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The innovation of teaching music to persons with visual impairments

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Abstract

Recent research has shown that most music students in Thailand with visual impairments lack access to musical knowledge, resulting in certain limitations in their music performance. The purpose of this study was to assess the effectiveness of a mixed-media instructional course developed by the researcher for persons with visual impairments that used Braille music notation and the GoodFeel software as the primary media. Qualitative and quantitative data were collected from three sample groups recruited through purposive sampling method: (1) seven musicians with visual impairments who had studied music in higher education; (2) three music specialists in music composition; and (3) two music teachers who had experience teaching students with visual impairments. The results demonstrated the effectiveness of the course developed by the researcher. Three post-tests showed that participants with visual impairments who completed the 12-week course developed for this study gradually improved. Post-interviews with music teachers indicated that Group 1 participants who used supportive learning tools were able to initiate processes of musical analysis and synthesis independently. Furthermore, the compositions made by the participants in Group 1 were commended by the specialists.

Introduction

At present, there are many musicians with visual impairments in Thailand. According to data from the Ministry of Social Development and Human Security dated May 31, 2022, Thailand has 2,221 musicians in total. Conversely, the number of musicians with visual impairments who study music at educational institutions is significantly lower. According to data compiled by the Office of the Permanent Secretary of the Ministry of Higher Education, Science, Research, and Innovation over a seven-year period (2014–2020), there were only 15 students with visual impairments who studied music at the higher education level. Together with this information, the researcher, who is also a saxophonist with a visual impairment and a music teacher, discovered that several students with visual impairments in Thailand were restricted from studying music in higher education. Some of them were asked to transfer to study a different major because most music institutions in Thailand lack the knowledge and supporting factors to improve the music learning process for persons with visual impairments (PVI hereafter).

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When the interview with Mr. Torpong Selanon, president of the Thailand Association for the Blind Music Academy Foundation, was compared to the data collected from Thailand-based research over a 20-year period by Leesomboonphol (1993), Prommas and Sapaso (2018), and Punsuk (2020), it was found that the music system in Thailand is still unable to help PVI study music theory or even access music content due to a lack of appropriate curriculum and teaching media. Moreover, there is a lack of assistive technology and personnel who are capable of teaching music and braille music to visually impaired students.

It may be beneficial for visually impaired students to be educated in a higher music education alongside regular students in order to be able to perform music as a stable career, communicate professionally with other musicians, and rely less on others. Drawing from scholars, there are three essential factors that are crucial in music education: (1) the development of listening skills; (2) the development of performing skills; and (3) knowledge and understanding of music content (Bogusz-Witczak et al., 2015; Campbell, 2008; Darrow, 2010; Draves, 2016; Royal National Institute of Blind People, 2013). Therefore, it is important for visually impaired music students to comprehend music theory, musical components, notes, and music symbols, as well as the significance of serious repertoire practice. Skills in music composition and creation, in addition to the ability to listen and play by imitation, are also crucial (Pino & Viladot, 2019).

Accordingly, the researcher has developed a music instructional course for PVI that uses assistive technology to improve musical skill in theory, performance, and composition. The purpose of this study was to evaluate the effectiveness of this specific course.

Literature Review

Music theory is the fundamental knowledge that aids in a better understanding of musical content (Saslaw, 2009; Wilson, 2019). Moreover, music theory allows PVI who want to study music seriously, especially classical music, to better understand and access music content as well as composers' intent. Similar to learning a language, learning music theory requires the ability to read and write (Clifft, 2022; Jun, 2022), implying that music performance students should comprehend the content of the music they perform (Jean, 2021). Another important aspect of approaching and understanding musical performance is the communication process in learning music theory, as well as the awareness between teacher and student (Wilson, 2019).

PVI, on the other hand, must learn music theory in a unique way. They typically listen to music and play the piano or other musical instruments to demonstrate their understanding and knowledge (Wilson, 2019). The problem is a lack of instructional tools as well as teachers' prior experiences with visually impaired students (Whipple & VanWeelden, 2012; Wilson, 2019). Several studies related to the music learning of PVI in Thailand discovered that they lacked knowledge in music theory and braille music. In particular, learning opportunities for students and specialists who can teach PVI were found to be lacking (Leesomboonphol, 1993; Prommas & Sapaso, 2018; Punsuk, 2020). Pino and Viladot (2019); and Draves (2016) pointed out that braille music and music theory are necessary for PVI to learn, communicate, improve skills, and develop their musical abilities more independently. Furthermore, the proper organization of music learning in inclusive education classes as well as instructional tools such as assistive technology and audio resources, are important for music theory learning among PVI, for whom braille music is a key medium (Pino & Viladot, 2019; Prommas & Sapaso, 2018; Saslaw, 2009).

Braille music is an instructional tool for PVI that allows them to access and understand music theory, music notation, and musical detail (Campbell, 2008; Darrow, 2010; Draves, 2016; Goldstein, 2011; Kersten, 1997; McCann, 2002). Reading braille music requires three primary steps: (1) exploring the Braille dots; (2) learning the letters; and (3) learning the music notes (Borgesa & Toméb, 2013). Another important factor that children with visual impairments require in order to develop the ability to read braille music is practice (Stanfa & Johnson, 2015). Pino and Viladot (2019) indicated that students should have a minimum knowledge of the braille alphabet before learning braille music. To learn music, PVI are required to practice and possess expert listening and memorizing skills. While PVI are not born with good listening skills, they appear to have more listening experience than sighted people because they must rely on listening in their daily lives (Bogusz-Witczak et al., 2015; Campbell, 2008; Erasmus Programme of the European Union, 2021; Royal National Institute of Blind People, 2013; Saslaw, 2009; Worland, 2014).

The primary philosophy of the music classroom in the Berklee College of Music course MTH-P111, Assistive Music Technology for Visually Impaired Musicians (Berklee College of Music, 2021), inspired the form of the music instructional course in this research. The music-making software Cakewalk Sonar was used to

make songs in the classroom at Berklee College, which helps music students with visual impairments. There are two main types of media that support access to learning contents: (1) audio media, such as teachers' speech and sounds, computer media, and programs that help explain contents on the screen; and (2) braille music (Saslaw, 2009).

The first type of media can also be called assistive technology. It is an audio medium that allows PVI to access music content and theory on their own via a screen reading program called Jaws for Windows (Freedom Scientific, Inc., 2018) and GoodFeel software. The GoodFeel software allows PVI to access music notes by listening and reading the details of the music on a computer. They can also type music notes in staff music independently (Erasmus Programme of the European Union, 2021; McCann, 2002; Wilson, 2019). In addition, GoodFeel software can be used to convert staff music to braille music, allowing PVI to read their own works and other musicians' works (Erasmus Programme of the European Union, 2021; McCann, 2002; Wilson, 2019).

The second type of media is braille music, which can be read in four patterns: (1) bar over bar, which is commonly used for piano or score types; (2) bar by bar, which is suitable for reading one-melody music as the bar is lined continuously without other melody or other musical instrument; (3) paragraph method, which is used in singing songs where lyrics and notes are separated and have to be synchronized by readers; and (4) phrase or sight method, which contains a proper amount of lyrics with notes and enables readers to read a small portion of the lyrics before braille music plays from left to right (Kersten, 1997).

As it was potentially beneficial to develop a teaching plan and media to fulfill the music learning process of Thai PVI, the researcher has created a mixed-media instructional package to support the understanding and access to music content, which may help musicians with visual impairments perform music with greater efficiency and accuracy. The purpose of this study was to investigate the effectiveness of the developed course in order to provide one of the tools that can enhance the music learning process of PVI.

Methodology

This study employed a single-case research design (Creswell, 2014). The researcher collected quantitative and qualitative data from three sample groups.

Group 1 Participants

Seven participants from this group were students and musicians with visual impairments who tested the instructional course developed by the researcher. Pre- and post-tests were used to collect data. While the pre-test assessed the efficiency of the original process of music learning, which the participants were familiar with, the post-test assessed the new process of music learning that applied assistive technology. GoodFeel software and braille music, together with observation and interviewing, were adopted during the course. At the end of the course, participants from Group 1 produced musical output for sighted musicians to perform.

Participants from Group 1 were recruited using purposive sampling method based on the following qualifications: (1) being a professional musician, having studied at a music college, or having participated in the college's music club; (2) being able to use a computer along with a screen reading program; (3) being able to learn music via listening; (4) never having encountered braille music or GoodFeel software before; (5) never having written music with step-time thinking and typing processes in staff music according to western theory; and (6) never having shown his or her own composition to any sighted musician.

Group 2 Participants

The second group consisted of three music specialists who evaluated the output of Group 1. Music composition teachers in a university's music faculty or sighted professional musicians were selected as specialists through the purposive sampling method.

Group 3 Participants

The last group included two music teachers, who were interviewed by the researcher. Purposive sampling was used to select teachers who had experience with or were teaching students with visual impairments.

Course Development and Learning Activities for Students with Visual Impairments

The instructional package was created as a stand-alone course for PVI. GoodFeel software and braille music were used as assistive technology in this specific course. The key contents of the course were based on western music theory and included: (1) the principle of reading and writing music notes; (2) music symbols, key signatures, time signatures, accidentals, articulation, music expression, and dynamics; (3) harmony arrangements for band performances that focus on concert pitch

instruments; (4) music composition; (5) music form; (6) reading and writing braille music; (7) learning music via listening and reading; and (8) the use of GoodFeel software. These contents were integrated into the 12 subjects of the lesson plan. The teaching was conducted for three hours per week for a total of 12 weeks. Each class included theory learning and performance practice (see Table 1).

Data Collection

Lessons were arranged into three parts conducted throughout 12 weeks: (1) skill preparation (Weeks 1–5); (2) skill enhancement (Weeks 6–11); and (3) skill presentation (Weeks 12).

Skill preparation

Skill preparation took place during Weeks 1–5 of the course. Group 1 participants learned about software techniques, western music theory, and braille music reading. The first session introduced the software, how to create files, and how to play music on Lime software. Moreover, participants learned primary braille music that included sound level and note value. The pre-test was conducted via music performance to evaluate musical knowledge and access to music content. The second session covered rhythm, music bars, general music information such as composers, music notation, and musical expression. The researcher presented the music in braille and trained participants to read sight-singing exercises out loud. In the process of reading practice, the exercises were done with the "Fixed-Do" system. The teacher could apply the "Movable-Do" exercise, but the note reading should be done in the form of "Fixed-Do" only to practice reading solfège out loud and accurately with braille code. Moreover, participants practiced typing simple notes by using computer software (Lime Music Notation). The music note was a one-melody with simple musical notes (e.g., whole notes, eight notes). As an assignment, participants were asked to type music that they liked with no more than 16 bars.

The third session focused on typing more complex notes by incorporating sixteenth notes as well as dynamic and articulation symbols. Participants were required to remember musical terms and musical braille code related to dynamics and articulation, further practicing reading braille music by exchanging the typed music with friends and doing solfège exercises. The fourth session concentrated on time signatures and writing four-part harmonies. Musical terms, dynamics, and articulation symbols were further emphasized. The researcher presented music composition techniques such as creating motives, phrases, and music paragraphs. The braille document on ornament was also given in this session for reference. On the fifth session, participants were asked to practice dynamic typing and ornament. They were also required to perform melodic and rhythmic dictation. The class also covered more advanced braille music reading. The final project was explained at the end of class, including the differences between arranging harmony and composing music for a string quartet.

Skill enhancement

Weeks 6–11 were dedicated to skill enhancement. Participants were required to learn music via braille music and assistive technology as well as how to type music notes correctly according to western theory. The sixth session focused on understanding the sound range of string musical instruments by learning how to read the different clefs of string instruments using the

Table 1 Lesson plan

Week/Session	Topic
1	Lime software, braille music, pre-test
2	Rhythm, music bars, composers, music notation, musical expression, sight-singing solfège with braille code, Lime music notation
3	Musical terms related to dynamics and articulation
4	Time signatures, four-part harmonies, and music composition techniques
5	Melodic and rhythmic dictation, final project
6	Clefs of string instruments, the Lime software, band performance, and "My Little Suede Shoes" by Charlie Parker.
7	The repeat sign, "My Little Suede Shoes," and "All the Things You Are" by Jerome Kern
8	Sounds and techniques for typing music for a string quartet
9	Four-part harmonies, melodic dictation, solfège "Fixed-Do" sight singing, and "Softly, as in a Morning Sunrise" by Sigmund Romberg and Oscar Hammerstein
10	"All of Me" by Gerald Marks and Seymour Simons
11	Braille, solfège, intervals, and melodic dictation
12	Music composition presentation

Lime software included in the GoodFeel software set. Before performing as a band, they were instructed to learn the music using braille music. The song used for the band performance was "My Little Suede Shoes" by Charlie Parker. The seventh session included the study of the repeat sign and musical form of the song "My Little Suede Shoes." Then, new music was introduced to the class by reading braille together with the Lime software. The song was "All the Things You Are" by Jerome Kern.

On Session 8, the researcher presented different types of sounds and techniques for typing music for a string quartet (e.g., tremolo, pizzicato, double stock). The ninth session focused on new methods of learning music. Participants had to type notes that they heard. Four-part harmonies using full-bar note values were also given as exercises. Moreover, participants were asked to practice melodic dictation and solfège "Fixed-Do" sight singing. At the end of the class, they were given time to learn music using the new method. The method was changed from learning music for band performances to learning music for solo performances, in which they had to learn the melody of "Softly, as in a Morning Sunrise" by Sigmund Romberg and Oscar Hammerstein. Participants were also instructed to prepare to compose music for sighted people.

On the tenth session, participants reviewed how to create music and practice music learning using another new method. In this method, the researcher emphasized sound and musical symbols to enable participants to approach music independently. The melody of "All of Me" by Gerald Marks and Seymour Simons was distributed for participants to practice music learning via the Lime software on computers along with reading braille music. On the eleventh session, participants did exercises on reading braille and solfège. Participants had to remember braille code for intervals in an octave as it was the basis for reading and creating chords in braille. After that, participants were asked to practice interval listening and melodic dictation.

Skill presentation

On the twelfth session, the participants were required to present their compositions, which were then performed by sighted musicians in an event called "Music Talk Forum on Innovation of Music Composing by Persons with Visual Impairment."

Efficiency evaluation of the instructional package

Quantitative and qualitative data were used to evaluate the instructional course. The pre- and post-test scores of Group 1 participants, as evaluated by three specialists, were used to generate quantitative data. While the pre-test was only administered once, the post-test was administered three times for each learning topic. Qualitative data were collected from three sample groups: (1) the observation and interviews of Group 1 participants (musicians with visual impairments) before, during, and after class; (2) interviews with Group 2 participants (three music composition specialists); and (3) interviews with Group 3 participants (two music teachers).

Results

Quantitative Results

For the evaluation result of music learning by performance, the quantitative result was assessed by three specialists in music composition from universities in Thailand. One pre-test and three post-tests were conducted among participants from Group 1 in order to compare the outcomes between the previous learning method, which was based solely on listening, and the new method developed by the researcher, which employed both braille music and computer software. The scores of each participant were calculated from the average of the evaluations by three specialists, in which the post-test scores were calculated by averaging the three post-tests (see Table 2). It was discovered that the participants' musical abilities had improved significantly after taking the developed course.

For the accuracy of the notes, only 1 out of 7 participants

Table 2 Comparison of the Pre-test and Post-test Scores of Group 1 Participants

Evaluation Topic	Pre-test Scores for Each Participant							Post-test Scores for Each Participant						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
1. Notes	2.6	2.3	3.3	3	2	3.3	1.6	4	2	4	4.1	3.5	4.3	4
2. Musical expression and dynamics	2.3	2	3	2.3	2	3	1.6	3.4	2.3	3.6	3.5	3.9	3.4	3.3
3. Musical form and paragraph	2.6	1.6	3.3	2.6	2.3	3	1.6	4.1	2	4.4	4.2	4	3.9	4.3
4. Clefs and scales	2.6	1.3	3.6	3	2.6	2	1.6	4.2	3.6	4.6	4.4	3.8	3.5	4.5
5. Musical knowledge	2	1.3	3	2.6	1.6	1.3	1.3	3.8	2.3	4.2	4.4	3.4	4.3	3.9

had a slightly decreasing score but still remained at the "good" level. One participant whose score on the pre-test was at the "poor" level improved significantly to the "very good" level in the post-test. Two participants who had the "fair" level in their pre-tests advanced to the "very good" level and the "good" level, respectively. Three participants who scored at the "good" level in their pre-tests advanced to the "very good" level and the "excellent" level, respectively. For the musical expression and dynamics, during the pre-test, one participant was at the "poor" level, whereas the other four participants were at the "fair" level, and two participants were at the "good" level. During the post-test, one participant remained at the "fair" level while the other six participants improved to the "good" and "very good" levels.

During the pre-test, two participants scored "poor," three scored "fair," and two scored "good" for their understanding of form and paragraph. During the post-test, one participant received a "fair" rating, while six others received a "very good" rating. During the pre-test, two participants had "poor" understanding of clef and scale; three participants had "fair" understanding; and two participants had "good" and "very good" understanding. Three participants were at the "good" and "very good" levels during the post-test, while four performed at the "very good" and "excellent" levels.

For the knowledge of general information about the music (i.e., music notes, composer, music expression), during the pre-test, four participants did not know or could not access information with details about music, resulting in a "poor score." Furthermore, two participants with "fair" or "good" scores recognized and could identify the music information. While one participant scored at the "fair" level on the post-test, another participant scored at the "good" level. The remaining five participants received "very good" or "excellent" ratings.

Qualitative Results

Qualitative data were obtained from three sample groups. Participants who were musicians with visual impairments (Group 1 participants) were asked to describe their feelings when they listened to their own compositions being performed by sighted musicians. They recalled that, unlike in the past, when they had to rely on a voice recorder or other musicians, this was the first time in their lives that they had the opportunity to learn music theory with complete instructional tools, allowing them to independently create their own music works and have sighted musicians perform them. Positive comments on compositions created by Group 1 participants were mentioned in interviews with three composition specialists (Group 2 participants). They praised the successful musical compositions performed by sighted musicians at an event for musicians with visual impairments.

Three positive outcomes emerged from interviews with the two music teachers (Group 3 participants). The teachers observed that Group 1 participants could use analytic and synthetic skills to make several variations on certain chords that follow the harmony rules based on the original version. They also mentioned that the instructional course cut down on teaching time because they did not have to spend as much time on theory and performance. Finally, they agreed that participants with visual impairments could do music exercises without having to respond orally or with musical instruments. Nevertheless, the teachers discussed a number of issues that arose during the course. Because it was uncommon for music teachers and students to use software related to braille and a braille embosser, they were not familiar with them. Producing music has taken a long time for both teachers and students. Furthermore, they stated that it would necessitate specific knowledge and understanding of braille music as well as specific computer software.

Discussion

The purpose of this study was to assess the effectiveness of a mixed-media instructional course developed by the researcher for persons with visual impairments that used Braille music notation and GoodFeel software as the primary media. The results indicated that, compared with the learning method that was based solely on listening, the learning method developed by the researcher, which incorporated braille music and computer software, played a significant role in improving the post-test scores of the participants with visual impairments as well as their abilities to create their own music. This has demonstrated some level of effectiveness.

Similar to a study conducted in Brazil (Borgesa & Toméb, 2013), it is evident that the instructional course developed by the researcher could enhance the reading, singing, and composing abilities of participants with visual impairments, with braille music playing a significant role. Many scholars agreed that braille music is useful and can help PVI understand music as an image (Saslaw, 2009), learn music theory (Campbell, 2008; Royal National Institute of Blind People, 2013), and pursue a teaching career (Draves, 2016).

According to the findings, assistive technology is

another important factor in the success of music and music theory learning, echoing the findings of Wilson's (2019) study. The quantitative and qualitative results of this study demonstrated that PVI were able to compose music for other musicians to perform with certain music theory knowledge acquired using braille music learning and computer software in the course developed by the researcher. This is consistent with Saslaw's (2009) work, which shows that knowledge of music theory can contribute to the creation of music among PVI. Furthermore, proficiency in music creation may contribute to success in fields related to music (Campbell, 2008; Draves, 2016; Erasmus Programme of the European Union, 2021; Pino & Viladot, 2019; Prommas & Sapaso, 2018; Wordland, 2014).

Findings from this study offer implications for theory and practice. While the qualitative data provided useful insights into understanding the music education of PVI, the quantitative data demonstrated that a course developed to meet the needs of PVI could improve and enhance their process of music learning. Furthermore, this study may offer a solution to certain music learning issues encountered by visually impaired students. While it was difficult for music students with visual impairments to learn music in the same way that sighted students did (Borgesa & Toméb, 2013; Saslaw, 2009), the integration and application of braille, various music contents (e.g., theory, notation, expression, composition), and assistive technology may fill the gap in music education for PVI. In addition, this study emphasized that music educators who teach PVI need to have certain knowledge, such as braille music and the use of assistive technology in order to enhance the music learning process of PVI, so that they can become independent learners (Draves, 2016; Wilson, 2019). Finally, the researcher hopes that music education in Thailand will become more inclusive, with music educators providing learning opportunities and suitable music learning for every student in their classrooms.

Conclusion and Recommendation

To the best knowledge of the researcher, this was the first study that attempted to examine the effectiveness of the music teaching contents and materials for PVI. This study found that the mixed-media instructional course developed by the researcher for persons with visual impairments, which used Braille music notation and GoodFeel software as the primary media, was effective in enhancing the music learning process of participants with visual impairments.

By providing quantitative and qualitative insights into the music education of PVI, this study has contributed to PVI research and the larger field of music education for people with disabilities. The results of this study may be used as a theoretical model for music educators who wish to assist PVI in enhancing their music learning process. Findings from this study also advocate for music educators and other involved people to provide more and better opportunities for PVI to create their own music, further encouraging sighted musicians to perform their works in public spaces.

Given the small sample size of the participants with visual impairments, the researcher does not claim generalizations for every PVI. Future research may recruit larger samples to investigate the music learning of PVI as well as its effectiveness. It should also be noted that this study focused music education for PVI, with the intention of connecting with the visual-oriented musical literacy. However, because PVI have already acquired the aural ability that should not be overlooked, future studies may explore some of the ways in which the enhanced listening skills of PVI may be included into the learning modules, further examining how listening skills might be emphasized in regular models of music education at the collegiate level.

Conflict of Interest

The author declares that there is no conflict of interest.

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