicating negative perceptions of the degree to which they believe an organizational and technical infrastructure exists to support the use of technology. Items generated to measure

facilitating conditions included the topics of class scheduling, availability of technology in the classroom and at home, training and assistance provided for the use of technology, and parental support. Upon closer examination of the results of each of the items within the construct, it was found that all items averaged less than 3.0, indicating negative perceptions. Teachers feel that the lesson schedule makes it difficult to use technology in class, the classroom is not well equipped to support the use of technology, students do not have the resources necessary to use technology at home, and parents do not provide adequate support to help students practice using technology at home. However, facilitating conditions also generated the lowest reliability coefficient (Appendix D). This may be due to the small group size of teacher participants (Huck, 2012) as well as the possibility that items within the construct of facilitating conditions addressed a broader range of topics than other constructs. These facilitating conditions may need to be explored more deeply in future studies.

The teacher's years of technological experience significantly predicted teacher attitude. The more experience teachers had using technology for music, the more positive their attitude. Doherty (2019) also found that technological knowledge may have more of a positive impact to a music teacher's overall self-efficacy than either content or pedagogical knowledge. However, the years of technological experience of the teacher did not significantly predict the attitudes of students or parents, despite literature suggesting otherwise (Rohaan et al., 2012). This may be due to the low amount of actual use of technology by the participants, particularly in home practice environments where the students and parents use technology away from the teacher. The teachers in this study also may not involve students much in the technology used in class or convey much about their levels of technological experience within the short periods of time they interact with students and parents.

Contrary to existing research (Rohaan et al., 2012), this study found years of teaching experience to be nonsignificant in predicting user attitudes toward technology. A possible reason for this may be because the subjects of this study perceive instrumental music instruction and technology as separate entities. The use of technology in instrumental music may be considered a nicety, promoted primarily to save time, rather than a necessity. Music learning and performance is not reliant on technology but may be enhanced by its use. Yet this may be hopeful news for music educators. If attitudes toward technology are generally positive whether a teacher is a novice or a veteran, then teachers of any level of professional teaching experience should feel encouraged to try incorporating relevant technological resources in their classrooms.

Also, existing literature (Lin et al., 2012) contradicts the nonsignificant contribution of parent attitudes toward student attitudes. Social influences do not appear to significantly contribute to participant attitudes; however, the use of technology was not mandatory for respondents in the school district surveyed. Teachers were not required by administrators to use technology, and most teachers do not assign technology for practice outside of class. Social influence has been found in previous research to be a significant predictor when the use of technology is mandatory (Hartwick & Barki, 1994; Karahana et al., 1999; Taylor & Todd, 1995; Thompson et al., 1994; Venkatesh & Davis, 2000).

It may be surprising to discover that teachers had the highest attitude toward technology and students had the lowest attitude, when many may have supposed the contrary to be true. In a time when it is widely assumed that students brought up in the digital age are perhaps more favorable to using technology than adults, students may not think technology is as useful given the complicated task of learning to play an instrument. In fact, of all the constructs measured, students scored the lowest in performance expectancies, or perceived usefulness. Therefore, to

increase student attitudes, teachers may need to better explain why the technology is necessary and helpful for musical growth.

Upon examining the relationships between student and parent attitude and technology use, there appears to be no relationship between student attitude and the actual use of technology or between parent attitude and the actual use of technology. This finding is contradicted by research that suggests student attitude improves with the use of technology (Edmunds et al., 2012; Judi et al., 2011; Maria et al., 2011).

Despite the overall positive attitudes of all participants towards technology in instrumental music, no statistically significant linear relationships were found between the overall attitudes of participants and the actual use of technology, contrary to what might be expected. Whether or not technology is used in class or assigned for practice outside of class does not influence attitude toward technology, either positively or negatively.

Implications for Music Education

The purpose of this study was to determine what technologies are being used in fourth- and fifth-grade instrumental music settings and to examine factors that influence the attitudes of teachers, students, and their parents toward the use of those technologies. There may be some possible limitations in this study. Because this project was exploratory in nature and due to ease of access as well as time constraints, participants were associated with a single school district. This generated a smaller sample size of teachers and less generalizability than could be obtained by surveying teachers from multiple school districts across different geographical locations. Despite the small sample size of teacher participants in the current study, the response rate was high. Because there was a statistically significant difference found in answering the third research question, the sample size was not too small to analyze and was large enough to

differentiate from chance occurrences. However, the smaller sample size of teachers may have contributed to the non-significant result in answering the fourth research question due to a possible Type II error. Replication of this study will be necessary to confirm its findings.

Based on the results of this study, it is recommended that music educators be given opportunities to select their own technological resources depending on their classroom environments and students' needs. The fact that social influence scores were nonsignificant is favorable; teachers do not feel pressured to use technology. Likewise, their perceptions of influential people do not affect their attitudes one way or another. Therefore, it is not advisable for administrators and school districts to mandate the use of any particular technology for elementary instrumental music teachers.

Teachers should use caution in selecting technologies and ensure that they can be easily understood and applied not only by themselves, but their students and their students' parents as well. Since effort expectancies significantly contributed to attitudes of all participants in this study, it is essential to promote technologies that are perceived as easy to use. Further, because performance expectancies significantly contributed to the attitudes of students and parents, it is critical for teachers to be able to effectively relay the educational and performance goals the technology serves. Wiebe and Kabata (2010) suggested that teachers allocate time to explain why the technology will benefit students in order for them to have positive attitudes towards the usefulness of the technology. When using technology in middle school instrumental music programs, Summers (2018) found that positive communication between teachers and parents improves the ability of students to self-regulate their learning in independent practice at home as well as promotes increased understanding of the student's musical development. For music educators, it may be beneficial for them to hold an informational meeting for students and

parents to demonstrate exactly how the assigned technology should be used in practice at home. Letting students know the goals the technology serves may help bridge the gap between teacher and student attitudes toward technology.

Because teachers had an overall negative score for facilitating conditions, the use of technology should be governed by teachers based on their individual preferences, experiences, and the accommodations their teaching and learning environments provide. For teachers who only see each of their students for 30 minutes once a week, travel among multiple school locations, and lack the appropriate technological equipment necessary to fulfill their goals, implementing technology may seem infeasible and should not be standardized across the district. School administrators or other educational leaders may need to provide guidance and support to help alleviate some of the pressure teachers feel in their job assignments in order to improve their ability to include technologies in the classroom. Scheduling improvements, increased class time with students, employing more qualified teachers to reduce extensive traveling, and the acquisition of transferrable technologies may be beneficial to improving the outlook of teachers toward technology implementation.

This study found that increased technological experience of teachers improves their attitudes toward technology. A trend was also revealed by the moderately positive correlation between teacher attitudes and the actual use of technology. Therefore, continued technological training and professional development is necessary in order to provide teachers with meaningful experience using technology. The need for support in the implementation of technology fit for the classroom is defended by previous research (Alexiou-Ray et al., 2003).

Despite finding that as perceived ease of use increases, teachers' attitudes toward technology increase, few teachers reported that technology is easy to use in class and in practice

environments. This suggests that teachers consider the technologies they are actually using to, in application, not be easy to use. Therefore, teachers may need further professional development to become aware of technologies that are available as well as opportunities to discover resources that provide the best fit for their classroom environments and levels of experience. Teachers are still widely using materials, such as method books, that are considered traditional without employing the full technological offerings many updated method books provide. Given time to complete training, develop awareness of what is available, and discover how resources can be used in the classroom, teachers may be able to use more effective technologies throughout longer portions of class periods. Further, acquiring knowledge and training about technologies that are interactive and allowing students to connect with the technology during class may improve students' attitudes towards technology as well as the relationship between student attitude and the actual use of technology. The fact that no relationships appeared to exist between the attitudes of all participants and the actual use of technology implies that perhaps the right kinds of technologies are not being used. It is not enough to simply use technology, but it may be more important to consider what is being used and how.

Tablets were the technologies most teachers (69.6%) wished they could use if given the opportunity. Teachers expressed concerns about not having well-equipped classrooms, a lack of technological resources, and insufficient parental support for practice at home. Portable, user-friendly devices such as tablets may be key in establishing a connection between technology that is used at school and transported to home for practice. Summers (2018) found that using computer-based technology in the classroom, particularly that which utilized evaluation features, helped middle school instrumental students with effective and motivating practice sessions. Acquiring "crossover" technologies, such as tablets, that can be used similarly both in class and

in practice environments, may improve perceived usefulness as well as reduce the amount of time needed in class to provide instruction on using the technology. Further, many technological resources available online are free to use and can be accessed through a variety of devices. For instance, 47.8% of teachers reported using the notation software Finale in class. However, free, Internet-based applications such as Noteflight have many of the same features and capabilities of Finale, but no teachers reported its use. Many applications and online resources are not only designed with the use of portable electronics such as tablets in mind, but they are much more economical to acquire than expensive software better suited for computers or laptops. Informing teachers of such possibilities may help alleviate some of their concerns about not having access to technologies.

Conclusion

In order to keep up with current trends in educational policy and societal expectations with regards to the comprehensive integration of technology, it is essential for music educators to be informed about best practices in classroom technology and engaged in its application to the curriculum. Suggestions for future study include continuing development of the survey instruments to establish test-retest reliability, involving a larger pool of teacher participants, replicating this study with subjects from other school districts and different geographical locations, adapting research to reflect the inherent fluidity of changing technologies, and applying mixed methods or qualitative analysis to provide deeper insight into the responses provided by participants.

When carefully considered and integrated, technology can benefit the music classroom by supporting students' motivation and improving the quality of their learning (Ho, 2004). However, much training and professional development is needed for music educators to become

aware of the technologies available and to understand how to effectively implement them into the curriculum. Teachers can help bridge the gap between their own attitudes toward technology and those of their students by explaining why the use of selected technologies are useful to instrument performance. Teachers may also provide training to students and parents on the expectations for using technology in practice at home to improve student growth outside of the classroom. School administrators and educational leaders can provide much-needed assistance in alleviating some of the challenges elementary instrumental music educators face so that they are more empowered and willing to implement relevant technologies successfully. Only through the cooperative efforts of all stakeholders can technology lead to improved student learning environments.

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Appendix A

Survey Instrument (Teacher Version)

Technology Attitudes in First-Year Instrumental Music

*** 1. Please select the following technologies that you *currently use* OR *would like to use* for instrumental music. (Check all that apply. If you *do not use* an item, *would not like to use* an item, or are unsure, please leave blank.)**

	In-Class Instruction		Assign for Practice	
	Currently Use	Would Like to Use	Currently Assign	Would Like to Assign
Software				
SmartMusic	❑	❑	❑	❑
Interactive Practice Studio (IPS)	❑	❑	❑	❑
Interactive Pyware Assessment System (iPAS)	❑	❑	❑	❑
Finale	❑	❑	❑	❑
Sibelius	❑	❑	❑	❑
GarageBand	❑	❑	❑	❑
iTunes	❑	❑	❑	❑
Supplemental DVD/CD in Method Book (Please specify which method book used):	❑	❑	❑	❑
Other (please specify):	❑	❑	❑	❑
Hardware				
Computer	❑	❑	❑	❑
Laptop	❑	❑	❑	❑
Tablet (ex: iPad)	❑	❑	❑	❑
Digital Music Player (ex: iPod)	❑	❑	❑	❑
Interactive White Board (ex: SMART Board)	❑	❑	❑	❑
Smart Phone/Cell Phone	❑	❑	❑	❑
Other (please specify):	❑	❑	❑	❑
Online Resources				
Noteflight	❑	❑	❑	❑
MuseScore	❑	❑	❑	❑
Audacity	❑	❑	❑	❑
Social Media (ex: Facebook)	❑	❑	❑	❑
Class Website	❑	❑	❑	❑
Other (please specify):	❑	❑	❑	❑

*** 2. How many years of experience do you have using technology for music?**
Years of experience using technology for music: _____

*** 3. Do you use technology in class or do you assign technology for student practice? If your answer is "Yes", please continue with question #4. If your answer is "No", please skip to question #9.**

- ❍ Yes, I use technology in class AND assign technology for practice.
- ❍ Yes, I use technology in class, but do NOT assign it for practice.
- ❍ Yes, I assign technology for practice, but do NOT use it in class.
- ❍ No, I neither use technology in class nor assign it for practice.

* **4. How many average minutes *per class* do you spend using technology?** Average minutes *per class* using technology: _____

*** 5. How many average minutes *per week* do you expect students to practice using technology outside of class?** Average minutes *per week* of expected student practice using technology: _____

*** 6. I use technology primarily for:**

- ❍ Lesson delivery
- ❍ Student interaction
- ❍ Both lesson delivery and student interaction
- ❍ Other (please explain)

*** 7. I use technology in the following ways: (Check all that apply).**

❑Assessment ❑Accompaniment ❑Composition/Arrangement ❑Listening

❑Recording ❑Games ❑Visual display of notation ❑Other (please explain)

*** 8. I use technology because: (Check all that apply).**

Technology in Class		Technology in Practice
❑	It helps me reach my teaching goals.	❑
❑	It helps my students reach their performance goals.	❑
❑	It saves me time.	❑
❑	Technology is readily available.	❑
❑	Using technology is a requirement.	❑
❑	Using technology is inexpensive.	❑
❑	I am knowledgeable about using technology.	❑
❑	Using technology is easy.	❑
❑	Technology is useful in beginning instrumental music.	❑
❑	There is enough parental support to use technology.	❑
❑	Other (please explain)	❑

Please continue with Section #2, the Technology in Music Attitude Questionnaire (TMAQ).

*** 9. Please indicate your response.**

- ❍ I previously used technology for music, but I don't anymore.
- ❍ I do not use technology for music and I hope I never have to.
- ❍ I do not use technology for music, but I would like to if I could.

*** 10. Why do you *NOT* use technology in class or assign it for practice? (Check all that apply).**

Technology in Class		Technology in Practice
❑	There is not enough time.	❑
❑	The lesson schedule does not allow for me to incorporate technology.	❑
❑	I have to travel between buildings, so using technology is difficult.	❑
❑	Technology is not readily available.	❑
❑	Using technology is not a requirement.	❑
❑	Technology is too expensive.	❑
❑	I don't know enough about using technology.	❑
❑	Using technology is too difficult.	❑
❑	Technology is not useful in beginning instrumental music.	❑
❑	There is not enough parental support to use technology.	❑
❑	Other (please explain)	❑

Please continue with Section #2, the Technology in Music Attitude Questionnaire (TMAQ).

Technology Attitudes in First-Year Instrumental Music

Please read each statement and indicate your opinion on a scale of 1-5 (1=Strongly Disagree with the statement; 5=Strongly Agree with the statement). If you do not have enough information to provide a response, please indicate "Unable to Answer." Throughout this questionnaire, "music" refers to band or orchestra, not general music.

*** 1. Music would be more interesting with technology.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 2. I like the idea of using technology for music.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 3. Using technology for music does NOT seem enjoyable.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 4. Music would get boring quickly with technology.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 5. Using technology for music would be fun.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 6. Technology has no effect on the quality of music performance.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 7. Technology is useful for learning to play an instrument.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 8. Music students can learn more when they use technology than when they don't.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 9. Using technology for music does NOT work very well.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 10. Technology creates positive results for instrument performance.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 11. Working with technology is so complicated, it's difficult to understand what's going on.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 12. Using technology is easy.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 13. Using technology takes too much time away from other things I have to do.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 14. I can accomplish more when I use technology than when I don't.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 15. It would take too long to learn to use technology to make it worth the effort.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 16. Using technology for music would make me appear to be a better teacher.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 17. I don't have to use technology for music if I don't want to.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 18. Other teachers use technology for music, so I feel like I should, too.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 19. I use technology for music because someone else thinks I should.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 20. Using technology for music makes me more valuable to my administrators.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 21. The way music is scheduled during the day makes it really difficult to use technology.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 22. The music room is well-equipped to use technology during class.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 23. Students do NOT have everything they need to use technology when practicing their instruments at home.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 24. If I don't know enough about using technology for music, I know where I can go for help.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 25. Parents do a good job helping students use technology for practicing their instruments at home.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

Please continue with Section #3, Demographics.

Technology Attitudes in First-Year Instrumental Music

*** 1. My gender:** ❑ Male ❑ Female

*** 2. Please indicate your age in number of years:** Years of age: _____

*** 3. How many years of professional teaching experience do you have?** Years of experience: _____

*** 4. How many years of experience do you have teaching first-year instrumental music students?** Years of experience: _____

*** 5. My highest earned professional degree:**

❑ Bachelor's ❑ Master's ❑ Doctorate

*** 6. What does your teaching assignment include? (Check all that apply).**

❑ Elementary Band ❑ Middle School Band ❑ High School Band
❑ Elementary Orchestra ❑ Middle School Orchestra ❑ High School Orchestra
❑ Elementary Choir ❑ Middle School Choir ❑ High School Choir
❑ Music Technology ❑ General Music/Music Appreciation
❑ Other (Please specify): _____

*** 7. How often do you typically meet with your beginning instrumental music students for lessons?**

Number of lessons per week: _____

Number of minutes per lesson: _____

*** 8. How many different schools does your teaching assignment include?** Number of schools in teaching assignment: _____

*** 9. How many students are enrolled in your first-year music classes at the school(s) in which you teach? (Please enter the number of students enrolled at each school or leave blank if not applicable).**

School 1 students: _____ School 4 students: _____

School 2 students: _____ School 5 students: _____

School 3 students: _____

You have successfully completed this survey. Please return your survey in the envelope as soon as possible. Thank you for your valuable time and input.

Appendix B

Survey Instrument (Student Version)

Technology Attitudes in First-Year Instrumental Music

Please read each statement and indicate your opinion on a scale of 1-5 (1=Strongly Disagree with the statement; 5=Strongly Agree with the statement). If you do not have enough information to provide a response, please indicate "Unable to Answer." Throughout this questionnaire, "music" refers to band or orchestra, not general music.

*** 1. Music would be more interesting with technology.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 2. I like the idea of using technology for music.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 3. Using technology for music does NOT seem enjoyable.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 4. Music would get boring quickly with technology.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 5. Using technology for music would be fun.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 6. Technology has no effect on the quality of music performance.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 7. Technology is useful for learning to play an instrument.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 8. Music students can learn more when they use technology than when they don't.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 9. Using technology for music does NOT work very well.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 10. Technology creates positive results for instrument performance.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 11. Working with technology is so complicated, it's difficult to understand what's going on.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 12. Using technology is easy.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 13. Using technology takes too much time away from other things I have to do.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 14. I can accomplish more when I use technology than when I don't.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 15. It would take too long to learn to use technology to make it worth the effort.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 16. Using technology for music would make me appear to be a better student.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 17. I don't have to use technology for music if I don't want to.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 18. Other students use technology for music, so I feel like I should, too.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 19. I use technology for music because someone else thinks I should.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 20. Using technology for music makes me more valuable to my teacher.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 21. The way music is scheduled during the day makes it really difficult to use technology.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 22. The music room is well-equipped to use technology during class.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 23. I do NOT have everything I need to use technology when practicing my instrument at home.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 24. If I don't know enough about using technology for music, I know where I can go for help.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 25. My parents do a good job helping me use technology for practicing my instrument at home.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

Please continue with Section #2, Demographics.

Technology Attitudes in First-Year Instrumental Music

*** 1. My gender:** ❑ Male ❑ Female

*** 2. Please indicate your age in number of years:** Years of age: _____

*** 3. My grade in school:**

❑ 4th Grade ❑ 5th Grade ❑ 6th Grade ❑ Other

*** 4. I am currently in my first year of taking:**

❑ Band ❑ Orchestra ❑ Band AND Orchestra

You have successfully completed this survey. Please return your survey in the envelope as soon as possible. Thank you for your valuable time and input.

Appendix C

Survey Instrument (Parent Version)

Technology Attitudes in First-Year Instrumental Music

Please read each statement and indicate your opinion on a scale of 1-5 (1=Strongly Disagree with the statement; 5=Strongly Agree with the statement). If you do not have enough information to provide a response, please indicate "Unable to Answer." Throughout this questionnaire, "music" refers to band or orchestra, not general music.

*** 1. Music would be more interesting with technology.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 2. I like the idea of using technology for music.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 3. Using technology for music does NOT seem enjoyable.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 4. My child would become bored with music quickly with technology.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 5. Using technology for music would be fun for my child.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 6. Technology has no effect on the quality of music performance.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 7. Technology is useful for learning to play an instrument.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 8. Music students can learn more when they use technology than when they don't.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 9. Using technology for music does NOT work very well.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 10. Technology creates positive results for instrument performance.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 11. Working with technology is so complicated, it's difficult for my child to understand what's going on.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 12. Using technology is easy for my child.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 13. Using technology takes too much time away from other things my child has to do.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 14. My child can accomplish more when using technology than when technology is not used.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 15. It would take my child too long to learn to use technology to make it worth the effort.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 16. Helping my child use technology for music would make me appear to be a better parent.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 17. I don't have to help my child use technology for music if I don't want to.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 18. Other parents help their children use technology for music, so I feel like I should, too.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 19. I help my child use technology for music because someone else thinks I should.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 20. Helping my child use technology for music makes me more valuable to my children and their teachers.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 21. The way music is scheduled during the day makes it really difficult to use technology.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 22. The music room is well-equipped to use technology during class.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 23. My child does NOT have everything needed to use technology when practicing his/her instrument at home.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 24. If I don't know enough about using technology for music, I know where I can go for help.**

SD SA
❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

*** 25. I do a good job helping my child use technology for practicing his/her instrument at home.**

❍ 1 ❍ 2 ❍ 3 ❍ 4 ❍ 5 ❍ Unable to Answer

Please continue with Section #2, Demographics.

Technology Attitudes in First-Year Instrumental Music

*** 1. My gender:** ❑ Male ❑ Female

*** 2. Please indicate your age in number of years:** Years of age: _____

*** 3. My child's grade in school:**

❑ 4th Grade ❑ 5th Grade ❑ 6th Grade ❑ Other

*** 4. My child is currently in the first year of taking:**

❑ Band ❑ Orchestra ❑ Band AND Orchestra

You have successfully completed this survey. Please return your survey in the envelope as soon as possible. Thank you for your valuable time and input.

Appendix D

Reliability Coefficients of TMAQ Constructs

To assess the internal consistency of the items in the TMAQ, Cronbach's coefficient alpha was calculated for each of the five constructs measured across all three groups of participants. Cronbach's alpha was estimated at 0.866 for attitude, 0.778 for performance expectancies, 0.722 for effort expectancies, 0.650 for social influences, and 0.564 for facilitating conditions. Because the estimated reliability coefficient was lowest for facilitating conditions, Cronbach's alpha was also calculated for this construct for each individual group of participants: teachers (0.459), parents (0.495), and students (0.671). The small group size of the teacher participants may account for the lower reliability score (Huck, 2012), as well as the possibility that the items within the facilitating conditions construct addressed a broader range of topics than other constructs. Weakened reliability for parent participants may be a result of parents having to guess at items if they did not have enough information to answer the questions.