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Designing an Interdisciplinary Learning Environment for Conservatory Students: Using the Liberal Arts to Expand Education and Better Support Performance Interpretation

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ABSTRACT

This paper discusses designing an interdisciplinary learning environment to promote learning of the liberal arts for advanced music students in order to expand the boundaries of their education experience beyond the technical mastery of their musical instruments. The paper discusses the utilization of salient features of information, communications, and technology and the use of instructional theory to promote the understanding of how individual pieces of music can be connected to knowledge of the context in which they were created to support the understanding of the relationship between experience in the world and musical composition.

Key words*: ICT (information, communications and technology), connected knowledge, global network, learning technology, integrated application technology, learning environment, cognitive flexibility theory, multisensory learning, and interdisciplinary learning.*

1. INTRODUCTION

The concept of connecting knowledge, which combining two or more disciplines to create interdisciplinary curricula, has been in existence throughout the history of education. During the early twentieth century, the concept of interdisciplinary learning has been widely supported due to the popularity of the progressive education movement [1], [2]. Constructing the learner's understanding through the formation of multilevel connections between different fields of education has been essential in making the transition from the industrial age to the post-industrial age and in supporting the creation of a knowledge workforce [2], [4]. This transition was driven by the rapid globalization where it had impacted in the areas of production, acquisition, and dissemination of information. This transformation was closely linked to the rapidity of technological innovation and the interest it sparked in the relationship between different contexts of learning and learning domains [3].

In spite of wide agreement on the need for an innovative approach to designing and the use of an interconnected learning environment for preparing the learners in an interconnected world, there has been limited development of domain specific learning content that specifically focuses on such transitions in the field of musical performance in conservatories worldwide [7].

This paper discusses the use of the web and the use of instructional theory in the education of music students in the conservatory to promote an in depth understanding of musical composition that goes beyond technical dexterity of their instruments and to support the connection of knowledge across fields and disciplines.

1.1 The ways of connecting knowledge

The web portal, "Web Concert Hall" (webconcerthall.com) was developed to offer a wide variety of relevant content for advanced music students so they can make use of a many interconnected areas of thought as they strove to understand the piece of music they are learning. The idea that deeper understanding of inter-connected areas of knowledge is necessary to the field of arts is not new. For example, Leonardo da Vinci felt that he could not paint a human body unless he knew its skeleton and its architecture [8]-[10]; like a human body, music has an architecture and skeleton, therefore, understanding the architecture and skeleton of a piece of music requires understanding the worldly knowledge and experiences

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connected to its birth -- literature, art, and other music [3], [5], [13].

More specifically, the goal of the Web Concert Hall is to lead the students to an understanding of how a wide array of other subjects is necessarily interconnected with the musical work they are currently learning. Experts in the performing arts field, such as music critiques, music historians, composers and faculty members of conservatories for example, believe that demonstrating to students how other areas of study are interconnected with musical composition and performance can provide the basic intellectual competencies necessary for dealing effectively and responsibly with the reality of performing a given musical composition [19] (Fig. 1)

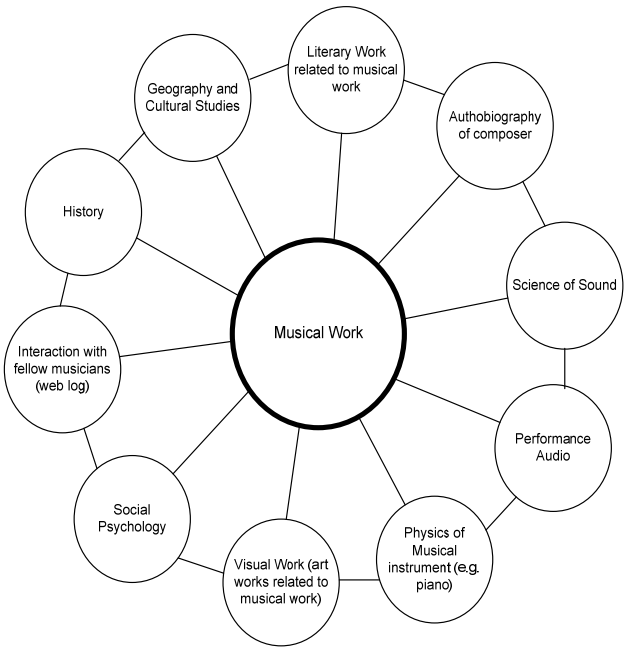

Fig. 1. Each musical work is connected to various subject domains that may be connected to the musical composition.

The remainder of this paper discusses two aspects of the design of Web Concert Hall: the section 2 (Performing arts education in a typical music conservatory) identifies the challenges of performing arts education in a typical music conservatory and the section 3 (Designing interdisciplinary learning environment) identifies an appropriate instructional theory for use in designing the interdisciplinary learning environment needed for the education of performing musicians.

2. PERFORMING ARTS EDUCATION IN A TYPICAL MUSIC CONSERVATORY

A key theoretical assumption behind performing arts education is that music is an expression of emotion in the form of a statement of musical ideas by a composer. Therefore, it follows that it is the performer's responsibility to communicate the composer's ideas in an orderly fashion, just as the composer arranged his experiences for the performer to convey for the listeners. For the musician to be able to communicate at this level, learning to perform a piece of music must include three distinct cognitive operations: 1) possibly imaginatively re-living and mentally recreating a part of the history by which the music was shaped; 2) understanding both historically and culturally how the piece of music connects to diverse genres of thought; and 3) translating this cognitive experience into an action, that is, using technical dexterity to reflect one's learned or processed knowledge.

When a performer is weak in one or more of these cognitive operations, or in the ability to execute effectively on stage the mental activities described above, the performer is likely to interpret the composition in an oversimplified way that gives an unbalanced emotional understanding – and hence experience for the audience – of the composition [11]. Two studies by Ericsson et. al. have conducted a study of a group of professional violinists that collected data on the musicians' historical practice habits [35], [41]. The study found that there was a correlation between the amount of time spent in instrument practice and the level of achievement of execution of musical instrument. Based on this study, the accepted theory has been practicing only the necessary skills to master a chosen musical instrument as the principal means for acquiring expertise in both musical and technical facility. The limitation of this study is that it does not provide evidence of the relative role played by increasing the depth of understanding of musical ideas in comparison to the value of hours of practice spent only on technical agility.

By contrast, an earlier study by Ackerman found that – at high levels of technical achievement on an instrument– the execution of a musical work in performance is more influenced by individual differences in cognitive ability and understanding of the personal historical and social conditions surrounding the composition than by practice of the instrument itself [33]. That is, the study found the performance was "more strongly influenced by (understanding of the musical ideas) than by technical agility.

Concert performances that display incongruent emotional expressions of thought are common among typical conservatory-trained students. This is due to the fact that curricula offered in conservatory mainly emphasize the mastery of instrument technique and place little emphasis on knowledge of the interconnectedness of a piece of music with the social ideas and movements that may have influenced the composition of the work (i.e., ideas and movements as reflected in history, science, philosophy, literature, and art works.)[16]-[18].

Although there are exceptions among conservatory-trained performers, most schools of thought behind the conservatory simply do not emphasize teaching the interconnectedness of knowledge of the historical period and composer's experience with performance. Based on the review of course bulletins since the beginning of twenty-first century from three prestigious conservatories in the United States, most music instruction and courses offered in these conservatories take only limited account of the cognitive development of the students in related intellectual activities, the interconnectedness of different areas of human thought, and the interdependence of all genres of thoughts with a piece of music [16]-[18]. A typical instrumental teaching method relies heavily on a fixed body of information. Often, the pedagogical materials are repetitive and

cognitive activities are limited, if not non-existent [11], [12]. Students and instructors make little effort to relate relevant background information to the learning process. Even on the most basic level, the creation of opportunities for students to see the interconnections between harmony, structural analysis of a composition, visual art works from a period, and other social documents that may be related the composition that would aid the student in attaining a better awareness of a piece of music is seldom emphasized.

Detterman and Ruthsatz [36] noted that the process of becoming an expert may be better understood as taking place through a combination of factors. These factors may include the performer's general intelligence, domain-specific skills, and ability for deliberate acquisition of knowledge that supports the recreation of specific emotional states to express the musical work. These are the important components that contribute to a successful execution of the musical work.

The lack of interdisciplinary experience gives music students limited experience in gaining critical thinking skills and in the mental processes of connecting worldly knowledge with the learning material. For example, similar to professional athletes, typical conservatory students concentrate on the "technical outcome," often a somewhat *ad hoc* affair that does not lead to the student becoming a self-evaluator from multiple perspectives. That is, most of the time, the majority of the information presented in a private music lesson covers isolated facts that cannot be reliably recalled and used in other domains. Such a lesson rarely covers information relating to other fields of knowledge to expand the learning experience. Instead of spending the majority of their time attempting to memorize music for a technically polished performance, these students should also be encouraged to explore interdisciplinary studies that are related to the music they study [14], [15]. This will make well-rounded musicians and develop valuable skills for those who may not be professional musicians in the end.

The general outcome from conservatory music education is that students often undervalue acquiring knowledge about anything beyond their instrumental technique. This approach has a distinctly limiting effect on cognitive development and limits students' ability to become well-rounded, emotionally effective performers [19]. It is authors' observation that this separation of the subjects on the theoretical level may have a direct impact on conservatory students' interpretation of a piece of music during live performances.

Many classical concerts are offered throughout major cities worldwide by professional artists who studied abroad and perform in their homeland concert halls. However, witnessing technically competent performances from these conservatories trained but mood and temperament expressed by the performers being incomplete because the performer may have limited understanding or knowledge about the composition's background is a typical. Such experience of limited understanding of performing repertoire has been evident at all levels of concert halls worldwide.

Unable to convey an adequate emotional understanding of a musical work and leaving the audience unmoved is not an isolated case. Such observations have been made in the past in the class of Gustave Reese at New York University [20] and Dorothy Delay at the Juilliard School [31].

A decline in the level of world knowledge that music students possess is evidenced by the stories faculty exchange. Gustave Reese, a musicologist at New York University, asked his music class:

"When was the Renaissance?" "When was the Rococo period?" "How is Rococo different from Baroque?" and "How should work [composition] be interpret today based on some of the historical facts?" Finally, one brave student asked, "Who's supposed to teach us these things[20]?".

At this point, we have to wonder how students understand what they play and/or read when they do not have an instructor with a comprehensive education nearby to answer their questions. One can also argue that such may be the student's learning responsibility to learn on their own. However, in many cases, students seldom exposed to making the interconnection of two or more domains of studies that leads to unique learning outcomes of their current learning activities. Therefore, students are not aware of generating such inquiries on their own to begin with.

Every instructor in a conservatory has substantial anecdotal evidence to show that students do not know very much about general music history. This is not only the case in music. In other domains, there have also been a significant number of reports indicating that students have limited knowledge about the world. The National Endowment of the Humanities reports, *American Memory: A Report on the Humanities in the Nation's Public School* [21] cites data from a survey funded by the NEH that indicate that "more than two-thirds of the American 17-year-olds were unable to place the Civil War within the correct half-century." The workplace in late 80s had brought new pressures to bear on all levels of education to modify existing curriculums to be made more interdisciplinary curricula to prepare the workers for the twenty-first century. In its response, much of research in the field of cognition has shifted from focusing on knowledge structures to looking at how the brain acquires and connects knowledge in order to generate higher-order thinking that promotes problem-solving and critical thinking skills [6], [7], [13].

2.1 The core of the problem for conservatory students and access to necessary information

One often hears intellectually, emotionally, and a technically unbalanced performance from advanced conservatory students and even from professionals when they are performing a piece without having attained sufficient background knowledge about the cultural context from which it comes. This is due to a combination of (1) limited time spent on research on the composition to perform; (2) minimal acquisition of personal research skill; and (3) limited access to or research skills for locating critical historical information and cultural resources. Because of the importance of these problems, each of these three factors is elaborated below.

1) **Limited time spent on research on the composition they are to perform:** a great deal of time is required for

performers to develop proficient technical skills on their instruments. As a result, performers often invest little or no time in learning about the cultural background of musical composition, which is not seen as directly relevant to their development as musicians. Furthermore, such activity is not required in typical conservatory curricula.

2) **Limited institutional emphasis on developing necessary research skills:** Teaching academically necessary research skills are not seen as a primary educational goal of a typical conservatory. Therefore, music students often do not exposed to the skills that would enable them to explore new materials on their own and inform their interpretation of the music. Far from teaching these students on how to become inquisitive learners, the conservatory approach gives them a false sense of confidence based on the mistaken idea that their only responsibility is to master their instruments technically.

3) **Limited availability of research materials:** Conservatories generally provide a large collection of recorded sound materials and scores of music. However, library resources on the liberal arts and other related intellectual materials, such as commentaries on these recordings and structural guides to relevant data are much more limited in conservatory libraries compared to the libraries of standard universities. This represents an additional obstacle in terms of finding information on these important background matters, even before beginning the difficult and time-consuming work of integrating and applying intellectual materials to one's interpretation of music.

3. DESIGNING INTERDISCIPLINARY LEARNING ENVIRONMENT

Taylor [5] at Columbia University Teachers College outlines the utilization of media technology in education: "the greatest benefit of such technology would be if it could be used to solve a problem that has proven difficult or impossible to address via traditional media. One key way to do this would be to use computer-based customized learning environment to enable students to construct their own musical knowledge and view of the world through active and authentic learning experiences.

Computer technologies have been used widely to create learning environments that can deliver much of the information described above without requiring the presence of human experts. It is the creation of such a multisensory learning environment using web technology that is the central purpose of this paper and development of the Web Concert Hall. The Web Concert hall attempts to alleviate the problems described above by providing information that may be useful to advanced music students (Fig. 2).

Fig. 2. The portal is linked to a series of sub-portals with the list of links to musical performances and its related material

With the Web Concert Hall, knowledge that was previously accessible only through books, classroom lectures, and museum artifacts is now available for asynchronous electronic instructional delivery. The creation of the Web Concert Hall should affect not only the way in which information is communicated to the learners, but also the way in which learners make sense of the information that is presented and the way in which they use this information to construct new knowledge [23], [24].

It is the authors' belief that when performers are placed in a richly customized and structurally guided learning environment, the learners should be able to make the connections that are necessary to a deeper understanding of music. That is, by presenting students with concrete models of learning resources that are interconnected with the music they practice, such should be able to offer new modes of knowledge to express the music they are studying, therefore, the outcomes of the performance should be positively affected. In this respect, the Web Concert Hall has taken a full advantage of existing resources and using an instructional theory, cognitive flexibility theory, to its advantage, both technologically and educationally. Technologically, the Web Concert Hall combines the advantages of multiple media formats such as images, video, sound, and hypertext technology to deliver information to the users. Educationally, the Web Concert Hall organizes the wealth of information available on the Web into many domains and categories related to the understanding of musical work. The next section discusses the cognitive flexibility theory and its use in the designing of the Web Concert Hall.

3.1. Cognitive Flexibility Theory

Cognitive flexibility theory is largely concerned with the transfer of knowledge and skills beyond their initial learning situation. The theory builds upon other constructivist theories in terms of media and learning interaction. For this reason, emphasis is placed on the presentation of information from multiple perspectives and the use of many case studies, that is, criss-crossed linkages of subject matter and models that present diverse examples [25]. In addition, the theory stresses the

importance of constructed knowledge; learners must be given an opportunity to develop their own representations of information in order to properly learn [26], [27]. A great advantage of cognitive flexibility theory is that it has been especially devised to be used with hypertext and web-based instruction. From the point of view of constructing mental models, this theory would appear to be highly appropriate as its use would result in the formation of a very complete, well-linked teaching and learning environment.

Cognitive flexibility means enabling the learner to spontaneously restructure his or her knowledge in an adaptive response to radically changing situational demands [25], [28]. The theory specifically address issues of advanced knowledge acquisition, where knowledge is often nonlinear and complex and therefore inappropriate for simple hierarchical organization [26]. Therefore, cognitive flexibility theory can act as an "antidote" to the different types of learning failures associated with advanced learning in ill-structured domains, such as music, when traditional instructional strategies are employed that do not emphasize critical thinking or an inter-disciplinary approach. Jacobson outlines the features of cognitive flexibility theory as follows [27]:

> *... complex knowledge may be better learned for flexible application in new contexts by employing case-based learning environments which do the following: (1) use multiple knowledge representations; (2) link abstract concepts in cases to depict knowledge-in-use; (3) demonstrate the conceptual interconnectedness or web-like nature of complex knowledge; (4) emphasize knowledge assembly rather than reproductive memory; (5) introduce both conceptual complexity and domain complexity early; and (6) promote active learning opportunity.*

3.2 Designing the Web Concert Hall as to promote an interdisciplinary learning experience for conservatory students

Jonassen, Ambruso & Olesen [26] described an application of cognitive flexibility theory to the design of a hypertext program on transfusion medicine. The program provides a number of different clinical cases which students must diagnose and treat using various sources of information (including advice from experts). The principles of this theory are: 1) learning activities must provide multiple representations of content; 2) instructional materials should avoid oversimplifying the content domain and should instead support context-dependent knowledge; 3) instruction should be case-based and emphasize knowledge construction, not transmission of information; and 4) knowledge sources should be highly interconnected rather than compartmentalized (Fig. 3).

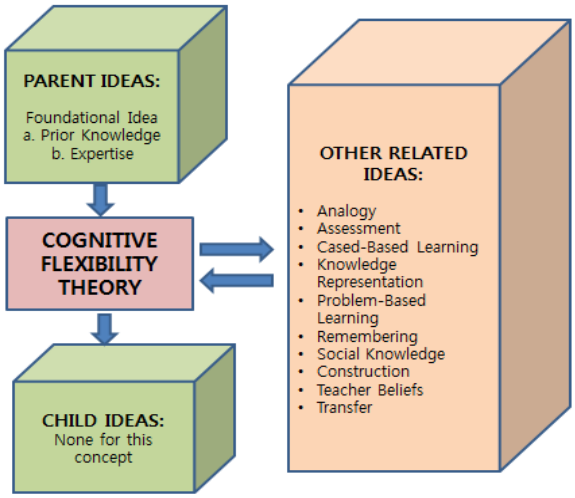

Fig. 3. WCER (2004) [29]

The Web Concert Hall hopes to set music students on a different course by giving them with a new conception of where they are going and what to look for, as well as why and how to get there. The Web Concert Hall does not attempt to offer knowledge or information to the student for the sake of providing all possible knowledge. Rather, it attempts to offer guidance by offering selected, exemplary information that supports a deepening understanding of selected repertoire, and by providing assistance for music students in interpreting music. Like a good teacher, it sets the student on a course, and it gives a new conception of where the student is going and what to look for. With a talented musician, this may be all that is necessary as a starting a process.

For example, in the Web Concert Hall, a student who wishes to learn about *Rachmaninoff's Piano Concerto No. 3 in D* minor may have an opportunity to listen to the performance itself; read life stories about the composer; explore and see various Art works created during the time of Rachmaninoff's 3rd piano concerto was in progress; read about the composers who influenced Rachmaninoff's composition, such as Tchaikovsky; read poems or social documents that were written during the composer's time from various regions of the world; read biographical information about the soloists who are performing the composition; use email to discuss and exchange thoughts with other musicians, experts and a soloist who performs the composition in the Web Concert Hall; listen to and discover newly recorded performances of other musicians; and read about the solo instrument itself.

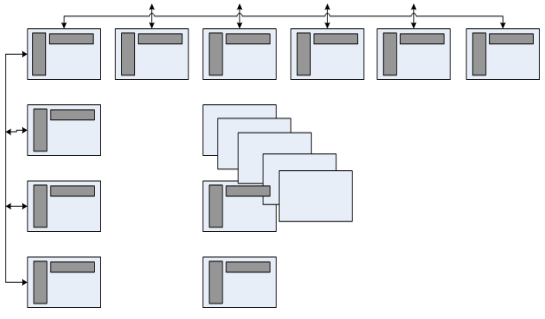

Fig. 4. The construction of web concert hall based on Fig. 2

The Web Concert Hall, in essence, is a multisensory learning portal that launches students on their own search (Fig. 4). Different minds call for different educational approaches. This may be the reason that imposing only one type of learning medium, such as book, can only offer limited sensory learning experience for the music students.

A good interpretation of musical composition can be erected from proper training of an instrument and shaping the mind at tender age. However, these intellectual models cannot be directly imitated at first. A performer must be provided with good models with its justification for imitation. Therefore, providing structural guidance with appropriate information to musicians as examined in the Web Concert Hall is critical for advanced learning and ill-structured domain because the nature of the subject. Using the Web Concert Hall, the knowledge that was previously available only through books, lectures, or static media) is now available for asynchronous electronic instructional delivery (Fig. 5). The creation of Web Concert Hall should affect not only the way in which information is delivered to the learners, but also the way in which the learners make sense of the information that is presented and the way in which they use this information to construct new knowledge.

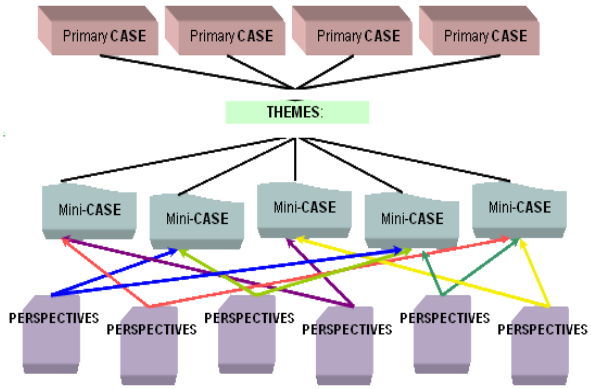

Fig. 5. Graddy (2001) [30]

A typical conservatory is hampered in their ability to provide natural learning because of the amount of individual attention it requires. This is not because of a lack of knowledge about how learning is accomplished, but more the result of economic necessity. It is financially costly to get students involved in goals they care about and then to coach them on an as-needed basis of each learning domain that are needed to improve student's understanding of music. However, such economical challenge of providing such learning experiences may be significantly reduced by widely available and fully developed interdisciplinary and multisensory learning environments like the Web Concert Hall. Such learning environments can make individualized attention a real possibility for many more students and present students with tasks in which they are interested. Only such systems can offer large numbers of students the opportunity to become fruitfully inquisitive, exploratory, and the opportunities for doing both learning and accepting failures as part of the process of true learning. Therefore, using a learning portal like the Web Concert Hall, it can offer music students an opportunity to follow the course prescribed by the processes of natural and spontaneous learning.

4. CONCLUSION

Art is inherently interconnected and interdependent with thinking about the world. To be an artist, one must become a spectator of all things. Therefore, learning to perform a piece of music cannot be an isolated process. To be able to understand and perform a piece of music requires a systematic investigation of the cultural context in which the work was written, and that information must be taken from a range of available sources.

How can knowledge about literature and related fields help musicians develop their performance skills? It is believed by many people that being creative, innovative and being able to express oneself may be the key to performing effectively. Plato suggests that emotion without knowledge or education can only produce an incongruent emotional expression of thought [2]. To apply this to performing arts education, a performer's interpretation of a musical work can be oversimplified if there is insufficient background knowledge of the piece of music at hand. This interconnectedness of distinct disciplines is true not only in the arts but in all fields. This is reflected in the current state of educational research where, in an attempt to solve problems in the last two decades, institutions and educators have turned to psychology, cognitive science, and new technologies in order to better understand the principles of innovative learning experience [22]. Although such approaches might seem at first to diminish the importance of philosophical approaches to education in favor of more empirical methods of inquiry, philosophical problems continue to occupy the center of educational concerns, as educators and citizens are confronted with inescapable questions about the value, meaning, purpose, and justification of education.

The design principles that underlie an interdisciplinary learning environment rely on a philosophical point of view that also underlies the authors' belief about music education. The importance of this philosophical point of view is not rooted in ancient Greek philosophers having the right answers, but in their belief that most questions could be addressed and understood through rational thought.

In sum, the Web Concert Hall is designed to offer a viewer a chance to (1) re-live and resuscitate a part of the history music was shaped by; (2) understand how any given piece of music connects to diverse genres of thought; and (3) participate and acquire information in ways that were not possible in the past. The Web Concert Hall is an example of solution to problems in music education that have grown more and more intractable in the last century, even as the need to solve them has become more and more obvious to the musical world.

It is the authors' belief that when performers are placed in a learning environment that is rich in content and structurally interconnected from one source to another, they will be able to make the connections that are necessary to a deeper understanding of musical works. Presenting the conservatory students with customized learning models as a spring board for them to experience the interconnectedness of their learning will

provide new modes of expression for interpreting music and be able to raise the level of their own performances.

Nevertheless, to measure the improvement of these students interpretation on the stage as well as their technical skills to express their understanding with their instrument through the use of Web concert hall remains an interesting question, not only in music but where such learning environment can be applied elsewhere. This question certainly deserves the attention of focused research in the future.

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