Modernizing Our Methods: Incorporating Technology in Undergraduate Applied Violin Lessons

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MODERNIZING OUR METHODS: INCORPORATING TECHNOLOGY IN UNDERGRADUATE APPLIED VIOLIN LESSONS

By

Jaya Kristina Varma

A DOCTORAL ESSAY

Submitted to the Faculty of the University of Miami in partial fulfillment of the requirements for the degree of Doctor of Musical Arts

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MODERNIZING OUR METHODS: INCORPORATING TECHNOLOGY IN UNDERGRADUATE APPLIED VIOLIN LESSONS

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Technology has become a part of education in many areas. However, there is no current model for incorporating technology into applied violin lessons at the undergraduate level. This project provides background research in the areas of learning with technology, designing technologically-integrated courses, and currently available resources and tools for music studies. As a result of the research, a course map for a technologically-integrated course in violin has been developed. Recommendations for further study are included.
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CHAPTER ONE

INTRODUCTION

Background

The increasing sophistication, convenience, and portability of powerful
 technological devices has changed the way society operates. We rely on it for
 communicating with friends and family, getting directions, keeping records, and news.
 We also rely on it as a tool for learning. There has been a greater demand for educational
 technology as well as a demand for a higher quality of learning applications. From a very
 early age, children are engaged in learning activities disguised as games often embedded
 in a computer or handheld device. Military training now incorporates web-based training
 programs as part of basic instruction.¹ As more areas of society are turning to technology
 to teach certain skills, undergraduate lessons courses must also look to incorporate
 technology to keep up with the pace of learning.

At this point in time, most institutions of higher learning offer blended learning
 courses (partially online) and fully online courses. These approaches to learning are
 intended to engage students in new ways, make their learning lives flexible and
 convenient, and also lowering the cost of education.² Whether or not a student engages
 in a blended learning course, the increased use of technology in the classroom has
 steadily expanded and will continue to do so as new tools emerge. Computers have been

¹ Kara Orvis, Robert Wisher, Curtis Bonk, Tatana Olson, “Communication Patterns During
 Synchronous Web-Based Military Training in Problem Solving,” Computers in Human Behavior 18, no. 6
² Terry Anderson, ed. The Theory and Practice of Online Learning (Edmonton: Athabasca
 University Press) accessed October 12, 2015,
hailed as “saviors of the education system” since they can structure learning according to individual needs, keep records of development, and notify users of errors.³

Instrumental performance courses have yet to catch up with this new trend in learning environments. Violin pedagogy has seen many new method books with accompaniment CDs or even DVDs emerge over the past ten years. The use of such technology paired with a print method is fairly common; however, there has yet to be an in-depth study of how to incorporate technology into an applied lessons course. Most of the technology-based resources are left for students to discover on their own rather than fully incorporated into the objectives of a lessons course.

As technology becomes more widely used, it is appropriate that applied lessons courses begin to incorporate technology. Doing so can help foster the development of key concepts such as sound, vibrato, intonation, and rhythm. Students and teachers working with technology have new ways of evaluating and assessing progress. Although technology-based learning tools are often considered for use solely in the realm of distance education, there are tools available that can develop metacognitive skills in instrumental students who are studying their instruments in the more traditional setting of weekly lessons at a college or university.

Many factors can contribute to the efficacy of computer based learning tools. These include the instructional design, instructor familiarity, and scaffolding in the programs. Instructional design refers to the way an educational course is laid out or

contrived. An example of this is the placement and pacing of lectures in relation to tests or assignments. Instructional design also refers to the way student work is delivered and assessed. All of this is decided by the teacher and based on the learning objectives of the course.

The importance of the instructor being familiar with the technology or computer based tool is clearly important. William Bauer discusses the role of professional development in teaching music with technology by examining how training can change teachers’ level of comfort with technology as well as the amount they use technology. For the learning process to be effective, teachers must understand the programs and platforms they are using to deliver information. This involves an understanding of how the tool or program can support the outcomes and goals they have for their students.

Scaffolding in online courses is defined by Dan Keast as “the deliberate placement of tools for the student to use”. Keast goes on to describe the approach by stating that the inclusion of scaffolding techniques enables educators to control elements of the course that are beyond students’ capabilities so that the students can focus on features they are able to grasp quickly. Deliberate planning and creativity is required in order to place tools within a course that students can use at liberty to enhance understanding and focus practice sessions. Scaffolding information allows multiple

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access points to the same or similar information so that students have a variety of
opportunities to grasp necessary information on the way to the ultimate goals of the
lesson or course.

Statement of Problem

Professors must not only find appropriate applications, but also incorporate them
into the course in an effective way that supports course objectives and overall learning of
the student. This project will solve the problem of finding available and appropriate
technologies and show how to incorporate them into a traditional lessons course. Applied
lesson courses have been approached the same way for many years. Students have a
designated one hour per week with their studio teacher. Generally, this is accompanied
by a one-hour studio class. At best, students enrolled in applied lessons get two hours a
week receiving instruction from their teachers directly in their individual lessons and
indirectly in studio class. Technology can expand interaction time between professors and
students through the use of outcome-based activities executed outside the lesson time
while still being guided by the professor. The purpose of this project is to create a course
map outlining several currently available tools that will assist in creating a
technologically integrated course for violin instruction at the collegiate level.

Technological tools exist that could enhance student learning and understanding,
but they are not being incorporated into courses. Applied lesson courses are inherently
different from any other course a college music student takes. High emphasis is placed
on the development of the individual and, unlike other courses or lectures, the mode of
receiving information relies on one to one communication between teacher and student.
At the undergraduate level, it is important to note that the brains of students are still considered to be in the adolescent stage. According to Sprenger, the adolescent brain needs assistance making decisions, staying on task, and moving to abstract levels.\(^7\) The National Association of Schools of Music (NASM) dictates requirements for all types of music majors at accredited universities and colleges. One of these guidelines states that at the undergraduate level, students are required to have a minimum of one hour of individual instruction per week in their primary area.\(^8\) When compared with the amount of time spent with coaches in collegiate sports, this one hour a week is a remarkably small amount of time to assist students in decision-making and staying on task. During this limited time, it is crucial for instrumental instructors to create the motivation for individuals to practice outside the lessons. Beyond this, the teacher has the goal of getting the student to think creatively about problems in order to reach a higher level of technical and musical skill. On average collegiate athletes spend between 33 and 44 hours a week devoted to training. Most of these hours are spent with a coach guiding the practice process.\(^9\) While music students do get feedback in orchestra and chamber music, applied lessons teachers are not able to guide the practice process in the same way that athletic coaches are able to. By using available technologies, music faculty can increase interaction with students beyond the NASM requirement of one hour per week.

Incorporating technology-based learning tools into the private lesson environment can

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also access multiple learning styles, foster motivation and creative thinking, and improve overall skill level on the instrument.

Video tutorials are a commonly used technology among those seeking music instruction. However, most computer-based private lesson platforms and tutorials have drawbacks. These include: lack of real-time coaching, infrequent teacher modeling, dependency on good internet connection, issues of latency, no variance in point of view, and sound quality. These challenges are unique to computer-based instruction in that they do not exist in the traditional private lesson setting. Many students and teachers believe that using technology to teach means taking lessons online through a video based platform such as Skype. This is simply taking the traditional format of instruction from in person to online, thereby continuing the same method of learning and teaching with the addition of impediments discussed above. However, this type of “hastily configured classroom-adapted-to-the-web approach that bypasses known principles of learning and teaching makes little use of technology affordances in an intelligent or creative fashion.”

Incorporating technology into the traditional lesson setting will require research, creativity, and understanding on the part of instructors and students involved.

Need for Study and Justification

Finding effective technological tools that can support learning is necessary for instrumental pedagogy to keep up with the pace of educational developments and to support students’ learning outside of the lesson time. This study will lead to an understanding of how to approach the development of an applied lessons course that

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11 Ibid.
incorporates technology. This research will lead to increased use of technology-based learning tools in the private lesson environment to foster motivation, creative thinking, and improve overall musical skills in students. In order for instrumental music faculty to engage students in new ways, research must be done on what makes technology based learning tools effective. A course map for a technologically integrated applied lessons course has been developed as part of this project. The research will serve as justification for creating a technologically integrated course for violin lessons which will serve as an instructional design guide for future courses with similar goals.

**Purpose and Research Questions**

The purpose of this study is to identify technology-based learning tools and establish a course map which incorporates them into the traditional setting of applied violin lessons. This study will explore the benefits of technology-based learning. It will also investigate currently available resources for instrumental instruction and examine what the benefits and drawbacks of using these resources in the lesson as well as in the practice room. The information collected in the literature review serves as the basis for the course map detailing an applied lessons course that integrates technology.

There is a lack of scholarly research specifically regarding the efficacy of computer based learning tools for instrumental instruction. While much research has been done regarding blended learning and distance education in other academic areas, research needs to be done in order to discover how to design an applied lessons course that incorporates technology. Traditionally, the private lesson is the only instance of knowledge being transferred from the teacher to the student. This study will show that with proper design, instructor familiarity, and scaffolding approaches; integrating
technology into applied lessons is a legitimate and effective means of fostering higher levels of understanding, enhancing technical abilities, and assessing progress in applied violin courses.

The research will answer the following questions: (1) What are the benefits of incorporating technology-based learning tools into courses at the college level? (2) How does the use of technology foster a higher level of understanding in students? (3) What technological tools are currently available for string instrument instruction? (4) How can these tools be incorporated into an applied lessons course?

Many studies have explored how incorporating technology and web-based elements can increase student motivation and enhance understanding. In order to discover the benefits of incorporating technology-based tools into courses at the college level, the project will include a literature review exploring teaching and learning with technology. Identifying currently available tools for instrumental instruction courses is also an important part of this project. While a few of these tools do have scholarly studies examining their benefits to students, many more exist that have not been evaluated in a scholarly manor. These apps, computer programs, and devices can still be valuable to faculty. A thorough examination of their features will aid in determining how they can be used to support the goals of an applied lessons courses. As a result of evaluating these questions, a course map for applied lessons will be developed. The project will serve as justification for a new type of applied lessons course that incorporates technology in order to support students both in the lesson and during practice.
Definition of Terms

The terms below are used in this paper and will be defined using the following definitions.

**Technology-based tools and/or resources** – Encompasses the following: video conferencing platforms, e-learning, distance learning, websites, apps, wearable technology, computer assisted learning.

**Course Map** – A sequencing of instructional events that lay out the plan for a course in relation to goals or objectives for the course.

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Teaching and Learning in the Digital Age

In her book *Brain Based Teaching in the Digital Age*, Marilee Sprenger explores the need for teachers to incorporate technological tools into schools. Today, educators are considered to be digital immigrants, a term first used by Marc Prensky. Digital immigrants use technology, but have not necessarily had access their entire lives. Digital natives have had technology play a part in their lives from birth and are immersed in it from extremely young age. Digital immigrants must adapt and learn new skills to use advancing technologies. It is important for educators to acknowledge that students have very strong relationships with technology such as their phones, tablets, and computers. Sprenger believes that the key to learning is based on relationships and teachers must use students’ relationship to technology to aid the process of teaching and learning. Sprenger states that the brain craves “novelty, excitement, and innovation…naturally turning to things that are different.” Technology can offer this type of stimulus and educators can use its novelty to engage the brain in ways that are not otherwise possible.

Undergraduates have what are considered to be adolescent brains. This refers to the brain of anyone from the age of nine through twenty-five. At this stage, the brain needs guidance making decisions, staying focused on a task, and moving to higher levels of understanding. The use of technology can not only provide the novelty factor

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15 Ibid.
discussed above, but also provide a tool for focusing attention and fostering student motivation.

Often video tutorials come to mind when discussing teaching with technology. Sprenger discusses the phenomenon that makes these types of videos successful on a neurological level. When we observe someone accomplishing a task, mirror neurons in our brains begin to connect together. As a result of this, our brain becomes set up to accomplish the same task or do the same thing we are observing. This suggests that the power of observing master performers through applications such as YouTube can have a great effect on students’ brains.

The power of observation is also brought up by Elizabeth Haddon in her writings on masterclasses in the British Journal of Music Education. Learning through observation is essential to the development of certain skills. Haddon found evidence in various studies which supports the belief that observation paired with assessment leads to increased understanding of several elements of music making. Students involved in Haddon’s study were given questionnaires to fill out after observing a masterclass. Although responses varied, overall students reported that observing and listening to others affected how they approached their own work. Haddon suggests that there is an opportunity for increasing the benefit of the masterclass by giving the audience members guidance on what specifically to observe as well as a reflection session that includes a

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discussion with the master teacher. This type of discussion ultimately leads to what
Haddon describes as interactive pedagogical learning.\textsuperscript{18}

Just as the act of observing with intent can be a powerful exercise for learning,
being observed also has a great impact on our behaviors. Research by Ernest-Jones,
Bateson, and Nettle found that even an illustrated picture of eyes altered the way people
behave. This means that even just the idea that someone could be observing us changes
the way we act.\textsuperscript{19} These research findings will be incorporated into the applied lessons
course map found in Chapter 4.

Another way in which technology can aid in the learning process is by providing a
sense of ritual. As Sprenger notes, rituals can provide a feeling of safety and security
which provides an opportunity for information to travel to the brain and allow higher
level thinking to occur. Using technological tools during practice sessions can provide
this sense of ritual for music students by helping to structure practice sessions.

Sprenger also recognizes the need to use technology wisely as well as provide
“low-tech” time for students. Using media and technology wisely is part of providing a
healthy learning environment. This includes time away from technology. Sprenger
discusses how spending time in the low-tech world makes for a healthy brain that is ready
to learn effectively. The low-tech part of life is necessary for a healthy balance.
Sprenger’s book focuses on the brain’s plastic nature and its ability to learn through

\textsuperscript{18} Elizabeth Haddon, “Observational Learning in the Music Masterclass,” \textit{British Journal of Music}
\textsuperscript{19} Max Ernst-Jones, Daniel Nettle, Melissa Bateson, “Effects of Eye Images on Everyday
August 2016. http://miami-
primo.hosted.exlibrisgroup.com/uml:Everything:TN_sciversciencedirect_elsevier$1090-5138(10)00122-
4.
observation. Technology can be an effective way of creating exciting environments, establishing ritual, and engaging digital natives.

Many educators acknowledge that the landscape of education has been changed dramatically through technology, most notably through the Internet. Internet-based programs afford students customized learning environments with easy access to vast amounts of information. Editors Jason Huett and Leslie Moller show how the capabilities of technology paired with knowledge building pedagogy can create a model for the future of distance education.20 Distance education programs are frequently constructed to teach the “lowest common denominator.” They compare these types of programs to fast food that fattens “the mind with packaging and promised convenience but offer little intellectual nutrition and provide few positive effects other than the illusion of being satisfied.”21

Distance education has grown in popularity and capability with the advent of new technologies. The first distance courses were correspondence-based. Gradually, with the advent of new technologies, these courses moved into the online world. The third generation of online learning, or distance education, incorporates more than simply a discourse between student and teacher. There exists the capability to share files, interact, participate, simulate situations, incorporate gaming, and the ability to adapt to the needs of students. Huett and Moller lay out important principles for the future of distance education. Useful for the purposes of this project are:

21 Ibid.
• Enhancing social presence that results in a move towards collaborative learning requiring participants to work with each other.

• Effective distance learning is based on more than mere information presentation. Distance should be seen not as an obstacle, but as an opportunity to build knowledge, collaboration, and incorporate multi-level feedback.

• Participants in distance education will take greater ownership for their own learning in order to serve their personal objectives.

• The future of distance education will be characterized by assessment and evaluation practices that value real world problem solving.

• There will be an emphasis on motivational aspects of instructional design.\(^{22}\)

Incorporating technology into applied lessons will require students to access information on their own, or at a distance from their private instructors. Since distance education is largely self-directed, its effectiveness centers on the students ability to set goals, plan, understand expectations of performance, and self-observe.\(^{23}\) When students follow these principles, they are able to focus and take advantage of the learning opportunities in distance education courses. The instructional design of such courses should provide opportunities for feedback, challenges that are of an appropriate level, meaningful tasks, and opportunities for discourse. Practice using tools as well as guidance about when to use such tools is necessary for learners to feel confident and comfortable with distance or computer-based tools. When students feel confident and comfortable, they are more motivated learners.


\(^{23}\) Ibid.
Several studies have been done to assess student satisfaction with web-based learning. One such study by Sanja Bauk, Snežana Šćepanović, and Michael Kopp attempts to measure student satisfaction of such courses.\(^\text{24}\) An important acknowledgement made in this study is that there has yet to be an established accepted definition of blended learning. For the purposes of their study, they refer to blended learning as existing partially online with the student having some control over time, place, path and/or pacing.\(^\text{25}\) Perceived value is a crucial factor that affects satisfaction with these types of learning systems and courses. Perceived value is value placed on the learning tool by the user based on qualities that user perceives to be important. As discussed in Sprenger’s book, today’s students have important, interactive relationships with technological devices and are constantly using them. They place value on quick access to information and feedback. Therefore, the perceived value of being able to access course content or complete tasks using technology is quite high.

Bauk, Šćepanović, and Kopp employ a questionnaire for ascertaining student satisfaction with web-based courses. The model of the questionnaire addresses quality attributes of the various systems including system quality, information quality, self-assessment possibilities, and the net benefits. The goal of the study is to identify successful elements of web-based learning systems in order to provide recommendations for creating better teaching and learning systems in the future. Sixty-three students from University “Mediterranean” (UNIM) Montenegro were surveyed. The survey yielded observations regarding which features users felt were important in web-based portions of


\(^{25}\) Ibid.
blended courses. Presence of audio/video recordings was found to be a very important and its absence was noted to cause “great dissatisfaction”.\textsuperscript{26} High value was also placed on the ability to collaborate with others. It came as a surprise to researchers that students did not place a high value on easy access to content. They believe this was because access to content was something the students took for granted and expected. The presence of tutors was also found to be unimportant.

In addition to surveys about satisfaction with computer and web-based portions of courses, there have also been studies about the attitudes of instructors and learners towards e-learning. In the journal of Computers \\& Education, a study by Shu-Sheng Liaw, Hsiu-Mei Huang, and Gwo-Dong Chen surveys these attitudes in order to propose guidelines for developing e-learning environments.\textsuperscript{27} In this study, e-learning is defined as the use of the Internet to deliver a “broad array of solutions that enhance knowledge and performance.” The study sites an earlier book about e-learning in which the author, Marc Rosenberg, bases e-learning on three standards.\textsuperscript{28} The first of these is that it should be capable of instant updating and sharing of information. Secondly, e-learning is delivered via a computer using the Internet. The last of these criteria states that it should exceed the traditional models of learning.\textsuperscript{29} The study makes an important point that


\textsuperscript{29} Ibid.
regardless of how sophisticated or capable a technology is, effective use of such a tool depends on all users (instructors and students) having positive attitudes towards it.\textsuperscript{30}

The above referenced researchers make hypotheses about perceived enjoyment, usefulness, and self-efficacy as they relate to the quality of e-learning. Similarly, they make hypotheses regarding whether instructor-led learning or multimedia instruction can be a predictor of learner attitude toward e-learning and its perceived effectiveness. The study was conducted in a university with fifty instructors. For the learner portion of the study, the survey was distributed to one hundred sixty-eight college students who had spent six weeks in an e-learning environment. Interestingly, the data was gathered using a paper and pencil survey. The study includes a thorough statistical analysis of the data. Basic conclusions of the study are that instructors are willing to use e-learning environments to enhance learning and that learners respond positively to this method of incorporating technology. The guidelines recommended are: multimedia instruction, autonomous or self-directed learning, instructor-led interaction, and improving learning effectiveness.\textsuperscript{31} Another important finding is that interaction between instructors and students enhances the success of e-learning courses. This justifies an integrated approach to learning which includes in-person interaction paired with the use of technology to enhance student learning and advancement.


\textsuperscript{31} Ibid.
Dan Keast discusses constructivism in his article “A Constructivist Application for Online Learning in Music”. The basic theory of constructivism assumes that humans are active learners and must “construct knowledge for themselves by using tools at hand to learn from experiences”. Constructivism, according to Keast, gives students the choice to pursue their interests making connections and reaching conclusions through the course of actions thereby constructing their understanding. As students move through this process of construction in online learning, it is necessary for instructors and designers of these courses to build in information at various points for students to access on their own. This is referred to as scaffolding. Scaffolding is defined by Kest as the intentional placement of tools for students to use as they work towards the goal of the course or lesson. He describes two types of scaffolding that can be used in online courses. The two types of scaffolding: “just-in-time” and learner selectable. The first type of scaffolding is embedded within the activity or lesson at points where learner assistance is predicted to be required. This could be as simple as providing a hyperlink to words or concepts. The second type of scaffolding is not necessarily embedded into the lesson, but located elsewhere on the page and provides the learner with a variety of information to access as desired. This information is intended for the self-directed learner. When these types of tools are included in a course, the instructor becomes the architect of knowledge enabling students to construct their understanding. Typically, applied lessons teachers have to address issues as they arise and tailor content of lessons to each individual since every

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33 Ibid.
34 Ibid.
student has unique strengths and deficiencies. Knowledge of how to scaffold in general information into an applied lessons course ensures that all students get access to basic information at appropriate times during their course of study.

Kest also discusses Vygotsky’s *Zone of Proximal Development* in relation to the constructivist approach to education. According to this theory, the zone of proximal development is considered most optimal when a student needs instructor assistance to complete a task or assignment. The right balance of difficulty in assignments must be found in order to encourage instructor interaction. In other words, assignments and activities have to be challenging enough that the student cannot complete them without some level of instructor input or guidance. Conversely, assignments and activities cannot be so easy that no instructor involvement is necessary.

Mobile learning has also been investigated for its potential to expand the learning environment. Mike Sharples takes on the task of discovering a method for evaluating mobile learning platforms for usability, effectiveness, and satisfaction.\(^\text{35}\) This study provides information for those designing mobile learning platforms as they consider aspects of tracking usability and effectiveness. Mobile app technology allows tracking to take place automatically, as learners use the programs. This data can provide valuable feedback about which features learners gravitate to, how often they access information, and how long they spend using the application.

Technology in Music Education

In the book *Computers in Music Education: Amplifying Musicality*, author Andrew Brown writes about several areas of music affected by advances in technology. According to Brown, technology and e-learning tools as have the unique ability to break down the barriers of distance and time. E-learning refers to the use of Internet based technologies to deliver or support education-based programs. He breaks down e-learning tools into various categories. These categories are information distribution, interactive software, asynchronous communication, synchronous collaboration, and web content creation. Brown discusses several points developed by Hubert Dreyfus in the book *On the Internet* where the stages of learning are outlined. Dreyfus believes that the nature of distance education makes the transfer of advanced concepts difficult; however, distance education can prove effective in the early stages. The stages of student progress according to Dreyfus are novice, advanced beginner, competence, proficiency, expertise, mastery, and practical wisdom. Dreyfus believes that in-person interaction is required for anything beyond the first three stages of development. Brown suggests that although e-learning provides opportunities for enhancing learning for music students, Dreyfus’s points must be remembered as course materials incorporating e-learning are developed.

Brown also discusses the importance of design in music e-learning courses. In summary, Brown’s six elements for effective e-learning design are:

- **Activity** - design should include tasks that lead students to desired educational objectives
- **Scenario** – situation of tasks relation to each other and the real world

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• Feedback – reaction or comments that turn student experience into understanding
• Delivery – consideration of benefits and limitations of technology as they relate to interaction with material
• Context – accommodation of other material and/or human interaction
• Impact – anticipation of effect (educational, psychological, cultural, ethical, physical)\(^37\)

Incorporating these elements into the design of a technologically integrated applied lessons course will maximize effectiveness. Brown concludes that for music, e-learning’s focus should be on developing musical intelligence.

The challenge is maintaining a high quality despite the increased accessibility and volume of resources. Brown acknowledges that many music education programs are hesitant to incorporate new systems because they are seen as a potential threat to the traditional way of teaching and learning music. Much like the constructivist approach of Dan Kest, Brown believes that an environment that includes technology allows the teacher to act as a facilitator for students who are guiding and constructing their own learning and understanding. When developing curriculum and pedagogies, educators must understand the context for students to have meaningful musical experiences. This comes from fostering personal, social and cultural meaning in music. Technology has the ability to enhance these contexts creating meaningful engagement.

YouTube videos and other user-generated content can be an effective resource for music students and teachers. Janice Waldron explores the online community Banjo Hangout (www.banjohangout.com) in her journal article published in the International

The purpose of her research was to examine informal learning in Banjo Hangout’s community. The community is based on the off-line interest of old time and bluegrass banjo music. The entire community exists through what Waldron refers to as computer-mediated communication or CMC. She examines the various means of communication (Skype, forums, vlogs, blogs, chatrooms, emails) in order to find out how members of the community learn and teach. Her “cyber ethnographic” research questions include: How does belonging to an online music community facilitate informal music learning? What resources and technologies do participants use to engage and promote this informal music learning? How do the on and offline communities overlap? How does this overlap in communities facilitate music learning? Though Waldron is focusing on community, she notes that the participants’ musical motivations for being part of the community were greater than social motivations. Members of the online community provide each other with feedback and have access to shared resources. Waldron concludes that music educators can learn volumes from examining successful music practice communities although they operate differently than traditional modes of imparting knowledge than are employed at schools of music. The study implies the great impact technology has on the formation of communities among learners. The study of music can be inherently isolating, with many hours spent alone in a practice room. Forums, videos, and other platforms can provide a supportive community for collegiate music students.


39 Ibid.
Using social technology to foster higher level thinking in students is also used in fields outside of music. Margaret Norris and Philip Gimber explore the ways in which nursing students expand their knowledge and metacognitive skills a 2013 article published in the journal *Teaching and Learning in Nursing*. They discuss the ways in which Twitter and other online social platforms have a positive effect on the self-directed nursing student. They make an important point that pen and paper or “hard-copy” journal entries do not allow for feedback or other points of view as twitter or blackboard do present this opportunity.\(^{40}\)

YouTube is also the focus of Thomas Rudolph and James Frankel’s book, *YouTube in Music Education*.\(^{41}\) The authors of this book believe that as YouTube’s content moves away from amateur videos and towards a greater volume of expert content, educators will benefit from having access to a greater amount of pedagogical resources. Aside from online tutorial videos, the book discusses other ways in which music educators can use the platform to enhance student learning including having students create content, using content to generate discussion or for students to review, facilitating collaborations, and providing resources for home study.\(^{42}\) Although a majority of the book focuses on the specifics of how to set up a YouTube profile and channel as well as how to upload videos, there are also several teaching strategies that instrumental teachers can consider when incorporating YouTube into lessons. For example, having students compare and contrast different versions of performances can

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\(^{42}\) Ibid.
enhance their understanding of a particular piece or technical element within a piece. When learners have to articulate these types of similarities, differences, and observations they are able to reach a new level of understanding. Comparing and contrasting professional recordings is not often part of applied lessons courses. This simple activity would require students to think critically about essential elements of music making.

Teaching students to become creative performers is a goal for many teachers. John Kratus defines creative performance as occurring “when performers make personal decisions about how a piece should be played.” Kratus believes that the process of developing creative performance should include having students attempt several different ways of playing. The main goal for the advanced player is to eventually make the process of intentional musical decision automatic, simply part of individual artistry. However, a student must be initially guided through this process. Students should attempt many different options with the intent of identifying which is best or most appropriate. Additionally, requiring students to articulate why one approach is preferred over another will encourage them to be critical listeners and eventually better performers and teachers themselves. The compare and contrast activity can serve as platform for exploring intentional music making.

Available Technologies

Elizabeth Axford explores over 1,000 music apps for musicians and teachers in her 2015 book. Apps can provide affordable and accessible tools for students. Axford suggests that the apps in her discussed in her book can be used as tools to achieve the

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National Standards for Music Education. She lists apps in various categories and describes their function. Music theory, ear training, notation, dictionaries, sight reading apps, scale and chord apps, music readers, improvising aids, diction apps for singers, accompaniment tracks, songwriting apps, music streaming, music appreciation, concert tickets, recording, mastering, editing apps, and synthesizer apps are all listed and described in the chapters of the book. Axford also breaks down instrument specific apps in this book. Of particular note in the section on string instrument apps is Bowing Fun, an app that generates string-crossing exercises with customizable difficulty levels. This book is a simple list of currently available music apps in the multitude of categories mentioned above. It would be beneficial to have an expert in each area evaluate and rate the apps based on usability, effectiveness, and user satisfaction.

Cadenza, an app produced by the company Sonation, synchronizes a recording of a full orchestra to users’ tempi and uses a predictive model based on previous performances to “play” more accurately with you.45 The company has tested its app with musicians from various conservatories and schools of music as well as with professionals. Sonation believes there are benefits to experiencing the context of a full orchestra during practice sessions. Experiencing this type of immersion in the music is not often afforded to music students, but with this app, learners can carry the orchestra with them on their iPhone or iPad. Sonation seeks to help students become better musicians by “enabling greater self-expression through technology.”46 Since Cadenza is

a relatively new tool for music teachers and students, there has yet to be an in depth study of its efficacy in fostering greater self-expression. However, many educators at the conservatory level have been quoted saying marvelous things about the app and these positive endorsements cannot be ignored.

Although specific research regarding Cadenza has yet to take place, there has been research on the effect of similar interactive accompaniment recordings. A study on this topic by David Klees compared performances of two musical selections prepared by the same student, one with accompaniment and one without. Klee hypothesizes that students using interactive accompaniment during the process of preparing specific flute literature would show improvements in the areas of accuracy, quality, and musicality. He surmises that a holistic approach to teaching music incorporates the use of accompaniment throughout the learning process instead of the student practicing without accompaniment until close to the performance. Although the study found that there was no significant difference in the final performances, it did show that the availability of accompaniment likely increased motivations and overall practice times of students.

Cadenza can provide easy access for students to accompaniment without having to schedule rehearsals with pianists.

Klee’s study mentioned the use of Vivace which was a precursor to the currently available tool SmartMusic, an intelligent accompaniment system used frequently in elementary and secondary school music programs. Brian Nichols of Kennesaw State University examined the effects of SmartMusic on Student Practice in his 2014

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48 Ibid.
Nichols explores motivations and goals and the idea of students seeking mastery above performance based goals. Since instructors in music programs have a limited amount of time, an interactive music practice system such as SmartMusic can provide a technological supplement that offers guided practice. Additionally, SmartMusic provides personalized assessment and feedback. The study found that while the SmartMusic group of students was not necessarily more motivated to practice than the control group, they did spend more time practicing overall. As noted by Nichols in his recommendations for further study, it would be interesting to incorporate social media and explore the effects of cultivating a community of practice to further test student motivations when using SmartMusic.

Other studies regarding SmartMusic such as the 2007 study by Evan Lee compare two groups of students. One group having access to the program and the other without access. One of the problems Lee notes with SmartMusic is that the program allows for a wide range of accuracy in both pitch and rhythm. For this reason, Lee has judges check the SmartMusic program’s scoring. In this case, the judges scored similarly to the computer program. Lee also found that there was little difference between the abilities of the SmartMusic group and the group that received traditional instruction.

In the book Teaching Music with Technology, Thomas Rudolph categorizes four basic types of computer assisted instruction. They are:

1) Drill and practice
2) Games
3) Tutorials
4) Simulation

SmartMusic falls under the first category of drill and practice since its function is to assist students in practice.

Having access to a tuner and metronome is now as convenient as carrying around a smartphone or tablet. These tools are very important to musicians regardless of skill level. Technological advances have enabled these basic tools to take on advanced features. For example, the app Tonal Energy seems like relatively basic tuning app, but upon closer inspection it is found to include unique features that traditional tuners cannot compete with. In addition to being able to select the pitch frequency, the user can also tell the app what skill level they are: intermediate, advanced, or professional. The increasing levels allow for a narrowing margin of error when using the tuner. The app has a built in recording feature that plots the pitch graphically. In this feature, users can slow down or speed up recordings of themselves. Users can also use the in-app metronome as a separate tool or incorporate it into recordings for an increased level of analysis. Recordings can be saved for future reference. This app is a great example of taking a simple tool that musicians are already familiar with and elevating it with technology. It takes multiple tools that musicians already use (tuner, drones, metronome, recording device) and combines them into a single app that is inexpensive and easy to use.

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Researchers have developed a computer-based visualized quantitative learning system for violin vibrato. The justification for the development of this tool rests on the assumptions that traditional methods of teaching are largely subjective and based on teachers’ personal experiences and contains a lack of scientific analysis. The visualized quantitative learning system or VQVA-Sys enables students to use a visual representation of vibrato to adjust vibrato frequency and amplitude rather than relying on instructor feedback. The study sampled eight expert violinists and analyzed an excerpt from the opening of Bruch’s G minor violin concerto. The sample was taken from previously made professional recordings. Eight college-level students performed the same excerpt and were able to compare visual data from the system to that of the experts. There were two playing trials for the students: one before getting to view data from the experts and one after. The study found that most students were able to quickly adjust their vibrato based on the visual representations of the experts. Marilee Sprenger noted the power of observing experts in her book on brain-based teaching in the digital age. This tool could provide a powerful way for students to observe details of expert vibrato in ways not possible without advanced technology.

The Royal Danish Academy of Music engaged in a long-term study of distance learning with specific focus on the use of videoconferencing at the conservatory level. The project involved collaboration with Aalborg University as well as the American

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54 Ibid.
institutions New World Symphony and the Cleveland Institute of Music. Teachers in Denmark collaborated with these American institutions through the use of Internet2. The goals were to create a body of research that would serve as the basis for teachers and students to develop skills and awareness regarding the use of distance learning.

In the findings of this study, we are again presented with the idea that technology allows instructors to be facilitators of learner understanding, an idea referenced by other sources in this literature review. They found that because of the nature of the technology, students had to be more active in reflections and questions. Physical contact became replaced by verbalization. The use of technology allowed for multiple visual dimensions including simultaneous view of close up and full body shots thereby accomplishing something that cannot be accomplished in the traditional lesson setting. The study also found that visual expression is of great importance for the learning process. Details of camera settings, placement, and lighting were explored and discovered to be of great importance. It is clear that those involved in the study had access to technicians and quality equipment to make these types of adjustments when necessary. New teaching strategies can be developed as a result of videoconferencing and distance learning. The technology allows for teachers to observe other instructors and create dialogue about the teaching and learning process. There is also an increased attention to pedagogical issues such as planning and reflection. The use of gesture instead of speaking is an example of new teaching skills necessary in this new digital space of learning.57

Digital Audio Workstation (DAW) refers to both hardware and software used to record, edit, mix, and create music. There are many free platforms that can be used as a

DAW. This makes the ability to record and edit more convenient than ever before. Programs like Garage Band allow for students and teachers to carry this powerful technology on their personal devices.\(^\text{58}\)

Play with a Pro is an online company that provides learners with both asynchronous videos and synchronous lessons with teachers. The benefits of this service vs. Skype or FaceTime include access to the recording of all lessons so that both student and teacher may review at a later date. The recorded lesson is only accessible through the Play with a Pro website. Teachers set up profiles that include languages spoken, a bio, and a cost of lessons. The violin lessons range from $20 to $150 per lesson depending on the teacher. There are over twenty-five violin teachers to choose from. Most offer a free introduction lesson.\(^\text{59}\) Play with a Pro takes advantage of combining both synchronous and asynchronous content so that learners can get the most out of using the site. Students can watch pre-recorded master class videos, take private lessons which are recorded and stored automatically, or join live-stream events. Elements such as live-streaming and online profiles contribute to the feeling of community and collaborative learning, discussed earlier in this literature review. First hand experience with this application has proved that both quality of sound and latency issues with this platform are quite minimal when compared with Skype and Facetime.

Another web-based forum for learning can be found at Artistworks.com. This website allows students to access a multitude of instructional videos about their chosen instrument for a subscription fee. Students are also allowed to upload videos and get


feedback from teachers. ArtistWorks has trademarked the term “Video Exchange”. This exchange process includes one question or short playing video from the student which is followed up with a short response from the expert. All exchanges are viewable by anyone paying a subscription for access to a particular instrument on ArtistWorks. This allows for students to learn from instructional videos by the expert, but also from video submissions by their peers. Instead of having many teachers to choose from, there is only one for violin: Nathan Cole, the first associate concertmaster of the LA Philharmonic. The categories of videos for classical violin are beginner violin, intermediate violin, advanced violin, orchestral excerpts, and concertmaster solos. The basic videos can be beneficial to students at virtually any stage. The excerpts and concertmaster solo videos are very useful to teachers seeking to incorporate orchestral audition literature into applied lessons. Very few violin students will wind up with solo or chamber music careers, yet much of the focus of undergraduate lessons is on solo and chamber repertoire. Another interesting feature of ArtistWorks, is its inclusion of several piano reduction tracks for both orchestral excerpts and solo works that students can access and play along with. As found in previously mentioned studies, playing with accompaniment is beneficial to the student when learning music. It solidifies intonation and rhythm as well as provides musical context.

Learning to play the violin, or any instrument, is a very complex process. In private lessons, it is difficult to find the time to address every aspect of being a musician, practicing, and performing at a peak level. Injury awareness and prevention, and peak

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performance are areas where technology can provide a simple way to fill in the gaps in these topics outside the lesson time.

The Bulletproof Musician is a wonderful resource for students curious about how to optimize their practice and performance. Written by performance psychologist and Juilliard faculty member Noa Kageyama, the site contains valuable information on topics such as mental practice, technique, rhythm, self control, procrastination, and virtually every other topic that relates to becoming what Kageyama considers to be a “Bulletproof” musician. Kageyama also offers an online course entitled “Beyond Practicing” for an at-home version of his Juilliard course. It covers seven skills necessary for musicians to master: Energy Regulation (regulation of the stress response), Preparation (effective practice), Confidence, Courage (building trust), Concentration, Focus, and Resilience. Kageyama also offers individual coaching sessions via Skype for more customized sessions.

In the category of optimal performance and performance anxiety help, musicians can also find useful tools in the app store. Guided meditation and visualization apps offer a way for students to access expert assistance with stress management without the challenge and expense of finding a therapist. Apps like “Musicians Hypnosis” offer customizable ways for musicians to explore this side of performance preparation. The app includes the subjects of auditions, confidence, creativity, exams, lyrics, pitch/tuning, gigs, reading, rhythm, stage-fright, turbo-practice, and visualization. Users can select a length and a few topics for each virtual session.

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“Musicians’ Health Collective” is a blog founded by San Antonio Symphony violist Kayleigh Miller. Miller expertly writes articles regarding common physical ailments experienced by musicians. It is a place to find concise, well researched and written information for students and professionals alike. It is rare for a violinist in college to take any courses in anatomy or restorative exercise. These pages can serve as a resource and sounding board for those interested in such issues. This site also creates a community for those seeking answers or information about physical issues associated with playing.

A study by Peter Visentin, Gongbing Shan, and Edwin Wasiak explores injury prevention in violinists through the use of movement analysis technology. The study sought to determine if a technical violin skill, legato bowing in this case, could be generalized and if data can be used to inform pedagogy and minimize the risk of injury among violinists. Electrodes were used to measure muscle responses among fourteen professional violinists. Angles of the arms were analyzed as well as the relationships between arm angles and the string being played. Patterns among the highly trained participants which can be useful in pedagogical approaches. This study could have implications for teachers seeking to use imaging to reduce injury in students.

In 2003, Evelyn Orman explored the computer assisted instruction category in her study on the effect of virtual reality on performance anxiety in saxophone players. Her

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study focused on undergraduate saxophonists. The researcher measured physiological responses to performance environments and had subjects complete a written survey to self report anxiety levels before during and after the performance. The subjects were given twenty-minute virtual reality performance simulations in weekly sessions. Each of the eight subjects were reviewed in detail in Orman’s study. The findings of this study, while not conclusive, show that there are positive effects and applicable uses for this type of technology.

Another simulation tool can be found at violinexcerpts.com in the form of a YouTube video. The video is intended to give users a taste of what it is like to audition for a committee giving prompts to play a typical preliminary round from behind a screen. Users are given the following times before being cut off by the virtual panel in the video:

- Concerto: 1:05
- Excerpt #1: 45 seconds
- Excerpt #2: 38 seconds
- Excerpt #3: 45 seconds
- Excerpt #3 second try 30 seconds (or play excerpt #4)

This tool could be way to supplement orchestral repertoire classes or for students who are preparing for orchestral auditions. Based on Orman’s study, and the writings of Noa Kageyama, preparing for an audition by simulating the audition environment can be very effective.

An area of technology that is not often considered for music pedagogy purposes is that of wearable technology. A device called MusicJacket was developed as a system to help teach certain aspects of violin playing. The areas addressed are: using a straight
bow, using more bow, and position of the violin. When the subject is wearing the MusicJacket, motion capture sensors can sense when the position or bow is not ideal and will send a vibrotactile signal (vibration or pulse) to the subject which allows them to recognize there is an issue that requires their attention. The system provides real-time feedback.

The subjects in this study consisted of beginning violin students ranging in age from 10 to 13. All students received lessons with teachers and the system. Data was collected from the lessons as well as interviews with both teachers and students. One extreme drawback of the system is the time it takes to set up. Getting a child to spend ten minutes putting on the equipment is impractical in the typical lesson situation. The study found that the system was overall beneficial to students in their ability to recognize errors. The study also emphasized the importance of having a teacher present to help correct the physical movement.

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CHAPTER THREE

METHOD

The information synthesized from the amassed literature provides context and perspective for incorporating technology into applied lessons. Identifying elements of technology-based learning tools that foster and facilitate understanding serves as a basis for developing a course map for violin lessons that integrates technology. The relevant material in the areas of teaching and learning in the digital age, teaching music with technology, and currently available music teaching technologies have been explored in the literature review.

Discoveries in these areas of research guide the next steps in the process of determining how to merge technology-based learning with traditional philosophies and goals of applied lessons courses. By researching and evaluating the current technologies available for enhancing instrumental instruction, the researcher has developed a course map for a technologically-integrated applied violin lessons course. This new structure for lessons will aim to enhance student understanding, motivate students, and provide support for practice through the use of technology.

By using the categories of effective instructional design from Andrew Brown and Thomas Rudolph, the researcher has categorized technology-assisted tools and place them appropriately to support the overall performance ability and musical understanding of an undergraduate violin student. Andrew Brown’s components of instructional design are:
Activity
Delivery
Collaboration
Feedback and Assessment
Impact and Benefit

With the assistance of Thomas Rudolph’s definitions of the types of computer assisted instruction, the category of Activity can be further defined. Activity is defined by whether the tool is one for drill and practice, a game, a tutorial(video), or a simulation. These terms are the basic types of computer assisted instruction as defined by Thomas Rudolph in the book Teaching Music with Technology. The table below combines these components and is used in the creation of the course map.

<table>
<thead>
<tr>
<th>Component</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Drill and practice</td>
<td>SmartMusic is for drill and practice. Tutorials can be found on YouTube and Artistworks; Compare and contrast exercises function as an activity.</td>
</tr>
<tr>
<td></td>
<td>Game</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tutorial</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Simulation</td>
<td></td>
</tr>
<tr>
<td>Delivery</td>
<td>Mode of delivery</td>
<td>App, Website, Video, Written content</td>
</tr>
<tr>
<td>Collaboration</td>
<td>Whether the tool provides an opportunity for students to collaborate inside the studio or beyond</td>
<td>Online practice videos, webcasts and forums, live-streaming practice sessions, masterclasses, discussion.</td>
</tr>
<tr>
<td>Feedback and Assessment</td>
<td>How feedback is delivered and assessment is provided. Whether it is part of the technology or if the student/teacher is required to analyze and self assess</td>
<td>SmartMusic uses colors to chart and analyze accuracy; MusicJacket uses vibrations</td>
</tr>
<tr>
<td>Impact and Benefit</td>
<td>Anticipated effect and how it assists the development of the student</td>
<td>A simulated audition environment could lead to improved control of performance anxiety</td>
</tr>
</tbody>
</table>

Table 3.1

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Determining the outcomes of an undergraduate lessons course is a necessary first step to designing a course map that incorporates technology. The goal of an undergraduate applied lessons course in violin is ultimately to develop musicians who have a strong concept of sound, rhythm, and intonation. Building a strong technical foundation is an important step to achieving this goal. It is further supported by advancing repertoire, forming a musical identity or musical awareness, collaborative work, adaptability, effortlessness and ease of playing, and guiding the student to be able to analyze, assess, and overcome problems on their own.

The technology-based tools explored in the literature review will be assessed based on which elements of musical development they assist. The researcher has identified which components of instructional design they satisfy. Based on these elements, a course map with diverse technology has been developed for applied violin lessons. The course map will be laid out for a four-year undergraduate applied lessons trajectory. It will outline the basic of violin playing that can be addressed with each activity. The project will serve as a guide for instructors seeking to incorporate technology into lessons programs.
CHAPTER FOUR
BUILDING A COURSE

The goal of an undergraduate violin teacher is for their students to become musicians with a strong concept of sound, rhythm, and intonation. Building a good technical foundation is an important step towards achieving this goal. This technical foundation includes development of basic bow strokes, (collé, martelé, and detaché), vibrato, and shifting. It is further supported by assigning repertoire of increasing difficulty, forming a musical identity or awareness, collaborative work, adaptability, effortlessness in playing, and guiding the student to be able to analyze, assess, and overcome problems on their own.

Based on the information in the literature review, we have learned that the adolescent brain responds well to the novelty and structure that a technologically-integrated course can provide. It was also discovered that for any type of technology-based tool or resource to be effective, both instructor and student must have some familiarity with how to use it. Additionally, the intentional placement of these resources over the course of study creates an environment where the student can effectively learn. This chapter will serve as a detailed description of resources and will also include a course map for undergraduate violin performance majors that incorporates the use of technology. Since technology is rapidly changing and evolving, the course map will serve as an example for professors seeking to use technology in their applied lessons courses. Although there are no set rules for incorporating technology into lessons programs, it is recommended that each resource is thoroughly investigated by the instructor and there is a clear intention for each element to serve a specific purpose based
on the goals for the course. The technology-based tools discussed in this chapter will include eleven resources. They were chosen based on their features and commercial availability. Some of the resources detailed in the literature review are not commercially available. The Music Jacket and the tool for quantitative vibrato analysis fall into this category, so they have been not been included as part of the resources used in this course. SmartMusic has also been left out of consideration for the purposes of this project. The information in this chapter reflects the researcher’s personal use of the resources.

The first step to integrating technology-based resources into a course is to define them and evaluate them based on what sort of assistance they provide and then further defining them by the elements of instructional design they satisfy. The elements of successful instructional design are adapted from Andrew Brown. They are: activity, delivery, collaboration, feedback and assessment, and anticipated impact and benefit. Activity type is refined by the categories of e-learning environments detailed by Thomas Rudolph: Drill and Practice, Game, Tutorial, and Simulation. In addition to these two methods of evaluation, the resources will be evaluated by whether they provide the instructor with an opportunity to outsource certain topics, whether they are tools to be used in the practice room or lesson, and whether or not they can serve as self-help tools for the self-directed learner.

As discussed in the literature review, psychologists have observed that humans behave differently when we know we are being watched. Technology provides an easy way for instructors to take advantage of this phenomenon without having to stroll up and

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down the practice room hallway to spy on students’ practice habits. Various live streaming platforms from Facebook to Periscope can provide motivation for students to employ their best practice habits. The activity of live streaming a portion of practice can occur with whatever frequency the instructor deems necessary. Videos can be public or shared with only specific people. They can also be saved for future uploads to YouTube. The method of delivery is a video that is taken by the student in the practice room in real time. It provides an opportunity for feedback and assessment of practice habits by giving the instructor a glimpse into the many hours students spend alone in the practice room every week. The live-stream activity is for students to complete in the practice room and is to be analyzed in the lesson. This activity is a drill and practice activity. The anticipated benefit of the activity is improved efficiency and effectiveness of the practice session. Feedback for this activity occurs in the lesson as practice habits or issues are discussed.

Observing an expert accomplish a task can help students prepare to accomplish the same task. The power of observing experts can be easily harnessed through videos on YouTube. In the past, such a vast array of performances was not easily accessible. Even gaining access to audio recordings required research and a trip to the library. Today, videos of phenomenal professional musicians are easily accessed on any phone, computer, or tablet. By incorporating an activity where students observe, compare, and contrast high quality performers, instructors can encourage the development of musical awareness as well as students’ ability to analyze and solve problems on their own. Comparing and contrasting various violinist renditions of assigned works can also serve as an opportunity to incorporate writing into a course that traditionally does not require
writing. Even if done so informally, articulating differences in performer approaches will develop critical thinking in students. This activity can also serve as a platform for in-lesson explorations of how certain musicians obtain certain sounds. For example, comparing bow speed and sounding point of different performers provides an opportunity for teachers to assign exercises to develop control over these particular elements of playing. This activity will build a musical vocabulary for the student. The anticipated benefit of this activity is amplified by an in-depth exploration of violin technique. Comparing and contrast video analysis is an activity that can be utilized by the self directed learner.

Internet based communities provide an important sense of collaboration and community among their members. Studio teachers often encourage interaction and community building in studio class and outside of studio class. This sense of community can be easily expanded to include a wider network by creating a virtual studio. The virtual studio is a web based place for communication and collaboration. Whether hosted on Facebook, a personal website, or through an institution-hosted website or software, this type community is important since students spend many hours in isolation in the practice room. Students actively part of the studio will be required to post content similar to a traditional studio class, but with shorter, video performances. A collaborative attitude for solving problems will be encouraged through the use of a constructive comment feed. The network resources can be expanded by including alumni of the studio and even guest posts curated by the professor. Benefits include the development of assessment and analysis skills as students receive and give feedback to others in this supportive virtual environment.
The Cadenza app conveniently provides students with an opportunity to hear the full orchestra accompaniment to some of the major violin literature typically assigned for study during the undergraduate years. The benefits of practicing with accompaniment has been shown through various studies explored in the literature review. In addition to the literature available through Cadenza, there is piano accompaniment for other major works on Artistworks.com. The activity is a simulation of what it is like to play with an orchestra or accompanist. It is delivered through the app or website and is intended for use in both the practice room and lesson. The anticipated benefit students’ development of awareness of how their part fits with the accompaniment thus preparing them for future collaborations. Cadenza records each “performance” for future review and analysis. Although ArtistWorks does not have an in house recording feature, students can utilize an alternative recording device. With the use of both these resources, issues of rhythm and intonation can be resolved with the help of simulated accompaniment activities. This activity can be incorporated into the virtual studio and is very useful for the self-directed learner.

Metronomes and tuners as physical devices have been replaced by apps on personal phones and tablets. As a technology, drones and metronomes are not new, however, they contain new features that can provide feedback and analysis in novel ways. Requiring students to use these tools in specific ways at specific points in practice will provide a sense of ritual that human brains require when learning. As part of this course map, students will be required to use TonalEnergy or another drone source as part of daily warm up as well as metronome apps in practice. The instructor guides a portion of this activity by monitoring the use of the resource both in the lesson and during the live
stream practice activity. It is not enough to merely say that a resource exists and expect the student to use it properly and effectively especially if they are unfamiliar with the resource. If necessary, its use must be supervised and guided so that students can gain insight as to how to effectively incorporate it into their daily practice routines.

TonalEnergy was selected for this course map due to its unique in-app features. It is at once a metronome, drone, and recording device with the ability to provide visual representations of recordings. By recording even very brief segments of practice, students can step away from the instrument and analyze the success of both pitch and rhythm. This can be done in the lesson with the teacher to review and revise practice strategies. This creates an opportunity for assessment and feedback that is not available with conventional metronome/tuner devices. The recording function allows for the user to visually see a graphic representation of the sound waves. This visual representation of a sonic event can serve as an entry point for exploring how to articulate cleanly in lessons. It can be utilized in the practice room and in the lesson.
Figure 4.1 below depicts a screen shot of the analysis feature of Tonal Energy. The user can see how varying types of bow articulations appear visually. This visual representation of articulations is useful in teaching bow strokes such as collé, martelé, and détaché.

Below (Fig. 4.2) is a comparison of slow, wide vibrato to fast vibrato. The screen shot on the left shows the slow vibrato while the screen shot on the right shows fast, narrow vibrato. The numbers below represent the pitch variation due to the amplitude of the vibrato. Students can clearly see that the larger the amplitude or wider the vibrato is, the pitch variance is lower. This can be useful tool for students who have trouble
vibrating below a pitch. This is a visual representation of the amplitude and frequency of vibrato. Students can record for analysis in the practice room as well as in the lesson.

**Fig. 4.2**

Figure 4.3 shows the use of the stretch tempo feature in Tonal Energy. The long vertical lines are the clicks of the in-app metronome that the recording picks up. The wave forms in between the clicks are sixteenth notes played on the violin. The screenshot at left is with the tempo at the shown metronome marking, real time. The screenshot on the right shows the same excerpt slowed down to 25% of the original tempo. It is a zoomed in version of the same feature explored in all of the related figures. In the stretch tempo graphic representation, one can clearly see that the articulation is not exactly with the first beat.
This tool not only makes it possible for students and teachers to get a visual representation of sounds, it also allows users to slow down tempo, zoom in, and get specific with where problems are occurring. Pinpointing issues like this is very difficult without the aid of slowing down the recording and examining the visual representation of the recording.

Orchestral repertoire is often pushed to an outside the lesson elective course for violinists in undergraduate performance programs. There are several technology-based resources that allow for orchestral excerpt training to be incorporated into a traditional lessons course. ArtistWorks.com hosts tutorial videos for over fifty standard orchestral excerpts. Many aspects of addressing the approach to learning excerpts, practicing, fingerings, and bowings can be outsourced with the use of this resource. This resource does not replace the in-person lesson. It is intended as supplementary resource. Every
student will have different issues when attempting to learn excerpts that cannot be addressed outside the lesson. This tutorial resource is intended for use in the practice room, but the students’ efforts in learning assigned excerpts will be assessed in the lesson. In this course map, students will be assigned a set number of excerpts during junior and senior year as part of the lesson curriculum. An additional feature of the resource is the inclusion of a piano reduction track for many excerpts (and also solo repertoire) that users can play along with. The only potential drawback of this feature is that the tempo of the piano track is not adjustable. Playing with accompaniment helps solidify the performer's sense of rhythm and pitch. The piano reduction of the full score does not include the violin part. This creates an opportunity for the user to hear their own part more clearly than when playing along to a full orchestral recording. The benefits and outcome of incorporating a unit on orchestral repertoire include: preparing the performance major for orchestral auditions, further developing musical awareness, and building repertoire. By treating this unit as something students largely prepare for on their own, it also prepares students for their musical life outside of school, where problems associated with learning new repertoire must be tackled on their own. Feedback for this activity is given in the lesson with the studio instructor. Another opportunity for feedback exists if students choose to submit what Artistworks calls a Video Exchange™ on the website itself. The short performance video will receive a response from Nathan Cole, the LA Philharmonic violinist who created the video content. This asynchronous video and the response can be viewed by any Artistworks classical violin subscriber.

Masterclasses from teachers outside the regular studio teacher provide new insight into technical and musical issues for students. It is refreshing for instructors to witness
other master teachers work with their students. Traditional masterclasses generally require that one or more parties involved incur the expense of travel. Through resources like Playwithapro.com, the masterclass can be brought to students through technology at a rate that is relatively affordable to host institutions. All lessons are recorded for later review which provides a platform for feedback from the primary studio instructor and allows for more self-directed learners to analyze and review the virtual masterclass on their own. This activity can serve as a springboard for other community building activities in the virtual studio. Such activities include an instructor-mediated discussion of pedagogical approaches used in the masterclass.

The resources chosen for this course to tackle Optimal Performance Training is the website Bulletproofmusician.com and the app Musicians Hypnosis created by Sam Brown. This is an area of interest for many students. The content covers a wide range of topics from general performance anxiety to effective practice habits. The activities in this area involve reading and responding to various posts from the website. The information is delivered through the website and intended for use in the practice room, but will be discussed in the lesson and in the virtual studio. It is an opportunity for professors to outsource this important topic to the website where all content comes from a reputable performance psychologist. It provides a great deal of content for the self-directed learner to explore. The app provides guided visualization exercises designed for mental preparation of performance. Studies in the literature review explored the idea of mental preparation as an important part of reducing performance anxiety. Teachers can address performance anxiety issues with expert information. There is an opportunity for collaboration and community building when these assignments are discussed in the
virtual studio. Although there is no direct platform for feedback with this activity, the outcome of incorporating this source into lessons will be seen in juries, performances, and lessons with the students.

Injury prevention and body awareness is another outsourced topic in this lessons course that is not typically covered in conventional applied lessons courses for violin. By assigning students to read and comment on articles on websites such as musicianshealthcollective.com, teachers can help raise awareness of potential issues that arise for violinists. As a result of incorporating this resource into studio lessons, students will become aware of various issues and have access to information geared specifically towards string players. This is paired with the use of video recording practice and lesson sessions in order to closely analyze movements as they relate to playing the violin.

The chart on the following page (Table 4.1) outlines the resources incorporated in the course map. It identifies which elements of instructional design each resource and subsequent activity satisfies. Additionally, it shows method of delivery, intended space of use, anticipated benefit, and whether there is an opportunity for feedback and assessment.
Table 4.1

The chart in figure 4.4 details the resources used in the following course map.

Defined in Chapter 1, a course map is a sequence of instructional events that outlines the course in relation to the goals and objectives. The goal of an undergraduate violin teacher is to develop musicians with a strong concept of sound, rhythm, and intonation. Building a good technical foundation is an important step towards achieving this goal. It is further supported by assigning repertoire of increasing difficulty, forming a musical identity or awareness, collaborative work, adaptability, effortlessness in playing, and guiding the student to be able to analyze, assess, and overcome problems on their own.

Below is the course map with activities and a description of which course objectives are met, how often they will be utilized by the student and at which point in the course, and how the objectives will be assessed. The typical elements of a standard undergraduate applied lessons course for performance majors are assumed. This includes weekly one hour lessons, weekly studio class, and end of semester performance juries. Daily practice is required as part of this course. Technical studies, etudes, and repertoire
are assigned to students as part of the course, however specifics regarding which studies, etudes, and repertoire have not been addressed as part of this project. It is also assumed that juniors and seniors will be performing recitals as part of this course. The activities below are additional requirements for the technologically-integrated applied lessons course.

**Live Stream Practice**

Objectives: Development of key concepts, (sound, rhythm, intonation) ability to analyze and assess, technique, effortless playing

Technology: Live-stream video app through phone using Periscope or Facebook

When/How Often: Students in this course submit two weekly 10 minute sessions directly to the teacher or upload to the virtual studio for feedback and assessment.

Assessment: Issues of how to approach practicing will be assessed in the lesson or virtual studio if appropriate.

Anticipated Benefit: Development of practice skills, development of key bow strokes, vibrato, and shifting.

**YouTube Compare and Contrast**

Objectives: Repertoire development, musical identity and awareness, technique, ability to analyze and assess

Technology: Videos viewed on YouTube accessed via computer or phone

When/How Often: Students in this course will compare and contrast master performances of each new work assigned. This will happen with at least two works a semester. Instructor will detail specific elements to be compared and students will submit a brief written analysis.

When/How Often: This activity will be completed at least twice a semester.

Assessment: This activity can be assessed in the lesson or virtual studio.

Anticipated Benefit: Development of analytical skills, ability to break
Virtual Studio

Objectives: Development of key concepts (sound, rhythm, intonation), technique, musical identity, effortless playing, ability to analyze and assess, build a supportive community of learners

Technology: Studio website or Facebook page

When/How Often: Students will submit one video a month and be required to comment on each submission. The virtual studio should be set up as a safe space for students to share content, ask questions, and connect with others.

Assessment: Video submissions will be assessed by members within one day in the virtual studio environment. Other content that is shared may or may not require assessment.

Anticipated Benefit: Creation of a community of collaborative learning and sharing, aiding in awareness of issues related to playing violin specific to professor’s learning community/studio.

Accompaniment Simulation

Objectives: Development of key concepts (sound, rhythm, intonation), musical identity and awareness, effortless playing

Technology: Cadenza App or Artistworks.com website

When/How Often: If the assigned repertoire has corresponding accompaniment simulation available for use, students will use this in daily practice and in the lesson as necessary.

Assessment: Performance simulation with accompaniment will be assessed in both the lesson and virtual studio.

Anticipated Benefit: Improved intonation, improved ability to play with others, increased musical awareness.

Tuner and Metronome

Objectives: Development of key concepts (sound, rhythm, intonation), musical identity and awareness, effortless playing, technique, ability to analyze and assess
Technology: Tonal Energy App

When/How Often: Students are to use these tools daily. The incorporation of this type of work will be addressed in the first lessons and subsequent lessons if necessary. Recordings will be made in the practice room and analyzed in the lesson with the teacher as necessary.

Assessment: Successful work with this activity will be assessed in the lesson and in the end of semester jury.

Anticipated Benefit: Easily develop a sense of what basic articulations should sound like based on visual graphic representation in the app. This will aid in the development of basic bow strokes (collé, martelé, detaché). The use of this app will also aid in the development of vibrato.

Orchestral Repertoire Training

Objectives: Development of key concepts (sound, rhythm, intonation), musical identity and awareness, technique, collaboration, ability to analyze and assess, building repertoire

Technology: Artistworks.com website, Tonal Energy App, Virtual Studio

When/How Often: Students in the second two years of study will be required to learn and perform a selection of orchestral excerpts each semester. Students will submit an end of semester video of all excerpts for feedback in the Virtual Studio.

Assessment: The successful utilization of outside resources to learn the assigned orchestral excerpts will be assessed in the virtual studio and in the lesson as necessary.

Anticipated Benefit: The exposure to expert approaches to standard orchestral literature will give students a solid foundation for how to approach this literature. This benefit would not otherwise be afforded without the existence of this technology-based resource.

Masterclasses

Objectives: Development of key concepts (sound, rhythm, intonation), musical identity and awareness, technique, collaboration, ability to analyze and assess

Technology: playwithapro.com or Internet2, Virtual Studio for discussion

When/How Often: There will be at least one masterclass a semester.
Although not every student will be able to participate as a performer-learner, all students will participate as observer-learners in discussions.

Assessment: Participation in this activity will be assessed in studio class for both performer learners and observer learners.

Anticipated Benefit: Students will broaden their knowledge of approaches to playing as well as approaches to teaching through the incorporation of virtual masterclasses in violin lessons courses.

**Optimal Performance Training**

Objectives: musical identity and awareness, effortless playing

Technology: bulletproofmusician.com website, visualization/meditation app such as Headspace, or Musicians Hypnosis

When/How Often: Specific articles will be assigned reading at least twice a semester. Students will share comments and/or personal experiences in the virtual studio. Pre-jury preparation will include use of apps for guided visualization exercises.

Assessment: These activities are assessed in the virtual studio. Overall effects of this work on performance ability will be seen in juries and lessons.

Anticipated Benefit: A holistic approach to performing includes mental preparation. The apps and websites listed provide expert resources for students.

**Injury Prevention and Awareness**

Objectives: Effortless playing, awareness, technique

Technology: musicianshealthcollective.com website, video of practice

When/How Often: Specific articles will be assigned reading at least twice a semester. Students will share comments and/or personal experiences in the virtual studio through the use of recorded video.

Assessment: Activities associated with violin related health and wellness issues will be assessed in the lesson as necessary.

Anticipated benefit: Analysis from video provides an opportunity for
teachers and students to take a closer look at details related to playing that could result in future injury.

By requiring these activities multiple times throughout undergraduate study, students will gain familiarity with the technologies used. Student familiarity with resources leads to successes in the areas of practicing, preparation, and performing. As this happens, the impact of the technology-based resources and their related activities will grow.
CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER STUDY

The objective-based course map detailed in Chapter 4 shows that it is possible to create opportunities for students to use and interact with technology within the context of traditional applied violin lessons at the undergraduate level. It is not suggested that these activities take the place of traditional instructor/student interactions. The activities support the objectives of the course and allow for students to be self-directed learners as they use the tools and resources under the guidance of the studio instructor. The course is engineered with multiple activities that support objectives allowing for students to grasp key concepts at various points along their study, allowing the instructor to craft and guide the learning experience. Exploring the goals of traditional lessons through the use of technology will allow students to use different senses while learning and develop stronger analytical skills which will lead to the development of overall stronger musical skills.

Each selected activity matches with an area of research in the literature review. Live Stream Practice is based on research that we behave differently when we think we are being watched. For the most impact, it would be beneficial for the teacher to actually watch at least some of the streamed practice sessions. However, the research implies that the instructor would not actually have to be observing for the desired effects of the activity to take place. The YouTube Compare and Contrast activity is based on research which describes the power of mirror neurons in our brain to model what we observe. This phenomenon is also harnessed in the Masterclass and Orchestral Repertoire Training portions of the course. Teachers can take advantage of these activities by guiding the
focus of the observations and facilitating discussions in the Virtual Studio. The Virtual Studio is a key component of the technologically integrated undergraduate violin lessons course. It serves as a community hub for discussion, support, and sharing. The use of Tonal Energy provides an opportunity for teachers to show a visual representation of occurrences in playing that would not otherwise be possible to observe. This allows other parts of the brain to become involved in the learning and analyzing process. Performance and accompaniment simulations through Artistworks.com and Cadenza provide valuable opportunities to create the performance environment in the practice room or lesson. Research in the literature review shows the value of simulated environments and the subsequent effect on performance ability.

As explored in the literature review, the adolescent brain desires new challenges and needs assistance staying on task. The activities in the course map provide opportunities for the instructor to provide challenges and directives for staying on task in practice sessions through the use of technology. As technology is a rapidly changing field, it will be necessary for instructors creating technologically-integrated courses to stay aware of new resources to incorporate into courses. Teachers generally only see students in their studios one hour per week which is not a lot of time to address all the intricacies and issues associated with playing. By utilizing these resources, instructors are able to outsource certain topics to reliable sources such as the case with the Orchestral Repertoire Training unit, Optimal Performance Training, and Injury Prevention and Awareness. This not only provides exposure to often neglected topics, but encourages self-directed learners to take control of their learning. It is important to consider the goals and outcomes for students when designing a technologically-integrated course. The
activities selected should be varied to allow students with different learning styles and preferences to grasp onto concepts at different points throughout the course.

Researching and reviewing the related literature has shown that the benefits of incorporating technology into applied lessons include access to information, engaging the brain in new ways, the creation of a learning community, visual representations of auditory occurrences, and multiple opportunities for feedback and assessment. The use of technology fosters a higher level of understanding in students through specific activities. Observation related activities such as the YouTube Compare and Contrast activity and Masterclass Observations allow students to develop critical thinking skills as they apply directly to playing the violin. This will likely produce students who are better equipped to solve musical and technical problems for themselves as well as for their future students. Objective-based activities that use technology allow students and professors to track progress and engage the brain in new ways. Professors will be able to craft the learning experience for individual students based on goals.

**Recommendations for Further Study**

The efficacy of integrating technology into applied lessons may be difficult to study, but it is an appropriate next step for research in this area. A short-term study should be implemented to compare the small-scale effects of a few of the technologically-integrated activities on student performance outcomes. This type of study would involve assigning the same piece to a number of similarly abled students but giving them different activities as part of the learning process. The control group would receive traditional once a week lessons, and the other group would be required to complete a YouTube Compare and Contrast activity, Live Stream Practice, and
Accompaniment Simulation activities in addition to weekly lessons. The outcomes of this study would be evaluated through a performance jury as well as a student survey evaluating student perceptions of the activities as related to their abilities to learn, practice, and perform the assigned piece.

A long-term and larger-scale study is also an appropriate next step for this type of research. This study would follow students over the four years of undergraduate study and culminate with a survey of student and instructor attitudes and perceptions of the effectiveness of a technologically-integrated course in applied violin. It would not be necessary to deprive some students in a studio of access to technology-based resources, but it would be necessary to limit guidance in terms of the use of the resources in order to study the effectiveness of this type of course map.


