**ABAC ODI JOURNAL Vision. Action. Outcome**

ISSN : 2351-0617 (print) , ISSN: 2408-2058 (electronic)

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ABAC ODI JOURNAL Vision. Action. Outcome Vol 9(2) pp. 106 -122

www. http://www.assumptionjournal.au.edu/index.php/odijournal

Published by the
Organization Development Institute
Graduate School of Business and Advanced Technology Management
Assumption University Thailand

ABAC ODI JOURNAL Vision. Action. Outcome is indexed by the
Thai Citation Index and ASEAN Citation Index

# Effectiveness of the Pro Tools Software to Enhance Vocal Music Students Singing Performance of a Polytechnic Institution in Middle ff China

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**Received: 15 January 2021** **Revised: 15 February 2021** **Accepted: 5 March 2021**

## Abstract

The purposes of this research were to 1) determine the effectiveness of the integration of ProTools software as a supplementary tool enhancing vocal music students' singing performance, and 2) to identify the students' satisfaction toward using ProTools software. A mixed-method research design of the quasi-experiment and the interview were conducted. The participants were 80 vocal music students aged 18-20 years at a Polytechnic Institution in Middle of China. Forty samples were assigned into the control group, and the other 40 were the experimental group. The 10 students from the experimental group were selected for the interview. The control group was taught traditionally while the experimental group was taught using ProTools software. The independent sample T-test was applied for hypotheses testing, while the content analysis was used for qualitative data analysis. The results revealed that the students from the experimental group had higher scores than the control group in all skills—pitch, rhythm, enunciation, singing ability, performance ability, and emotion controlling. Therefore, ProTools software serves as an effective learning tool to improve student vocal music performance. In addition, the students showed a positive satisfaction towards using ProTools software as the blended learning to enhance singing performance.

Key Words: blended learning, pro tools software, singing performance, supplementary tool, vocal music

## Introduction

Vocal music teaching is an art related to human voice and singing. Educators offer instructions and guidance to students' singing behaviors through theoretical explanations, language expression and singing demonstrations to achieve the goals of teaching singing performances, which ultimately help cultivate comprehensive vocal professionals. Vocal music teaching in higher vocational colleges in China has formed a new model with Chinese characteristics. Vocal music teaching has also become the focus of the training of vocal music professionals.

With the rapid development and growing application of science and technology, educational information technologies : multimedia, educational soft-wares, mobile APPs, and education-specific resource databases, have gradually been incorporated into the teaching field, becoming essential auxiliary tools for teachers' teaching, and also supplying abundant information materials to students to use in the classroom and for self-practice by themselves as needed after class. In the field of vocal music teaching, teachers' skillful teaching, to some extent, relies on their own knowledge, teaching skills and aesthetic tastes to determine the teaching content and direction in the traditional teaching environment whether it is in a small one-to-one class or collective vocal music class.

In vocal music teaching, Pro Tools software is currently internationally recognized as one of the best integrated audio productions software. Through explicit visual and auditory comparative feedback, the software can visually display the direction and quality of sound text through multiple expressions such as waveform graphs, peak-valley graphs, status quo graphs, block graphs, and contrast sound quality through the quantified adjustment of a specific link. In addition, Pro Tools software has powerful computing capabilities, are scientific and offers rich options in the recording environment (Nakano & Got, 2007). The outstanding ability of the software in human vocal recording has achieved unanimous recognition in the industry.

Meanwhile, vocal music teaching has faced problems of the traditional spoon-feeding on the construction of a novel interaction mode (Li, 2015). Special consideration has been given to the innovative technologies in vocal training for future musical arts teachers. Therefore, vocal music teaching in higher vocational colleges should be a teaching model that places equal emphasis on music theory literacy and artistic practice skills and emphasizes the cultivation of high-quality music talents with specific innovative capabilities.

Firstly, due to the differences in the voice conditions of each student, vocal music courses in higher vocational colleges are mainly taught in one-to-one or group lessons (one-to-four, one-to-eight). The vocal music classroom teacher uses a similar and fixed teaching mode. The teacher plays the piano to accompany the students to sing. The teacher finds problems and adjusts and corrects the students' singing according to their own knowledge structure. There have been worries that the dominant position of teachers is too strong. The teaching is relatively inflexible, the teaching methods are not attractive and varied, and there is little room for students to interact and practice independently (Zhang, 2019). Vocal music classrooms need to use more technology and information technology to enrich teaching methods, improve students' attention and teaching efficiency.

Secondly, in the classroom, teachers are often the only source of knowledge, and the differences in teachers' subjective consciousness and aesthetic abilities have caused the diverse quality of vocal music teaching and the ability to cultivate talents. Teachers may lack effective and unified quantitative standards for sound evaluation, sound shaping, and proper correction. The non-standardized small class system of vocal music teaching and teachers' diverse subjective judgment abilities could impact teaching performance. The scientific quantification of sound standards in vocal music singing has received widespread attention. The objective and reasonable way to judge the normativeness of the voice in singing performance is a common problem in vocal music. Some researchers have proposed scientific methods for vocal music teaching and singing voice measurement, using spectrum instruments or related hardware to

show accurate data analysis results of singing (Nakano & Got, 2007). Teachers use audio software in vocal music teaching which helps in sound evaluation, sound shaping, sound correction, etc., to develop effective and unified quantitative standards.

## Literature Review

### The History of Development of Chinese Vocal Music Education

Vocal music education is a part of singing education. It is a way to add beauty to the human voice through education in line with the physiological functions of the human body Vocal music education in China has a unique history. As a way of inheritance, singing can be traced back to the early days of feudal dynasties. Vocal education is inseparable in both court music culture and in the spread of folk songs. From a historical perspective, the sudden emergence of ancient music culture and religious music culture has provided sufficient resources and guidance for developing traditional Chinese vocal music education (Liu, 2018). The artistic charm of singing in the ritual music culture of the Western Zhou Dynasty, and its educational philosophy was represented by the spirit of learning and passing on, which fostered the artistic ideal of Chinese vocal music. With the spread of Taoism and Buddhism culture from the Western Zhou Dynasty to the Sui and Tang Dynasties, singing forms with religious backgrounds such as ceremonial music and Buddhist singing, have also developed into the specific way of oral transmission and produced unique concepts of Chinese vocal music education in the cultural heritage.

Traditional Chinese vocal music education inherited the classical culture period. However, since the 20th century, Chinese vocal music education has entered a new era. At the beginning of the 20th century, Chinese vocal music education was transformed from the old system to the new one, including the sudden emergence of art education under industrial rejuvenation and the combination of Western music tunes and Chinese lyrics in music teaching. The opening of music lessons in school education has filled the gap of the Chinese vocal education scientific system and promoted professional education into the following stages: May, Fourth Period of the 1930s, and the War Period; New China and the Cultural Revolution; and Period from Cultural Revolution to the 1980s and 1990s (Liu, 2018). Many authors have studied the establishment and development of many music academies and professional vocal music education institutions, sorted out the typical deeds of music educators, and also made detailed comments on major events and activities that influenced the development of vocal music education in China (Xie, 2021). These studies can present the ups and downs of Chinese vocal music education in the 20th century and reflect the vertical historical development of Chinese vocal music education from weak to strong in the future.

### The Teaching Mode of Modern Vocal Music Education

With the modernization of music education and the coronavirus pandemic situation, the enhancement of using innovative technologies effectively for musical arts teachers is recommended. There are varieties of pedagogical technologies being considered in the field of music pedagogy and vocal pedagogical technology which includes features of both pedagogy and technology such as WebCT, MIDI IN, MIDI OUT (a synthesizer and mixer of

sound), Dreamweaver, Sibelius (a music notation software) Sonar 3 (to produce MP3), and Pro Tools software (Ovcharenko et al., 2020). After the reform and opening up, a relatively stable model in China vocal music education has come into being, which is characterized by a small-class one-to-one teaching method. The mode of contemporary Chinese vocal music teaching and Italian vocal music teaching form equal and parallel–use of teaching methods in the university vocal music (Zhang, 2016). The existing vocal music education system has been implemented for many years but there is still room for improvement in teaching methods to avoid the problems of a surplus of talents and lack of competitiveness in the face of the current reality of college enrollment expansion and changing social needs.

Analyzing the value and significance of the whole education process, the vocal music evaluation in modern vocational colleges is closely related to students' career prospects. To study the evaluation mode of vocal music teaching, it is necessary to start from the purpose and significance of the content, content index, procedure and method of student development evaluation, and evaluation result. The teaching content and current evaluation methods of vocal music course, including the current evaluation methods and scoring standards, all take the analysis of vocal music teaching examination mode as feedback, and reveal the significance of innovating vocal music teaching process. Therefore, researchers think it is necessary to use the new evaluation method and cultivate students' abilities. It is suggested that teaching be carried out according to students' personalities. Such research is forward-looking and in line with the current state of the educational environment. Moreover, Li (2015) conducted a study about a new mode of vocal Music Teaching and Research on the construction of a novel interaction mode to discover and seek a solution relevant to the problem of identity crisis of the traditional spoon-feeding education mode characterized by an interaction on an equal and democratic footing between learners and teachers in light of Habermas' Communicative Action Theory. The findings indicated a new mode about students' personalities and characteristics could help cultivate the innovative spirit and practical ability, enhancing the teaching content's expressiveness and bettering teaching effect and the quality of vocal music talents.

Blended learning is a combination of traditional teaching mode and online learning mode. Nowadays, blended learning has been introduced and utilized worldwide and nationwide, especially during the pandemic. Blended learning attempts to bring about all the best elements of online teaching which provide students with rich learning experiences through self-directed learning and skills development. Thus, blended leaning was introduced and developed for this study with the integration of Pro Tools software to enhance vocal music students' singing performance.

*Singing performance:* A performance ability that includes a strong artistic expression that can accurately express the style and content of the work. There are strong and weak voice singing, voice contrast changes and ups and downs with a strong emotional appeal (Reid, 1983) that includes emotional controlling, enunciation, rhythm, and pitch.

*Emotion Controlling:* The stage image is good, the costumes are appropriate, the movements are appropriate, and the singing voice has the appeal of stage art (Lei, 2017).

*Enunciation:* Language in singing is a way of expressing emotions. Enunciation can express the content well. The language of singing should be accurate, clear and standard, so as to achieve beautiful singing (Reid, 1983).

*Rhythm:* Combine sounds of varying duration and length together. The length and strength of a scale, note, or syllable in progression of a musical melody (Grosvenor & Meyer, 1960).

*Pitch:* A basic feature of sound. The height of the tone, the pitch of each sound is different. The pitch of a sound is determined by its frequency and wavelength. If the frequency is high and the wavelength is short, the tone is "high"; if the frequency is low and the wavelength is long, the tone is "low" (Gregory et al., 1993).

**Pro Tools Software: The Feasibility of Integration of Vocal Music Teaching and Pro Tools Software**

Contemporary science and technology development plays an essential auxiliary role in vocal music teaching. At present, the introduction of technology is mainly divided into two levels. The first is the application of Internet technology; the second is the application of data analysis technology.

Pro Tools software has auxiliary functions in vocal music teaching. The software can provide immediate support for correction and visualization effects at the level of visual feedback, so that teachers and students can accurately perceive the number level and variable data. Although there is rarely a case of Pro Tools software directly applied in vocal music teaching in the existing research, the academic circle pays close attention to guiding students to improve the singing quality and effective teaching in vocal music education. Stavropoulou et al. (2014) stated and supported through the use of images, among which the "psychological hook" or the concept of promoting the use of gestures is deemed suitable for production. When feedback is provided, the students easily perceive the teacher's visual teaching method (Howard, 2005) Some studies have randomly assigned non-singers and singers to one of two training conditions. Zaki and Justeena (2016) studied the visual feedback of sound performance, and the other without visual feedback by comparing pitch accuracy, vocal cord variability, and response to sudden frequency changes. The superiority of visual feedback is finally determined. Several studies on real-time feedback, voice control, learning evaluation, and skill guidance provided by similar software for vocal singing found that the software has a positive meaning for improving singing skills through experimental research on these software and tools.

To identify students' singing intonation, the teacher's instantaneous hearing often cannot make accurate judgment, but the Pro Tools software plug-in (Waves Tune) can record the sound in detail, through the display of lines, and analyze the intonation value.

Waves Tune can identify a singer's intonation in real time, either during or after a performance. Under normal circumstances, the sound should be free in the range of line spacing compared with the left key. Once the deviation occurs, it can be regarded as overtone jitter or intonation deviation, reminding teachers and students to make singing adjustments. This can be used as a standard reference for software evaluation, for observing and evaluating the singing sound, and could serve as a series of quantitative indicators to assist the practice of vocal music singing. The diagram is shown in figure 1.

**Figure 1**

*Pro Tools Software Line Display*

## Previous Research

Through the analysis of the existing academic literature, the researcher found that audio software in vocal music teaching is necessary. Given the present situation of vocal music teaching, the rapid development of Internet, software, and hardware. Audio software can provide a variety of visual information. This software can provide real-time data in various fields of sound analysis and plays an essential supporting role in improving teaching efficiency and accuracy. However, in the current teaching process, the popularity of these audio software is just beginning and has not been widely used. Researchers analyze the operation function of some mainstream recording software and think that it can form a good cooperation and integration with vocal music teaching (Zhou & Gong, 2021). This software can be used as a studio singer's guide in the regular vocal classroom application and promotion.

With the help of sound recording software and sound spectrum analysis software, sound recording, visual observation analysis and acoustic parameter analysis are carried out to guide sound control exercises and guide the direction of learning. Researchers have investigated the effect of real-time visual feedback training on speech control hoping to improve sound control through practical real-time visual feedback training project. The results show that short-term real-time visual feedback training can improve the performance accuracy but does not directly affect the improvement of sound control. Research shows that multimedia assisted teaching can improve students' ability to absorb music learning, and rich content and interesting teaching courseware can improve students' interest in learning. The effective interaction between teachers and students can improve the effectiveness of multimedia music teaching (Gupta et al., 2018). Researchers have found that using visual feedback singing software can improve the accuracy of different song sounds, and teachers can help children sing better, understand the quality of vowels, and learn how to improve their singing (Moschos, 2008). Researcher hopes to replace and/or enhance the considerable current diversity of terms, images, and psychological connections by using quantifiable measures that are reliable, repeatable, and recordable. It was found that the real-time visual feedback system enhanced the understanding of fundamentals, monitoring of progress, and support in practice. Real-time visual display technology has certain application value in teaching singing.

At present, there are studies on the application of Pro Tools software at home and abroad, mainly focusing on the technical support provided by the software in recording and post-production. In the field of music education or vocal music teaching, there is no cross-border use of the software. Pro Tools software has powerful computing capabilities, convenient and reasonable operation capabilities, scientific and rich options in the recording environment (Nakano & Got, 2007). Especially, the outstanding ability of the software in human vocal recording has achieved unanimous recognition in the industry.

Zhou and Gong (2021) developed the vocal music system model of sound recognition and completed the overall system architecture design combining music sight-singing. The result revealed that the vocal music system model evaluates the level of music sight-singing ability and multiple ability evaluation indicators realize the intelligent evaluation of the cognitive level in the intelligent guidance system.

Xiang and Yuan (2021) conducted a research study about the student satisfaction with blended teaching in an online vocal music course, investigated how to use the Chao Xing Superstar online platform to conduct effective vocal music teaching for preschool education major college students and then carry out a quantitative evaluation of student learning satisfaction., The results revealed that the students' satisfaction is acceptable, the performance expectation, system functionality, and learning climate are significantly positively correlated with the overall learning satisfaction.

Another research study of Li (2015) about new field of vocal Music Teaching and Research on the construction of a novel Interaction Mode to investigate and seek a solution to the relevant problem of identity crisis about the traditional spoon-feeding education mode and to construct a new mode of vocal music teaching characterized by an interaction on an equal and democratic footing between learners and the teachers in light of Habermas' Communicative Action Theory. The results revealed that a new mode to be considered were students' personalities and characteristics which can help to cultivate their innovative spirit and practical ability, thus, enhancing the expressiveness of the teaching content and bettering teaching effect and the quality of vocal music talents.

As the leader of recording software, Pro Tools software tries to simplify the software operation procedures and make it easy to operate. As a result, amateur music lovers can master a large number of plug-ins and software resources, and put forward better requirements on the precision, operation suggestion, powerful function, compatibility and perfection of the software.

## Research Methodology

### Research Design

The researcher adopted the mixed research design: quantitative and qualitative research design.

In the quantitative part, the quasi-experimental research design has been applied. Pro Tools software was integrated into a blended learning class to enhance vocal music students' singing performance in a higher vocational college. Participants were divided into experimental and control groups to carry out the quasi-experiment. After eight weeks of experiment, the singing performance scores of the two groups were compared. The singing performance of each member of the group was evaluated based on the Henan Polytechnic vocal music examination scoring standard 2002 and Vocal Music Professional Examination Scoring Standard.

In the qualitative part, the researcher conducted face-to-face interview with ten randomly selected students in the experimental group after 8 weeks to determine the students' satisfaction toward using Pro Tools software in improving their singing performance. The researcher requested five experts in the field of vocal music education, holding master's degree or above, having more than 20 years of teaching experiences, are professional academic leaders and familiar with Pro Tools software to evaluate the content validity of the questions using S-CVI.

**Research Questions**

1. How effective is the integration of Pro Tools software to enhance vocal music students' singing performance?
2. What is the difference in students' singing performance between blended learning and traditional classes?
3. How satisfied are the students using Pro Tools software to enhance their singing performance?

**Research Objectives**

1. To develop blended learning using Pro Tools software as a supplementary tool to enhance vocal music students' singing performance.
2. To investigate the effectiveness of the integration of Pro Tools software to enhance vocal music students' singing performance.
3. To examine students' satisfaction towards using Pro Tools software as a supplementary tool to enhance singing performance.

**Population and Sample**

The population of this study was 80 students from the School of Music, Henan Polytechnic. The researcher employed purposive sampling method. The sample were second year vocal music major students, enrolled in a vocal music course. The sample size for the quasi-experiment was 80 students divided into 40 students for experimental group and 40 students for the control group. In addition, ten students were randomly selected from the experimental group for face-to-face interview for the qualitative part.

**Quantitative Research**

The 80 participants were selected from the vocal music major students who enrolled in vocal music course at Henan Polytechnic of Music who obtained 80-85 points in the final vocal

music course examination in the first year. There were 40 students in the experimental group, and 40 students in the control group. The 40 students in each group were further divided into five groups with eight students per group.

**Qualitative research**

The face-to-face interview was conducted with ten students. Simple random sampling techniques was employed to select ten students from experimental groups to investigate students' attitudes towards the software.

**Research Instruments**

The vocal music course was designed as a group teaching consisting of eight students per class for both the experimental and control group. Each class lasted for 90 minutes. Each group student in both groups has to practice voice and sing four songs, with the teacher's guidance within the eight-week period totaling 20 classes per week. The experimental group was assisted with Pro Tools software in their singing performance while the control group was taught the traditional way. In the final week, students in both groups had singing performance of a song they had chosen. A panel of five experts who are teachers in vocal music evaluated the vocal music singing performance of each student in both the experimental and control group using the standard evaluation criteria for vocal music of Henan Polytechnic as shown in table 1 which were based on the vocal music examination standard criteria of China Conservatory of Music.

**Table 1**

*Henan Polytechnic Vocal Music Examination Scoring Standard 2002*

| Singing Performance | Excellent | Good | Passing | Failure |
|---|---|---|---|---|
| Pitch | 20 | 20 - 15 | 14 - 10 | < 10 |
| Rhythm | 20 | 20 - 15 | 14 - 10 | < 10 |
| Enunciation | 20 | 20 - 15 | 14 - 10 | < 10 |
| Singing integrity | 20 | 20 - 15 | 14 - 10 | < 10 |
| Performance ability | 10 | 9 - 8 | 7 - 6 | < 6 |
| Emotion controlling | 10 | 9 - 8 | 7 - 6 | < 6 |

**Table 2**

*Vocal Music Professional Examination Scoring Standard*

| Scoring criteria | Excellent | Good | Passing | Failure |
|---|---|---|---|---|
| 1.The voice pitch is standard, and the singing is smooth and complete. | 20 | 20 -15 | 14 - 10 | < 10 |
| 2.Singing the song in a stable rhythm, in line with the song speed requirements. | 20 | 20 - 15 | 14 - 10 | < 10 |
| 3.Enunciation clear, no dialect sound. Able to sing accurately in Mandarin or original. | 20 | 20 - 15 | 14 - 10 | < 10 |
| 4.Sound is correct and scientific. Able to perform songs completely. | 20 | 20 - 15 | 14 - 10 | < 10 |
| 5.Singing has a strong artistic expression, can accurately express the style and content of the works. | 10 | 9 - 8 | 7 - 6 | < 6 |
| 6. The stage looks good, perform properly, with stage art appeal. | 10 | 9 - 8 | 7 - 6 | < 6 |

The qualitative part was done by using face-to-face interview with ten students randomly selected from experimental group to determine the students' satisfaction toward using Pro Tools software to enhance their vocal music singing performance and its effectiveness.

## Validity of the Interview Questions

The validity of the interview question was evaluated by five experts in the field of vocal music education using I-CVI and S-CVI. The experts selected should be familiar with technology, have academic title of Professor, and hold master's degree or above, have more than 20 years of teaching experience, have rich experiences in vocal music teaching and learning and familiar with Pro Tools software. The content validity score of the eight questions were 0.97 indicating that the questions were valid and acceptable.

## Data Analysis

There are two parts of data analysis.

The quantitative data were analyzed using descriptive statistics; frequency, percentage, means, standard deviation and independent sample t-test to test the hypotheses to determine if there was significant difference in student singing performance between the control group (traditional teaching) and experiment group (blended learning with integration of Pro Tools software) in a vocal music course.

*Qualitative*

The data from face-to-face interview were analyzed using content analysis to determine the vocal music students' satisfaction toward using Pro tool software to enhance their singing performance.

## Results and Discussion

### Quantitative Results

There are six hypotheses:

*Hypothesis 1:*

$H_0$1: There is no difference in students' vocal music singing Pitch between the experimental group and control group.

$H_a$1: There is difference in vocal music students singing Pitch between the experimental group and control group.

Table 3 indicated that there is a significant difference in the pitch scores of experimental and control groups, t (39), = 6.858, p=.000.

**Table 3**

*Independent Sample t-test for Pitch Scores of Experimental and Control Groups*

| | Mean Difference | SD | Sig. | N |
|---|---|---|---|---|
| *Experimental & Control Groups* | 0.865 | -0.189 | .000 | 80 |

*Hypothesis 2*

$H_0$2: There is no difference in vocal music students singing Rhythm between the experimental group and control group.

$H_a$2: There is difference in vocal music students singing Rhythm between the experimental group and control group.

Table 4 indicated that there is a significant difference in the rhythm scores of experimental and control groups, t (39), = 7.085, p=.000

**Table 4**

*Independent Sample t-test for Rhythm Scores of Experimental and Control Groups*

| | Mean Difference | SD | Sig. | N |
|---|---|---|---|---|
| *Experimental & Control Groups* | 0.990 | -0.120 | .000 | 80 |

*Hypothesis 3*

$H_0$3: There is no difference in vocal music students singing Enunciation between the experimental group and control group.

$H_a$3: There is difference in vocal music students singing Enunciation between the experimental group and control group.

Table 5 indicated that there is a significant difference in the enunciation scores of experimental and control groups, t (39), =5.426, p=.000

**Table 5**

*Independent Sample t-test for Enunciation Scores of Experimental and Control Groups*

| | Mean Difference | SD | Sig. | N |
|---|---|---|---|---|
| *Experimental & Control Groups* | 0.805 | -0.074 | .000 | 80 |

*Hypothesis 4*

$H_0$4: There is no difference in vocal music students Singing Integrity between the experimental group and control group.

$H_a$4: There is difference in vocal music students Singing Integrity between the experimental group and control group.

Table 6 indicated that there is a significant difference in the singing integrity scores of experimental and control groups, t (39), = 5.426, p=.000

**Table 6**

*Independent Sample t-test for Integrity Scores of Experimental and Control Groups*

| | Mean Difference | SD | Sig. | N |
|---|---|---|---|---|
| *Experimental & Control Groups* | 0.610 | -0.074 | .000 | 80 |

*Hypothesis 5*

$H_0$5: There is no difference in vocal music students singing Performance Ability between the experimental group and control group.

$H_a$5: There is difference in vocal music students singing Performance Ability between the experimental group and control group.

Table 7 indicated that there is a significant difference in the performance ability scores of experimental and control groups, t (39), =5.809, p=.000

**Table 7**

*Independent Sample t-test for Performance Ability Scores of Experimental and Control Groups*

| | Mean Difference | SD | Sig. | N |
|---|---|---|---|---|
| *Experimental & Control Groups* | 0.645 | -0.882 | .000 | 80 |

*Hypothesis 6*

$H_0$6: There is no difference in vocal music students singing Emotion Controlling between the experimental group and control group.

$H_a$6: There is difference in vocal music students singing Emotion controlling between the experimental group and control group.

Table 8 indicated that there is a significant difference in the singing emotion controlling scores of experimental and control groups, t (39), =9.787, p=.000

**Table 8**

*Independent Sample t-test for Emotion Controlling Scores of Experimental and Control Groups*

| | Mean Difference | SD | Sig. | N |
|---|---|---|---|---|
| *Experimental & Control Groups* | -4.835 | 0.964 | .000 | 80 |

The results revealed statistically significant differences at 0.5 between the control and the experimental groups. Therefore, it indicates that the integration of Pro Tools software effectively enhanced the vocal music singing performance of students in the experimental group.

## Qualitative Results

The researcher conducted face-to-face interview with ten vocal music students from experimental group for their opinions a week after the final examination of singing performance to determine the students' satisfaction toward using Pro Tools software to improve singing performance. The results revealed positive opinions about using blended learning with integration of Pro Tools software as a learning tool for a vocal music course.

On the first question, what is the difference in students' singing performance between students in the blended learning class and students in the traditional class? Seven interviewees thought and mentioned that using Pro Tools software was very good for vocal learning; two of them thought that using Pro Tools software was better for vocal learning because they think that it is more interesting than the traditional vocal music learning. One thought that using Pro Tools software had a general significance for vocal learning.

On the second question, what do you mostly like and dislike about using Pro Tools software to assist vocal music learning? Six interviewees liked using Pro Tools software because they said it could help vocal learning and improve their vocal accuracy. Three students said they prefer to use Pro Tools software to help with vocal learning. All of the interviewees really love using the Pro Tools software. The interviewees were particularly pleased with the improvement in their singing performance.

On the third question, do you think Pro Tools software is helpful and support in vocal music learning? Eight interviewees believed that using Pro Tools software were very helpful and supported them in vocal music learning, especially when practicing by themselves after class by being able to quickly assess the accuracy of their singing and improve it by practicing more. In addition, two interviewees believed that using Pro Tools software were helpful for vocal learning and would continue to try to use it.

On the fourth question, will you continue to use Pro Tools software to help you learn vocal music? Six interviewees said, "they will continue to use Pro Tools software to help with vocal learning daily." Two interviewees said they will occasionally use Pro Tools software to

help with vocal learning. Two interviewees said they might use it after class and still liked the traditional learning methods in the class.

On the fifth question, how do you use Pro Tools software to assist vocal music learning after class? Three interviewees used Pro Tools software after class to check the correctness of songs in their own learning process. Five interviewees used Pro Tools software to help them judge their singing accuracy during vocal practice. Two interviewees used Pro Tools software to evaluate and select the correct singing state for practice. To sum up, the interviewees mainly used Pro Tools software to help them judge the accuracy of the sound and improve singing judgment.

On the sixth question, in your opinion, what is the difference between Pro Tools software assisted vocal music learning and traditional vocal music learning? Five interviewees thought that Pro Tools software helps vocal learning, improves motivation for learning and is more attractive than traditional vocal learning. Four students believe that Pro Tools software helps vocal learning more scientifically than traditional vocal learning and helps them to have intuitive scientific data judgments. An interviewee believed that Pro Tools could help in vocal learning, but traditional vocal learning is more conducive to emotional communication.

On the seventh question, do you know what other software can be applied to vocal music learning? Eight interviewees recommended the use of "Quan ming K Song" APP and thought it could work with Pro Tools software because this APP can score the singing and test the results of some singing. Two interviewees felt that the Adobe Audition software also can help with vocal learning. Students can try to use a combination of a variety of software to help with the learning of vocal singing.

For the last question, what are your suggestions for using Pro Tools software in vocal music learning? Eight interviewees thought Pro Tools was good to help learning vocal music in class and after class. Two interviewees thought that learning vocal music would be easier if the Pro Tools software was installed on a mobile phone. This advice could be considered in later research experiments.

In summary, the themes that emerged from the interview could be classified into two: (1) Helpfulness is defined as the characteristic of providing useful assistance, helpful disposition, giving or rendering aid or assistance, (2) Usefulness and learning is defined as the quality of being of practical use, beneficial and advantageous. The blended learning with integration of Pro Tools software was effective and was considered to be a helpful technology tool that allows students the chances to learn and practice and self-evaluate to improve vocal singing performance in and outside the classroom anywhere at any time. Students were proud to be involved in a program that offered such a learning technology tool as supplement resource. It is beneficial for students, with all responses indicating the benefit of additional learning tool. Students also felt that it was a convenient way to learn and evaluate their singing performance by themselves. The results of the qualitative part revealed positive opinions about using blended learning with integration of ProTools software as a learning tool for a vocal music course and supported the quantitative research findings.

## Conclusion and Recommendations

Based on the results of the quasi-experiment, blended learning with integration of Pro Tools software compared with the traditional teaching was found to improve the singing performance of vocal music students. The findings are consistent with the findings of other research studies conducted by Roukonena, and Ruismakia (2016), indicated that blended learning with technology tools increase student's learning engagement in music and assists students with conducive learning, improving their learning experiences not only in the classroom but also outside the classroom through the creative use of information from the internet and online learning. Moreover, teachers could reduce lecture time and let the students initiate productive work with creative ideas. Moschos et al. (2008), and Gupta et al. (2018) asserted that using visual feedback singing software can improve the accuracy of different song sounds, and teachers can help children sing and understand the quality of vowels better while improving their singing. In addition, it was found that the real-time visual feedback from the software could enhance the understanding of vocal fundamentals, monitoring of students' progress, as well as supporting the practice. It is evidence that the real-time visual display technology has certain application value in teaching singing. Furthermore, the results were supported by the studies on the application of Pro Tools software, mainly focusing on the technical support provided by the software in recording and post-production. There is no cross-border use of the software in music education or vocal music teaching. Pro Tools software has powerful computing capabilities, is convenient, and has reasonable operation capabilities, scientific and rich options in the recording environment (Nakano & Got, 2007). Especially, the outstanding ability of the software in human vocal recording has achieved unanimous recognition in the industry.

The research results revealed that a blended learning with integration of Pro Tools software was an effective tool in improving the vocal music students' singing performance in Henan Polytechnic. Additionally, the qualitative data from face-to-face interviews reflected a positive opinion about the software and satisfaction toward using Pro Tools software to enhance vocal music students 'singing performance. The blended learning with integration of Pro Tools software was effective and considered a helpful technology tool that gives students the chance to learn and practice in and outside the classroom anytime and anywhere and allows them to self-evaluate to improve their vocal singing performance. The vocal music students were satisfied, proud to be involved in a program that offered such a learning technology tool as a supplementary resource. It is beneficial for students, with their responses indicating the benefit of additional learning tool. Students also felt that it was a convenient way to learn singing and evaluate their singing performance by themselves.

The findings suggested that the use of Pro Tools software to assist vocal students in learning is effective which enables students to practice singing after school. However, based on the results, future research can explore more technological means, used in conjunction with Pro Tools software to improve students' singing performance. Pro Tools software can only detect, record and observe changes in sound, but it cannot be scored. Future research could incorporate a scoring application with Pro Tools to help score self- assessment and evaluate

singing performance. Other software with evaluation function could be explored to find out its effectiveness in improving the vocal music performance of students.

**Acknowledgements**

Many thanks to my advisor during all my doctoral. Thanks to the students for their cooperation. Thanks to my family for their support. Without them, I can't finish all these. Thank you all.

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