A CASE STUDY EXPLORING THE USE OF COMPUTER ASSISTED SOFTWARE TO PROVIDE STUDENT CENTERED INSTRUCTION IN A HIGH SCHOOL PIANO COURSE

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to The School of Education

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I am proud to have completed my degree but, more importantly, I know that I could not have done this without the help and support of so many people.

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Abstract

Students’ lives have become intertwined with technology. As technology is readily available, students are more connected and dependent on digital technology than in previous generations. Technology can become a valuable tool to the instruction of students and many schools across the country are beginning to embrace various programs to provide a more interactive, student-centered learning environment. This study focused on the use of computer assisted learning software in a high school piano course to provide a student-centered learning environment. The Ecology of Resources and Technological Pedagogical Content Knowledge (TPACK) theoretical frameworks provided a lens to help understand how technology can be integrated within a classroom to provide a student centered learning environment. The primary research question was:

Does computer assisted learning software provide student-centered instruction as effective as traditional instruction?

This research question was answered using data collected from a single case study of an urban high school located in southwestern Connecticut using input from teachers and students.

Keywords: Computer Assisted Learning, Student Centered Learning, Music Education, Ecology of Resources, Technological Pedagogical Content Knowledge (TPACK)
# Table of Contents

Chapter I: Introduction .......................................................................................................................... 7
  Problem of Practice ................................................................................................................................. 7
  Overview .................................................................................................................................................. 9
  Significance of the Problem ..................................................................................................................... 10
  Purpose of Study ..................................................................................................................................... 11
  Positionality Statement .......................................................................................................................... 12
  Research Questions ................................................................................................................................. 14
  Theoretical Frameworks ......................................................................................................................... 14
  Research Design ..................................................................................................................................... 15
  Limitations ............................................................................................................................................... 15
  Document Organization ......................................................................................................................... 16

Chapter II: Literature Review .................................................................................................................. 18
  Theoretical Frameworks ......................................................................................................................... 19
    Ecology of Resources .............................................................................................................................. 20
    Technological Pedagogical and Content Knowledge (TPACK) ............................................................. 22
    Theoretical Frameworks Summary ....................................................................................................... 25
  A Historical Perspective on the Progression of Student Centered Learning ........................................ 26
    Introduction ............................................................................................................................................ 26
    What is Student Centered Learning? ..................................................................................................... 26
    Early Philosophies ................................................................................................................................. 27
    Progressive Movement .......................................................................................................................... 29
    Psychologists Theory ............................................................................................................................. 31
    Piaget and Vygotsky Theories Used in E-learning to Assist Student Centered Learning .................... 33
    Student Centered Learning Summary .................................................................................................. 34
  Computer Assisted and Online Learning Approach .............................................................................. 36
    Skills, Participation and Learning Styles ............................................................................................... 37
    Basic Types of Learning Techniques for Online Programs ..................................................................... 42
    Empirical Work on Computer-Based and Online Learning .................................................................... 44
  Music Education Introduction ................................................................................................................. 50
<table>
<thead>
<tr>
<th>Musical Learning and Human Development</th>
<th>52</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessing Past Learning Experiences in Music Education</td>
<td>54</td>
</tr>
<tr>
<td>Literature Review Summary</td>
<td>58</td>
</tr>
<tr>
<td>Chapter III: Research Design</td>
<td>60</td>
</tr>
<tr>
<td>Research Questions</td>
<td>60</td>
</tr>
<tr>
<td>Research Approach</td>
<td>61</td>
</tr>
<tr>
<td>Site and Participants</td>
<td>62</td>
</tr>
<tr>
<td>Data Collection</td>
<td>64</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>65</td>
</tr>
<tr>
<td>Trustworthiness</td>
<td>65</td>
</tr>
<tr>
<td>Chapter IV: Results</td>
<td>68</td>
</tr>
<tr>
<td>Participant Description</td>
<td>69</td>
</tr>
<tr>
<td>Research Questions</td>
<td>70</td>
</tr>
<tr>
<td>Chapter V: Discussion of Findings</td>
<td>123</td>
</tr>
<tr>
<td>Introduction</td>
<td>123</td>
</tr>
<tr>
<td>Recurrent Themes</td>
<td>124</td>
</tr>
<tr>
<td>Benefits to Working at Own Pace</td>
<td>124</td>
</tr>
<tr>
<td>Benefits of Immediate Student Feedback</td>
<td>127</td>
</tr>
<tr>
<td>The Importance of Teacher’s Role</td>
<td>129</td>
</tr>
<tr>
<td>Supplementing Instruction</td>
<td>132</td>
</tr>
<tr>
<td>Students’ Ability to Learn Piano</td>
<td>134</td>
</tr>
<tr>
<td>Summary of Findings</td>
<td>136</td>
</tr>
<tr>
<td>Delimitations and Limitations of the Study</td>
<td>137</td>
</tr>
<tr>
<td>Recommendations for Future Study</td>
<td>137</td>
</tr>
<tr>
<td>References</td>
<td>139</td>
</tr>
<tr>
<td>Appendices</td>
<td>150</td>
</tr>
<tr>
<td>Appendix A: List of Terms</td>
<td>150</td>
</tr>
<tr>
<td>Appendix B – Teacher Recruitment E–mail</td>
<td>152</td>
</tr>
<tr>
<td>Appendix C – Parent Requirement English Letter</td>
<td>153</td>
</tr>
<tr>
<td>Appendix D – Parent Requirement Spanish Letter</td>
<td>154</td>
</tr>
<tr>
<td>Appendix E – Teacher Signed Consent Form</td>
<td>155</td>
</tr>
<tr>
<td>Appendix F – Student Signed Consent Form</td>
<td>158</td>
</tr>
<tr>
<td>Appendix G – Student Signed Spanish Consent Form</td>
<td>161</td>
</tr>
<tr>
<td>Appendix H – Parent Signed Consent Form</td>
<td>164</td>
</tr>
</tbody>
</table>
Appendix I – Parent Signed Spanish Consent Form................................................................. 167
Appendix J – Teacher Interview Protocol and Questions......................................................... 170
Appendix K – Student Focus Interview Protocol and Questions ............................................. 171
Appendix L – Signed Permission to Conduct Research (School Principal)............................ 172
Appendix M – Signed Permission to Conduct Research (District) ........................................... 173
Appendix N – IRB Approval ....................................................................................................... 174
Chapter I: Introduction

Problem of Practice

Today’s students have grown up in an environment in which digital technology is part of their way of life. Furthermore, current high school students grew up with the internet and all that it offers being readily available. Consequently, they have been surrounded by technology that has made today’s generation of students’ lives more connected and more dependent on digital technology than previous generations. Students are truly digital natives (Prensky, 2001). In discussing technology within education many people generally think of digital technology such as computers. In fact, technology has been used for as long as education has been formalized; some of these important developments include chalk and the chalkboard, the ability to mass produce textbooks, the abacus, the overhead projector, calculators, VCRs and the list continues to grow. All of these tools used within educational settings have allowed teachers to educate more effectively and efficiently. The Association for Educational Communications and Technology (AECT) has provided a definition of educational technology stating that it is “the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources (Richey, 2008).” The latest in educational technology is providing student-centered learning opportunities in all educational subjects.

Computer assisted learning software was designed to give students individualized instruction while tracking student learning and progress (Harris, Mishra, & Koehler, 2009). Using such software allows instructors to act as a guide while the program determines previous knowledge and establishes a better course of instruction to keep students motivated and
challenged. This allows the instructor to receive the feedback and interact with each student to provide individualized focused instruction (Peters, 2000).

Studies have shown that music education can provide benefits in various areas such as increases in verbal memory, pitch processing, temporal processing and self-esteem (Rickard, Vasquez, Murphy, Gill, & Toukhsati, 2010). In the case of piano instruction, students and families that learn piano generally come from upper-middle income families with well-educated parents who both live at home (Costa-Giomi, 1999). Thus, it would appear that less privileged students may not have the opportunity to take piano classes and therefore are deprived of the benefits of music education.

Additionally, the use of computer assisted learning reaches beyond the scope of the site of this study, a high school classroom. A search on Google for computer-assisted instruction in universities show well over one and a half million results, proving its increased popularity. Computer assisted learning is being utilized in universities curricula for wide ranging subjects including math, science, medicine, language acquisition as well as music. In order to better prepare students for future studies in higher education, it is important that school districts provide students with appropriate experiences in computer-assisted learning.

This study explored computer-assisted learning software to provide a student-centered learning environment. Additionally, an investigation of these methods explored the use of computer-aided instruction and the pedagogical approaches needed to successfully instruct students. This research will help further understand current knowledge regarding computer assisted learning software to create a student-centered learning experience.
Overview

There are a number of researchers who have done various types of studies regarding the effects of music education on nonmusical abilities. The research of Rauscher, Shaw and Ky (1995) led to many other studies on the “Mozart effect.” The study suggested that listening to Mozart could increase spatial ability (Rauscher, Shaw, & Ky, 1995; Rauscher, 1994). A later study by Rauscher and Zupan (2000) suggested that classroom keyboard instruction improved spatial ability in kindergarteners who took lessons versus those that did not (Rauscher & Zupan, 2000). Glen Schellenberg has studied Rauscher et.al and tried to duplicate the research with mixed results. Schellenberg found that music can alter mood and arousal levels which can lead to improvements in spatial abilities such as creativity and processing speed (Schellenberg, 2001, 2005a, 2005c). In addition, Schellenberg found that the general affect of music lessons had an increase, albeit minimal, in general IQ (Schellenberg, 2011). Finally, Sylvain Moreno also studied the effects of music exposure in relation to the studies of Rauscher et al. Moreno examined possible structural brain changes in musicians and non-musicians, finding that musical training improved pitch and processing speed in speech for eight year olds (S. Moreno et al., 2009; Sylvain Moreno, 2009). These studies indicate students are positively impacted through the use of music as a strategy for learning and cognitive progression.

Computer-assisted instruction differentiated the piano music lab that was studied from other more traditional classrooms. Hartley (2009) discusses Computer Assisted Learning (CAL) as having differing perspectives depending on the theoretical approach applied. He described that using CAL in a behaviorist approach allows students to use technology for “practice and skill improvement (Hartley, 2010, p. 4).” On the other hand, in a pedagogical approach, CAL would be far more structured and allow students greater control over their own learning. Finally, Hartley
discussed a third approach utilizing cognitive perspectives. In this approach, software would be created that allows “students to construct and reflect on tangible models which represented their understanding” (Hartley, 2010, p. 4). Luckin (2011) focused on a pedagogical approach and suggested a framework based on the Vygotsky’s theories. Luckin suggested that software can be used to enhance the student’s learning experience and presents a theoretical framework which will be discussed later in this review (Rosemary Luckin, 2011). There were few studies done regarding computer-assisted learning in relation to incorporating programs based on music; Studies on CAL and the use of pianos were even scarcer. Lou, Guo, Zhu, Shih and Dzan (2011) studied the effects of computer assisted musical instruction but focused solely on application with Chinese musical instruments (Lou, Guo, Zhu, Shih, & Dzan, 2011). While research in this area is lacking, other studies were completed which involved combining computer-assisted learning with other content areas. Some examples include mathematics, statistics, special education, reading intervention, foreign language and technology (Amaral & Meurers, 2011; Chapelle, 2009; Hui, Hu, Clark, Tam, & Milton, 2007; Ke, 2009; Scheid, 2010; Sosa, Berger, Saw, & Mary, 2010; Torgesen, Wagner, Rashotte, Herron, & Lindamood, 2010). The success of these programs indicates that CAL can be effective across a spectrum of content areas and provides a basis for further exploring the benefits of computer-assisted learning techniques. This extends to the exploration of the impact that music can have on students’ acquisition of knowledge.

Significance of the Problem

The use of technology within education has grown tremendously in the past several years. Many schools are currently implementing or investigating the use of devices such as interactive whiteboards, mobile devices and tablets. Additionally, a large variety of educational software has been introduced in the classroom. The Association for Educational Communications and
Technology has defined educational technology as “the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources (Richey, 2008, p. 1).” One such advancement in educational technology that has potential to make significant changes in future instructional pedagogy is computer-assisted learning software which could be designed to give students specialized instruction by tracking each student’s process and progression of learning (Harris, Mishra, & Koehler, 2009b). This type of software allows instructors to act as a guide while providing extra support and focused instruction to individual students. In addition, the software could track student progress and set a pace that would keep students challenged and motivated (Peters, 2000).

**Purpose of Study**

This study described how music teachers are implementing computer-assisted learning software in a high school piano lab to foster a student-centered learning environment while also addressing how students are utilizing the program. Students use the software as the primary means of learning to play an electronic keyboard. The teachers act as guides by providing additional assistance such as demonstrating or correcting finger placement and by delving further into music theory. Student focus groups, teacher interviews and classroom observations were conducted to provide an in-depth description of the utilization of the software within the classroom lab in order to better understand the benefits and possible limitations of this educational technique. Further, these research methods provided an understanding of how the software may facilitate a student-centered learning environment when coupled with instruction from the teacher. Consequently, concrete recommendations have been developed to further improve the use of computer-assisted learning software within a classroom setting to help
teachers provide a student-centered learning environment and to offer the most substantial educational benefit to students using similar software.

**Positionality Statement**

My first experience using computer-assisted learning software was in the mid-1980’s as an elementary school student. At the time our school had approximately a half dozen computers and our class of 30 students would rotate into the computer lab on a monthly basis. With 4 or 5 students surrounding a computer, we played educational games such as Oregon Trail. It was exciting to manipulate the characters on the screen and we learned quite a bit through experimentation. Not long after, I clearly remember the day my mother brought home a computer to our house. I was 12 at the time and spent countless hours playing on the desktop, experimenting and learning as much as I could about the machine. Much to my parent’s dismay it wasn’t long before I had even found out how to pull the computer apart and do simple upgrades. I was completely fascinated by technology from that point forward.

When I entered high school my passion for technology continued and I took any computer related courses that were offered. As a high school junior, enrolled in a computer-programming course, I created a rudimentary interactive program that would allow a user to ask basic questions and receive answers. This project was not assigned, rather a side project that I had imagined and created through self-motivation. Although I wasn’t a particularly ambitious student in other disciplines, I found that my enthusiasm spiked with any computer project because working with a computer allowed me to be creative and learn at my own pace.

Upon entering college I chose to major in business, however, I continued to take computer courses which included other programming classes. After finishing my bachelor’s degree I went back to school to earn my master’s degree in secondary education. My first
teaching assignment was at the same high school I had attended where I taught in the business department. The business department offered computer science courses and, in fact, I taught the same courses I had taken years earlier as a student. I was now able to rewrite the curriculum to provide more engaging opportunities for students to learn various programming languages. One such program I used was a culminating project for the AP Computer Science courses. The program was designed to allow students use the Java programming language to manipulate robot objects to attack other student’s robots. Students were able to use their previous knowledge that they had learned all year to try to win a final competition. I had observed that many students became completely, intrinsically motivated to try to build a better, smarter robot. Students would stay after school, do their own research at home and work entirely at their own pace to complete their robot and prepare for the final class battle against other students. Often students would comment that they learned more in those last few weeks than they had all year and that programming various objects suddenly seemed to make more sense and become real. One student who had graduated, continued to come back for years afterwards just to help others with their robots. Ultimately I found that students wanted to learn when they were in control of the learning process and using a computer allowed them to personally navigate how they acquired knowledge.

After leaving the classroom and becoming an assistant principal I continued to encourage others to find computer programs to help students learn. Moreover, I began my doctoral studies at Northeastern University wherein my research always focused on student-centered learning and technology. Therefore it was only natural that in my current position at a public high school, I have encouraged teachers to use computer-assisted learning software for our English language learners, helped the school create an AP Computer Science course and pioneered the
development of a piano lab which used computer-assisted learning software. As both a student
and an educator I believe that computer software can greatly motivate learners. It is that belief
that has led me to research the potential benefits of technology in education.

Research Questions

In order to explore the utilization of computer-assisted learning and provide descriptions
of software use by both teachers and students, teaching methods that were employed and the
effectiveness in providing a student-centered learning environment the following questions were
investigated:

1) Does computer-assisted learning software effectively provide student-centered
instruction?

2) How do students describe and experience the instruction provided in the piano lab?

Theoretical Frameworks

To provide a clear understanding of computer-assisted learning software integration in a
piano classroom two theoretical frameworks were studied: Ecology of Resources and
Technological Pedagogical Content Knowledge (TPACK). The Ecology of Resources
framework is an extension of Vygotsky’s Zone of Proximal Development theory and Vygotsky’s
Most Knowledgeable Other (MKO). Proximal Development theory is the gap between what the
student already understands and what the student can learn based on education. Knowledgeable
Other refers to the person or entity which has a greater understanding and mastery than that of
the learner. This framework gives a view of how technology can be adapted in an educational
setting to provide student-centered learning opportunities (R. Luckin, 2006). Conversely,
Technological Pedagogical Content Knowledge (TPACK) is used as a framework to provide an
understanding of the interactions that exist among instructional content, an instructor’s pedagogy
and the implementation of technology within a classroom (M. Koehler & Mishra, 2009). The purpose of this study is to describe how computer-assisted learning software can provide student-centered learning instruction. These frameworks are closely related and create a lens through which we can determine how content, pedagogy, and technology interconnect to provide a student-centered setting with computer-assisted learning software as well as the classroom teacher becoming what Vygotsky would describe as the Most Knowledgeable Other.

Research Design

The primary objective of this study was to examine and describe the implementation of computer-assisted learning software in a high school piano class. The research, a case study, provided thorough descriptions of the use of computer-assisted learning software from both the teachers’ and students’ perspective. As a result, the case study design allows for a deep understanding of the implementation of technology to provide a student-centered learning through multiple perspectives.

Limitations

This study explored the use of computer-assisted learning software in an urban high school in a single district with a diverse population of mixed socio-economic and ethnic backgrounds. Given that the study only described the implementation of the software in one urban high school, the use of the study in reference to other school districts and high schools with other socio-economic characteristics is limited. Additionally, differences in other schools may include the availability of technology: electronic piano keyboards, computers or other electronic or devices and the CAL piano software. These variables can significantly vary among schools and impact other districts in their attempts to provide a student-centered learning environment using computer-assisted learning software.
In addition there are limitations in the student focus groups, teacher interviews and classroom observations. Students, including their parents, and teachers, were guaranteed that all identifiable information would remain anonymous throughout the study. The use of focus groups provided students with another layer of anonymity, interview questions were clarified to ensure understanding by participants, multiple classroom observations were conducted to confirm data and observe implementation of software and member checking were used with participants to ensure an accurate account of their thoughts and opinions were recorded.

Moreover, the researcher is an assistant principal at the high school involved in the study. This is a potential source of bias because the research is well-known among the students and the teachers. In order to minimize such bias it should be noted that the researcher is not the direct supervisor of the piano teachers, therefore the researcher does not directly evaluate the teachers’ job performance. Additionally, the use of student focus groups was used to minimize further bias by allowing students to speak more freely in a group setting than in a potential one on one interview. Further, protocols were followed throughout interviews, focus groups as well as observations to increase consistency among those three areas of data collection. Throughout the entire process bias was limited by giving all participants descriptions of the study, specifically regarding research on student-centered learning and computer-assisted learning software. Finally, the utilization of peer debriefing was employed to provide teachers and students ample opportunity to read and assess the findings.

**Document Organization**

This study is divided into five chapters. The first chapter provides the background and significance of the problem, a summary of the research questions as well as presentation of the main theoretical frameworks. In addition, the researcher’s positionality statement was included
along with a brief summary of the research design. Chapter 2 provides the literature review of the theoretical frameworks, student-centered learning, computer-assisted and online learning and music education. Chapter 3 provides an in-depth description of the research design which includes methodology, data collection, participants, data analysis as well as validity and reliability. Chapter 4 discusses the data obtain through interviews with students and teachers and Chapter 5 discusses the findings and recommendations for future studies.
Chapter II: Literature Review

The idea of using technology in classrooms to help students learn has been discussed for years. Thomas Edison was quoted in 1922 as saying “I believe that the motion picture is destined to revolutionize our educational system and that in a few years it will supplant largely, if not entirely, the use of textbooks” (Cuban, 1986, p. 11). Nearly 100 years later, technology has become common in nearly every classroom with a majority of classrooms in the United States having access to computers and high speed internet access (Gray, Thomas, & Lewis, 2010). Today’s students are considered digital natives because they grew up in an environment in which technology is integrated into nearly every aspect of their everyday lives (Prensky, 2001). School districts continue to spend large amounts of money on technology to help students prepare for the 21st century yet, attempting to implement technology in an educational setting is not effective unless educators have a clear understanding of how technology can be combined with pedagogy to help students understand content (Cox & Graham, 2009; Jaipal & Figg, 2010; M. J. Koehler & Mishra, 2005; M. Koehler & Mishra, 2009; Lei & Zhao, 2005). Furthermore, as technology becomes more readily available, the use of computer-assisted instructional software, which is designed to help students learn in a self-directed manner, has also become more common-place. These methods are being introduced into various classroom settings with computers and mobile devices made available for students enrolled in pre-K all the way through those investing in higher education (Barone, 2012; Ketelhut, Nelson, Clarke, & Dede, 2010). The use of computer-assisted instruction allows for a more engaging, student-centered approach to education that adapts to the student’s needs (Roels, Van Roosmalen, & Van Soom, 2010). In addition, music education attracts a wide range of students from various ages, experience levels and with a myriad of learning objectives. Therefore, computer-assisted instructional software can
be utilized to help students develop as musicians with a wide range of skills and increased levels of comprehension (Hosken, 2011). Examining the literature related to technology integration, computer-assisted instruction and student-centered learning help to explain the possible benefits of integrating this type of software and technology in music education.

**Theoretical Frameworks**

Two theoretical frameworks, Ecology of Resources and Technological Pedagogical Content Knowledge (TPACK), were studied in order to better understand technology integration and the potential benefits of computer-assisted technology in a piano classroom. The Ecology of Resources framework is based on two of Vygotsky’s theories: Zone of Proximal Development and the Most Knowledgeable Other (MKO). The framework provides a lens into the creation of student-centered educational opportunities and how technology can adapt to the needs of the learner (Luckin, 2006). The next framework, Technological Pedagogical Content Knowledge (TPACK), provides an understanding of the potential benefits of the interaction between content, pedagogy and technology (Koehler & Mishra, 2009). It has been demonstrated that the successful integration of technology into a classroom can be a very challenging task. Moreover, effective integration of technology occurs when learning becomes meaningful to students. Generally, skilled teachers are able to create learning opportunities for their students when they can combine pedagogy and content in a way that gives students a deeper meaning of the content. However, the use of technology may provide additional benefits to students by creating a more meaningful learning opportunity by creating a student centered learning environment. According to Koehler and Mishra these frameworks provide deeper understandings on utilizing technology, combined with content and pedagogy and its effect on student learning.
Ecology of Resources

The Ecology of Recourse framework is derived from Vygotsky’s sociocultural theory. Vygotsky (1978) stated that every child has some level of ability which allows him or her to complete learning tasks individually. However, as in common practice, children can also complete tasks with assistance from a teacher or in collaboration with others. Vygotsky (1978) described the zone of proximal development (ZPD), as the difference between the ability to complete a learning task individually and the potential ability to complete a learning task with some guidance. In addition, Vygotsky further stated that the process of learning occurs when a learner receives instruction by a more knowledgeable other (MKO), acting as a guide, who can expose the learner to the knowledge they require to reach a greater level in learning. Therefore, a connection could be made to Vygotsky’s theory that computer-assisted instructional software, when incorporated into a learning environment, is able to act as the more knowledgeable other and provide students with learning opportunities that extend beyond their current abilities.

Acknowledging that technology can change the delivery of instruction, the Ecology of Recourse framework was created to add to the ZPD by introducing two additional concepts: The Zone of Available Assistance (ZAA) and the Zone of Proximal Adjustment (ZPA) (Luckin, 2010). The framework suggests two main focuses in the creation of interactive learning. First, that focus on the activity that will engage learners with specific concepts that will be absorbed, and secondly that activities that use technology should be clear and simple with limited functions available from technology (R. Luckin, 2006, 2008, 2011). These two foci helped inform the research on effective activities that occur when using technology.

One of the important aspects of the Zone of Proximal Development is the use of scaffolding during instruction. Luckin (2008) described scaffolding as “tutorial assistance” that
not only encourages interactions between students and their more knowledgeable partners but requires the more knowledgeable partner to organize learning so that it is not overwhelming for the student (Luckin, 2008, p. 450). The relationship between the MKO and the student should be collaborative, and one in which the MKO does not interfere with the learning process unless the student has made an error. Otherwise, the student should control their own learning and the MKO should not interfere (Wood & Middleton, 1975). Understanding the use of scaffolding and more importantly the role of the MKO provides valuable information to the research as it relates to the implementation of computer-assisted instruction as the MKO.

Furthermore, the framework expands on Vygotsky’s Zone of Proximal development and introduces two additional areas: The Zone of Available Assistant (ZAA) and The Zone of Proximal Adjustment (ZPA). The ZAA includes anything garnered from people, technology, books or other sources of knowledge. ZAA is broken into three categories, which include that which must be learned, tools needed to learn and the environment in which the learning takes place. ZPA, on the other hand, represents the learning opportunities present for the individual given the appropriate ZAA. Therefore, the ecology of resources would determine that in order to increase the ZPD of an individual the ZAA must be maximized to target the learners ZPA (R. Luckin, 2006, 2008). The role that technology as the Zone of Available Assistance plays in learning and the learner helped inform the study by identifying the assistance that is available to learners and how they interact with that support within a given learning environment.

The Ecology of Resources informed the research by providing an understanding of how students can learn when given proper computer-assisted instructional resources. In addition, this framework informed the research of how students can interact with technology to guide learning and provide students with greater control of their own attainment and application of information.
The framework further identified situations where the use of technology may be more appropriate than others.

**Technological Pedagogical and Content Knowledge (TPACK)**

The Technological Pedagogical and Content Knowledge (TPACK) framework was designed with the understanding that teaching is an extremely complex process which involves integrating knowledge of content, and knowledge of learning (Koehler & Mishra, 2009). As digital technology becomes commonplace in today’s society, educators are finding various uses for the incorporation of digital technology in the classroom. However, simultaneously, this further complicates the teaching process in that instructors also need to have knowledge of the employed technology. Further complicating the use of technology in education are the varied ways in which technology can be implemented as well as the mediums in which technology can be delivered to students. In addition, many teachers were not instructed in the use of digital technology within the classroom and though they may have an understanding of technology in their personal lives, it is more challenging to incorporate technology effectively in a classroom (Baran, Chuang, & Thompson, 2011; Cox & Graham, 2009; Jaipal & Figg, 2010; M. Koehler & Mishra, 2009). Understanding the TPACK framework and how technology, pedagogy and content meld together for effectual teaching and effective learning is an important factor in informing the research.

TPACK can be broken into three parts: Content Knowledge (CK), Pedagogical Knowledge (PK) and Technology Knowledge (TK). Content Knowledge is the knowledge that an instructor has regarding their subject. Knowledge encapsulates “concepts, theories, ideas, organizational frameworks, knowledge of evidence and proof as well as established practices and approaches toward developing such knowledge (M. Koehler & Mishra, 2009, p. 62).”
Knowledge varies greatly between subjects and the instructor’s understanding of subject matter is an important component in insuring fidelity of content. Pedagogical Knowledge is the instructors understanding of the methodology of instruction and the implications related to teaching and learning. This knowledge includes not only comprehension and mastery of material but also the application of social, cognitive and developmental learning theories. Additionally, instructors understand how the construction of knowledge and implementation of skills assist in the development of student learning. Technology Knowledge can be best described by Fluency of Information Technology (FITness) as defined by the National Research Council. FITness extends beyond obtaining computer literacy of basic skills such as word processing, e-mail, and web browsing. FITness is the person’s ability to apply technology productively at work and in their everyday lives; it is the understanding of how technology can support or obstruct a person’s daily life and a person’s willingness to adapt as technology evolves (National Research Council (U.S.), 1999). Using Fluency of Information Technology (FITness) as the foundation of technology knowledge therefore “requires a deeper, more essential understanding and mastery of information technology for information processing, communication and problem solving (M. Koehler & Mishra, 2009, p. 64)” than computer literacy.

It is necessary to understand how each of the three components function individually and ultimately as they blend the Technology, Pedagogy and Content Knowledge (TPACK) framework. Pedagogical Content Knowledge (PCK) is the combination of Pedagogical and Content Knowledge. This occurs when an instructor is able to take the subject matter and provide it to the students in a variety of approaches, adapting to the student’s needs and their prior knowledge. In addition, PCK underscores the instructor’s ability to understand and
properly integrate curriculum, teaching and learning methods, assessments and the provision of feedback that ultimately promote learning.

Technological Content Knowledge (TCK) is the combination of Technological and Content Knowledge. The premise behind TCK is the instructor’s ability to utilize the proper technology that can best introduce and allow students to build learning connections to the content’s subject matter in such a way that it is beneficial to student’s identified learning outcomes. An example of TCK is the use of graphing calculators in geometry classes; graphing calculators at one time were an emerging technology in education that has since become common-place (Koehler & Mishra, 2009).

Technological Pedagogical Knowledge (TPK) is the combination of Technological and Pedagogical knowledge. TPK is the understanding of how technology can be used to benefit instruction. Generally, technology was not created specifically for educational purposes but can serve a great value. For example, Microsoft Office Suite, which includes Word, PowerPoint and Excel were created for businesses as were electronic whiteboards such as Promethean and SmartBoards. Moreover, software and websites that incorporate video streaming, podcasts or blogging were initially created for entertainment. However, in each of those examples, educators have been able to incorporate technology to further their pedagogical purpose. As a result, instructors must have a significant understanding of the constraints and capabilities of technology and how to reconfigure their usage to improve student learning and understanding (Koehler & Mishra, 2009).

Therefore, TPACK as a whole is the interaction between each of the three components of technology, pedagogy and content, yet holistically it differs from each of the components individually. Each of the components is important to teaching and learning because not
understanding each of their significance or ignoring one or more can cause ineffectiveness in student learning outcomes. Consequently, TPACK is a balance of the three components and an understanding that they each rely on each other. A change in one, for example, technology, will lead to a change in the pedagogy and how connections to the content is made. As technology is constantly changing, this then, requires educators to be “continually creating, maintaining, and re-establishing a dynamic equilibrium among all components (Koehler & Mishra, 2009, p. 67). “

The TPACK framework informed the research because it provides a more in-depth focus of technology integration in education. Moreover, when viewing the integration of technology through the lens of TPACK, technology is not simply a supplementary afterthought to instruction but a fundamental element to instructional and learning outcomes.

**Theoretical Frameworks Summary**

The Ecology of Resources and the TPACK frameworks help provide a balanced view on the integration of technology in an educational setting. The two frameworks supplement each other because there is an understanding that technology alone will not immediately improve instruction. Technology is a tool like any other within a classroom; therefore, these theories provide an understanding that appropriate use of technology in an educational setting requires a sound understanding of pedagogy to help students further learn the content. This basic understanding was essential to fully comprehend how technology may effectively be integrated in an instructional setting.
A Historical Perspective on the Progression of Student Centered Learning

Introduction

Ideas regarding student centered learning have been in existence for hundreds of years and have evolved to various educational theories. Throughout the years, various philosophers, writers and educators have believed in the importance of focusing education on the needs of individual students so that they become active learners. The student-centered approach became widely known and followed in the late 19\textsuperscript{th} and early 20\textsuperscript{th} century during the progressive movement in the United States which was led by John Dewey and Francis W. Parker; many of the student centered ideas derived from the progressive movement continue to be used today and have merged with instructional technology. Currently, the concept of developing active learners through the student-centered approach continues to evolve, including Bill Gates' belief that the use of technology continues to drive this approach.

What is Student Centered Learning?

Huba and Freed (2000) described the student-centered paradigm as students developing knowledge on a topic through gathering and synthesizing information. Subsequently, the information gathered and synthesized would now be used for their own inquiry, communication, critical thinking and problem solving. As a result, students are actively involved in their own learning and often will apply these new skills to real life problem solving. (Huba & Freed, 2000)

Weimer (2002), (as cited by Alsardary & Blumberg 2009) described five ways to create a student-centered teaching environment. The first is the delivery of content where students need to understand why they are learning the content. Students must be actively involved in their own
learning and they need to internalize the importance of the information as it relates to their lives. The second is the teacher’s role as a facilitator in the learning process which suggests that teachers should not disseminate information, as is common in most lectures, but use proper teaching and learning methods to help students reach their personal goals. The third area discusses the shift of learning responsibility from the teacher to the student. The teacher creates a class environment with activities that produce situations to inspire students to learn. Assessment is the fourth way to create student-centered learning; this requires teachers to give timely feedback to students and not simply hand out grades. Assessment promotes learning by becoming part of the process and not just the end result of a lesson. Lastly, students and instructors share in the decisions about their class environment, their own learning styles and assessments. (Alsardary & Blumberg, 2009, pp. 401–403) Ultimately, students need to be part of their own learning process. They should feel in control of their own learning and be allowed to take control of the process. This greatly informs the research because computer-assisted learning allows students to take control of their own learning by accumulating knowledge intrinsically based on their own curiosities or at their own pace.

**Early Philosophies**

One of the first writings on a student-centered education was that of Jean Jacques Rousseau’s who wrote the book *Emile*. In the book, the main character, Emile, was able to learn valuable lessons through his own timely discovery during his interaction with nature. Rousseau thought that children needed to learn at their own pace, believing that society, especially in France, treated children like young adults and did not nurture their ingenuity. (Henson, 2003, p. 7) Rousseau (1762/2007) continued by stating that a parent should nurture curiosity and not feed
the answer to a child too quickly. The belief is that a child should be asked appropriate questions then allow the opportunity to solve them. Clearly wanting children to learn for themselves, Rousseau stated “Let him know nothing because you have told him, but because he has learnt it for himself (Rousseau, 2007, p. 142).” Rousseau then asked “Why not begin by showing him the object itself so that he may at least know what you are talking about? (Rousseau, 2007, p. 142)” According to Rousseau, the ideal approach to education was student centered; this belief became the inspiration for many future educational philosophers.

One of these inspired educators was Johann Heinrich Pestalozzi, from Switzerland, who created the first student-centered school partially based on Rousseau’s writings. The school eventually failed financially, but was deemed educationally successful and copied in other cities throughout Europe. (Henson, 2003, p. 8) Like Rousseau, Pestalozzi also believed that learners acquire knowledge at their own pace, that instead of being given information learned by someone else’s own experiences, students are free of other peoples ignorance (Pestalozzi, 1969, p. 35). His educational contribution may not have been in his own directed schools but rather in those educators that he influenced such as Friedrick Frobel.

Friedrick Frobel was a German educator who studied with Pestalozzi (W. Reese, 2001, p. 14). Like Pestalozzi and Rousseau, Frobel’s belief was that a person, specifically a young child, should learn “through his own doing, feeling and thinking and in conformity with his own nature and relationships so that his life is an integrated whole (Lilley, 1967, p. 119).” Frobel’s greatest contribution to education was creating the first kindergarten school for younger children (Henson, 2003, p. 8). Frobel was a religious person and believed that children could learn by growing plants to be in harmony with nature and God (Lilley, 1967, p. 117). Kindergarten
schools stressed creative play through the use of toys and activities, both of which were designed by Frobel to help students become aware of their surroundings (Smith, 1997). The first kindergarten classrooms began in Germany in 1837 and eventually were found in the United States in 1856. Frobel’s believed that in order for students to learn they needed to have activities (Logan, 1950). This concept is the basis of many of computer-assisted learning programs.

**Progressive Movement**

By the late 1800’s, Francis W. Parker helped begin the progressive school movement in the United States. Before becoming the superintendent of Quincy, Massachusetts, Parker had read and researched the European philosophers who had begun implementing student centered schools. Wanting to further his research, Parker went to Berlin to learn directly from European educators about their student centered educational practices (Henson, 2003, p. 8). Quincy was like other school districts throughout the nation, which had traditional teacher-centered schools. These schools characteristically had more traditional approaches to school in that they incorporated strict instruction, strong use of textbooks to lead curriculum and constant “drill and memorization (Stout, 2001, p. 77).” However, as the superintendent, Parker had the desire and wherewithal to propose the first student-centered schools in America. These schools would use various materials to supplement current curricula and allow students to learn at their own pace through the experience of activities and not merely through lecture and memorization (Stout, 2001, p. 77). Parker developed the theory of concentration, believing that quality of teaching should replace quantity of subjects offered. Referring to this as the quality of mental action, Parker stated that “it consists in the supreme power of the mind to reason, to choose for itself (Parker, 1894, p. 389).” Parker defined the quality of mental action as “that action of the mind
which makes original inferences, which goes through consecutive reasoning processes based upon exact data” (Parker, 1894, p. 409). Student-centered schools followed the belief that “Education consists in presenting the right conditions for personal choice” (Parker, 1894, p. 409). Moreover, Parker believed that the science of education and quality teachers were vital to the success of the school and its students. Additionally, Parker felt strongly in the importance of teacher training, he felt that that the “artist teacher, the teacher trained and skilled in the science of education – a genuine leader of little feet.” would not magically appear (Parker, 1894, p. 451). As soon as the University of Chicago established the School of Education in 1901, Parker became its first dean (Henson, 2003, p. 9). Parker’s work in the public school system and writings on education is the reason many consider this educator the “father of the progressive movement” (Stout, 2001, p. 77).

Also working at the University of Chicago during this time was an educational philosopher who was the head of the Department of Philosophy, Psychology and Pedagogy; his name was John Dewey. Dewey believed in the psychological and social aspect of a child’s growth. Dewey also believed that the best way to develop a child was through a social setting; this is a theoretical shift from Rousseau, who wanted to protect children from society (Henson, 2003, p. 9). Through the University of Chicago, Dewey began laboratory schools; the school’s curriculum revolved around problem-solving activities. In time, these schools were started in every state and some are still in existence today (Henson, 2003, p. 10). Stout (2001) explained Dewey’s view on progressive education as being one that “is characterized by cultivation of individuality, free activity as opposed to external discipline, learning from experience rather from text and teachers, acquiring skills that are deemed relevant to the individual…” (Stout, 2001, p. 76). This progressive education movement occurred during the early 1900’s as a result
of student-centered learning theories. Laboratory schools were developed to foster individual student growth which was in contrast to typical schools in the United States system. Dewey believed that the current system of mass education was designed so that students could learn passively, but children should not be taught in mass without individualized instruction. In addition, Dewey (1990) stated that once a child acts as an individual they stop acting as part of the mass and become a distinctive individual. Furthermore, Dewey believed that the current methods of lecture and using uniform materials and text books offered little opportunity to adjust lessons (Dewey, 1990, p. 33). However, there was a feeling of necessity to efficiently educate the nation during this time as enrollment rose from 4.8 million in 1929 to 7.1 million in 1939. Generally, schools were seen as a way to prepare students for the workplace, creating a working class population to ensure that the factories continued to operate (Stout, 2001, p. 78). Nevertheless, Dewey believed that schools had the responsibility to provide a more adequate education to meet the needs of each individual student.

Psychologists Theory

As student-centered theory continued to evolve as a result of progressive educators and writers, it also became more scientific and practical. Two psychologists, Swiss Jean Piaget and Russian Lev Vygotsky, began their individual work in the early to mid-1900’s on an educational theory later known as Constructivism. These two had some similar views on a child’s ability to learn (Henson 2000, p. 13).

Piaget theorized that every individual has four distinct stages of development. Believing that children will move from one stage to the next at their own pace and their development should not be hurried. The first stage is simply the maturation of a child’s physical capabilities. The
second stage is the use of learning aids to help students gain experience and develop skills. The third is the use of social interactions from peers or teachers and the ability to learn from feedback received. Finally, Piaget believed that learning takes place by fitting new experiences into existing knowledge causing an adjustment of existing knowledge (Webb, 1980). The fourth stage is important in regards to student-centered learning. Webb (1980) clarifies Piaget's fourth stage by suggesting that:

“If learning was viewed merely as an increase in knowledge, active participation on the part of the learner would not be so vital. However, if one accepts Piaget’s concept that learning involves a restructuring of the student’s cognitive schemas, learner involvement becomes mandatory (Webb, 1980, p. 96).”

Webb (1980) summarizes the implications that Piaget has had on education; these implications have a direct correlation to student-centered learning. One is that individualized learning experiences are challenging enough for the student but realistic enough so that the student doesn’t quit (Webb, 1980, p. 97). Additionally, Good, Kromhout and Mellon’s book: (as cited by Webb, 1980, p. 97) describe the role of the teacher as being the cessation of being a lecturer “satisfied with transmitting ready-made solutions” and he “should rather be that of a mentor stimulating initiative and research (Good, Kromhout, & Mellon, 1979, p. 430).” Like Dewey, Piaget also believes in the importance of social interaction to promote learning experiences (Webb, 1980 p. 97).

On the other hand, Lev Vygotsky’s work focused on social interactions as a means of helping a child to learn. Vygotsky believed that students should work together to complete a task and be split into varying abilities so that their own experiences would help each other learn; this
became known as cooperative learning (Stout, 2001, p. 81). Additionally, the system allows for a group of members to collectively solve problems more efficiently by working collaboratively. This student-centered approach placed the emphasis on the students and not the teacher so that learning became engaging and was no longer passive (Henson, 2003, p. 13).

**Piaget and Vygotsky Theories Used in E-learning to Assist Student Centered Learning**

The use of computers to help students learn, known as electronic learning (e-learning), began in the 1950’s. Today e-learning is used for online courses, virtual schools or as tools within schools to further assist learning in a classroom (Ravenscroft, 2001, p. 133). One of the first programs, CASTE (Course Assembly System and Tutorial Environment), was designed using Piaget’s theory. The system allowed students to learn the curriculum at their own pace by allowing users the ability to control navigation and materials. The system was also able to identify the users learning style and matched the learning style to the user (Ravenscroft, 2001, p. 135). A programming language called LOGO was created in the early 1980’s which was also based on Piaget’s theory. The language allowed users to “develop their own knowledge and understanding in a principled manner but without explicit guidance from a tutor” (Ravenscroft, 2001, p. 136). This allowed the learner to interact with the computer programming specific commands and observing the response whereby students were able to learn by discovery and experimentation (Ravenscroft, 2001, p. 136). Simultaneously, using the LOGO system proved difficult because that the user first had to learn the programming language which was challenging for some students (Ravenscroft, 2001, p. 137). Likewise, other computer programs were created and educational theories were tested. The findings, as summed up by Ravenscroft (2001), were that “studies demonstrated the need for a collaborative dialogue with a tutor, or ‘more learned’ other, which
included dialectical features” (Ravenscroft, 2001, p. 140). These studies showed the importance of Vygotsky’s beliefs of learning through the development of higher mental processes (Ravenscroft, 2001, p. 140).

Vygotsky theories became relevant to e-learning and the student-centered approach. Ravenscroft (2001) wrote that Vygotsky believed

“First, learning, and particularly the development of higher mental process, requires a cooperative interaction between a student and a more learned other, where the latter may be a human tutor or an intelligent computer system. Secondly, learning is engineered by shifting the learner’s zone of proximal development, which can be achieved via a collaborative dialectic maintained between the learner and a tutor or system. Thirdly, meaning – in the head – devices from the social context and the interaction so the learner develops a conceptual understanding ‘through’ dialogue. Finally, language is considered the primary mediator of thought and a tool for thinking (Ravenscroft, 2001, p. 142-143).”

Developers saw the importance of Vygotsky’s work that learning occurs through interaction and linking dialogue to promote further learning and created programs based around those theories (Ravenscroft, 2001, p. 146).

**Student Centered Learning Summary**

It is evident that student-centered learning has advanced throughout the years. Student-centered learning can be described as having students develop knowledge through gathering and synthesizing information. Students are actively involved in the process of learning through individual discovery and experimentation (Huba & Freed, 2000).
Jean Rousseau wrote *Emile* to describe how a child might learn when protected from society but allowed to learn at their own pace using nature as their guide (Henson, 2003, p. 7). Rousseau’s idea of allowing students to learn at their own pace and independently control the learning process became the basis of student-centered learning. Though later philosophers did not agree that protecting students from society was the best way to learn, Rousseau’s educational ideas resonated with many.

Later, Johann Pestalozzi created the first student-centered school based on Rousseau’s writings. This school was important, because student centered learning became a more formal approach to education. Friedrick Frobel then studied and worked with Pestalozzi and created the first kindergarten school for young children (Henson, 2003, p. 8). Frobel’s belief of creative play using toys and activities allowed students to further discover learning through their own experiences (Smith, 1997).

Subsequently, Colonel Francis W. Parker went to Europe to study the ideas and schools of the European philosophers previously mentioned (Henson, 2003, p. 8). Parker proposed the first student-centered schools in America which would allow students to learn at their own pace using their own experiences (Stout, 2001, p. 77). In addition, Parker saw the importance of teacher training in the art and science of education and was named the first dean of the School of Education at the University of Chicago (Henson, 2003, p. 9; Parker, 1894, p. 451). Shortly after, John Dewey worked with Parker at the University of Chicago. Dewey had a strong belief in the importance of a social setting in helping students learn. The laboratory schools designed by Dewey had curriculum that was student-centered and revolved around problem-solving activities (Henson, 2003, p. 9-10).
Additionally, Piaget and Vygotsky dramatically influenced the student-center movement, because they took a scientific approach to learning. Piaget believed that learning experiences had to be challenging yet realistic so that students do not become so frustrated that they quit (Webb, 1980, p. 97). Piaget believed that learning would take place by taking new knowledge and building upon the old (Webb, 1980, p. 93). Vygotsky's work focused on social interactions, specifically that of cooperative learning, which had an emphasis on student learning based on the student interaction and dialogue (Henson, 2003, p. 13). Vygotsky also believed that cooperative interaction and dialogue between an expert and the pupil was essential to help students learn (Ravenscroft, 2001, p. 140). This belief was tested with computer e-learning models and found to greatly improve learning (Ravenscroft, 2001, p. 140-146).

Student-centered learning is now at the forefront of many discussions especially when examining e-learning. Bill Gates has stated that “software can also be used to tailor lessons to individual students, so kids can stop spending time on the things they already know and focus on the areas they are confused about (Gates, 2010).” The progression of e-learning will further work concurrently with the use of student-centered learning.

**Computer Assisted and Online Learning Approach**

There are many connections that can be made between computer-assisted learning and online learning approaches. The staggering increase of distant education programs appears to at least be an indication of their success and the success of computer-assisted learning. Despite this seemingly positive outcome, students have not rushed to online degree programs as quickly as forecasted (Mangan, 2001). On the hiring side, many corporate recruiters and HR professionals seem to question the credibility of e.degrees (Dolezalek, 2003; Drago & Wagner, 2004, p. 2).
The success of online education and computer-assisted learning will likely depend on such programs being able to clearly prove their worth as educational tools.

Computer and online learning programs face similar challenges but by the same token can also take advantage of similar opportunities that traditional classroom programs cannot offer their students. This section explores the challenges that online education faces. The first focus of this section is on active student participation as a core ingredient for these programs. Next, a detailed approach to learning styles is taken in order to understand the advantages and challenges that software and course designers face. Finally, the lessons on participation and learning styles allows for the exploration of the type of techniques that are put forward by the literature and the way in which they tackle the hindrances of these educational tools. The goal is for future students to come to expect not only high quality education but also a student-centered focus in utilizing technology, which will be designed to meet their individual needs (Diaz & Cartnal, 1999).

Skills, Participation and Learning Styles

Designing an online or computer-based program should focus on ensuring an active learning experience. In both traditional and computer based approaches, active participation ultimately means that students remain engaged to provide a positive learning environment. The research that supports online distance programs have many similarities to computer assisted learning software due to the use of technology as the instructional medium. There are three factors that have a positive impact on the success of an online education program: Rapport, required skills, and learning styles (Ryle & Cumming, 2007).

Rapport allows for students to feel acknowledged and have a connection with their instructor. Learning is not a process that occurs in isolation rather it is a social experience that is
conducive to participation by generating a learning community where duties and responsibilities become a part of the learning process. Therefore, rapport has a positive impact on keeping students motivated, up to date with a course’s content, and interested in continuing a longer-term program. Researchers argue there are three keys to establishing rapport with students are:

1) Developing a social climate, where students consider themselves insiders in the learning community, therefore, heightening their motivation, participation and satisfaction (Ryle & Cumming, 2007, p. 36)

2) Peer-to-peer contact and the ability to share personal experiences is another key to increasing participation by means of personalizing the learning experience (Ryle & Cumming, 2007, p. 37)

3) Keeping students updated with all relevant information is perhaps a self-evident, albeit still essential aspect to distant learning (Ryle & Cumming, 2007, p. 43). Consequently, this feedback helps students feel included, and encourages responsibility and commitment.

These three basic principles that aid teachers and program designers in increasing participation reveals the importance that teachers’ responsiveness has on students’ active participation. Remaining attentive and recognizing work that is well done are areas in which distant education programs may have to provide additional efforts given the flexibility and autonomy that is granted to students. Conversely, computer assisted learning software can provide direct response to students’ progress.

Skill requirements are another important aspect that increases participation. Prior to using technology as the basis of its education programs, students must acquire a series of basic to intermediate skills which enables them to proficiently use the computer technologies available to
them (Ritchie, 2011). As a result, purchasing equipment and commercially available educational software has been shown to be ineffective. This is because students are disinclined to use these resources unless directed to do so by the inclusion of specific and assessable tasks (Devitt & Palmer, 1999; Scanlon & Issroff, 2005). Therefore, the success of learning programs based on computer software and Internet communications requires that educators have a clear understanding of the extent to which tech skills must be mastered from students; this will allow the student population to utilize programs successfully.

According to Ritchie (2001), researchers argue that there are four tech skills that are keys to success:

1) Identifying in detail the ICT skills required by students
2) Making sure that the adequate technology is being used for the subject matter
3) Providing technical support to students at all times
4) Assessing the need for a face-to-face teaching component to the program

Moreover, rapport and tech skills are fundamental elements for online learning experiences to become effective educational tools as opposed to merely replacements for traditional classrooms. Hopefully this will lead to improvements in traditional education. Computer based approaches to education should have the objective of overcoming traditional hindrances.

Individual learners have a preference or predisposition to perceive and process information presented to them in one manner or a combination of methods (Drago & Wagner, 2004, p. 1). This preference is usually acquired as the person transitions from primary to secondary education (Zapalska & Brozik, 2006). This means that learning is not a uniform process which is the norm in traditional classroom education. Researchers have reported that choosing an online versus a traditional classroom program may, in part, be selected based upon
the individual’s learning style (Drago & Wagner, 2004, p. 9). By focusing on the literature regarding learning styles, this research demonstrates how technologies can prove to be powerful learning tools, delivering a superior learning experience to students by means of flexibility and autonomy.

There are at least four learning styles that researchers agree upon whose listed dimensions have been discussed in Drago and Wagner (2004) and Zapalska and Brozik, (2007). The first dimension is cognition which is how individuals typically process information as they perceive, think, solve problems, remember and relate to others. Secondly, affect relates to learning as it directly correlates with a person’s personality. This also considers such characteristics as attention, emotion, motivation, incentive, curiosity, boredom, anxiety and frustration. Characteristically, it is believed that learning is influenced by biological traits such as the incorporation of one’s senses (auditory, visual or kinesthetic) as used for learning. The psychological style views learning as it relates to the inner strength and individuality of the student (Drago & Wagner, 2004, p. 2).

Traditional methods do have some advantages over computer-based programs. For example, classroom teachers can observe the behavior and level of engagement of the students directly and make changes accordingly. For this reason, researchers suggested that educators create feedback mechanisms that replicate the lost advantage over classroom teaching; some authors go even further by saying that the idea of learning communities should be used to mitigate this disadvantage (McAllister & Moyle, 2006). Ultimately, an instructor should not rely solely on computer software but act as an instructional guide observing behavior and student engagement to create learning communities that aid students’ self-regulation of their learning.

Generally, classroom teaching is not able to deliver a multidimensional experience but
concentrates primarily on the cognitive learning dimension. However, researchers argue that learning should be multidimensional. Therefore, any learning experience should be designed to take all learning dimensions into account. This means that students should be exposed to and must incorporate a variety of learning experiences to become more versatile learners. Accordingly, attempts to replicate a traditional classroom experience is neither essential to the education process nor a guarantee of success (Gunawardena & Bowerie, 1993; Zapalska & Brozik, 2006).

Using technology, such multidimensionality can be reached by following the VARK approach which is an acronym that can be disaggregated as follows:

V = visual (graphs, charts, diagrams)
A = aural refers to audio (lectures, speeches)
R = reading/writing
K = kinesthetic (learning experience using all senses)

This definition of VARK (Drago & Wagner, 2004; Zapalska & Brozik, 2006) divides the learning experience according to the role that different senses have on the individual learner. Courses that use computer assisted learning software can be advantageous because they can be designed to stimulate various styles of learning. For example, the visual learner can be engaged through the use of animation, hypertext and video clicks (Drago & Wagner, 2004, p. 4,5; Ross & Schulz, 1999). Thus, the goal of computer-based approaches should be to impact all learning dimensions by including resources throughout the VARK spectrum. To reiterate, the importance of multidimensional learning is that it provides multiple avenues to meet the various learning styles of students.
Basic Types of Learning Techniques for Online Programs

To review, there are many similarities in the learning techniques of online programs and computer assisted learning software as both share the same mediums, allow for peer collaboration and feedback from not only the software but from the instructor. Thus, there are three basic types of learning techniques that researchers propose for online programs: Text-based forms of instruction, online course projects, and online group works. The following section explores the manner in which each approach can be used to stimulate different aspects of VARK, and so, facilitate the learning process, despite the dissimilarity of learning styles.

Text-based form of instruction (TBI) is perhaps the most popular approach to online learning (Ryle & Cumming, 2007). Most online courses are thought of as TBIs much like as a textbook, a specific bibliography or a pool of written resources is used as the main guide to the contents and progression of a course. In short, the student is given the materials and is expected to follow a particular guide. This approach accentuates autonomy and flexibility, but can result in disengagement without proper feedback on student progress.

Course projects constitute a second approach. By adopting a group dynamics approach, the instructor can easily incorporate the concept of active learning into a virtual environment. This means that, instead of providing the typical read-and-write course, the teacher encourages hands-on engagement with different sources of knowledge and subject content. A project-based approach has been reported as having a positive influence on the learning experience, although in this case attention should be potential risks such as, disengagement and dominant voices within a group (Ryle & Cumming, 2007, p. 44).

Online work in groups is the third approach to online learning programs. This approach encourages cooperative learning, by means of collaboration, leadership, and the setting of
autonomous objectives (Zapalska & Brozik, 2007, p. 10). Work groups encourage peer interaction, which is one of the above-mentioned pillars of the learning process. Group work also allows for the learning experience to be shared, in turn, enabling the formation of an online community around the education program at stake. Online work group allows for the entire VARK spectrum to be part of the learning approach.

Regardless of what learning style an individual prefers, the basic learning techniques that a student uses in any type of learning process are discovery learning, project-based learning, and cooperative learning (Zapalska & Brozik, 2007, p. 10). These three techniques should be all enabled and accounted for in an online program. To ensure this there are three main strategies that should be put in place (Zapalska & Brozik, 2006).

First, educators should provide content in multiple formats: text-books and papers, interactive software packages, videos are a few examples (Zapalska & Brozik, 2007, p. 10). These allow for learners with a variety of learning styles to remain engaged and to be able to move along the course in a progressive manner. Second, educators should allow for individual learners to control their own learning. This can be accomplished by encouraging and allowing students to gain responsibility and autonomy as the program progresses. Further, to increase learner’s locus of control, Zapalska and Brozik (2006) suggest that all course content should be online and an interface should provide various means of navigation. Additionally, students should be able to access course material in a variety of ways. The course can be built and presented in a hierarchical sequence, but students should be able to move through the course topics in random order (Zapalska & Brozik, 2007, p. 10). Thirdly, educators should encourage active participation and collaboration. Students should be encouraged to show their research interests and their assignments should also include group work when applicable. Zapalska and
Bozik (2006) suggest that each course should be designed with activities that are both individual and group-based. These groups can allow students to work together and solve problems, analyze cases, and develop group projects. These assignments allow individual ideas, perspectives, and experiences to be heard and collectively considered. The idea of agreeing to disagree is taught through these experiences (Zapalska & Brozik, 2007, p. 10). The creation of a learning community requires active participation where students feel engaged with the rest of the learners rather than with the teacher alone.

This section has explored how attention to individual learning styles, a multidimensional approach to the learning process, and how a relevant and updated pool of resources are all necessary aspects which are conducive to a successful learning experience.

**Empirical Work on Computer-Based and Online Learning**

The following section explores current empirical work done by researchers with the aim of understanding and testing the learning outcomes of online learning and computer based programs. Much of the literature found focuses on higher education yet this does not imply that such programs are unsuitable to high school education programs as is further discussed in Valtonen, Kukkonen, Dillon and Väisänen (2009).

Previously discussed in the literature review were learning preferences that new technologies should take into account in order to determine effective instructional approaches. This section focuses on a study which investigated the link between VARK learning styles and online course delivery. More specifically, it explores how online courses are presented and received by students whereby their learning preferences are expected to affect their perception of the online programs. This study reports six important results that are worth restating here:
1) Current online courses seem to be attracting students with high visual and read-write learning styles.

2) The visual learning style is positively and significantly associated with the aural and kinesthetic learning styles.

3) The read-write learning style was strongly and negatively associated with the kinesthetic learning style.

4) Read-write learners appear to be less satisfied with online delivery.

5) Students with all four learning styles as dominant were less satisfied with online delivery.

6) Aural/read-write learners were highly satisfied with online courses (Drago & Wagner, 2004, p. 11).

It is interesting to note that this study suggests online programs to use the potential that technology gives them to engage students in a variety of ways, rather than focusing on the visual aspects at stake.

Perhaps, more importantly, studies like Drago and Wagner 2004 suggest the need to think about how students readily adapt to computer based programs, and what obstacles can be identified. The research of Valtonen, Kukkonen, Dillon and Väisänen (2009) examined the readiness for students to adapt to online learning methods and technologies. Their study is based upon the researcher’s claims that when technology is applied to open and distance learning, the most important features of the ICT, its potential for collaboration and communication can bring about better results than traditional learning tools (Harasim, 2000; Paavola, Lipponen, & Hakkarainen, 2002; Valtonen, Wulff, & Kukkonen, 2006). The study expected adaptability to come about readily given the advantages of the new technologies over traditional methods.
In the piloted project, the study (EFEN) targeted second year high school students (ages 17 to 18 years) from 36 high schools in Finland. The study proceeded with the submission of an online questionnaire to schools in the autumn of 2005 wherein students’ perception was gathered and analyzed. The hope was that one class of students from each school would fill in the questionnaire. Their final sample included 1300 students (Valtonen, Kukkonen, Dillon, & Väisänen, 2009a, p. 744).

EFEN surveyed students about their perceptions, intentions to use and expectations of online learning after which an assessment of their ICT skills was made (Valtonen et al., 2009a, p. 745). The purpose of the ICT assessment was to explain outliers and groups that would readily adapt as well as those reluctant to do so. Results indicated that 60% of the students surveyed had negative beliefs regarding online learning while their ICT assessment showed most students surveyed as having roughly the same level of ICT skills (Valtonen, Kukkonen, Dillon, & Väisänen, 2009b, p. 747). These results prompted the authors to deduce that online learning is still perceived as inferior to traditional methods due to the students’ lack of experience with computer based programs and students spending more time in leisure activities such as browsing the internet (Valtonen et al., 2009a, p. 748).

Student perception and student learning preferences are vital to determine effective learning environments. However, how do traditional methods fare in comparison to online programs?

To answer this question, a review of the literature found another interesting research project to highlight. This one compares the effects of presenting two versions of lessons on punctuation which differed only in their mode of presentation (Emerson & MacKay, 2011, p. 727). The research sample consisted of 59 college students (85% female, 63% aged 18–26, 39
on-campus and 20 off-campus students) who completed a pre-lesson questionnaire and, after the lessons were completed, received another questionnaire and completed a test on subjective cognitive workload stress (Emerson & MacKay, 2011, p. 729). Students were randomly allocated to either the web-based or paper-based programs after which they completed an evaluation on the course’s content (Emerson & MacKay, 2011, p. 729).

The second questionnaire, about stress levels, would be filled out by both groups of students upon course completion in order to measure stress levels. Results provided a series of interesting lessons that compliment what has been stated thus far. In general, students from both lesson modes were positive about their current understanding of grammar and punctuation prior to undertaking the program on apostrophe usage. The groups showed no significant differences in response to punctuation usage, in terms of having been taught these skills, and being confident in their use of punctuation in general and their attitudes towards the importance of proper punctuation (Emerson & MacKay, 2011, p. 730). In short, both approaches proved to be good learning tools in that they produced positive learning outcomes. Nevertheless, the results demonstrated that students from the traditional method group performed 24% better than those who were placed in the online learning group. Reasons for the difference in learning outcomes were considered by the researchers but no clear or singular reason could be established from the data gathered (Emerson & MacKay, 2011, p. 732).

Additionally, stress levels in both groups differed substantially and poorer performance clearly displayed a direct correlation between lesser stress and a better learning outcome (Emerson & MacKay, 2011, p. 732). Stress levels were higher for those in the online learning program, which seemed to require an additional effort on behalf of students (Emerson & MacKay, 2011, p. 734). Moreover, similar stress-related results were also mentioned in other
studies which seem to emphasize the importance of ICT skills for an online or computer based learning process to be successful (Emerson & MacKay, 2006; Mottarella, Parrish, & Fritzsche, 2004).

It has been noted by researchers that ICT skills are essential to the success of online and computer based programs. However, the perception and readiness to use and adapt to new technologies seem to continue to be a vulnerable aspect of such programs. Given the importance of the learning preferences analyzed earlier it seems that the information gathered on these preferences could be the gateway towards successful online and computer based programs. This means new technologies provide possibilities to engage students according to their learning styles. The flexibility, ability to cover the VARK spectrum, and autonomy granted students are powerful advantages that have by no means gone unnoticed. The results of the empirical work surveyed seems to suggest that matching learning styles to student preferences helps to improve both the perception and the readiness of students to adapt to computer based programs.

A final empirical research that is worth mentioning in detail studied the effects of written feedback in a computer-based assessment for learning on students’ learning outcomes, in an experiment at a Higher Education institute in the Netherlands (van der Kleij, Eggen, Timmers, & Veldkamp, 2012, p. 264). This research is significant because it specifically discusses the importance of feedback. Instructional feedback may help prevent the rising stress levels that were noted above with respect to computer based learning technologies.

The feedback mechanism that was researched worked in parallel to the student being asked to perform a series of tasks. Afterwards, feedback was provided, either positive or negative accordingly (van der Kleij et al., 2012, p. 265). It is important to note that this research didn’t simply focus on the corrective function of the feedback but also on the motivational aspect of
positive critique. Additionally, the study separated feedback according to the time of reception in order to measure the effects of immediate or delayed feedback and elaborated versus knowledge results feedback where the latter would simply cue students with regards on the specific task fulfilled (van der Kleij et al., 2012, p. 264). Therefore, the feedback categories explored analyzed the effects of immediacy and depth, as well as feedback connotation or perception (positive or negative).

Three groups of 58, 52, and 48 university students were chosen with different combinations of the feedback responses mentioned (van der Kleij et al., 2012, p. 266). This study did not measure the ICT skills of students which were assumed to be roughly the same; issues with handling the technology at hand were not cued in the feedback mechanism. The results provide a series of interesting indications about the importance of feedback for computer and online-based programs.

Although no significant effects of the feedback types were found, the study did find a strong relation between the feedback types and the student’s motivation to complete the assignments ((van der Kleij et al., 2012, p. 269). Surprisingly enough, the motivational effect may perhaps be the most important aspect of feedback. If we take into account that computer based programs must make an additional effort to keep students engaged, updated, and motivated, as mentioned in the previous section, then it is clear that the existence of feedback constitutes another crucial aspect that the learning programs must take into account in addition to ICT skills, adaptability and learning preference. Researchers reported that students receiving both immediate and delayed feedback had the most positive response to the learning experience and reported the entire learning experience as useful (van der Kleij et al., 2012, p. 270).
Additionally, the study pointed out that students paid more attention to feedback after answering an item incorrectly than correctly which correlates with previous research on the effect of feedback on learning outcomes (Timmers & Veldkamp, 2011; van der Kleij et al., 2012). Therefore, students will actively seek feedback when they meet an obstacle to the learning process. These studies suggest that motivational and corrective feedback may be both essential to students by not only providing them motivation but also guidance with respect to their mistakes. Taking into account the results reported by Emerson and MacKay (2011), it seems plausible to conclude that feedback mechanism may be a solution to the higher stress levels that these researchers reported. This relates strongly to this study because one of the important components that computer assisted learning can provide is immediate feedback to students.

In conclusion, the review of the empirical literature helps inform this study regarding computer-assisted learning because of the following concepts. First, the student's perception of incorporated technologies plays a big role in determining their readiness to adapt to computer and online-based programs. Next, the lack of feedback and confidence of their ICT skills may increase stress levels, which in turn has an effect on the learning outcome of any such program. Finally, feedback mechanisms can play a crucial role in dealing with the issue of stress and learning perception by providing students with motivation to remain engaged in addition to employing appropriate guidance to address common challenges to learning.

Music Education Introduction

So far, the research has explored the advantages, issues and obstacles that online and computer-based education brings to the table of educators. This exploration has allowed for a variety of educational fields to serve as entry points into the various elements that are often used
in creating technology based educational programs. This section turns its attention towards music education. The following section provides further insights to understand the current efforts, challenges and potential of the use of technology in music education.

A review of literature found that technology use in music education could be implemented in direct instruction or as a supplement to enhance student learning. Ward (2009) studied students’ musical creativity using technology. The study revealed that technology could become a valuable tool to hold student’s attention and keep students motivated. However, Ward also concedes that some classroom tasks are more easily done using the musical instrument without the use of technology. Thus, it depends on how technology is being used which requires teachers to be “versed in possible problems (Ward, 2009, p. 164)”. Lou, Guo, Zhu, Shih and Dzan (2011) used computer assisted music instruction software to learn Chinese musical instruments. The study found that students felt the software was more interesting than traditional instructional methods and produced greater learning achievement (Lou et al., 2011). The use of technology in music education has changed “the way that music is composed, performed, recorded and taught (Ho, 2004, p. 65).” Students can enhance their learning by downloading MIDI files from the Internet, using those files to listen, learn, and modify music from other cultures and musical performances. This allows students to broaden their musical perspectives (Ho, 2004).

At this time, there exists understandable skepticism in the teaching community with regards to the use of educational technologies in music programs. Neal (2011) provides some insights for music teachers (p. 81, 2011):

- “I have to be there to guide my students through the listening experience;”
- “Class discussion is essential”
• “How will I know what they’re learning?”

• “Music is a human endeavor”

Conversely, these concerns have not deterred the rate of growth of computer based educational programs. Students are leaning more and more towards online education with the New York Times, in 2007, reporting that 3.5 million college and graduate students, approximately one-fifth of the population, had already taken an online course (Neal, 2011, p. 82). This trend means that educators must adapt to the needs of students as they move towards technology based education.

Musical Learning and Human Development

This section begins by outlining the role that music education plays in human learning and development. Music education has specific differences that go beyond merely auditory stimulation, as compared to any other of the senses, as music further relates to the cognition and development that is fundamental in early childhood.

Various studies have been conducted regarding the effects of music education on nonmusical abilities. Rauscher, Shaw and Ky (1995) initiated research that led to many other studies on the “Mozart effect”. The study suggested that listening to Mozart’s classics could increase spatial ability (Rauscher et al., 1995; Rauscher, 1994). A later study by Rauscher and Zupan (2000) suggested that classroom keyboard instruction improved spatial ability in kindergarteners who took music lessons versus those that did not (Rauscher & Zupan, 2000). Schellenberg has studied Rauscher et.al and tried to duplicate the research with mixed results. Schellenberg found that music can alter mood and arousal levels which can lead to improvements in spatial abilities such as creativity and processing speed (Schellenberg, 2001, 2005a, 2005b, 2006). In addition, Schellenberg (2004) found that the general affect of music
lessons had an increase in general IQ, albeit minimally. Further, as a result of the influence of Rauscher and his cohorts, Moreno also explored the effects of music exposure and examined possible structural brain changes in musicians and non-musicians, finding that musical training improved pitch and processing speed in speech for eight year olds (S. Moreno et al., 2009; Sylvain Moreno, 2009).

Music is deeply entrenched in the human mind which is conducive to healthy development (Holmes, 2009, p. 104). Holmes (2009) states that music education at an early age can help stimulate the child’s memory and cognitive curiosity. Technologies that increase accessibility to music are invaluable because music, in various forms, becomes more easily attained by students of all ages. It is fair to argue that children today will be not only interested in developing their music skills but will also be responsive to sound stimuli as part of their educational experience.

Musical experience in early childhood, continues Holmes (2009), when experienced in a social context, allows children to develop social skills (Holmes, 2009, p. 105). This means that exposure to music is not only a matter that is relevant at the individual cognitive level, but also an experience that can help to build and consolidate relationships at an early age. With music having the capability to play such an important role in social interaction, throughout the entirety of a person’s educational experiences, it becomes worthwhile to ask about the existence of the specific advantages of these methods. Computer based and online technologies makes these significant contributions when it comes to music education as it opens many avenues to further discover and apply the auditory experience.

Holmes (2009, p.105) found that singing not only aids students in obtaining skills such as recitation and memorization but also provides a background for future implementation of
instrumental compositions. Holmes states that the use of computer-assisted programs can help students learn singing in a variety of ways:

In early years, miniature computers with an ear microphone can teach recitation and naming and production of intervals, pitches, and rhythms. Keys, harmonies, and musical notation can be well taught by computer-administered drill and practice (Holmes, 2009, p. 106).

This example is one illustration of the advantages of computer technologies. I have argued in previous sections that computer based learning has the ability to engage students in a more comprehensive manner in that it stimulates learning by engaging the students in different manners; reading and writing, group work, video and interactive learning are examples of the such tools that can be used to involve students with varied learning preferences.

Assessing Past Learning Experiences in Music Education

It is necessary to explore the literature in order to understand the way in which new technologies can be used for music education. Studies on the use of new technologies in digital education have been conducted since the early nineties (S. Reese, 1999). Reese (1991) conducted a series of studies designed to test the feasibility of online mentoring of secondary school pupils by student music teachers. These studies were interested in assessing the technological viability of online mentoring, the student teachers’ attitudes to composition mentoring and the attitudes of recipient secondary school pupils. Reese used Musicshop, a standard music sequencing software, and First Class, a widely available online conferencing tool. Reese found that online mentoring was technologically feasible using these tools however internet connections during the early 1990s were slow and unreliable (S. Reese, 1999, 2001). Results of the project showed that student teacher mentors’ attitudes and confidence significantly
improved yet there were no significant enhancements to pupils’ attitudes. This outcome proved consistent in more recent studies (S. Reese, 1999, 2001; Seddon, 2006; Simoni, 2003). The study provided further evidence that student engagement is necessary to create an effective learning environment. Music education is therefore no different from the empirical work previously analyzed.

One of the first studies that specifically dealt with technology and music education was the Vermont MIDI project. Utilizing technology, the project created an educational environment that required peer-evaluation and mentoring for music students (MacLeod & Cosenza, 1998). The Vermont MIDI project worked with 60 schools in the state of Vermont and includes students from kindergarten through 12th grade. The project not only taught students to compose music using software, it provided an opportunity for students to work in collaboration with their peers and teachers. The outcomes of this project were highly positive as students reported having higher levels of motivation as well as an increased knowledge of music analysis and evaluation. Further, students demonstrated a greater acquisition of musical vocabulary (MacLeod & Cosenza, 1998; Seddon, 2006, p. 275). The Vermont MIDI project provided an atmosphere of collaboration and encouraged students to work with each other in a common goal of composing new music. It showed that utilizing technology students can ask for specific feedback and are able to apply their use of this software to replay the music they have created.

This type of collaborative learning is in line with the Ecology of Resources framework previously mentioned, wherein a group of learners work collaboratively to solve a problem. Therein, each provides their own knowledge which is built upon previous information acquisition and experiences (Rogoff, 1990; Seddon, 2006). What these researchers argue in favor
of is for education program designers to use technologies as an allowance for and encouragement of sharing and collaboration.

Another music education program, which harnessed the advantages of teamwork, was Project Lovelace. This project was a school-based program sponsored by Michigan University. Students in this program were aged between twelve and eighteen and used technology to create music (Simoni, 2003). There were three goals of Project Lovelace. The first was to “bolster self-esteem, nurture creativity, improve analytical skills and promote self-discipline through music technology (Simoni, 2003, p. 58).” The second was geared specifically towards school-aged females and aimed to increase their exploration of music technology. Finally, the study hoped to create a more gender-balanced repertoire. Project Lovelace was analyzed by researchers who followed its results by way of performing a longitudinal study that would assess the progress toward these mentioned goals. The dominant teaching method of the program was assessed to be collaborative-based learning (Simoni, 2003, p. 59). The project is summarized by the researcher as follows:

In collaborative-based learning, groups of four to five students of differing backgrounds and competencies engage in a wide variety of musical tasks. The students are assigned roles within the group by self-selection, teacher assignment, or by chance. Various roles within the group may include leader, conductor, timekeeper, and record-keeper depending on the nature of the assignment. The roles are carefully selected for each task and categories of roles are rotated so students gain experience in a variety of roles (Simoni, 2003, p. 59).

The role of collaboration is twofold: Initially, the students work in groups in order to propose and complete a composition. Subsequently, once this first process is completed, the
group presents their findings to the class who then collaborate to assess the best arrangement for the composition presented (Simoni, 2003). The final step takes place thereafter utilizing student-teacher engagement. A discussion about the process takes place as the teacher engages the students in a conversation about the coherence of the composition, its contribution to learning and the components that contribute to the style of the musical structure (Simoni, 2003). This final step, it is argued, motivates the students to achieve a high standard of musical competencies (National Standards for Arts Education, 1994). It also, perhaps most importantly, “increases self-esteem through creativity, analysis and teamwork (Simoni, 2003, p. 59)”.

The researchers conducted a longitudinal study as a means to unearth the relationship between the students’ attitudes toward various aspects of the musical training. This included musical schooling, the employment of computer based technology and analysis and notation. A series of demographic components included class standing, gender and academic achievement (Simoni, 2003). A similar analysis of correlations was conducted with respect to the teachers involved in the project (Simoni, 2003). The research concluded that the results were extremely positive in terms of both the learning experience and the outcomes of information accumulation (Simoni, 2003). Further proof of the perceived success is the replication of the Lovelace project which was conducted by the author, in collaboration with academic peers, in 2006 and 2007. The study’s aim was to assess the learning needs of females and those in mixed-gender music centers. The purpose was to design and implement a set of modules to enhance creativity, stimulate self-expression and acquire command of technology skills via musical composition and performance (Simoni & Younker, 2008).

Moreover, the project challenged the students’ abilities to use the best technological tools for the tasks at hand. Teachers and program designers were also pressured to increase their
knowledge of one another’s domains (Kassner, 2002; Simoni, 2003). This supports the TPACK framework as technology was just as important to the success of the project was content. The results showed that music education can incorporate a variety learning tools and can effectively train professional musicians, composers and others. The program further highlights the importance of collaborative learning as an efficient method of engaging both students and faculty.

Finally, another recent study linked a school in the UK with a school in Norway to engage in computer-mediated, collaborative composition via e-mail. High school students were grouped into composing pairs consisting of one European and one Norwegian pupil. These pairs were balanced based on prior musical experience. Results were intriguing and revealed that previous experience of formal instrumental music tuition (FIMT) was associated with extended and complex musical dialogues. Students’ connection to musical ideas created an environment more suited to educational exploration (Seddon, 2006). To the contrary, no prior experience of FIMT was associated with uncritical and descriptive dialogues and a cumulative environment (Seddon, 2006). This research suggests is that collaborative learning may prove to be a more advantageous approach for those students who are already interested in or experienced with musical instruments. To a certain extent the study seems to suggest that classroom or after-school musical education can be complimented and truly rendered advantageous by means of computer based learning programs.

**Literature Review Summary**

Teaching is a very complex process and the use of technology as a tool can enhance traditional classroom methods. Students can thus be more easily engaged and become accountable for their own learning. Today’s students, through the use of technology, have access
to far more information than ever before therefore allowing them to explore interests anywhere at any time. Therefore, student autonomy is an aspect that must be recognized as an integral part of the education process and the use of computer-assisted learning software can provide such autonomy. In the words of Neal (2011, p. 86):

[W]e can’t control how the students are interacting with our material, other than by writing sophisticated and subtle prompts and questions. While online courses allow the students to work at their own pace, that sometimes means faster, not slower, than the classroom equivalent might be.

Computer-based and online education programs are not a replacement for traditional programs, but are fundamentally different in their approach to education (Neal, 2011). This study explored how computer assisted learning could provide learners with a student centered learning environment. Such an environment allows students to receive feedback in various ways which triggers consideration of what they are learning, granting pupils more command over the individual attainment of knowledge.
Chapter III: Research Design

Research Questions

This research examined and described the use of computer-assisted piano learning software in a high school piano class. The research deepened the understanding of the implementation of computer-assisted learning while providing student centered learning in music education. With the increase of digital technology in schools across the country, the use of computer assisted learning software is growing exponentially although the research is still limited. The study investigated how teachers incorporate computer assisted learning software in their daily teaching and provided insights from both teachers and students into the use of this software.

The study took place in an urban high school in a district in southwestern Connecticut. The research explored the utilization of computer-assisted learning and provided a description of how the software was used by teachers and students alike. Additionally, teaching methods that and their effectiveness in creating a student centered learning environment were observed and assessed. Descriptions of the stakeholders were collected using a qualitative approach and the research questions addressed the teachers’ and students’ experiences of learning to play the piano using the computer assisted learning software as their primary resource for instruction.

The primary central research questions that this study addressed were:

1) Does computer assisted learning software effectively provide student-centered instruction?

2) How do students describe and experience the instruction provided in the piano lab?

The following questions were designed to provide a deeper understanding of the primary question:
1. How do students describe the instruction provided in the piano lab?
2. How do teachers describe the instruction provided in the piano lab?
3. How do teachers and students feel about the use of the computer-assisted learning software?
4. How do teachers describe their instructional role in the classroom?
5. How do students describe the teacher’s role in the classroom?

**Research Approach**

The study was investigated using a qualitative approach and investigated a single bounded system: the piano classroom. The research questions were created to allow teachers and students to describe the integration of computer-assisted learning to provide a student centered learning environment. A qualitative study allows for in-depth explanation and description of relationships and experiences of participants and groups. This case study allowed for a deep insight into and description of the ways in which computer-assisted piano learning software was being implemented and whether it provided an adequate student centered learning environment for students (Creswell, 2009). Additionally, observations of classroom practice and interviews of both students and teachers provided thorough descriptions regarding the dynamic of the classroom. The integration of the computer assisted software at this level of analysis is another important component of a qualitative study (Creswell, 2009). By gathering various data points and perspectives from the use of the interviews and observations, a holistic view of the incorporation of technology as a means of creating student-centered learning in the classroom was obtained. This is also an important factor of any qualitative research design (Creswell, 2009).
The qualitative research used a case-study approach for the research design. For this particular study, this method was most applicable due to the in-depth description and analysis required to understand the creation of a student-centered learning environment through the use of computer-assisted learning software. The case study examined the integration of the computer-assisted learning software in a single bounded environment (the piano classroom) in order to investigate the research questions. In addition, the case study is restricted to a period of time for which the investigation lasted. Information was gathered during one high school semester which lasts 90 school days. Information gathered during that specific timeframe was used for this investigation. This timeframe was selected as the duration of the course spans one semester in length.

This study was a single case design. The unit of analysis was an urban high school located in southwestern Connecticut. The case had subunits of teachers with multiple piano classes running during a semester. The unit of analysis allowed for assessment of the research questions. Additionally, comprehensive descriptions of the integration of the computer-assisted learning software providing student centered instruction were constructed. The research further studied the individual teachers who integrate technology into their instruction as well as the students who are utilizing the computer-assisted learning software. This provided access to the dual perspectives needed to form an analysis of the student-centered instruction which occurs using computer-assisted learning.

Site and Participants

This study took place in a southwestern high school in Connecticut. The school has a student population of approximately 2100 students from grades 9 through 12. The specific site of the study was a piano lab. The lab consists of 24 student computers each connected to
electronic piano keyboards equipped with headphones. Each computer has the computer
The teacher’s computer is set up the same way as the students but also has software that
allows the teacher the ability to monitor each student computer. Simultaneously, the teacher’s
computer screen can be displayed from a projector to an electronic whiteboard, providing all
students with a view of the teacher’s computer. The site and individuals studied were
purposefully selected because it is this population who can provide an understanding of the
research question. Purposeful sampling is often used in qualitative studies because it allows
the researcher to choose the sample based on the need of the research being investigated
(Creswell, 2009). In this particular study the two teachers were selected because they are the
only two music teachers at the school. During the semester of the study, two sections of the
piano classes ran with a total of 43 students. One section had 23 students while the other had
20 students. As a whole, there were 19 ninth grade students, six tenth grade students, eight
eleventh grade students and ten twelfth grade students. The sections were made up of 24
females and 19 males with seven of those students being English Language Learners and six
students identified with special education needs. Demographically there were one Asian
students, 18 Hispanic students, eight Black students and 12 White students. It should be
noted that there were four students who did not have information listed to for any special
learning needs or demographic information. Each teacher taught one section of the piano
class and integrated the computer-assisted learning software into their instruction.
Additionally, both teachers were asked to participate in interviews and allow classroom
observations of the instructional practices during as they were implementing the software.
Students enrolled in classes were also asked to participate in focus groups to inform the
research on student-centered learning. In addition, students were observed utilizing the software and piano keyboards to gain a better understanding of the employment of the software in conjunction with the keyboards.

**Data Collection**

In any case study, including multiple sources of evidence is imperative to provide the researcher with a complete view of the research. The triangulation of data in this study includes multiple perspectives from the teachers and students through the use of various methods of data being received through observation, interviews and focus groups. The use of triangulation provides corroboration of data and validity (Creswell, 2009; Patton, 2002).

Focus groups, as opposed to one-on-one interviews, were used to gather data from students in order to increase the comfort of speaking through a group setting. Focus groups are a valuable tool to collect data when the interviewees are of similar groupings and cooperative with each other and are especially useful when the interviewees may have some reservations in speaking with the researcher (Creswell, 2009). Since the researcher is also the assistant principal of the school, students may not feel as free to speak in an individual interview with the researcher, therefore the focus group allows for a more natural conversation to occur. Questions during the focus group were open-ended and encouraged students to share their thoughts and impressions of the use of computer-assisted learning during their piano class (see Appendix K).

Interviews with teachers were also opened ended and structured to allow for a free-flowing conversation to occur (see Appendix J). The questions allowed teachers to share their thoughts and opinions on student-centered learning and the student’s ability to learn at
their own pace using the computer-assisted learning software. The interviews were adapted depending on the teachers’ responses to the questions (Creswell, 2009; Patton, 2002).

In addition, observations of the lessons were important for the study and utilized to gain a better understanding of the implementation of the software. The observations served to incorporate the knowledge obtained during the focus groups and interviews with the impressions gained through witnessing direct practice. They also provided information to help structure questions for the focus groups and interviews. Lessons were observed randomly and the focus was on the utilization of the software and how the teacher supplemented and provided extra guidance to students.

Data Analysis

Data gathered from interviews and observations were analyzed and coded to investigate the research questions. The focus walks and interviews were all transcribed, read and coded. During the first phase of open coding, the researcher examined all text and coded categories by looking for instances of text (Creswell, 2009). In addition, the researcher used Northeastern approved transcription services, Rev.com, to transcribe the recordings. The coded data was then integrated with all other data to provide a holistic and detailed description.

Trustworthiness

Two teachers and all forty three students were invited to participate in the study by a letter that explained the purpose of the study and requested voluntary participation. Students from each section had an equal opportunity to participate in the study. In addition, letters were sent home to the parents of each of the students, requesting permission for their child to participate in the study. Those students who did not return the permission slip or in which
permission was not granted were not asked any questions regarding the study. There were no incentives given to any of the participants during the research. In order to retain anonymity for all participants during surveys, no names or identifiers were included.

The researcher’s biases are stated so that future readers would clearly understand the point of view of the researcher and assess possible transferability to future studies. These statements also infer how the researcher’s biases may affect the study (Creswell, 2009). The researcher believes strongly in the use of technology in an instructional setting to provide additional benefits to students. As previously stated, the researcher was a former high school teacher who taught computer science and continuously implemented technology in the classroom. At present, the researcher is an assistant principal at the high school involved in the study. As an assistant principal, the researcher directly planned the development of the piano music lab chosen for this study. The researcher believes that computer assisted technology, whether on a desktop or mobile device, can provide a rich learning environment to students. The researcher further believes that educational software will continue to evolve to provide students with progressive student-centered learning opportunities.

To further limit bias, it was important to the study that the researcher not be the direct supervisor of the piano teachers. As a result, it should be noted that the researcher does not directly evaluate nor influence the teacher’s job performance. Additionally, student focus groups were chosen to minimize bias by allowing students to speak more freely in a group setting than in a potential one on one interview (Creswell, 2009). Students were assigned to the class because they had an interest in learning piano or were recommended to take the class by a guidance counselor in order to fulfill necessary graduation requirements. Protocols were followed throughout interviews and observations to increase consistency among those
three areas of data collection. Throughout the entire data collection process, bias was limited by providing all participants descriptions of the study and opportunities to read the research on student-centered learning and computer-assisted learning software. The utilization of peer debriefing was utilized to provide teachers and students ample opportunity to read and assess the findings.

Additionally, the triangulation of data was viewed as an important aspect in limiting bias. Utilizing multiple sources from teacher interviews, student focus groups and classroom observations, data was examined to validate each source and provide more credible findings (Creswell, 2009). The teacher interviews were held as individual meetings to ensure that one teacher did not influence the other. Two separate focus groups consisting of four to five student participants, were interviewed while multiple classroom observations were performed therefore ensuring a well-rounded portrayal of the study (Creswell, 2009; Patton, 2002).
Chapter IV: Results

Reported in this chapter are findings from focus group interviews with students and one-on-one interviews with two music teachers. The students are enrolled in a piano class that utilizes piano software, *eMedia Piano and Keyboard Method*, as its primary method of instruction. The teachers supplement the instruction utilizing traditional teaching methods. During the first semester of the 2013 school year, two sections of the piano class were offered and each section had a different music teacher. Both teachers participated in this study and 9 of the 43 students enrolled between the two sections volunteered to be part of the focus groups.

Data are reported as they relate to each of the study’s research questions.

1. Does computer assisted learning software effectively provide student-centered instruction?

2. How do students describe and experience the instruction provided in the piano lab?

The following questions were designed to provide a deeper understanding of the primary question:

1. How do students describe the instruction provided in the piano lab?

2. How do teachers describe the instruction provided in the piano lab?

3. How do teachers and students feel about the use of the computer-assisted learning software?

4. How do teachers describe their instructional role in the classroom?

5. How do students describe the teacher’s role in the classroom?
Participant Description

The following table illustrates makeup of the participants of this study:

Table 1
Teacher Demographics

<table>
<thead>
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<th>Demographic area</th>
<th>Teachers (N=2)</th>
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<tbody>
<tr>
<td>Gender</td>
<td>M=2 F=0</td>
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<tr>
<td>Highest Academic Degree Earned</td>
<td>Bachelors = 1</td>
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<tr>
<td></td>
<td>Masters = 1</td>
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<tr>
<td>Experience in Education</td>
<td>&lt; 5 years = 1</td>
</tr>
<tr>
<td></td>
<td>&gt; 10 years = 1</td>
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<tr>
<td>Area of Teaching Licensure</td>
<td>Music = 2</td>
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<tr>
<td>Prior Experience teaching eMedia Software</td>
<td>Yes = 2</td>
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</table>

Note: Both teachers taught the eMedia Software the previous year for two semesters.

Table 2
Student Demographics

<table>
<thead>
<tr>
<th>Demographic area</th>
<th>Students (N=9)</th>
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<tr>
<td>Gender</td>
<td>M = 5 F = 4</td>
</tr>
<tr>
<td>Grade</td>
<td>9 = 1 10 = 1</td>
</tr>
<tr>
<td></td>
<td>11 = 2 12 = 5</td>
</tr>
<tr>
<td>Prior Experience Playing Piano</td>
<td>Yes = 3</td>
</tr>
<tr>
<td></td>
<td>No = 6</td>
</tr>
</tbody>
</table>

Note: None of the students had used eMedia prior to this class. The experience playing Piano was basic for all but one student who had formal instruction years earlier as a young child.

In order to recruit participants, multiple attempts were made to provide teachers and students with the opportunity to partake in the experience. Individual contact was made with each teacher by speaking to them in person which was followed by an email inviting them to participate in addition to a formal, written invitation. Both teachers communicated their desire to
take part in the study and signed the appropriate consent forms. Each class was then visited by the researcher to explain the purpose of the study. During those visitations, each student was given a written invitation and appropriate consent forms to be signed by their parent or guardian. Students were also given the opportunity to ask questions of the researcher. The researcher made a second visit to each section to solicit a greater response, answer further questions and collect consent forms.

**Research Questions**

In the following chapter, a summary of findings is presented. The data collected from both teachers and students is broken down compared/contrasted. Questions for both teachers and students were similar but the researcher differentiated between the educators and the students in order to gather a specific and experiential perspective from each group. Subheadings identify each interview question and the correlating data stated from each group. Unless indicated, questions asked were the same for both groups of participants.

The first interview questions were asked to garner an understanding of how the instructional software (*eMedia*) was used in the classroom.

**Interview Question:** Describe how the computer assisted instruction software (*eMedia*) is utilized in the classroom?

Teachers described the classroom environment, the computer and piano keyboard arrangement, the procedures that the students must complete when they first log-on to the software and the general organization of the software thereby providing a broad overview of the classroom.

Teacher 1: The software is installed on a number of computers that are in the classroom. I believe there’s 24. The computers are connected to MIDI enabled keyboards, which
allow the computer to communicate with the keyboard. When the students play on the MIDI keyboard it communicates with the computer, and the computer is able to discern correct musical passages from incorrect musical passages based on preprogrammed musical passages that are in the software.

Teacher 2: When the students come in at the beginning of the class period, they log in to their computers using their school ID and password given to them by the school when they enter the high school. Then, they open the e-media software, log in using their name, first and last, and password that they're choosing. It will automatically load at the last trace that they left off. From the beginning of the year, obviously, they start at lesson number one. Lesson number one starts with things like basically what is a piano, how is it played, what's the history of it, and with the notes. It goes up to, I believe, lesson 320.

Students also described the software’s organization and described the interactions that they have with the software. A theme that was introduced and continues throughout is that students are allowed to work at their own pace. In addition, students discuss the ability to visually learn from the program through video demonstrations offered by the software. Their interaction with the program includes the software’s ability to allow students to repeat lessons until they have reached mastery.

Student 1: So basically what happens is they have different chapters and each chapter has different sections, and during each section, it focuses on certain topic.

Student 2: So you just learn on your own and you go on your own pace. The way it's utilized, yeah, it just goes by chapter, and you follow as it says and you go at your own pace, so that's pretty much it.
Student 3: You log onto the computers, and it’s a program where you log in and everything, and there’s instructions and demonstrations and everything. There’s a lot of interactions that you are able to do with it, and in case there are any problems, you can ask the teacher, but like I said, there are demonstrations and you get to practice everything a lot, so that’s how you get to interact with it.

Student 4: It also gets harder as you go and complete each lesson, and if you get a bad grade, you can go back and fix it.

Student 5: It gives videos of people demonstrating how to play the piano and how to help you out. The teacher could help you out if you have any problems or anything, but pretty much, you go by yourself and everything.

Student 6: It's used by, basically, trying to get you to learn how to play the piano. It gives you letters. It gives you letters to, basically, just memorize to learn how to play the keyboard by… forgot what it's called. Basically, just memorize everything, so that you can actually play it.

Student 7: It gives you a lot of visual images so you can play the songs that you're doing and watch the computer play the same song with the fingering. It's very helpful to see that and not just have to read the notes.

Student 8: The software eMedia uses technology to teach you the basic step piano, and then building upon that to more complicated techniques and songs by first using songs like Mary Had A Little Lamb. Then keep experiencing more songs, then to more advanced ones like Alouette and several songs and techniques. Teaches you positions of where your hands needs to be for certain songs and how your fingers should move of hitting the notes on the piano. It's very helpful because it's not only a one-time thing.
You go there every class and you can go back to your older lessons and remember how you learned so you never forget.

Student 9: eMedia has a lot of lessons for you to work on. Helps you practice, and it shows you where to put your hands on the key so that way you know how to play the song. It has multiple songs for you to practice on.

One student wanted to further discuss the ability to repeat lessons until they’ve reached mastery of a song.

Student 7: In the beginning they give you Mary Had A Little Lamb. Then you go on to different lessons and you learn different techniques. Then they give you that song again with the new techniques you learned. It's not like you're always playing new songs. You're going back to the old songs and just adding different techniques to play in. It's cool to see.

When asked if learning new techniques allows them to play previous songs more easily the student responded:

Student 7: Yeah, because you just add on to what you've learned. I know that towards the end of the program you play all the songs that you've learned with everything. It's not like you're forgetting what you’ve already learned. You're just adding on to it.

Interview Question: What is the primary means (traditional vs software) of instruction within the classroom?

Depending on the answer to the initial question, a probing question followed. As the teachers’ and students’ answers were comparable, the resulting follow-up question was also similar:

Teacher follow-up question: How do you supplement the instructional software?
Student follow-up question: How else are you taught the piano besides the software?

Teachers acknowledged that the instructional software provided the majority of the instruction and therefore felt that their primary role was to guide students through the software. Subsequently, they provide supplemental instruction by presenting visuals or giving individual guidance to help students learn the piano.

Teacher 1: The software is the primary means of instruction in that the majority of the time spent giving instruction and feedback given is actually done mostly by the software. The software gives instruction through prose, obviously through some videos as well. In addition to the prose and the videos, there’s visuals with audio that show exactly what the passages that they’re supposed to be playing sound, like as well as, they’re played on the keys on the keyboard as well, so they get pretty much every aspect of how they can know how a certain piece is being played.

Teacher 2: There is a combination but it is primarily software. My role on most days is to supervise and to aid and assist when necessary. Often times, I make it clear from the very beginning that if a student has an issue with something they don't understand, something that was just explained on the software or they're having trouble figuring out why it's not giving them the feedback they're expecting to get, then I'm telling them to raise their hand, and I'll come over to them, and listen to them, and help them, guide them through whatever is ailing them in that moment.

The teachers further discussed other means of providing supplemental instruction. One teacher expressed his hopes of increasing student interest while the other delves further into music theory and piano skills.
Teacher 1: One thing with the software doesn’t teach is, at least as thoroughly as I would like, is music theory. So what I do as far as personally with them is I’ll go over different concepts like… The software does go over certain concepts like the staff, and the note names, and the different, note lengths and beats, beat values and whatnot, but other concepts that I would like for them to know earlier on, the software may not get to around the same time or that it doesn’t get to it at all. I know like the dynamics, dynamic levels, I would like to teach them fortepiano, stuff like that earlier. Also, I teach them scales in different fingering patterns for each scale. I’ll quiz them as the semester goes on, but by the end of the semester, they’re familiar and fluent in all of the major scales and starting on pretty much any note and that includes many different fingering patterns that the software doesn’t go over.

Teacher 2: In the course of this semester course, I do sometimes teach things off of the program. Things that I feel are vital and important parts of regular piano pedagogy that the students should learn how to do. In some cases, some of what I teach them is stuff that’s not necessarily based in classical piano playing. I teach them more sometimes about how to play more rock, pop, R&B, things that they’re hearing nowadays. I teach them how to play things that are more in that vein as well knowing that that’s where a lot of interests lie.

The student group confirmed that the software provides the majority of the instruction but also discussed the role of the teacher in the classroom. They acknowledge that they expand instruction using techniques that the computer may not. For example:
Student 1: The software does the majority of the teaching. Whenever we have tests, the teacher usually does lectures or small lectures and he kind of teaches you how to do certain skills that the computer doesn't teach you.

Student 6: Well, this classroom, in general, basically, uses the computer and the teacher barely talks. In my opinion, I think he should at least teach us a few things because I'm sort of visual from, I guess, when someone's teaching me than a computer, but it kind of works either way.

Student 8: It is more computer-based. It's much different from other classes. With most classes, the teacher being the center of attention and you learning from what he says and does on the board. Now, it's the computer from what you see and you learn from that. The computer is what guides you and teaches you, and the teacher's just there. To me, he doesn't really have any part what I learn in the computer. But if I do have any problems or difficulties with the program, I just have to keep practicing on the program. That way I don't have a problem anymore. A need for a teacher to be there is somewhat understandable, but really isn't necessary.

Student 9: I want to add to what Student 8 said. The teacher should be walking around since it’s all computer-based and not all of us can be self-taught. We need the teacher there to teach us.

One student added a further explanation that the software allows for direct instruction that might not be otherwise possible.

Student 7: I think that it's the same concept where you come in, you sit down. Instead of taking your books out, you log on to the computer and you open the software. The software is very visual and I don't think that the teacher could help unless we're all
standing over and crowding him around the piano and that just doesn't make sense.

Unless we could interact through the computers.

All of the students described that the primary means of instruction comes from the instructional software. Students were asked to further describe how else they have learned to play the piano. Most students described their teacher’s ability to help them further when they are having trouble performing adequately.

Student 1: The computer helps you understand the mistakes that you made if you get a bad grade, but when your instructors teach you, when you ask your instructor to help you, he kind of clears it up for you and helps you understand it more versus the software.

Student 3: The teacher teaches us scales and the things that the computers can't teach us, like you know rhythm and playing the notes correctly, tempo, things like that, like the fine tuning things that computers can't really get to. That's what our instructor works with us on.

Student 5: The teacher taught us the skills that would help us play things better...

Student 6: Basically, you just have to either study it or just keep practicing it. If you still don't get it, just ask for help.

Student 7: I finished the program, so I just go on the internet and learn songs off there. It's a lot easier for me to learn songs from YouTube watching other people play because that's how the software taught it. I mean, there were notes, but it was just a lot easier to visually see it. That's what I'm currently doing, and it's helpful. I've learned a lot of new songs.
Student 8: Other than learning from the software, if you do have a piano at home you can practice on that and read from sheets. Or you can go onto the website and learn other techniques to learn on the piano and more songs that you would practice on it.

Student 9: Well, you could ask the teacher for help. Or, like what Student 8 said, if you have a piano at home, you can practice there. Or you can practice on YouTube. Watch YouTube videos and then do what they do to help you learn.

Although students recognize that the software is the primary means of instruction, they provided evidence of teacher supplementing classroom instruction. In addition, the concept of using an outside source such as YouTube was also introduced. Further support for using this type of electronic supplementation is later discussed.

Teacher Interview Question: How do you use the instructional software to teach piano?

Student Interview Question: Describe how the instructional software used during lessons?

This question was designed to provide a better understanding of how the instructional software is used within the classroom on an everyday basis. This question was necessary in order to determine how students interact with the software.

Teachers described the students as working independently and working at their own pace each day from the first day of class. Additionally, the teachers described how they introduce students to the program.

Teacher 1: Obviously the very first day of school, I give them a brief synopsis of the class, what they’re going to be learning. By the end of the course, you will be able to A, B, and C, that sort of thing, but then I give them an idea, right, “This is what is going to take place pretty much on a daily basis. You’re going to interact with the computer, with the software. It’s going to teach you things. You’re going to read. You’re going to
interact with the computer in various different ways.” Then I’ll start them with the very first lesson on the software. I’ll say, “All right, sign into your computers. Sign into your accounts, and open up eMedia.” They double click on it. At the very beginning, there’s a video, which basically gives them a heads up on everything that they’re going to be learning in the course as well. The first lesson is the video along with some prose that describes, gives a little history on the piano, and it gives some instruction on posture and some of the very, very basic, basic things. They’re really diving into the software right from the get-go pretty much.

Teacher 2: At the start of the course, I explain to the students, obviously, I go through the normal syllabus stuff on the first day. This is how you're going to be graded. I tell them that they need to bring headphones. The headphones is for them to plug in to the computer and that will allow them to both hear themselves playing through the computer and in the software. There's occasionally videos by a professional pianist who did the videos for these software. That will allow them to hear the audio on those videos. Also, there are background tracks that they can along to that is supposed to make it more fun, make it seem more like you're playing with a group of people in ensemble instead of solo. Also, it will play the piano piece that it's expecting to play for you so you can hear it so you understand what you're supposed to be expected to do as well. I tell them how all of that works. I walk them through the program, everything that they need to do and tell them where all of the important information is in the menus and what everything means. Then, after I give them log in information, I tell them to go ahead and get started. The software pretty much takes care of everything literally from lesson one. It teaches them how to read the music. It teaches them how to read the notation, quarter notes, half notes,
all sorts of things. It teaches them how to place their hands on the piano. It teaches them what technique to use, how the whole demands on the piano. Literally, from lesson one, the program covers pretty much everything you need to do once I explain how to use the program.

Students discussed the ability to continue working at their own pace, picking up where they left off, receiving visual cues from the software and having the ability to continuously practice a section until they have successfully obtained the appropriate knowledge. Some quotes pertaining to these themes are as follows:

Student 1: After the class is over, you log out, and then when you go to class again the next day, you log back in, it will log you back into the chapter that you were in and the place you were in with that chapter, and you can start from right there. Also, you get to go at your own pace, and it's also a lot more fun than just sitting in class and getting a lecture.

Student 3: It has it's, I guess, pros and cons, because going at your own pace is really nice, because for me, I like to do a lot of fine tuning. I focus on the details, so I do get to take my time a lot and make sure things are perfect. At the same time, though, because I'm also really doing the lesson. When you keep progressing, I guess, it gets a little tiring at the same time, even though it is fun, because it does get harder as you go. So yeah, I guess you got to rise to the challenge, but yet once you get to that certain level, things change a little bit.

Student 5: All you do is play the piano and try to pass each section of each chapter.

Student 6: The software is, basically, used by, if you click a button, it shows a lady playing. She teaches you how all the hand placements should be and exactly how you
should play it. If you click another one, it's like a piano-like button. It, basically, plays the song out for you. It tells you the rhythm and the speed.

Student 7: I know from what I do from the program. When playing the songs you can click a note and it'll show you the position of your hand at that point in time. On your right and left hand, so that you can play the song without having to listen to it and have to keep pausing it. It's a lot easier that way to just go note by note and then do it yourself.

Student 8: What the software does it has several buttons as what Student 6 said, where the position of your hands need to be. There's also another button like Student 6 says, it plays out the song for you. How fast it goes, how long each key should be hold on to. It is very helpful because back in the olden days, if you didn't get a song wrong, you would get smacked in the head with a ruler and said wrong again. The student would have no idea what they got wrong, so they would keep playing it the same way, incorrectly. With this software, it teaches you what you did wrong, how you could correct that next time, and how to perfect that. It really has been helpful.

Student 9: They have a button where you could see where you messed up and you can correct yourself. You can go back and correct yourself again. They also have the speed thing where it clicks every time you do it. A metronome, so you can pace yourself.

Student 7: I want to interject. When you play the song, the notes turn green when you play the right note and they don't turn anything when you play the wrong note, so you know what you're doing is right. It's just the speed that you're not sure, if you're not listening to the song. But like Student 9 said when you're finished playing that song, it gives you a grade and you can click that grade and it'll tell you what notes, specifically,
you played wrong, you went too fast on. It'll tell you the notes you played wrong and what you actually played instead, so you can go back and fix it yourself.

One student further discussed how the teacher sets specific expectations and goals. This is spoken in more depth later on in this chapter.

Student 1: Even though you get to go at your own pace, by the end of the quarter, you also have to make sure that you're at a certain chapter, because the teacher wants to make sure that all the students are together and no one's behind.

Two students then explained that they have or have observed others work independently from the program, learning to play songs found using internet resources.

Student 2: I like how we get to go at our own pace, but I'm sometimes the one who gets a little bit distracted but not by the thing I'm learning, but I know what I want to learn sometimes, and so I forget about the program sometimes, and then, I kind of learn on my own. So I like it at the same time, but sometimes I get distracted, but I still get the work done. Sometimes I'll be learning the song on the computer, but then, I would break away from it and then learn what I want to learn.

Student 1: Going back to what Student 2 said, I think what he means is sometimes students, instead of working on the program, they go on the Internet, and they go on YouTube, and they play songs that don't pertain to the program.

This was also observed in the classroom where multiple students were seen exploring YouTube teaching themselves other songs. One student in particular was viewing a YouTube video and the researcher observed her watching an instructional video of a popular song. The student was observed viewing and pausing the video, placing her fingers on the keyboard appropriately. She resumed listening to a section, paused again, played the song and rewound
the video thereby starting the process again. All of this was independent of the instructional video.

Teacher Interview Question: What benefits do you believe the program offers to the students?

Student Interview Question: What benefits do you believe the program offers to you?

Both teachers perceived one of the greatest benefits to this program being the students’ ability to work independently and at their own pace.

Teacher 1: Mainly it’s the ability to work at your own pace, and it offers for me as a teacher to be able to do a lot more one on one training.

Teacher 2: I think the best thing that the program achieves, in the terms of what we are asking it to do, in our environment, is it allows each individual student regardless of the amount of expertise and prior experience that they have to work at a pace that is comfortable for them. This year, actually, I had two students who have already finished the program, all 320. Both of them told me that they had some previous piano experience. That aided them in getting through that.

Additionally, both teachers discussed the importance of setting goals and objectives that would motivate students to move forward. One teacher provides students with extra credit to reward those students who move forward more quickly and at a high rate of achievement.

Teacher 1: It also of course, as I said before, allows them to work at a pace that’s comfortable for them without of course… Obviously everybody has to be say done with chapter one by a certain date, but kids are free to move forward if they want to without any penalty.

Teacher 2: What I do in terms of progress is I keep track of where everybody is and I set reasonable, attainable goals and I tell everybody, for instance, next Friday after 7:00, it's
due. They know that they have goals to work for and they have certain achievements that they're supposed to be getting or reaching but it still allows them to move at their own pace. The students that achieve beyond what I have expected them to do, I have offered ways for them to receive extra credit for what they're doing, bonus points towards their test grades to acknowledge the fact that they are moving quickly and achieving at a higher level than everybody else.

One teacher also discussed that while students are utilizing the software, he is free to work with students individually on specific issues they may be having.

Teacher 1: If I need to see a student or I recognize a student is maybe having difficulty with a certain lesson, I’m a lot more freed up to venture off into the classroom and go to that child’s station. I’ll say, “All right, let me see how you’re playing this.” Then they’ll show me exactly what they’re doing, and from there I can see, okay, they’re not holding out their three-finger long enough or they’re not playing that with a specific articulation that they’re asking for, staccato, legato, whatever, and then it frees me up to do a lot more one on one instruction, which is fantastic.

Students reiterated the benefit of being able to work at their own pace. Further, they expressed that the ability to work at their own pace provided an additional benefit which was the freedom to improve on previous lessons. This is achieved by repeating older lessons until reaching the desired goal.

Student 1: You can also go back to certain chapters that you misread for better understanding.
Student 2: What I see positive is that you can go at your own pace so you're not as pressured. I mean, you have a time limit, but you can take your time at the same time and go as you want to go.

Student 4: Also, there's different songs each lesson or level you're on, so you won't have to repeat the same one all the time.

Student 5: If you mess up on something, like you don't have to get a bad grade, you could repeat as many times as you want until you get the grade that you actually want.

Student 6: I think the software offers that it can teach me how to play the piano because I always wanted to learn, but I never had a tutor or anything. This class, basically, helps me. If not that, I could also try to look some things up on YouTube or on other websites to try to teach me how to play.

Student 8: It is very beneficial this software, eMedia because it teaches you so many things, and it helps you if you've made mistakes on songs or on certain keys. It'll tell you what you did wrong and tell you how to do it. It teaches you several songs, several techniques. It teaches you several things such as staccato or how to play the song more gradually and then more soft at the end. It teaches you so many things that you already know, but then you don't know. I think that's very helpful and very fun for some students.

Student 9: In my opinion, this software is good because it helps me learn the piano because I always wanted to learn the piano. It helps me with key placement. Where to put my hands, how fast to play it, how slow to play it. It helps me a lot.

Teacher Interview Question: What drawbacks does the software have to instruction?

Student Interview Question: What drawbacks does the software have to your learning?
When describing drawbacks, both of the teachers discussed a feature of the program, an electronic metronome, which helps keep students at a steady pace. One teacher then explained that the program does not always provide appropriate instant feedback to help improve student’s rhythm as the keys are being pressed.

Teacher 1: There’s a metronome setting in the software, which is fantastic, and I highly encourage all the students to use. In fact, I’m thinking about making it mandatory. What it does is it provides a very steady tempo for kids to play at. When say you’re supposed to be holding out say a whole note with your right hand, and say you’re supposed to be playing two half notes with your left hand, in the time it takes to get finished with the one whole note in your right, you will have done, finished your two half notes in your left, so if you lift your right hand up sooner than the two half notes are done in your left hand, it will recognize that, and it will actually detract from your score. It does recognize note lengths as you’re playing. The problem with that is as you’re playing the correct notes, say you’re looking at the computer screen and it gives you notes to play. As you play the correct notes on the keyboard, the MIDI keyboard, the notes on the screen turn green. They light up green like you played the right note. Congratulations, move on to the next one. Unfortunately, what it doesn’t do is it doesn’t give you an instant feedback, “All right, you didn’t hold that out long enough” or “Maybe you held it out for too long” or whatever, so it gives them a false sense of “Oh, you did this right” because the note turned green. That’s really one of the main, I think the only main drawbacks of this software is that even though the notes are turning green, it gives them a false sense, “Oh, you did this right.” What I find is as I’m walking around the class, a lot of the kids are just plunking through the notes just to get through them and not really paying attention to
the note values. Then at the end of the lesson, they’re like “Oh, why did I get such a low score?” What a lot of them don’t do is they don’t click on the actual score. If they clicked on the score, the number of the score that pops up afterwards, it actually goes back into the music and it says, “You didn’t play this long enough” or “You didn’t hold this out long enough” or “You played this too quickly.”

Teacher 2: One of my biggest complaints about this software is the highlighting. When it highlights and it says that it's green, it goes green when it's correct. It only applies to whether or not you press the right keys on the keyboard. It doesn't apply to when you hit them. One of the most common confusions that I get from my students is I hit all of the right notes. It was green the whole time but it gave me 50 somewhat percent. Why did I only get 50%? When I have them play it for me, I realize that they did the play the correct notes but they did not play it in the correct rhythm, therefore, the song was wrong. I wish that the program offered some more immediate feedback on rhythmic accuracy so that it was more understood. In order to make music, you need both pitch and rhythm. The software is only immediately acknowledged in pitch. It's not immediately acknowledged in rhythm. When it is done, it will pop up and give you certain items and say, "You are late here. You hit this note early." Things like that. That's an automatic pop-up first of all. If they're confused about what the grade is, they have to go click something in order for those to pop up. Like I said, it's not an immediate gratifier. It doesn't immediately tell them what they're doing right or what they're doing wrong. It tells them after the fact and it's hard for them to remember especially with no piano experience, no musical experience. It's hard for them to remember after the fact where they went wrong and how they went wrong.
To overcome the issue relating to rhythm, one of the teachers spoke about underscoring the lessons taught by the instructional software by providing demonstrations.

Teacher 2: At the beginning of the course, just to make sure that everybody is on the same starting point, even before we go in to the program because the program covers those things as well, I will also go through a unit of basics of music. I tell them how to find pitch on staff and I would tell them how to read rhythm and give them some brief examples how to put the two together, and then I'll tell them to go into the software which the software reinforces that in the first ten or 12 lessons, and then continues on from there. I do teach them the rhythm and I help them with the rhythm as it goes along. That is just one of the things that it's not, like I said, an immediate gratifier. It's not something that allows them to know instantly what they're doing wrong.

Both teachers were asked if there were any other drawbacks, between using software for instruction versus traditional piano instruction in a similar classroom piano lab setting.

Teacher 1: I’m going to have to say no because in order for the amount of learning to take place between all the individuals, it’s impossible for one teacher to be everywhere at once. One teacher can’t be 24 different people over the shoulder of somebody for 49 minutes during the period, so at least it’s better to have a software that’s giving you feedback that’s pretty darn good feedback too than it is to have, say you’re a teacher. You’re making the rounds, and a kid is practicing something. Say they’re practicing Jingle Bells or whatever and they practice it, and they’re the last person that I get to. Say they’ve been practicing it wrong for 10, 15 minutes before I get to them. They’ve learned bad habits, so they’ve learned it incorrectly. Then they have to divorce what they’ve done for the last 15 minutes and then learn something a completely different way of
doing it whereas if they have the software that’s telling them... They’re allowed to practice with it. They can practice with... The software’s giving them the constant feedback, “No, you did this wrong” or “You need to do it this way” or “Try it with a steadier beat” or something like that. I’m going to have to say unless it’s a private lesson, a one on one private lesson, then this is a better way to do it.

Teacher 2: Customizability. Can’t really tailor to the strengths, or more specifically, the weaknesses of the class as musicians. That being said, I can’t imagine trying to do this class with 25 kids without the software. Because with all the varying levels of expertise and experience, differentiating instruction for all levels in that class would have been a nightmare. I would have moved too slow for some, or too fast for others. This computer-driven model allows for differentiated instruction automatically.

It is interesting to note that both music teachers agreed that without the software, it would be difficult for them to be able to provide quality differentiated instruction to each student in the class.

Students also indicated that the instant feedback that the computer provided regarding rhythm was an issue for them.

Student 3: For this specific program, with the piano, because you're playing music, one of the drawbacks is that even though you pressed the right note, like I said with the whole tune and rhythm, that might not be correct, and although I want to make sure that you're hitting the correct notes, which is always good because I want to get that figuring and placement down. Just for this specific program, a drawback is that it's unable to tell whether you have the rhythm and tune correct. You can get a bad grade, and even though
you're hitting all the right notes, you keep wondering, "Why is my grade so bad?" And then, that's one of the factors.

Student 5: The computer doesn't really see how you're doing it. It just takes the notes that you're hitting, and then, you wonder how you're getting the bad... How he said, the rhythm, because I kept getting a bad grade that I really didn't want, and then, I asked the teacher to help me, and then, he helped me with the rhythm and stuff, and then, I got a better grade at it. I think the teacher is a little bit better than the software to have, because he sees what you're doing.

Student 1: Going back to what Student 5 said, the software, whenever you make mistakes, you can click on it, and it'll tell you what mistakes you're making, but sometimes, it can be difficult understanding what they're talking about. So then, when you talk to your teacher, your actual instructor, they can make it more clear for you and actually will give you an example and play whatever it is that the computer is asking you to play, so I think that helps better.

When asked further about the teachers’ ability to provide assistance, one student added,

Student 3: I mean, on certain occasions because you can listen to the song and everything on the computer, but just seeing your teacher do it is sometimes what you need.

A few of the students stated that they also found the software to get tiresome or repetitive. For example:

Student 6: One thing I don't like about the software, it gets annoying. It's too much songs to play and if you get it wrong or if you get a bad grade, you have to keep playing. You have to keep playing just to get a good grade. In my experience, I kept replaying it
for about, maybe 20 times. Close to a day, a day and a half or so to get a good grade on it.

Student 7: It definitely gets tiring. The software is boring after a while. You come in every day and you play and it's sort of a lot. You just keep going, and it's just tiresome.

Student 8: I'd like to add on what Student 7 said. Although it is very beneficial and it is very helpful, it does get repetitive, boring. You hit the notes correctly, you get a good grade, but you keep playing the songs. Sometimes there are songs that you don't want to play or they're too boring. Even though it is beneficial it does get stale over time by just playing song after song whether you like them or not.

However, when Student 6 was asked if he had tried asking the teacher for help in that particular instance, the student responded “no.” Further, one student stated that technical difficulties with the software led to some frustration.

Student 9: I've had incidents where my progression had deleted itself. Sometimes the program would pick up the sound very late whenever I played the keyboard.

Student and teacher perspectives on the issue regarding the software’s feedback were similar and demonstrate an important theme that continues into the next question. The following question was asked to teachers to understand what they believe might improve instruction for students.

Teacher Interview Question: What can be improved about the instructional software?

Teacher 1: It’s hard to learn, and they do go into some music theory. I would prefer it to be a little bit more. I understand it is a piano software, but for me, piano and music theory, any kind of music class and music theory go hand in hand. Maybe a little bit more music theory integration, circle of fifths, modes, stuff like that.
Teacher 2: I think that the instructional software should have something like that in the rhythms department to make it know. Perhaps, something from my standpoint, would be maybe to put arrows underneath of the notes after they hit it, so you still highlight green and say you hit the right pitches but that arrow to the left means you hit it to early and that arrow to the right means you hit it too late so that they have a general idea right away what they're doing wrong and how they're doing it. This one, I don't have a good answer to in terms of how to fix it but I wish there was another way to make it more motivating to want to continue through it. It is purely instructional in terms of the fact that it tells you everything you need to know but it relies entirely on the individual student to be motivated to complete each lesson and to keep moving forward. There's nothing precise grade of the percentage that they got correct that is really an external motivator to help them. That's why the teachers are there obviously and that's one of the things that I feel that that software and many other pieces of software that I've seen, but in particular this software, falls short. It needs more motivation so that the students have a reason to move forward. Perhaps putting a game into it or something like that, something that gives them that gratification and the motivation to want to keep moving forward.

Teacher 1 indicated that music theory was a key component which was lacking in the program. Thus, teacher 1 was asked why music theory was important for students to learn.

Teacher 1: It gives them a greater understanding of why they’re playing what they’re playing, like why does tendency tone want to go to this tone? Why does it want to resolve here? Why is it so important that I accentuate this note more than that note? That kind of a thing, so it gives them a greater understanding of why they’re supposed to be playing things a certain way rather than just being told, “No, you’ve got to play it this
way.” The other thing, obviously like I touched on before, is the rhythm thing, the instant green from the right notes but not necessarily the right rhythm.

Teacher 2 stated that the feedback provided to students was deficient and should be improved. He was asked to expand on the feedback that is being given to students.

Teacher 2: The feedback, it's pretty much limited you hit this note too early, you hit this note too late. That's, like I said, when you click on that option and the immediate gratification of the grade and the green highlighting. Beyond that, there is not much that is done in terms of feedback. It's not analyzing the data that's being input from the students. It's not saying, you always have trouble reading a G. You need to figure out what a G is and tells the exercises to that. It's really right notes or wrong notes at a percentage of grade after completion of each lesson.

Later in the interview, Teacher 2 referred back to this question to provide another example of where the software could improve.

Teacher 2: Which reminds me further a question that you already asked. One of the other things that I think the software could improve upon is it always labels notes by the finger number that's supposed to be used. It labels that for a very long time. I believe that the finger number, each figure has a particular number. The finger number is displayed almost through the entire program in all 320 exercises. Kids stop recognizing it as a C which is what I taught them in the first week and what they learned themselves during the first week. They start recognizing it as a one. I've gotten questions a lot from when students who have said, "Hey, isn't that a three? I'm hitting a three. It says to hit three. I'm hitting three and that's not right." You're using the third finger but are you hitting the right note. They identify too easily with the number and not enough with the note so that
when your hands are not in group positions, the first position that it teaches you, once your hands start to move, they have no idea what those notes mean anymore.

Teacher Interview Questions: What skills or training is provided to students on the instructional software?

This question was asked to the teachers to understand what skills are being taught by the instructional software. Both teachers discussed the basic skills that are necessary to learn to play the piano.

Teacher 1: Some music theory. Training, the basic, basic concepts, staff, note names, letters, beat values, note … or I should say when I say “note names”, I’m inferring A, B, C, D, E, F, G like the notes of the musical alphabet but also quarter note, half note, eighth rest, things like that. Later on, they do touch on dynamics and articulation, so those basic concepts. Skills, they’re learning how to keep a… musical skills, they’re learning how to… you can always edit that out. As far as musical skills, they’re learning how to perform to a steady tempo. They’re learning accompaniment skills as well, the difference between melody and harmony in accompaniment as well. It’s in chapter four, I believe, where they go into it’s actually you’re required to accompany a melody. The melody is being played for them, and they have to play the accompaniment for them, so they’re not necessarily playing the main melody of the song, but they’re accompanying it, which is kind of cool. Other just basic piano skills, posture, finger strength, coordination, like hand/eye coordination kind of thing, being able to… In a way, it’s also similar to typing, in that they teach you home row and being able to look at something like on a sheet of paper, or a computer screen and not have to look down at your fingers to know exactly
what you’re supposed to be doing but just kind of knowing from muscle memory where
exactly your fingers are supposed to go.

Teacher 2: It's basic music notation reading. Basic dexterity or finger motion, things like
that. It also does give brief synopsis of history of piano, where piano came from. It will
discuss some of the key composers and things like that that are happening throughout the
piece.

The following questions relate to the training that was necessary for both students and
teachers to utilize the program.

Teacher Interview Questions: What skills or training did you need in order to teach using the
instructional software?

Student Interview Question: What training was provided to you on the instructional software?

Both teachers and students described being able to learn the program on their own with
little training. Students specified that they were provided some training on the program to start
but it was easy to follow. Students indicated that their performance increased in direct
correlation to their understanding of the instructional software.

Teacher 2: I wouldn't say that I needed training. I needed time and experience on the
software to understand it and work with it. That was one place that I felt short a little bit
the very first time that we used it. We walked in on the first day of school and headed to
this software we're using and there wasn't much of an opportunity for us to explore it and
figure out how to use it ourselves before teaching the students how to use it as well.
Obviously, by the time we did it the second time, and now the third time, it was much
easier because we're now familiar with the software.
Student 3: The software is mostly self-explanatory, because it has an intro and it tells you about what it is when you first log on, so although our teacher, Mr. C did let us know how the software works and the edges around it. Mostly, it was self-explanatory, on the software itself and just picking things up.

Student 5: We learned really quickly, I guess. Some not better than others, but we adapt to it, so I guess, I like it has its own introduction and stuff and it tells you exactly what to do, but you're not exactly knowing exactly what to do, so you adapt to it and get used to it as time goes on.

Student 1: Going back to what Student 5 said, at first, I did very poorly. The first half of the first chapter, because I didn't really understand the program very well, but then, after a while, I started to get used to it, and I was able to go back to all the assignments that I did really bad on because I knew the program after a while and I was able to correct those grades and eventually get an A in the class for the first quarter, so that was very helpful.

Student 6: In my opinion, there really was no training. The only thing the teacher said was just log on and showed us the program and we just started it like that, but before he introduced us to the program, he taught us how to read the notes, like a treble clef or a bass clef.

Student 7: When we got the program, he [teacher] told us to read the introduction, which is just sort of how to use the piano and what the notes were and following the videos, doing those. That's what we did in the beginning.

Student 8: In the beginning there were technical difficulties in the beginning of the year. In the middle of that, we learned how to read the notes. We learned bass clef and treble
clef. Then after that we just went into the program and the introduction, and that taught us the very basics of the piano and that's when we progressed on.

Student 9: We also had an instruction video where a lady taught us, at first, where to put our hands on the keyboard. How to shape our hands so that way we could play straight. It [eMedia software] had a little bit of reading at the beginning. We had to read what to do, how the notes looked.

Student Interview Question: How comfortable do you feel using the instructional software?

Each student discussed that they were comfortable with the program and provided examples of the ease of use with the software.

Student 1: I feel very comfortable using it. I really enjoy how the program allows you to highlight certain parts of the song and work on that consistently, so that you become better at it, because sometimes, there's a part of a song that you just don't get and everything else you do get, so you can kind of spend all of your time working on that and then play the song and getting a really good grade.

Student 2: I actually didn't have a problem with the program in the beginning. I guess, because I mostly teach myself most things, so I didn't have much of a problem. So the program is pretty helpful too, as well, so I didn't have much of a problem with it, learning and everything.

Student 3: I feel comfortable using it. There are some things about it when you get to highlight notes and everything to see what keys it's on. The actual software itself and maneuvering around it, I feel comfortable with that. It didn't take long for me to adjust to it, so I feel comfortable actually maneuvering with the software and clicking on the
options bar and everything, bringing the metronome up and stuff like that and all the tools
it has, so yeah, I feel comfortable using it.

Student 4: I do too, because I already know it and I'm used to it, and I know what to
expect.

Student 5: I feel very comfortable with it. I mean, there are some sections that are kind of
difficult, but then, if you keep practicing and keep doing it, you eventually get a good
grade and pass on.

Student 6: I feel very comfortable using it. However, I don't really like it because it gets
annoying like we said awhile back.

Student 8: I'm very comfortable with the software. It's just that it is very beneficial, but
you just play the songs. Unless you really love the songs, it really isn't all that fun. Other
than that, it is very beneficial. It's just very stale.

Student 9: I'm comfortable with the software. It's just that you play the same songs over
and over again.

The next two questions were asked to the teachers to determine how they planned their
lessons to utilize the instructional software and what instructional methods they implemented
when teaching with the software.

Teacher Interview Question: How do you plan your lessons to utilize the instructional software?

The teachers discussed that they provide direct whole group instruction at the beginning
of each chapter to provide students with a basic knowledge of what they might expect within the
software’s chapter. In addition, teachers explain that they have scheduled objectives that
students must meet.
Teacher 1: I do it by chapter. A lot of the kids, obviously, they’re going to go at their own pace, but I do say, “All right, you need to be done with say chapter two by October 6th” or whatever, and I’ll go over… I’ll look at the main themes of chapter two, and I’ll give a lesson, say if the lesson is dynamics or whatever, “You can play a passage of music, like a recording of a passage of music”, and they can write down say “What times did they go ‘piano’?” or “what times did they crescendo?”, “what times did they go forte?” and then we can touch on different dynamics. That way, they can apply what they’ve learned into their own performances.

Teacher 2: The vast majority of the lessons are walked in at the beginning of the period, sit down at your computer, log in and work. I have certain checkpoints. For instance, at the end of chapter seven is when I usually introduce the pop culture of piano playing stuff just because at the end of chapter seven is about where they have received the skills that I feel are necessary to understand some of the concepts that I speak to them about in the pop culture thing. There will be checkpoints based on that. Early on, also, I give quizzes, playing test about certain exercises just to make sure that they’re understanding the way that it's supposed to be used.

Teacher Interview Question: What instructional methods do you utilize when teaching with this software?

Both teachers described using other forms of technology such as an interactive white board (Promethean) to help them demonstrate finger placement using pictures of visual aids. In addition, one teacher mentioned using audio to describe different sections of a song and videos to depict correct finger placement.
Teacher 1: It’s a lot less than the actual software because the main means of instruction is the software, and they’re spending most of their time doing that. I do use some visuals. When I’m teaching the scales, there’s the SMART Board, or the Promethean Board. You can throw up a picture of a piano, and I can literally draw on it the number, your finger numbers that’s supposed to go on each key, so your thumb or your one finger is supposed to be on A. Your two finger, I draw a two on the B, a three on the C#, and stuff like that. Those are the kind of visual things that I can use. Auditory methods, like I had explained before, you can play a recording of a song, say, “At what points did they go, piano points did they go forte?” Did they crescendo anywhere? What other dynamic contrasts were brought into the piece?” that kind of a thing.

Teacher 2: There is lecture base. I also will show things. I use the promethean board in the room to show various things. PDFs of music to demonstrate things. I'll show them, that's how I first demonstrate the program as I pull it up on the promethean board and do it right there. I'll show videos on there. I will lecture. I will use the whiteboard to write on. Also, like I said, I do demonstrations. I play the piano for them.

The following question was asked to students to gain a perspective on the differences between a class taught through instructional software and other more traditional classes to which they may be more accustomed.

Student Interview Question: How is learning from the instructional software different than traditional means in other classes?

Students discussed enjoying the ability to work at their own pace without being “[held] back.” In addition, most students again described the importance of the role of the teacher in the class to help them when they are struggling on a section.
Student 2: It's different because the computer can teach you something, or the software can teach you, like for us in our case it's piano, so all right, we have the computer, so it teaches us the cover of it, so like the top of it, while a teacher teaches you the thing more deeper and gets more detailed into it, so you can understand it more than just seeing it and then you don't know what you're doing. The teacher helps you in deeper parts of what you're trying to learn.

Student 5: I feel like the software is kind of helpful in a way, but the teacher, how Student 2 said, he teaches you more secretly stuff, like more technique and that the software doesn't get to teach you, like the rhythm and things like that. Like, you can learn from the computer, the software doesn't teach you how to do the rhythm. When you click on mistakes, it just tells you that the rhythm was off or something. It doesn't really teach you how to get the rhythm, and the teacher does. He teaches you how exactly you're supposed to do it to get that rhythm and get it going and pass that section of the software, yeah.

Student 1: I think the software does teach you the rhythm and all that, but when the teacher is there, he just makes it easier, because he's the one that's actually there and he's showing it to you step by step.

Student 3: I guess, but the reason I like the software is for the reason that you can go at your own pace, and like in a classroom, there's always deadlines and there's still deadlines with the software, but it's different, because there's nobody else to really hold you back but yourself with the software, and there's not really an excuse. So that's the reason I like the software, but like everybody else said, the whole reason I like teachers in
the traditional way is because you get in depth with everything, and you get to fine tune stuff.

Student 6: While learning with a teacher itself, it can teach you lots of different things. However, they can't teach you visually that much because some teachers teach visually. Some teachers just teach as in just saying things and not really drawing it out or mapping it out or anything like that. While the software itself or the computer, it does everything visually.

Student 7: I think for this type of class, the computer software is very helpful. I'm not sure how a teacher could physically teach piano to a group of students. There isn't enough resources for that. Actual pianos to do that. I think that if it was a math class, it would be a lot easier if it was a teacher teaching it and showing us different ways to do it rather than a computer.

Student 8: Using this software, other than being in a traditional class is different in a positive way because in a traditional class, there are very few students who can keep up with the pace of how the teacher teaches. The rest are either confused because they can't understand the lessons fast enough or students are bored because they already know the lessons. With this software, everyone can go at their own pace no matter how slow or how fast they are. I believe it is very beneficial because everyone can go at their own safe pace without any worry.

Teacher Interview Question: How is the student's musical progress on the piano assessed?

Student Interview Question: How is your musical progress on the piano assessed?
Both teachers clearly stated that students are assessed using the program. The program stores each student’s grades and provides feedback to students as they progress through the chapters.

Teacher 1: It’s assessed through the software. The software will give a grade for every lesson, and that’s based on how well they stuck to a consistent tempo, how closely accurately did they hold out each note out for according to that tempo. Was each chord note played as one beat or did they hold certain notes out too long? Were certain articulations done? Did they play staccato? The software will actually assess each lesson. It will give them a grade for each lesson, which is fantastic because if they didn’t do so well, they can just go back and do it again until they get it right.

Teacher 2: I would say that's done through the progress they make in the program. The ones that have already finished chapter 12, all 320 lessons, obviously more musically advance at this point than the ones that are still working on chapter six and seven right now. The software is broken in chapters that isolate certain skills that they need. Chapter one is used in all black keys because it's the easiest ones to label and recognize. Chapter two moves to the white keys and start to incorporate those things. Chapter four, I believe, starts using both hands at the same time as opposed to one line moving between the two hands. Now, there's one line in the left and another line in the right. Each chapter has a certain progression to it. It's a logical progression in how to play piano.

Both teachers were then asked the methods they use to track student progress. Teachers explained that the feedback is provided to them and noted the simplicity with which students’ scores are presented.
Teacher 1: There is a teacher tool that comes with the eMedia software, and it allows me to see the progress of each student, how they did in each lesson, which scores they’re getting for each lesson, if they skipped over certain lessons, and it actually gives an average for each student. It does all the math for you, which is fantastic! Then what I’ll do is I’ll average that score with my own supplementary stuff like the scales and whatnot, but the majority of the weight of their score is the piano software.

Teacher 2: The student progress is stored. There are several options in the software. The one that we choose is through local area network. It's saved on a hard drive on a network drive. There is an instructor tool that is available on my computer in which I can pull it up and I can see pretty much in my time. It's probably about 15 seconds behind where I can see where each student is, what lessons they're working on at the time, what lessons have been giving them trouble, what grades they got in every lesson through there. Also, we use another external software program called LanSchool which I can open up and I can see straight on their screen what they're working on and how they're working.

Teacher 1 later explained that the feedback provided to the teacher regarding student performance is lacking in respect to incorrect tempo that students may be playing.

Teacher 1: It won’t tell me like they’re not sticking to the… say if they’re not sticking to the tempo well enough, it won’t give me that. It will only tell that to the student.

In describing the usefulness of the feedback that the software provides to them, two students found the feedback they received to be motivational. Furthermore, students stated that if the immediate feedback they receive is poor, they become motivated to repeat lessons to improve their grade.
Student 1: There's actually the section of the program that you can click on and it says progress, and you can see how you've done on each chapter and on each section of each chapter. If you see that you got a really bad grade, it'll literally have a number. Things that are 89 to 70 or 60, get these little yellow marks and failing grades all get X marks, like these big X marks, so then 90s and above get these check marks, so most kids are really encouraged to get those check marks, because they're really annoyed by the X's and the yellow marks, so it kind of encourages them to get 90s and do really well in the program. So that's basically how we're graded. That's actually very motivational, because a lot of kids hate those little yellow marks, and they'll go, "Okay, I can't see that anymore. I need to get that check mark." What the teacher does is, I think, he averages it out and if your average is an A minus or an A, then, you have an A for the quarter or whatever.

Student 5: Going back to what Student 1 said, it is very motivational, because I don't like to see the yellow circle thing on my grade, but sometimes, I try really hard to do it, but I just can't, so I just move on, and then, when I practice more, then I go back and get my check mark.

Student 7: Your grade is based on your performance on your songs. You're graded on your songs. Then you can check it. If you go something progress, record, progress, and it tells you what you got in all the songs. Like Friday Chapter 7 is due. If you have check pluses on checks, you'll be green checks. Then a yellow star if you get an 80 or something or 89 and below. Then a red x if you fail. Just based on that for each chapter. If you're ahead from what is due, then you get extra credit on what you've done.
Student 8: You are graded on all the songs that you've done in one lesson. When that one lesson is due, your overall grade is practically the overall of all the grades of the songs that you've done. In all of the songs, if you did around an 80% or a 85 or a 90, the overall grade is going to be between an 80 or a 90. If you’ve done maybe around 60, 50 70, a couple of failed, if you failed a couple of songs, your overall grade is going to be very low. I think it is a very good way of how to grade it.

Student 9: They have a progress, a list of all the songs and all the chapters and all the lessons. Just like what Student 7 said, they have checks. If you have 100’s, diamonds. A yellow diamond if you have an 80 or below. A red circle if you have pretty much a failing grade on there. Then I would say the teacher gives us a week before a lesson or a chapter is due. Then based on the overall that we got, he'll grade us on it. If we have a 90 or an 80, it'll be in between 80 or 90. Like an 85 or so.

Teachers were asked the subsequent question and follow-up questions to determine whether or not students’ progress at the same rate. The researcher wanted to know how teachers enhance their instruction for those students who are moving through the lessons quickly versus those who are struggling with the computer-assisted lessons.

Teacher Interview Question: Do Students Progress at the same rate?

Teacher 1: You find that there are some students that some tend to be a little bit lazier. Their mind wanders a little bit, and you’ve got to get on them, but then there are the students that have taken piano for a few years before or they stopped playing maybe a couple of years ago, and they’re able to just breeze right through everything. I have a student right now that’s on lesson 290-something. I have another kid who’s on lesson 95.

Teacher 2: No, they do not.
Follow-up Question One: How do you supplement instruction for those students who move quickly through the program?

Both teachers discussed supplementing the instruction. One takes advantage of the opportunity to provide one-on-one instruction to those students who are advancing quickly while the other allows students to use YouTube for instructional tutorials to “broaden their musical horizons.”

Teacher 1: That’s tough. A lot of them, it’s… again, because this is the first year, I’m having to … I wasn’t like for those … it’s only like two or three kids that are on much later lessons. It’s hard to predict who’s going to do well unless you have the back story on everybody. I have one student, she’s on 290-something. Let’s call her Sarah. Sarah is working with the pedal now, right, and nobody ever had to use the pedal before because nobody’s ever gotten that far. The great thing about the software is that you get that one on one instruction. If she has questions about the pedal or if she has questions about “What is … it says … am I playing this too … this staccato passage, am I lifting up soon enough or am I” whatever. You can give that feedback instantaneously. There’s really not much else really to supplement that the software doesn’t already cover at those later levels, at least not that I’ve seen. If I wanted to, I could take them out. I wouldn’t want to stop the whole class just to supplement some things for just a few kids. I guess I could pull them aside at some point and say, “All right, let’s just” … these two or three kids. “All right, let’s talk about natural minor scales for a second and the difference between all the natural minor versus melodic ascending” or something like that. “Let’s go over key signatures.” That would probably be the next thing to do would be get them all the key signatures learned. Something like that would be a little bit more advanced.
Teacher 2: Yeah. One of the things that I do is once they've finished the software, I will often allow them to go learn a song that they want to learn, give them an opportunity to broaden their own musical horizon from that standpoint and advance themselves. It is instructional tutorials on YouTube where there are plenty of. Some of it is looking up for sheet music online and learning how to do that. I will often check in on them and make sure that they're not having any troubles doing what they're trying to do there as well.

Follow-up Question Two: How do you supplement instruction for those students struggling with the program?

Both teachers stated that students who seem to struggle appear to have trouble finding motivation to continue without the teachers’ assistance. For example:

Teacher 1: The problem with the kids that are struggling. It isn’t necessarily a problem of them not being good enough. It’s really just a problem of focus, so helping them to focus. It can be difficult because especially for the long periods, but I try to give them a break in between those long periods to help that out. For the kids that are just sitting there and their mind wanders and they just stop playing, you’ve got to get on them a little bit, and I try to encourage them by coming up to their station and saying, “Let me hear how you’re sounding on this” or “Let me hear how you play this.” It’s just a matter of saying, “All right, well, you know what? You did this really, really well. Keep doing that. What would make it sound even better is this” and treat them like a musician. I find that that positive encouragement, you treat them like, “Hey, you’re a piano player now. You’ve learned how to play piano.” Everybody’s a … you’re always a student when you’re a musician. You’re always learning more and trying to get better as a musician,
but the moment you start to make music, you become a musician. You’ve got to try to treat each kid that way. That tends to help focus.

Teacher 2: I often will sit with them, and try to help them, and explain to them in ways that I've been trained as a teacher to do using differentiated instructions and things like that to explain the things that are causing them problems to fill the gaps and knowledge that they somehow missed. A lot of times, in the experience I've had with it so far, most often the things that are missed are because it was written on one of the lessons and they just decided not to read what was written in English and only do the exercises that were printed. I found that a lot of times, when there is an issue, it's more out of laziness or choice not to complete each lesson as designed rather than by a fault of the software itself.

Teachers were subsequently asked if most kids are motivated by the software or if they feel students get bored with the computer-assisted lessons. The teachers seemed to have differing views but one discussed that motivation is dependent on the self-determination of the students.

Teacher 1: Last year, last semester I should say because I only taught it for one semester last year. Last semester, there were a couple of kids that got bored with it. This semester is completely different. Everybody is really focused. Nobody has a hard time with it at all. I think it’s going to have to take a couple of years to really get a better view of is this too boring or did I just get a class of kids that had a hard time keeping focused?

Teacher 2: I do find that they get bored especially when we have the extended period which is 80 minutes of it. Particularly, in those class periods, they get bored. They get unmotivated. Most of it is based on the individual student. You can tell which students
are into it and want to excel. They are internally motivated. They try to keep moving and wanting to keep progressing like those two students that already finished the program. Then, there are students that are not internally motivated at all, even some that are resistant to external motivation as well. That has shown in their progress as well.

Teacher Interview Question: Have student’s been able to play piano without the use of the software?

Student Interview Question: Have you been able to play piano without the use of the software?

Teacher 1: I haven’t tried it yet with this class, but with last year’s class, their final was to bring me a song, find a song that they wanted to play, do some research, bring it into me for approval, and then play it. They would obviously have to practice it, but they would have to play it in front of the class. They’d memorize it and then play it in front of the class. I had some kids that were playing Moonlight Sonata by Beethoven, I had a kid playing Billy Joel, so it can be any genre.

Teacher 2: Yes. That’s part of the pop culture thing that I give them is I teach them how to play some of the more common pop songs and I teach them through getting the sheet music to do so they can read it and play it, and also demonstrate for them and show them how to do it. What I do ends up being similar to that program in that way through demonstration and showing it on paper instead of the computer monitor, but it's different in the fact that I'm not giving the instant gratification or the green highlight every time they hit the correct note.

The teachers’ views differed from many of the students. While the teachers believed that students could play music without the software the students did not seem as confident. Most of
the students believed that they could play at a basic level but were not sure if they could play without the use of the software.

Student 1: I can play maybe a portion of a song from the software without using the software, maybe like the very beginning of it, but I can only do the scales and the scales actually has nothing to do with the software. That's basically what I learned from my instructor, so I can only really do that.

Student 2: I could play without the software, but the software taught me a few of the basic things I should know from playing, and so, I also learned from going on my own, as I said, I would get distracted and play what I would want to play, so yeah, I could probably play without the software.

Student 3: Yes, I can play music without the software, but I'm also familiar with the piano, so that might be an attribute to that, but yeah, the software does help. I play songs from the software that I do like that I memorized, or you could also print out lessons actually. I've done that before, just because I like certain songs or I want to practice them. I do that as well, so yeah, I can.

Student 4: If I would see an easy song, then I would play it, because I already played it before, so I already know it.

Student 5: I haven't tried. I haven't done any. I don't have a piano at home, but I think I'm not sure if I could play, but probably I can a little bit read the music and play it.

Student 6: Honestly, no I haven't because I put a treble clef. I think that's the high pitch or something like that. I could read that. I could read the notes for that, but for the bass, which is the low, I can't read it. The software, basically, just tells you by the hand placement. That's what I use.
Student 7: Using YouTube is very helpful. I know I've memorized a bunch of songs, but reading the notes is still difficult for me. I got a copy of Moonlight Sonata and I don't think I can read that. I've memorized the first movement, I just can't read the notes, but I can memorize it.

Student 8: There are some songs that I'm able to play without the software, without the help of the software, but more complicated ones I'm not able to play them. I'd like to go back on the question that you said before. If there were any drawbacks. I think I see one drawback now. Is that it is so beneficial, it is so helpful that when you do make mistakes it’s there for you. It corrects you. When you get used to that and the software is taken away from you, I think you depend a lot on that help that you need. If you have a good memory, you are able to play songs without the software, but if you're not so great on memory, I think, you're able to play a few songs and I think that's it.

Student 9: I can't play without the software. I can't play on a regular piano because I'm not at that point yet. I could play a few songs, but I still need the extra help because like what Student 8 said. I can't remember that many songs that I've learned on there.

Student Interview Question: Do you feel comfortable reading music without the use of the software?

The students’ comfort with reading music also varied which may be a function of individual student progression within the program. A couple of students identified that in the beginning of the lessons the software would continuously demonstrate proper finger placement by using numbers (which were later removed as the lessons progress).
Student 3: Yeah, I feel comfortable reading music, but not to the extent that I would want to be, so like everybody said, there's always motivation to get better, but yes, I can read music, but I want to be more, I guess, fluid in the way I do it.

Student 4: In the beginning, it shows you which fingers to play. It says 1, 2, 3, and when you get more advanced, then, the numbers go away, so you could tell, you could read the music without knowing which ones.

Student 5: I don't know if I could probably read it, because I did do piano before but with an instructor, and I needed more practice reading it. I still needed to write the numbers on the keys so I could do it, but in the software, I like how it just took them away, the numbers, so I'll know further on that I don't really need it. It just sometimes tells you the letter of what you need to play, what letter you need to play from the piano.

Student 6: Just the treble, not the bass.

Student 7: No, unless I wrote out all the notes then I would be okay. Sight-reading it, I'm not very good at. You have the sheet music, then you can write out the notes like they do on the software. They have the notes available for you, then the finger placement, but I would just write the notes out and figure it out from there. Sight-reading it, no.

Student 8: I can't read the notes on the software and in piano songs because I learned a few techniques of how to locate which notes are in the treble clefs and in the bass clefs. I understand that some people can read notes, then some people need help reading them.

Student 9: I could read notes on the software, but I can't read it on the piece of paper because the software gives you extra help. It has the note and then it tells you how fast to play or how long to hold the note down.
Teacher Interview Question: Has the program helped students’ ability to read music? If so, how do you know?

Both teachers believed that students could read music if it was within their scope of knowledge.

Teacher 1: Oh, absolutely. You know because the software is giving them grades on their performances. If they weren’t reading it correctly, the software would tell them.

Teacher 2: It has for the most part. Like I said, there are those issues about where the students will look at an E and say, "Well, that's a three." That's not what that note is called. That note is called an E. You just happened to use the third finger in the first position. There has been some confusion there but for the most part, they all understand much more at the end of the semester than they do at the beginning how to read the music, how to understand it.

Consequently, the teachers were asked if they believed that students could play songs correctly when given music that they were not familiar with.

Teacher 1: Yeah, it really is dependent on the skill level of the piece of music. As long as it’s something that’s within their range of ability, then yeah.

Teacher 2: If it's within the confines of what they have learned in the program, for someone like that, it might take some time but I believe they could get it, yes.

Teacher 2 went on to state that in order to assess the student’s knowledge of reading music, a song outside their scope knowledge is picked as part of their final.

Teacher 2: On the final, I give them one exercise to do that is beyond what was due in class. Let's say chapter seven is the last chapter that we finished in this semester, I will pick a song that's relatively early in chapter eight, something that is not beyond the skill set that they have
learned but that's still going to be a challenge and something that they haven't done yet. That's part of what their final is based on.

Teacher Interview Question: What do you see as your primary role in the classroom?

Student Interview Question: What do you see as the primary role of the teacher in the classroom?

Teachers saw themselves as guides in the class, providing students with supplemental instruction by using their musical expertise to help students avoid pitfalls.

Teacher 1: I’m there just to oversee, make sure that, again like I had touched on before, making sure that the things that the computer can’t grade are being taken care of like posture, doing the different warm-ups, increasing their finger strength, improving muscle memory. We do warm-ups and certain exercises at the beginning of the class, plus the scales are another thing that are going to help out with that muscle memory. That’s that one, two, three, one two, three, four, five, and the left hand five, four, three, two, one, over, three, two, one, stuff like that that they don’t necessarily, that the computer can’t really see if they’re doing it correctly. I know things that won’t necessarily hurt them now but later on will just totally kill them. Say, for example, you had to play a major triad on C, E, and G. I had a kid last year that insisted on playing it with their one finger, their two finger, and their four finger. Obviously, the computer is going to see, “Oh, you’re playing it with the wrong fingers.” All that it tells you is, “Oh, you’re playing the right notes”, so it’s up to me to make sure that they’re practicing everything with the correct fingering. The most appropriate fingering, for example, this kid, I’ll call him Mike. Mike played with one, two, and three when he should have been playing with one, three, and five, and I really had to stay on him because he just always insisted on that one, two, and three. I know later on when he’s going to have to switch like from the one,
three, and five going to the fourth above the sixth versus the fourth above the base and the sixth above the base, you’re not going to be able to do that with one, two, and three. You’re going to have to be able to do that with one, three, and five, so certain things like that just to make sure that they’re staying true to what they’re supposed to be, like say the different fingering patterns over different, yeah, I guess different fingering patterns would be the best way to put. It’s little stuff like that isn’t necessarily so little, yeah. It’s anything that the computer can’t discern as being right or wrong, I’m there to make sure that they’re doing right.

Teacher 2: I see my role as primarily a, I guess, adviser. Most of the time, I'm observing. I'm making sure that they're staying on task and I advise. I help when students require that help. Sometimes, that role starts to seem more like, for lack of a better term, babysitting where I'm going over to a kid who is not motivated, just not want to keep working on the program and I have to spend a lot of time with him trying to get that individual motivated and trying to get them to continue their work and stay on progress. Other times, I have those students that finished the program and when they want to learn a song and they don't understand something new on those sheet music that was not covered in the basics of the program, I get to go over and teach them what that new skill set they didn't understood, that they never got in the program. It's diverse from that standpoint. I have to fill multiple roles depending on the students and what they do but primarily, I would say adviser is probably the best way to label that.

Students also saw the teacher as a guide and someone who could provide supplemental instruction. Additionally, students discussed the teacher’s ability to help with technical issues that they may have experienced with the computer or software.
Student 1: I see him as guidance, but I also see him as the problem solver of the class. Whenever students are having trouble with their software, even cutting their computer on, he helps them with that, or whenever their computer and their piano keyboard isn't connected, he helps them with that. He also helps students match certain rhythms, tunes, notes, things like that, so I see him as the overall problem solver with anything.

Student 2: I see him as somebody there, obviously he has to watch over us because you can't leave kids alone in a room, but also as a guidance in a way because, like I said, he helps us get through difficult parts we don't understand or we're having a problem with, and he also motivates us too, you know, and he speaks to us. He's like, "Oh yeah, you can do it," and he shows us, and then, we learn as well from him.

Student 3: I guess an assistant role, but it's an important assistant role, like we still wouldn't be able to do it without him so very necessary even though it's not the primary role.

Student 4: I find him very helpful, because if I don't get something the computer's telling me to do, then I'll just ask him. He'll show me and then I get it.

Student 5: I think that teacher is kind of very important in the class, because he helps us with anything that we need, like he helps with any problems we have. If we're getting a little distracted, he'll tell us, and if we're a little behind, he'll tell us. If we need help, he'll help us.

Student 7: I definitely had a lot of technical difficulties with this software. A lot of problems with it lagging, not working. I've had a lot of that. It never erased my progress, but sometimes it just stopped working on me and I couldn't hear anything or whatever. He helped me out with that. Just figuring out what's wrong. Definitely helped me with
that. If I had any other questions I'd ask him, but he didn't teach piano to us. He just facilitated it, and he can look at all of our computers from his.

Student 8: I'd like to add to what Student 7 said. I never really had any difficulty. Although, I didn't have any technical difficulties, I also didn't need any help from the teacher teaching me the techniques of the piano. For me, the position of the teacher is just to grade on what we do on the software. How we play the songs. He says that he grades them, so I just see him as he gets our grades, he average them out, and he gives the grade. I don't really see. Although, I do understand that if you do need any help, he's there for you, but for me I don't see any other importance of the teacher being there.

Student 9: I think the purpose of the teacher is to help us. If a student has a problem, he can show us how to do it or give us an example from his keyboard or show us where the key is so that if we don't know where the key is, if the program isn't clear for us, if we don’t understand it he is there to help us, to guide us through it.

Interview Question: Is there anything else that you would like to state about the classroom? The Software?

Both teachers stated some technical issues that they believed would help the instruction of the class.

Teacher 1: It would be nice just from a facilities point of view to be able to have… the computers by themselves are fine, but the sound cards as they are right now, if they were to use the keyboard as their means of input like they’re doing right now but have the computer be their means of audio output, that would be a lot easier to… because right now, it’s almost like they’re required to have headphones and an adaptor, and they have to unplug their headphones from the keyboard into the computer whenever the computer
has like say a video or something like that or some kind of audio example, and they have to keep on unplugging, unplugging, unplugging, unplugging. Now plug it back in. “Oh, now I can’t hear this.” Just from a facilities point, if they could have a better sound device for those computers, you could have one pair of headphones, plug it into the computer, and then that’s it. You wouldn’t have to worry about anything else, unplugging it from the computer, putting it back in the keyboard. “Oh, now I can’t hear this well enough” and that kind of thing… the latency as it is right now, if you were to press a note on the keyboard and if you were to listen through it through the computer, it would happen like a second later, and it’s impossible to do that and keep a good tempo, yeah.

Teacher 2: Not that I can think of. I mentioned most of what, I believe, are the downfalls of the program and also what I believe the program does well. The one thing that I can think of is actually more of a hardware thing than a software thing. There is a module. I'm not totally sure what it's called but I believe it's made by Yamaha in which all of the pianos can be networked in to one center module. That allows me to look on an individual student at any given time and listen to what they're doing with the piano at that exact moment. Right now, with the current software capabilities that we have and the way it was set up is in the room, it doesn't allow us to actually hear what they're doing on the piano. It only allows us to see what's going on in the computer. Like I said, that's not a fault of the software or anything else. It's just it's something that could enhance the overall program if we were able to acquire it.
When asked if the software offers further benefits in a class of 24 students, as opposed to attempting to teach without the software, Teacher 2 expressed that the program enhances instruction by allowing students at all levels to learn within an individual time-frame.

Teacher 2: It opens up the possibility of all the different variables that are going to enter the classroom on the very first day. I have freshmen, I have seniors. I have kids who have never touched an instrument of any type before in their lives. I have kids coming in who have a couple of years of piano lessons behind them. If I was teaching without the software, I would either be leaving behind the students who have absolutely no experience before walking in or I would be disserving the students who have that experience and don't necessarily need everything that I would have to teach to a beginner from day one. If for nothing else then, to just be able to keep every student moving at all times regardless of their baseline, that baseline of abilities, I think that software is already valuable for that, yes.

When asked if there were any students who did not have previous experience but were intrinsically motivated to learn, Teacher 2 provided insight.

Teacher 2: I have. In fact, one of them, one of the students that had no experience last year in the second semester, I believe, she has now joined one of my instrumental ensembles to play keyboards. She's now even supplementing what she learned in the piano class by what I'm asking her to do now in this other ensemble.

Students wanted to emphasize the importance of the teacher’s role in the class. One student simply stated that they enjoyed working on the program.
Student 1: I think that for the future if students do start using computers to learn, I think that it is necessary to make sure that you do have an instructor in the class to be that problem solver and be that guidance for all the students, so yeah.

Student 3: I just want to say that I do enjoy using the software so just throwing that out there.

Student 5: I think computers should just be used for things like piano and like that to learn basic stuff, like art, yeah, only that, but if you really want to learn something, you want to see more visual, more intense. I don't know how to explain it. You want someone to show you in your face, I don't know.

When asked if the student meant to describe a more hands-on approach, the student responded with ambiguity.

Student 5: Yeah. Well, it depends, I guess, because some students they learn differently. I feel like I learn better with a visual thing and it's a better understanding, and some students prefer better the computer. Yeah.

Student 1: Going back to what Student 5 said about how students learn differently, I think that yes, I think that it is okay to use computer software, but going back to having that instructor in the classroom, I think that that instructor can kind of give you those different ways to learn. They can give you that visual way, and they can give you all the other different ways that you can learn, so yeah.

One student responded to the original question by stating that he believed that having the program available to students at home would be helpful.
Student 8: I'd like to say a few things about the software. It is beneficial, but the software, you only see it here in your class. I'm not sure if you could download it on your computer or laptop. I'm not sure about that, but if you were able to I think it be very helpful because if you have a keyboard or a piano at home, you could practice there as well. Since it can teach you a lot more things than a teacher ever would, it would be very beneficial if you could download it at home and practice there as well.
Chapter V: Discussion of Findings

Introduction

The purpose of this study was to describe how music teachers are implementing computer-assisted instructional software in a high school piano lab as a means to foster a student-centered learning environment. Additionally, this study addressed how students were utilizing the computer-assisted instructional software. The focus of this chapter is a discussion of the data and the themes that emerged from interviews from teachers and focus group interviews with students. The literature review found in Chapter II offered an overview of studies that address topics in computer-assisted learning and student centered learning. Those findings were compared with findings from Chapter IV. The findings of the current study as well as suggestions for future studies are also discussed in this chapter.

The setting for this study was a piano classroom in an urban high school with 2,100 students. In the fall of 2013, the school offered two sections of a Piano 1 class which had an enrollment of 43 students. The piano classroom is a computer lab with 24 student computers, each with an electronic piano keyboard. Each computer has computer-assisted learning software, eMedia Piano and Keyboard Method, installed which is utilized to teach students to play the piano. Each section has a certified music instructor who has access to their own computer and equipped with the same software that enables them to monitor student progress as students’ complete lessons.

Through the lens of the Ecology of Resources, this study described how both instructors and the computer-assisted learning software acted as an MKO to provide a student-centered learning environment. Additionally, the Technology, Pedagogy and Content Knowledge
(TPACK) framework provided a lens to view the interaction and balance between technology, pedagogy and content needed to provide a rich learning environment.

Recurrent Themes

Benefits to Working at Own Pace

One of the major recurring themes that was discussed throughout the interviews was the ability for students to work at their own pace. Vygotsky (1978) described that the learning process occurs when a student receives instruction by a more knowledgeable other (MKO) acting as a guide to provide student with new learning opportunities. The eMedia software, as well as the teachers, depict the MKOs of this particular class. According to Zuckin (2010), the Ecology of Resources framework adds the concepts of the Zone of Available Assistance and the Zone of Proximal Adjustment to Vygotsky’s theory. These concepts are essential in technology to provide an interactive learning environment. The two concepts consist of the interaction between the learner and technology working in conjunction forms the assisted learning process. The needs of the learner is sustained by the technology through the use of activities. The eMedia software provides learners the interactive learning environment through the use of activities.

When Jean Rousseau wrote Emile (1762), he described a child working at his own pace and independently controlling their own learning process through the interaction. This concept is the basis for student-centered learning (Henson, 2003). Further, Frobel believed that allowing students to creatively play with toys and activities opens a forum for students to discover their own learning (Smith, 1997). As a result, student autonomy becomes an important part of the educational process and the use of computer assisted learning software provides a medium for such autonomy (Neal, 2011). Students reiterated throughout the interviews that the software
provided them with the ability to learn at their own pace and the opportunity to control their own learning. For example:

What I see positive is that you can go at your own pace so you're not as pressured. Also, you get to go at your own pace, and it's also a lot more fun than just sitting in class and getting a lecture. (Student 1)

I like how we get to go at our own pace, but I'm sometimes the one who gets a little bit distracted but not by the thing I'm learning, but I know what I want to learn sometimes, and so I forget about the program sometimes, and then, I kind of learn on my own. (Student 2)

Student 8 noted that eMedia affords students the ability to create their own pace regardless of how slowly or quickly they progress. The student went on to say, “I believe it is very beneficial because everyone can go at their own safe pace without any worry”.

Other students stated that the software allows them to go back and learn from their past mistakes which further affords them the ability to control their own learning.

You can also go back to certain chapters that you misread for better understanding. I like to do a lot of fine tuning. I focus on the details, so I do get to take my time a lot and make sure things are perfect. (Student 3)

Student 5 said that “if you mess up on something…you don't have to get a bad grade” as each pupil can “repeat as many times as [they] want until [they] get the grade that” is desirable.

Teachers also found benefits of allowing students to work at their own pace because they had the opportunity to work with pupils who were struggling while also enabling them to provide further instruction to those students who were excelling in their learning. According to Teacher 1, “[the software affords] the ability to work at your own pace, and it offers for me as a teacher to
be able to do a lot more one-on-one training” as opposed to having the student to struggle singularly with the program. Teacher 2 expressed the following:

I think the best thing that the program achieves, in the terms of what we are asking it to do, in our environment, is it allows each individual student regardless of the amount of expertise and prior experience that they have to work at a pace that is comfortable for them.

Teacher 1 emphasized that he recognized that if a specific student is struggling with a certain lesson, he is more free to “venture off into the classroom and go to that child’s station” in order to be of further assistance. The ability to have students learn from the software and work independently allows teachers the ability to work with others individually as the other students continue to learn without assistance. Teachers felt that this point was so instrumental to the class that they could not effectively instruct so many students in a piano class simultaneously without the software. Teacher 1 stated that “it’s impossible for one teacher to be everywhere at once. One teacher can’t be 24 different people over the shoulder of somebody for 49 minutes.”

Teacher 2 echoed this sentiment.

I can’t imagine trying to do this class with 25 kids without the software. Because with all the varying levels of expertise and experience, differentiating instruction for all levels in that class would have been a nightmare. I would have moved too slow for some, or too fast for others. This computer-driven model allows for differentiated instruction automatically.

One student reinforced this idea by stating “I'm not sure how a teacher could physically teach piano to a group of student. There isn't enough resources for that. Actual pianos to do that.”
Benefits of Immediate Student Feedback

The software allows for continuous feedback to students by providing them feedback on rhythm, playing the correct keys and overall performance on each song. As reported by van der Kleij et al. (2012) students who received immediate and/or delayed feedback had the most positive response to their own learning experiences and increased satisfaction in their own learning experiences. Studies have shown that corrective feedback provides students with motivation and important guidance on student errors (Timmers & Veldkamp, 2011; van der Kleij et al., 2012). Students had the ability to constantly check their progress with the feedback provided from the instructional software, their sentiments confirmed the studies previously discussed by stating:

There's actually the section of the program that you can click on and it says progress, and you can see how you've done on each chapter and on each section of each chapter. If you see that you got a really bad grade, it'll literally have a number. Things that are 89 to 70 or 60, get these little yellow marks and failing grades all get X marks, like these big X marks, so then 90s and above get these check marks, so most kids are really encouraged to get those check marks, because they're really annoyed by the X's and the yellow marks, so it kind of encourages them to get 90s and do really well in the program. So that's basically how we're graded. That’s actually very motivational, because a lot of kids hate those little yellow marks, and they'll go, "Okay. I can't see that anymore. I need to get that check mark." What the teacher does is, I think, he averages it out and if your average is an A minus or an A, then, you have an A for the quarter or whatever (Student 1).
It is very motivational, because I don't like to see the yellow circle thing on my grade, but sometimes, I try really hard to do it, but I just can't, so I just move on, and then, when I practice more, then I go back and get my check mark (Student 5).

Alsardary and Blumberg (2009) described the role of the teacher as a facilitator in the learning process. The study describes that the responsibility of learning should shift from the teacher to the student. In addition, assessments and providing timely feedback stimulates learning by becoming part of the learning process and not simply the end result. Furthermore, teachers were also encouraged with the feedback that was provided to students and its ability to report student progress to teachers. Teachers stated:

There is a teacher tool that comes with the eMedia software, and it allows me to see the progress of each student, how they did in each lesson, which scores they’re getting for each lesson, if they skipped over certain lessons, and it actually gives an average for each student. It does all the math for you, which is fantastic! Then what I’ll do is I’ll average that score with my own supplementary stuff like the scales and whatnot, but the majority of the weight of their score is the piano software (Teacher 1).

…I can see where each student is, what lessons they're working on at the time, what lessons have been giving them trouble, what grades they got in every lesson through there (Teacher 2).

Although both students and teachers acknowledged the importance of feedback on increasing student performance, motivation and reporting of student performance to teachers, there are some constraints on the type of feedback that is provided with this particular instructional software. Therefore, in the next section, the teacher’s role within the classroom and the individualized feedback that is provided by the teacher is discussed.
The Importance of Teacher’s Role

Throughout the interviews, one of the themes that emerged was the teacher’s role within the classroom and their usefulness in providing supplemental instruction and additional feedback to students who were struggling in their performance. Reiterated from Chapter 2, Neil (2011) discussed that computer based programs should not be a complete replacement for traditional programs but have different fundamental approaches. A Computer assisted learning environment allows for students to receive feedback and help generate a student-centered learning environment. However, the role of the teacher provides students with a broader understanding of the topic. Computer assisted learning software gives students individualized instruction and tracks student progress (Harris, Mishra, & Koehler, 2009). Utilizing such software allows teachers to act as a guide and interact with individual students providing them with focused instruction while other students continue to work independently (Peters, 2000). In this particular study, although the students felt that the software provided them with appropriate feedback, they felt the teacher had capabilities beyond that of the technology. A primary example would be the teacher’s ability to correct the students’ finger placement on the keys. There were multiple examples from the interviews that supported this here are a few notable statements,

For this specific program, with the piano, because you're playing music, one of the drawbacks is that even though you pressed the right note, like I said with the whole tune and rhythm, that might not be correct, and although I want to make sure that you're hitting the correct notes, which is always good because I want to get that figuring and placement down. Just for this specific program, a drawback is that it's unable to tell whether you have the rhythm and tune correct. You can get a bad grade, and even though
you're hitting all the right notes, you keep wondering, "Why is my grade so bad?"
(Student 3).

The computer doesn't really see how you're doing it. It just takes the notes that you're hitting, and then, you wonder how you're getting the bad... How he said, the rhythm, because I kept getting a bad grade that I really didn't want, and then, I asked the teacher to help me, and then, he helped me with the rhythm and stuff, and then, I got a better grade at it. I think the teacher is a little bit better than the software to have, because he sees what you're doing (Student 5).

… whenever you make mistakes, you can click on it, and it'll tell you what mistakes you're making, but sometimes, it can be difficult understanding what they're talking about. So then, when you talk to your teacher, your actual instructor, they can make it more clear for you and actually will give you an example and play whatever it is that the computer is asking you to play, so I think that helps better (Student 1).

I see him as somebody there, obviously he has to watch over us because you can't leave kids alone in a room, but also as a guidance in a way because, like I said, he helps us get through difficult parts we don't understand or we're having a problem with, and he also motivates us too, you know, and he speaks to us. He's like, "Oh yeah, you can do it," and he shows us, and then, we learn as well from him (Student 2).

A potential shortcoming to this software is its inability to physically observe students. Teachers noted that their role in the classroom provided guidance and as instructors they can make observations that the software cannot. In those cases, the collaborative relationship as discussed in Wood and Middleton (1975) is validated because the observing teacher, who is also the MKO, does not interfere with the learning process unless an error witnessed. For example,
I’m there just to oversee, make sure that, again like I had touched on before, making sure that the things that the computer can’t grade are being taken care of like posture, doing the different warm-ups, increasing their finger strength, improving muscle memory. We do warm-ups and certain exercises at the beginning of the class, plus the scales are another thing that are going to help out with that muscle memory. That’s that one, two, three, one two, three, four, five, and the left hand five, four, three, two, one, over, three, two, one, stuff like that that they don’t necessarily, that the computer can’t really see if they’re doing it correctly. I know things that won’t necessarily hurt them now but later on will just totally kill them. Say, for example, you had to play a major triad on C, E, and G. I had a kid last year that insisted on playing it with their one finger, their two finger, and their four finger. Obviously, the computer is not going to see, “Oh, you’re playing it with the wrong fingers.” All that it tells you is, “Oh, you’re playing the right notes”, so it’s up to me to make sure that they’re practicing everything with the correct fingering (Teacher 1).

Another aspect of the teacher’s role is the ability to provide technical assistance to students. One of the four tech skills that Ritchie (2001) argued for keys to success in a technology class was providing technical support to students at all times. This was also evidenced within the findings of this study. As one student stated,

I definitely had a lot of technical difficulties with this software. A lot of problems with it lagging, not working. I've had a lot of that. It never erased my progress, but sometimes it just stopped working on me and I couldn't hear anything or whatever. He helped me out with that. Just figuring out what's wrong. Definitely helped me with that (Student 7).
Supplementing Instruction

This study found that students using the computer-assisted learning software were exposed to and incorporated a variety of learning experiences such as those listed previously in the VARK approach. Those include visual, aural, reading/writing as well as kinesthetic (Drago & Wagner, 2004; Zapalska & Brozik, 2006). Students and teachers provided evidence of using interactive whiteboards, watching demonstrations of videos, researching and finding supplemental videos found on the internet, specifically YouTube. Some notable examples include:

I just go on the internet and learn songs off there. It's a lot easier for me to learn songs from YouTube watching other people play because that's how the software taught it. I mean, there were notes, but it was just a lot easier to visually see it (Student 7).

Student 5 expressed that “it gives videos of people demonstrating how to play the piano and how to help you out” while Student 9 emphasized that one can practice on YouTube by watching the videos and following the example. Both teachers went on to state that they incorporate the use of other technology in the classroom:

I do use some visuals. When I’m teaching the scales, there’s the SMART Board, or the Promethean Board. You can throw up a picture of a piano, and I can literally draw on it the number, your finger numbers that’s supposed to go on each key, so your thumb or your one finger is supposed to be on A (Teacher 1).

I use the Promethean board in the room to show various things. PDFs of music to demonstrate things. I'll show them, that's how I first demonstrate the program as I pull it up on the promethean board and do it right there. I'll show videos on there. I will lecture.
I will use the whiteboard to write on. Also, like I said, I do demonstrations. I play the piano for them (Teacher 2).

Students in this study were given additional visual aids through the use of the interactive whiteboard and were encouraged to seek out new learning opportunities by using sites such as YouTube. This particular class allowed for learners of all dimensions to become engaged in their learning. The students were able to supplement their learning because they had the freedom to work independently. Teachers provided students with deadlines to finish chapters within the software but within those timeframes students were able to work autonomously. During one particular interaction between two students discussing using other sources beyond the software they expanded on this topic.

I like how we get to go at our own pace, but I'm sometimes the one who gets a little bit distracted but not by the thing I'm learning, but I know what I want to learn sometimes, and so I forget about the program sometimes, and then, I kind of learn on my own. So I like it at the same time, but sometimes I get distracted, but I still get the work done. Sometimes I'll be learning the song on the computer, but then, I would break away from it and then learn what I want to learn (Student 2).

Going back to what Student 2 said, I think what he means is sometimes students, instead of working on the program, they go on the Internet, and they go on YouTube, and they play songs that don't pertain to the program (Student 1).

The student interaction above directly correlates to Huba and Freed’s (2000) study of student-centered learning. Students in this class had the ability and freedom to be actively involved in their own learning and as a result they set out on their own inquiry, problem solving by finding information through the internet to further their own learning.
Students’ Ability to Learn Piano

The utilization of computer-assisted instructional software can help students with a wide range of skills and levels of comprehension develop as musicians (Hosken, 2011). The sole purpose of this class was for students to learn to play the piano. In this study, students progressed through the software at different paces, some finishing the entire program quickly, others moving at a slower pace. One of the questions that was important to answer, was whether students felt that they could perform adequately on the piano without the use of the software. One method to assess students’ ability to play was to determine if students could read music without the use of the software. The results were mixed as students were not always confident in their abilities. This could have been attributed to students not having completed the class, nor had students had the opportunity to try and play sheet music independently. A recommendation for teachers may include providing students the opportunity to read appropriate sheet music that matches their level of learning. As a result, this would demonstrate students’ ability to effectively transfer their computer-assisted learning to actual application, thus gaining responsibility of the learning process (Zapalska & Brozik, 2006).

I can play maybe a portion of a song from the software without using the software, maybe like the very beginning of it, but I can only do the scales and the scales actually has nothing to do with the software. That's basically what I learned from my instructor, so I can only really do that (Student 1).

In the beginning, it shows you which fingers to play. It says 1, 2, 3, and when you get more advanced, then, the numbers go away, so you could tell, you could read the music without knowing which ones (Student 4).
I don't know if I could probably read it, because I did do piano before but with an instructor, and I needed more practice reading it. I still needed to write the numbers on the keys so I could do it, but in the software, I like how it just took them away (Student 5).

I can't read the notes on the software and in piano songs because I learned a few techniques of how to locate which notes are in the treble clefs and in the bass clefs. I understand that some people can read notes, then some people need help reading them (Student 8).

I could read notes on the software, but I can't read it on the piece of paper because the software gives you extra help. It has the note and then it tells you how fast to play or how long to hold the note down (Student 9).

It should be noted that students had not yet finished the class and at the time of the interviews still had approximately 3 to 4 weeks left. Their comfort of reading music without the use of the software seemed to depend on how far along in the program they had progressed. The instructors from this class have a broader view of student’s ability having taught the course previously. One teacher described the final that students had to perform at the end of last semester.

I haven’t tried it yet with this class, but with last year’s class, their final was to bring me a song, find a song that they wanted to play, do some research, bring it into me for approval, and then play it. They would obviously have to practice it, but they would have to play it in front of the class. They’d memorize it and then play it in front of the class. I had some kids that were playing Moonlight Sonata by Beethoven, I had a kid playing Billy Joel, so it can be any genre (Teacher 1).
Both teacher’s noted that the students’ ability to play a song without the music depended on how far they had advanced within the software. Webb (1980) summarized from Piaget’s theories that individualized learning opportunities should be challenging and realistic to promote positive learning experiences. Therefore, a possible recommendation from this study would be to provide students with further opportunities to play music without the software to help students build their confidence; doing so more frequently would help students apply their knowledge to real-world applications.

Summary of Findings

The analysis of data uncovered that teachers and students felt that the computer-assisted software provided a student-centered learning environment. Utilizing the software, students were able to learn independently and at their own pace based on their own comfort levels. Further, students were free to expand on their own learning by finding supplemental instruction, generally through videos found online. As students were each able to interact independently with the software, teachers had time to freely observe all students and work with individual students to provide supplemental instruction. Students found that feedback provided by the software was instrumental and motivational to the entire learning process. All of the students and both teachers understood the limitations of the software such as the software not being able to view the student’s finger placement. As a result of that limitation, the necessity of having an instructor present to help further facilitate learning is demonstrated. Although the software was the primary means in which students received instruction, the role of the teacher as a guide is important to provide challenging activities to those students who are excelling and support students who may be struggling. Teachers needed to continuously monitor student progress and differentiate instruction to students as needed. Interpreting the data lead the researcher to form
recommendations for future studies on the use of computer-assisted instructional software in an effort to provide student-centered learning environments.

**Delimitations and Limitations of the Study**

This case study was limited to one high school in one district in Connecticut. The data collected from the interviews were opinions of two high school music teachers and nine high school students within the school. The classroom was equipped with 24 computers with 24 piano keyboards utilizing the *eMedia Piano and Keyboard Method* software; therefore results cannot be widespread to all music teachers within the district or other districts. Many factors influence the integration of computer assisted learning software, including but not limited to, the equipment and software available, the perception and comfort of technology of the staff, the support from school and district administration and training that has been offered. The school in this study had used the software for a year prior to the semester in which the study occurred allowing the teachers to form a level of comfort using the software. This is an added benefit that cannot be attributed to all schools and all teachers.

Furthermore the researcher is a school administrator within the school and has worked with the music teachers for the past three years. The researcher also helped in the planning of the creation of the piano lab and is an advocate of computer-assisted learning software.

**Recommendations for Future Study**

1. This study was small in scope because it only included two teachers and nine students from one school in one school district. It is recommended to expand the study to multiple schools and school districts.
2. A study that would investigate other computer-assisted instructional software used in other types of classes. For example, the study could investigate how the use of computer-assisted instructional software in a Math lab is effective for student learning.

3. For this study the use of a desktop computer and electronic keyboard were utilized. Such equipment is stationary and students are not able to utilize the software without proper equipment outside of the piano lab. A study utilizing computer-assisted instructional software on a mobile device, such as a wireless tablet, would allow students to use the software at any time.

4. Research can be developed as a quantitative study comparing classroom that utilizes computer-assisted instructional software to a classroom that does not utilize such software. Such a study would measure the effectiveness of student learning through the use of quantitative data.
References


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Scheid, J. M. (2010). THE EFFECTIVENESS OF COMPUTER AIDED INSTRUCTION IN MATHEMATICS FOR STUDENTS WITH LEARNING DISABILITIES. Retrieved
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### Appendices

#### Appendix A: List of Terms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Term</th>
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<tbody>
<tr>
<td>CAI</td>
<td>Computer Assisted Instruction</td>
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<tr>
<td>CAL</td>
<td>Computer Assisted Learning</td>
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<tr>
<td>ICT</td>
<td>Information and Communications Technology</td>
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<tr>
<td>FITness</td>
<td>Fluency of Information Technology</td>
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<tr>
<td>FMIT</td>
<td>Formal Instrumental Music Tuition</td>
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<tr>
<td>MKO</td>
<td>More Knowledgeable Other</td>
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<tr>
<td>TBI</td>
<td>Text-Based Form of Instruction</td>
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<tr>
<td>TPACK</td>
<td>Technology Pedagogy and Content Knowledge</td>
</tr>
<tr>
<td>VARK</td>
<td>Visual, Auditory, Reading-Writing, Kinesthetic Learners</td>
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<tr>
<td>ZAA</td>
<td>Zone of Available Assistance</td>
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<tr>
<td>ZPA</td>
<td>Zone of Proximal Adjustment</td>
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<tr>
<td>ZPD</td>
<td>Zone of Proximal Development</td>
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Appendix B – Teacher Recruitment E-mail

Recruitment Email:

Dear (Teacher Name),

I am a student in College of Professional Studies at Northeastern University. I would like you to consider participating in my research study. The purpose of the study is to investigate how computer assisted software can provide an effective student centered learning environment. I am inviting you to this study because you currently teach a piano class which uses computer assisted software as a medium for instruction. To participate in the study, you and your classroom would be observed approximately 2 to 4 times, and you would participate in 1 to 2 interviews lasting 30 to 60 minutes each. All interviews would occur at a time and location of your choosing. The decision to participate in this study is completely voluntary. You do not have to participate and you may choose to stop participating at any time. In addition, although I serve as an assistant principal at your school, any observations of your lessons and classroom are strictly for this study and will not be used in any evaluation.

Your participation in this study will be completely confidential. Any reports or publications based on this research will use pseudonyms and will not identify you, your school, school district or any other individual as being affiliated with this study.

If you are interested or have any additional questions regarding this study, please contact me at 203-977-5322. You may also email me at ramos.a@husky.neu.edu. You may also contact my advisor, Dr. Kristal Clemons at kclemons@neu.edu

Thank you for your consideration,

Tony Ramos
Appendix C – Parent Requirement English Letter

Dear Parents,

As you know, I am one of the four assistant principals at (School Name). However, I am also Doctor of Education student in the College of Professional Studies at Northeastern University. I would like you to consider having your child participate in my research study. The purpose of the study is to investigate how computer assisted software can provide an effective student centered learning environment. I am inviting your child to this study because he or she is currently enrolled in a piano class, which uses computer assisted software as a medium for instruction. To participate in the study, your child may be randomly selected to participate in a focus group consisting of 4-6 other students. As the researcher, I will interview 2 to 3 groups of random students, 1 time, and each session is expected to last 30 to 60 minutes. All interviews would occur in a classroom before or after school or during a free period, depending on scheduling availability. It is not expected that students will lose instructional time, however, should that occur absences will be excused. The decision to participate in this study is completely voluntary. Your child does not have to participate and may choose to stop participating at any time. Even if you do consent, your child can decide whether he or she would like to participate before the focus groups begin.

Your child’s participation in this study will be completely confidential. Any reports or publications based on this research will use pseudonyms and will not identify your child, your school, school district or any other individual as being affiliated with this study.

If you have any additional questions regarding this study, please contact me at 203-977-5322. You may also email me at ramos.a@husky.neu.edu You may also contact my advisor, Dr. Kristal Clemons at kclemons@neu.edu

Attached is a consent form with further information. Should you have any questions regarding the consent form or the study please do not hesitate to contact me. If you and you’re child are interested please complete the consent form and return to school.

Thank you for your consideration,

Tony Ramos
Appendix D – Parent Requirement Spanish Letter

Estimados Padres y Estudiantes,

Yo soy Antonio Ramos, Asistente Director de Westhill High School y candidato para el doctorado en Educación en la Universidad de Northeastern, Boston, MA. Mi tesis requiere un análisis del efecto de un programa de computadoras en el aprendizaje de los estudiantes en una clase de piano. Le pido su autorización para observar y entrevistar a su hijo/a en la clase de piano para determinar el impacto del programa de computadoras. Algunos de estos estudiantes serán seleccionados para participar en un grupo de enfoque sobre el programa. Cada grupo consiste de 4 a 6 estudiantes. Como el investigador, voy a entrevistar a 2 a 3 grupos de estudiantes, y cada sesión durará de 30 a 60 minutos. Todas las entrevistas se llevarán a cabo en un salón de clases antes o después de la escuela o durante un período libre, dependiendo de la disponibilidad de la programación. No anticipamos que los estudiantes pierdan tiempo de instrucción, pero si resulta necesario, las ausencias serán justificadas. La decisión de participar en este estudio es completamente voluntaria. Su hijo/a no tiene que participar y usted tiene la opción de terminar su participación en cualquier momento.

La participación de su hijo/a en este estudio será completamente confidencial. Todos los informes y publicaciones basadas en esta investigación utilizarán seudónimos y no usaremos datos que pueden identificar a su hijo/a.

Si usted tiene más preguntas sobre este estudio, por favor comuníquese conmigo al 203-977-5322. También puede enviarme un email a ramos.a@husky.neu.edu. También puede ponerse en contacto con mi profesora, la Dra. Kristal Clemons en kclemons@neu.edu. Si desea más información en español, sírbase a comunicarse con el Dr. Roberto García en rgarcia@ci.stamford.ct.us.

Se adjunta un formulario de consentimiento con más información. Si tiene alguna pregunta con respecto a la forma de consentimiento o de los estudios, por favor póngase en contacto conmigo. Si usted y su hijo/a están interesados, por favor complete el formulario de consentimiento y devuélvalo a la escuela.

Gracias por su consideración,

Tony Ramos
Appendix E – Teacher Signed Consent Form

Teacher Signed Consent Form

Northeastern University, College of Professional Studies

Investigator’s Name:
- Kristal Clemons, Principal Investigator
- Antonio C. Ramos, Doctor of Education Student in the College of Professional Studies at Northeastern University

Title of Project: A Case Study Exploring the Use of Computer Assisted Software to Provide Student Centered Instruction in a High School Piano Course

You are being invited to take part in a research study. This form will tell you about the study, but the researcher will explain it to you first. You may ask this person any questions that you have. When you are ready to make a decision, you may tell the researcher if you want to participate or not. You do not have to participate if you do not want to. If you decide to participate, the researcher will ask you to sign this statement and will give you a copy to keep.

Why are you being asked to take part in this research study? You are being asked to participate in this research study because you are a teacher who utilizes computer assisted instructional software in a piano lab.

Why is this research being done? The purpose of this research is to gather information about how computer assisted instructional software provides an effective student centered learning environment.

What will I be asked to do? If you decide to take part in this study, the researcher will observe you and your classroom during 2-4 lessons utilizing the computer assisted instructional software in your classroom.

You will also be asked to have 1-2 one-on-one audio digital recorded interviews with the researcher. The interviews will be digitally recorded for transcription purposes only.

Where will this take place and how much time will it take? Observations will take place in your classroom for 30-50 minutes each for a total of 2-4 lessons. One-on-one interviews will take place in a location of your choosing and will last for approximately 30 to 60 minutes for a total of 1-2 interviews.

Will there be any risk or discomfort to me? There is no foreseeable risk or discomfort anticipated. Although I am an assistant principal at your school, nothing observed or discussed will be used for the purpose of your job evaluation.
Will I benefit to being in this research? There will be no direct benefit to you for taking part in the study. However, the information learned from this study may help music educators as well as other educators to integrate computer assisted instructional software into their classrooms.

Who will see the information about me? As a participant of this research, your part will be confidential. Only the researcher of this study will see the information about you. You will have a pseudonym to protect your identity. No reports or publications will use information that can identify you, your school district, or any individual in any way. The data collected for this study will be kept by the researcher, including digital audio recordings, and will not be shared with others. Digital recordings will be permanently deleted following transcription and analysis.

In rare instances, authorized people may request to see research information about you and other people in this study. This is done only to be sure that the research is done properly. The researcher would only permit people who are authorized by organizations such as Northeastern University to see this information. No identifying information will ever be shared with people at the public schools in the Stamford school district.

Can I stop my participation in this study? Your participation in this research is completely voluntary. You do not have to participate if you do not want to. Even if you begin the study, you may quit at any time. You may also refuse to answer any questions. If you do not participate or if you decide to quit, you will not lose any rights, benefits, or services that you would otherwise have.

Who can I contact if I have questions or problems?
Antonio C. Ramos
Doctor of Education Student
College of Professional Studies
125 Roxbury Road
Stamford, CT 06902
203-977-5322
Email: ramos.a@husky.neu.edu

Dr. Kristal Clemons
Assistant Academic Specialist
College of Professional Studies
360 Huntington Ave 42BV
Boston, MA 02115
Email: kclemons@neu.edu

Who can I contact about my rights as a participant? If you have any questions about your rights as a participant, you may contact Nan C. Regina, Director, Human Subject Research Protection, 960 Renaissance Park, Northeastern University Boston, MA 02115 tel. 617-373-4588, email: irb@neu.edu. You may call anonymously if you wish.

Will I be paid for my participation? There is no compensation for participation in this study.

Will it cost me anything to participate? There is no cost to participate.

I have read, understood, and had the opportunity to ask questions regarding this consent form. I fully understand the nature and character of my involvement in this research as a participant and the potential risks. I agree to participate in this study on a voluntary basis.

_____________________________________
Research Participant (signature)        Date

_____________________________________
Research Participant (printed)
Researcher who explained the study to the participant above and obtained consent (signature)

_____________________________________________

Date

_____________________________________________

Researcher (printed)
Appendix F – Student Signed Consent Form

Student Signed Consent Form

Northeastern University, College of Professional Studies

Investigator’s Name:
- Kristal Clemons, Principal Investigator
- Antonio C. Ramos, Doctor of Education Student in the College of Professional Studies at Northeastern University

Title of Project: A Case Study Exploring the Use of Computer Assisted Software to Provide Student Centered Instruction in a High School Piano Course

You are being invited to take part in a research study. This form will tell you about the study, but the researcher will explain it to you first. You may ask this person any questions that you have. When you are ready to make a decision, you may tell the researcher if you want to participate or not. You do not have to participate if you do not want to. If you decide to participate, the researcher will ask you to sign this statement and will give you a copy to keep.

Why are you being asked to take part in this research study? You are being asked to participate in this research study because you are enrolled in a class that utilizes computer assisted instructional software in a piano lab.

Why is this research being done? The purpose of this research is to gather information about how computer assisted instructional software provides an effective student centered learning environment.

What will I be asked to do?

You may be randomly selected to participate in 1-2 focus group interviews with 4 to 6 other students. These interviews will be audio digital recorded with the researcher. The interviews will be digitally recorded for transcription purposes only.

Where will this take place and how much time will it take? Focus groups will take place in a classroom either before or after school, or during a period in which you are free, this is dependent on the availability of students. Each focus group session will last for approximately 30 to 60 minutes for a total of 1-2 sessions.

Will there be any risk or discomfort to me? There is no foreseeable risk or discomfort anticipated. However, be assured that my position as an assistant principal will have no bearing on your grade regardless of the responses in the focus group or participation in the study. Although it is not expected that student’s will lose any instructional time, should they be late or marked absent, those absences will be excused.
Will I benefit to being in this research? There will be no direct benefit to you for taking part in the study. However, the information learned from this study may help music educators as well as other educators to integrate computer assisted instructional software into their classrooms. This in turn would help future students.

Who will see the information about me? As a participant of this research, your part will be confidential. Only the researcher of this study will see the information about you. You will have a pseudonym to protect your identity. No reports or publications will use information that can identify you, your school district, or any individual in any way. The data collected for this study will be kept by the researcher, including digital audio recordings, and will not be shared with others. Digital recordings will be permanently deleted following transcription and analysis.

In rare instances, authorized people may request to see research information about you and other people in this study. This is done only to be sure that the research is done properly. The researcher would only permit people who are authorized by organizations such as Northeastern University to see this information. No identifying information will ever be shared with people at the public schools in the Stamford school district.

Can I stop my participation in this study? Your participation in this research is completely voluntary. You do not have to participate if you do not want to. Even if you begin the study, you may quit at any time. You may also refuse to answer any questions. If you do not participate or if you decide to quit, you will not lose any rights, benefits, or services that you would otherwise have.

Who can I contact if I have questions or problems?
Antonio C. Ramos
Doctor of Education Student
College of Professional Studies
125 Roxbury Road
Stamford, CT 06902
203-977-5322
Email: ramos.a@husky.neu.edu

Dr. Kristal Clemons
Assistant Academic Specialist
College of Professional Studies
Northeastern University
360 Huntington Ave 42BV
Boston, MA 02115
Email: kclemons@neu.edu

Who can I contact about my rights as a participant? If you have any questions about your rights as a participant, you may contact Nan C. Regina, Director, Human Subject Research Protection, 960 Renaissance Park, Northeastern University Boston, MA 02115 tel. 617-373-4588, email: irb@neu.edu. You may call anonymously if you wish.

Will I be paid for my participation? There is no compensation for participation in this study.

Will it cost me anything to participate? There is no cost to participate.

I have read, understood, and had the opportunity to ask questions regarding this consent form. I fully understand the nature and character of my involvement in this research as a participant and the potential risks. I agree to participate in this study on a voluntary basis.

____________________________________________
Research Participant (Student) (signature)

____________________________________________
Date
Research Participant (Student) (printed)

______________________________________________________________________________  ________________________________
Researcher who explained the study to the participant above and obtained consent (signature)  Date

______________________________________________________________________________
Researcher (printed)
 Appendix G –Student Signed Spanish Consent Form

Student Signed Consent Form

Northeastern University, Facultad de Estudios Profesionales

Del investigador Nombre:
• Clemons Kristal, investigador principal
• Antonio C. Ramos, Doctora en Educación para Estudiantes de la Facultad de Estudios Profesionales de la Northeastern University

Título del proyecto: Estudio de un caso explorando el uso de Software Asistida por ordenador para proporcionar Estudiante Instrucción centrada en un Curso de Piano High School

Se le invita a participar en un estudio de investigación. Este formulario le informará sobre el estudio, pero el investigador le explicará a usted primero. Usted puede pedirle a esta persona a cualquier pregunta que usted tenga. Cuando esté listo para tomar una decisión, es posible que le dice al investigador si quiere participar o no. Usted no tiene que participar si no quiere. Si decide participar, el investigador le pedirá que firme esta declaración y le dará una copia de mantener.

¿Por qué se le pide que participe en este estudio de investigación? Se le pide que participe en este estudio de investigación porque usted está inscrito en una clase que utiliza software de instrucción asistida por computadora en un laboratorio de piano.

¿Por qué se está realizando esta investigación? El propósito de esta investigación es obtener información acerca de cómo el software de instrucción asistida por computadora proporciona un entorno de aprendizaje eficaz centrado en el aprendizaje.

¿Lo que se me pide que haga? Usted puede ser seleccionado al azar para participar en 1-2 grupos focales entrevistas con entre 4 y 6 otros estudiantes. Estas entrevistas serán digitales de audio grabado con el investigador. Las entrevistas serán grabadas digitalmente sólo con fines de transcripción.

¿Dónde esta llevará a cabo y cuánto tiempo tomará? Los grupos de discusión se llevarán a cabo en un salón de clases, ya sea antes o después de la escuela, o durante un período en el que su hijo es libre, esto depende de la disponibilidad de los estudiantes. Cada sesión del grupo especial tendrá una duración de aproximadamente 30 a 60 minutos para un total de 1-2 sesiones.
¿Habrá algún riesgo o molestia para mí? No hay riesgo previsible o malestar anticipado. Aunque no se espera que los estudiantes la voluntad de perder tiempo de instrucción, en caso de llegar tarde o marcados ausentes, serán justificadas las ausencias.

¿Voy a aprovechar para estar en esta investigación? No habrá ningún beneficio directo para usted por participar en el estudio. Sin embargo, la información obtenida de este estudio puede ayudar a los educadores de música, así como otros educadores para integrar el software de instrucción asistida por ordenador en las aulas. Esto a su vez podría ayudar a los futuros estudiantes.

¿Quién va a ver la información sobre mí? Como participante de esta investigación, su parte será confidencial. Sólo el investigador de este estudio será ver la información sobre usted. Usted tendrá un seudónimo para proteger su identidad. No hay informes o publicaciones usarán la información que le pueda identificar, su distrito escolar, o cualquier persona de cualquier manera. Los datos recogidos para este estudio serán mantenidos por el investigador, incluyendo grabaciones de audio digital, y no serán compartidos con otras personas. Las grabaciones digitales se borran definitivamente siguiente transcripción y análisis.

En raras ocasiones, las personas autorizadas podrán solicitar para ver información de la investigación acerca de usted y otras personas en este estudio. Esto se hace sólo para asegurarse de que la investigación se lleva a cabo correctamente. El investigador sólo permitiría que las personas que estén autorizadas por organizaciones como la Universidad del Noreste para ver esta información. No hay información de identificación será nunca compartida con la gente en las escuelas públicas en Stamford.

¿Puedo dejar mi participación en este estudio? Su participación en esta investigación es completamente voluntaria. Usted no tiene que participar si no quiere. Incluso si usted comienza el estudio, puede salir en cualquier momento. También puede negarse a contestar cualquier pregunta. Si usted no participa, o si usted decide dejar de fumar, usted no perderá ninguno de los derechos, beneficios o servicios que de otra manera tener.

¿A quién puedo contactar si tengo preguntas o problemas?

Antonio C. Ramos          Dr. Kristal Clemons
Doctor of Education Student    Assistant Academic Specialist
College of Professional Studies    College of Professional Studies
125 Roxbury Road                  Northeastern University
Stamford, CT 06902                  360 Huntington Ave 42BV
203-977-5322                         Boston, MA 02115
Email: ramos.a@husky.neu.edu      Email: kclemons@neu.edu

¿A quién puedo contactar acerca de mis derechos como participante? Si usted tiene alguna pregunta sobre sus derechos como participante, puede ponerse en contacto con Nan C. Regina, Director de Investigación de la Protección de Sujetos Humanos, 960 Renaissance Park, de la Northeastern University de Boston, MA 02115 tel. 617-373-4588, correo electrónico: irb@neu.edu. Usted puede llamar de forma anónima si lo desea.
¿Me pagarán por mi participación? No hay compensación por participar en este estudio.

¿Tendré que pagar nada para participar? No hay costo para participar.

He leído, entendido, y tuvo la oportunidad de hacer preguntas acerca de este formulario de consentimiento. Entiendo plenamente la naturaleza y el carácter de mi participación en esta investigación como participante y los riesgos potenciales. Estoy de acuerdo en participar en este estudio de forma voluntaria.

____________________________________________________________________
Participante en la Investigación (Estudiante) (firma) Fecha

____________________________________________________________________
Participante en la Investigación (Estudiante) (impreso)

____________________________________________________________________
El investigador explicó que el estudio de la Fecha participante el consentimiento anterior y obtenido (firma)

____________________________________________________________________
Investigador (impreso)
Appendix H – Parent Signed Consent Form

Parent Signed Consent Form

Northeastern University, College of Professional Studies

Investigator’s Name:
- Kristal Clemons, Principal Investigator
- Antonio C. Ramos, Doctor of Education Student in the College of Professional Studies at Northeastern University

Title of Project: A Case Study Exploring the Use of Computer Assisted Software to Provide Student Centered Instruction in a High School Piano Course

Your child is being invited to take part in a research study. This form will tell you about the study, but the researcher will also be available to explain it to you and your child. You may ask this person any questions that pertain to the study. When you are ready to make a decision, you may tell the researcher if you want to participate or not. Your child does not have to participate if you or they do not want to. If you and your child decide to participate, the researcher will ask you to sign this statement and will give you a copy to keep.

Why are you being asked to take part in this research study? Your child is being asked to participate in this research study because your child is enrolled in a class that utilizes computer assisted instructional software in a piano lab.

Why is this research being done? The purpose of this research is to gather information about how computer assisted instructional software provides an effective student centered learning environment.

What will I be asked to do?

Your child may be randomly selected to participate in 1-2 focus group interviews with 4 to 6 other students. These interviews will be audio digital recorded with the researcher. The interviews will be digitally recorded for transcription purposes only.

Where will this take place and how much time will it take? Focus groups will take place in a classroom either before or after school, or during a period in which your child is free, this is dependent on the availability of students. Each focus group session will last for approximately 30 to 60 minutes for a total of 1-2 sessions.

Will there be any risk or discomfort to me? There is no foreseeable risk or discomfort anticipated. However, be assured that my position as an assistant principal will have no bearing on your child’s grade regardless of the responses in the focus group or participation in the study. Although it is not expected that student’s will lose any instructional time, should they be late or marked absent, those absences will be excused.
Will I benefit to being in this research? There will be no direct benefit to your child for taking part in the study. However, the information learned from this study may help music educators as well as other educators to integrate computer assisted instructional software into their classrooms. This in turn would help future students.

Who will see the information about me? As a participant of this research, your child’s part will be confidential. Only the researcher of this study will see the information about your child. Your child will have a pseudonym to protect your identity. No reports or publications will use information that can identify your child, your school district, or any individual in any way. The data collected for this study will be kept by the researcher, including digital audio recordings, and will not be shared with others. Digital recordings will be permanently deleted following transcription and analysis.

In rare instances, authorized people may request to see research information about your child and other people in this study. This is done only to be sure that the research is done properly. The researcher would only permit people who are authorized by organizations such as Northeastern University to see this information. No identifying information will ever be shared with people at the public schools in the Stamford school district.

Can I stop my participation in this study? Your child’s participation in this research is completely voluntary. Your child do not have to participate if you or your child does not want to. Even if your child begins the study, you or your child may quit at any time. Your child may also refuse to answer any questions. If your child does not participate or if you or your child decides to quit, your child will not lose any rights, benefits, or services that your child would otherwise have.

Who can I contact if I have questions or problems?
Antonio C. Ramos
Doctor of Education Student
College of Professional Studies
125 Roxbury Road
Stamford, CT 06902
203-977-5322
Email: ramos.a@husky.neu.edu

Dr. Kristal Clemons
Assistant Academic Specialist
College of Professional Studies
Northeastern University
360 Huntington Ave 42BV
Boston, MA 02115
Email: kclemons@neu.edu

Who can I contact about my rights as a participant? If you or your child have any questions about your rights as a participant, you may contact Nan C. Regina, Director, Human Subject Research Protection, 960 Renaissance Park, Northeastern University Boston, MA 02115 tel. 617-373-4588, email: irb@neu.edu. You may call anonymously if you wish.

Will I be paid for my participation? There is no compensation for participation in this study.

Will it cost me anything to participate? There is no cost to participate.

I have read, understood, and had the opportunity to ask questions regarding this consent form. I fully understand the nature and character of my involvement in this research as a participant and the potential risks. I agree to participate in this study on a voluntary basis.
Research Participant (Parent/Guardian) (signature)  

Date

Research Participant (Parent/Guardian) (printed)

Researcher who explained the study to the participant above and obtained consent (signature)  

Date

Researcher (printed)
Appendix I – Parent Signed Spanish Consent Form

Parent Signed Consent Form

Northeastern University, Facultad de Estudios Profesionales

Del investigador Nombre:
- Clemons Kristal, investigador principal
- Antonio C. Ramos, Doctora en Educación para Estudiantes de la Facultad de Estudios Profesionales de la Northeastern University

Título del proyecto: Estudio de un caso explorando el uso de Software Asistida por ordenador para proporcionar Estudiante Instrucción centrada en un Curso de Piano High School

Se le invita a participar en un estudio de investigación. Este formulario le informará sobre el estudio, pero el investigador le explicará a usted primero. Usted puede pedirle a esta persona a cualquier pregunta que usted tenga. Cuando esté listo para tomar una decisión, es posible que le dice al investigador si quiere participar o no. Usted no tiene que participar si no quiere. Si decide participar, el investigador le pedirá que firme esta declaración y le dará una copia de mantener.

¿Por qué se le pide que participe en este estudio de investigación? Se le pide que participe en este estudio de investigación porque usted está inscrito en una clase que utiliza software de instrucción asistida por computadora en un laboratorio de piano.

¿Por qué se está realizando esta investigación? El propósito de esta investigación es obtener información acerca de cómo el software de instrucción asistida por computadora proporciona una estudiante eficaz centrada entorno de aprendizaje.

¿Lo que se me pide que haga? Su hijo puede ser seleccionado al azar para participar en 1-2 grupos focales entrevistas con entre 4 y 6 otros estudiantes. Estas entrevistas serán digitales de audio grabado con el investigador. Las entrevistas serán grabadas digitalmente sólo con fines de transcripción.

¿Dónde esta llevará a cabo y cuánto tiempo tomará? Los grupos de discusión se llevarán a cabo en un salón de clases, ya sea antes o después de la escuela, o durante un período en el que su hijo es libre, esto depende de la disponibilidad de los estudiantes. Cada sesión del grupo especial tendrá una duración de aproximadamente 30 a 60 minutos para un total de 1-2 sesiones.
¿Habrá algún riesgo o molestia para mí? No hay riesgo previsible o malestar anticipado. Aunque no se espera que los estudiantes la voluntad de perder tiempo de instrucción, en caso de llegar tarde o marcados ausentes, serán justificadas las ausencias.

¿Voy a aprovechar para estar en esta investigación? No habrá ningún beneficio directo para usted por participar en el estudio. Sin embargo, la información obtenida de este estudio puede ayudar a los educadores de música, así como otros educadores para integrar el software de instrucción asistida por ordenador en las aulas. Esto a su vez podría ayudar a los futuros estudiantes.

¿Quién va a ver la información sobre mí? Como participante de esta investigación, su parte será confidencial. Sólo el investigador de este estudio será ver la información sobre usted. Usted tendrá un seudónimo para proteger su identidad. No hay informes o publicaciones usarán la información que le pueda identificar, su distrito escolar, o cualquier persona de cualquier manera. Los datos recogidos para este estudio serán mantenidos por el investigador, incluyendo grabaciones de audio digital, y no serán compartidos con otras personas. Las grabaciones digitales se borran definitivamente siguiente transcripción y análisis.

En raras ocasiones, las personas autorizadas podrán solicitar para ver información de la investigación acerca de usted y otras personas en este estudio. Esto se hace sólo para asegurarse de que la investigación se lleva a cabo correctamente. El investigador sólo permitiría que las personas que estén autorizadas por organizaciones como la Universidad del Noreste para ver esta información. No hay información de identificación será nunca compartida con la gente en las escuelas públicas en Stamford.

¿Puedo dejar mi participación en este estudio? Su participación en esta investigación es completamente voluntaria. Usted no tiene que participar si no quiere. Incluso si usted comienza el estudio, puede salir en cualquier momento. También puede negarse a contestar cualquier pregunta. Si usted no participa, o si usted decide dejar de fumar, usted no perderá ninguno de los derechos, beneficios o servicios que de otra manera tener.

¿A quién puedo contactar si tengo preguntas o problemas?
Antonio C. Ramos  
Doctor of Education Student  
College of Professional Studies  
125 Roxbury Road  
Stamford, CT 06902  
203-977-5322  
Email: ramos.a@husky.neu.edu

Dr. Kristal Clemons  
Assistant Academic Specialist  
College of Professional Studies  
Northeastern University  
360 Huntington Ave 42BV  
Boston, MA 02115  
Email: kclemons@neu.edu

¿A quién puedo contactar acerca de mis derechos como participante? Si usted tiene alguna pregunta sobre sus derechos como participante, puede ponerse en contacto con Nan C. Regina, Director de Investigación de la Protección de Sujetos Humanos, 960 Renaissance Park, de la Northeastern University de Boston, MA 02115 tel. 617-373-4588, correo electrónico: irm@neu.edu. Usted puede llamar de forma anónima si lo desea.
¿Me pagarán por mi participación? No hay compensación por participar en este estudio.

¿Tendré que pagar nada para participar? No hay costo para participar.

He leído, entendido, y tuvo la oportunidad de hacer preguntas acerca de este formulario de consentimiento. Entiendo plenamente la naturaleza y el carácter de mi participación en esta investigación como participante y los riesgos potenciales. Estoy de acuerdo en participar en este estudio de forma voluntaria.

____________________________________________________________________
Participante en la Investigación (Padre / Tutor) (firma) Fecha

____________________________________________________________________
Participante en la Investigación (Padre / Tutor) (impreso)

____________________________________________________________________
El investigador explicó que el estudio de la Fecha participante el consentimiento anterior y obtenido (firma)

____________________________________________________________________
Investigador (impreso)
Appendix J – Teacher Interview Protocol and Questions

Teacher Interview

Interview Protocol:
- All audio from interviews and focus groups will be digitally recorded and transcribed.
- All interviews will occur in the teacher participant’s classroom, either before, after or during school but during a free period.
- Interviews will last approximately 30 to 60 minutes and will occur 1 to 2 times.

Primary Interview Questions:

Introductory Question:
- Describe how the computer assisted instruction software (eMedia) is utilized in the classroom?

Main Questions:
- What is the primary means of instruction (traditional vs software driven) within the classroom?
  - If teacher states, traditional, then the following question will be asked:
    - How do you supplement traditional instruction with the software?
  - If the teacher states, the software is the primary means of instruction, then the following question will be asked:
    - How do you supplement the instructional software?
- How do you use the instructional software to teach piano?
- What benefits, if any, do you believe the program offers to the students?
- What drawbacks, if any, does the software have to instruction?
- What can be improved with the instructional software?
- What skills or training is provided to students on the instructional software?
- What skills or training did you need in order to teach using the instructional software?
- How do you plan your lessons to utilize the instructional software?
- What instructional methods do you utilize when teaching with this software?
- How is the student’s musical progress on the piano assessed?
- How do you track student progress?
- Do student’s progress at the same rate?
  - How do you supplement instruction for those students who move quickly through the program?
  - How do you supplement instruction for those students struggling with the program?
- Have student’s been able to play piano without the use of the software?
- Has the program helped student’s ability to read music? If so, how do you know?
- What do you see as your primary role in the classroom?

Concluding Question:
Is there anything else that you would like to state about the classroom? The software?
Appendix K – Student Focus Interview Protocol and Questions

Student Focus Group Interview

Interview Protocol:
- All audio from interviews and focus groups will be digitally recorded and transcribed.
- Focus group interviews will last approximately 30 to 60 minutes. Two to Three groups will be chosen randomly and made up of 3 to 6 student participants.
- Focus groups will occur in a classroom within the school, either before, after or during the school day. It is not expected that students will lose instructional time from any other class.

Primary Interview Questions:

Introductory Question:
- Describe how the computer assisted instruction software (eMedia) is utilized in the classroom?

Main Questions:
- What is the primary means of instruction (traditional vs software driven) within the classroom?
  - If students describes a traditional approach the following question will be asked:
    - How has the software been used to help the teacher’s instruction?
  - If the students states the software is the primary means of instruction, the following question will be asked:
    - What else has been used to teach the piano besides the software?
- Describe how the instructional software is used during lessons?
- What benefits, if any, do you believe the software offers to you?
- What drawbacks, if any, does the software have to learning piano?
- What training was provided to you on the instructional software?
- How comfortable do you feel using the instructional software?
- How is learning from the instructional software different than traditional means in other classes?
- How is your musical progress on the piano assessed?
- Have you been able to play piano without the use of the software?
- Do you feel comfortable reading music without the use of the software?
- Do you feel comfortable playing the piano without the use of the software?
- What do you see is the primary role of the teacher in the classroom?

Concluding Question:
Is there anything else that you would like to state about the classroom? The software?
September 16, 2013

To Whom It May Concern:

This letter is to certify that I give Antonio Ramos, assistant principal at Westhill High School and Northeastern Doctor of Education student, permission to conduct his doctoral study in the piano classes at Westhill High School in Stamford, CT. I give permission for him to conduct his study as outlined in his doctoral thesis proposal entitled, "A Case Study Exploring the Use of Computer Assisted Software to Provide Student Centered Instruction in a High School Piano Course," utilizing our high school teachers and students who provide informed consent from Westhill High School as participants.

If you have any questions, please contact me at 203-977-4480

Sincerely,

Camille Figluizzi, Principal

Westhill High School values learning because it promotes academic excellence, civic responsibility, and personal growth. Our community provides all students with opportunities to acquire, analyze, and apply knowledge.
Appendix M – Signed Permission to Conduct Research (District)

October 18, 2013

To Whom It May Concern:

It is my pleasure to give permission to Antonio Ramos, Assistant Principal at Westhill High School and doctoral candidate in Northeastern’s College of Professional Studies to use subjects in the Stamford Public Schools to collect data for his doctoral dissertation, “A Case Study Exploring the Use of Computer Assisted Software to Provide Student Centered Instruction in a High School Piano Course.”

Mr. Ramos has provided us with all the requisite consent forms for the high school students and teachers who will be recruited for the study.

If you have questions, please contact me at (203) 977-4198.

Sincerely,

Judith Singer, Ph.D.
Executive Director of Research and Development
Appendix N – IRB Approval

NOTIFICATION OF IRB ACTION

Date: December 4, 2013
IRB #: CPS13-09-10
Principal Investigator(s): Kristal Clemons
Antonio Ramos
Department: Doctor of Education Program
College of Professional Studies
Address: 20 Bevidere
Northeastern University
Title of Project: A Case Study Exploring the Use of Computer Assisted Software to Provide Student Centered Instruction in a High School Piano Course
Participating Sites: School District Superintendent’s Permission Letter on file
DHHS Review Category: Expedited #6, #7
Exempt #3 – applies to classroom observation
Informed Consents: Three (3) signed consent forms (English and Spanish)
Monitoring Interval: 12 months

APPROVAL EXPIRATION DATE: DECEMBER 3, 2014

Investigator’s Responsibilities:
1. The informed consent form bearing the IRB approval stamp must be used when recruiting participants into the study.
2. The investigator must notify IRB immediately of unexpected adverse reactions, or new information that may alter our perception of the benefit-risk ratio.
3. Study procedures and files are subject to audit any time.
4. Any modifications of the protocol or the informed consent as the study progresses must be reviewed and approved by this committee prior to being instituted.
5. Continuing Review Approval for the proposal should be requested at least one month prior to the expiration date above.
6. This approval applies to the protection of human subjects only. It does not apply to any other university approvals that may be necessary.

C. Randall Colvin, Ph.D., Chair
Northeastern University Institutional Review Board

Nan C. Regina, Director
Human Subject Research Protection