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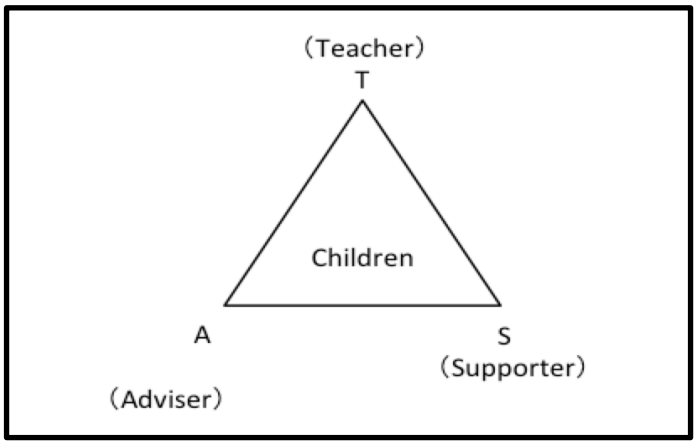
Special Issue: Music Education as a Bridge Between schools and Society



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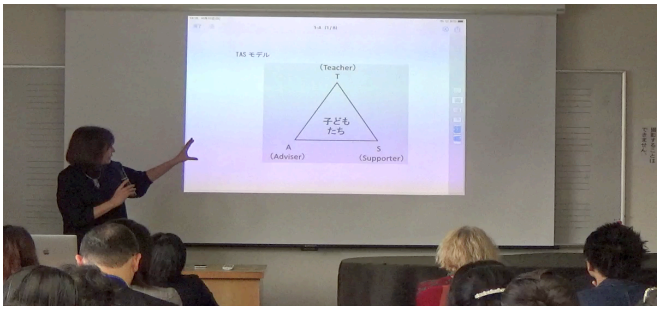
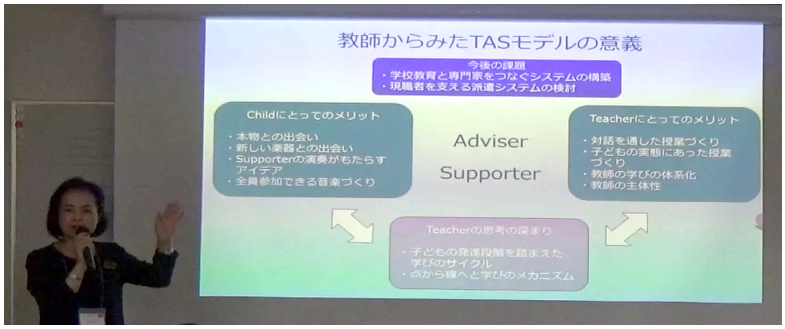
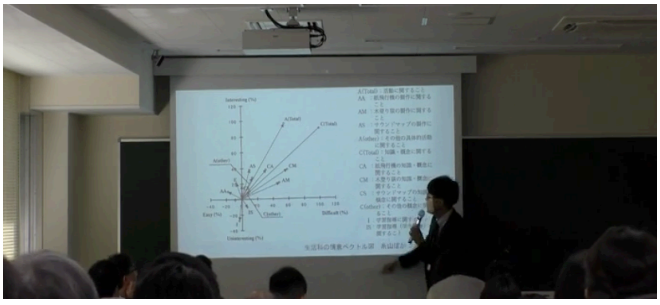






Music Education as a Bridge Between Schools and Society: Seeking New Partnerships in School Education

Yukiko Tsubonou

Institute of Creativity in Music Education

1 Various Connections between schools and social organization

Cooperation between schools and social groups can be broadly divided into three categories, namely, appreciation-only concerts, participatory concerts, and creative music making workshops. With regard to appreciation-only concerts, the Gunma Symphony Orchestra in Japan started giving concerts for children shortly after the Second World War. Even now similar concerts are held, but recently, the number of participatory concerts, that is, children participating in some form of music activity, is increasing more and more.

Furthermore, creative music making as a field of study was introduced into the National Curriculum in 1989, paving the way for a form of a creative music making where musicians and children make music together which has become quite widespread. Unlike appreciation-only or participatory concerts, creative music making involves professional musicians and children aiming to participate in music making while communicating with each other. Composer Yuji Takahashi conducted a workshop at an elementary school in Chiyoda-ward in 1991, pioneering these creative music making activities. This was the first case in Japan in which a composer worked with children at school. Moreover, it was the earliest collaboration between schools and social groups regarding creative music making.

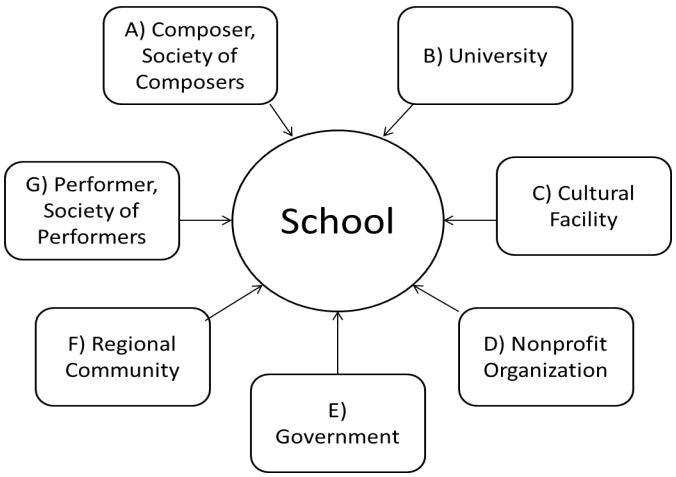
However, in the current participatory concert and creative music making activities, it is rare to see professional musicians seriously engaging in children's music. Even though some musicians have been trained as a facilitator for music workshops, there are few facilitators who can listen to, accept, and make use of children's musical ideas. They lack the understanding of how difficult it is to make use of a child's small ideas or sounds which can disappear in an instant. Fostering facilitators who can listen to children's sounds seriously and support children's musical ideas with their own sounds is desired in the future, not a performance which creates a farce or comedy.

Like this, many professional musicians and musical groups have participated in activities in schools. These movements have spread into various social organizations such those in Figure 1 below. However, most of these programs are neither interactive nor related to the musical objectives of each school’s educational curriculum. Moreover, the people who know the children best in the classroom, their music teachers, rarely play a role in these

visiting performances.

Figure 1

Typical approach to schools by social organizations



2 TAS model

The research project named “Music Education as a Bridge Between Schools and Society” has been organized by the board of directors of the Japan Music Education Society (JMES) and has been taken charge of by Yukiko Tsubonou for the purpose of exploring new educational programs for music, specifically, to exploit new relationships between schools and society by compiling class lessons from the schools which have included the participation of musicians, music researchers, and music organizations. Symposiums and lectures about the research project were held from 2017 to 2019 in each respective annual conference of JMES.

Based on this background, Tsubonou proposed the “TAS model”, figure 2, as the basis of the new educational program of music. This model indicates the relationship of the three stakeholders of the music class.

Figure 2

TAS model indicating the positions of the participants

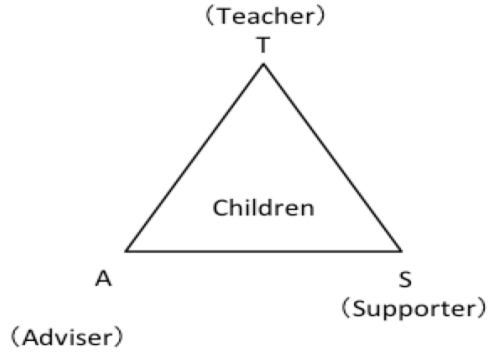


Figure 3

The roles of the participants in class activities

Teacher, those who organize the class lesson as a whole; Adviser, music researchers or composers who give advice about music; Supporter, people, specifically, the performers, who support teachers and children with their live sound and music.

We developed a framework for bringing together a team of T (Teacher), A (Adviser), and S (Supporter). Accordingly, we built a network of professionals at different stages in their careers and examined the potential for developing music lessons based on the TAS model.

We conducted this new approach from February 2018 to January 2020 across 20 classes for children of all ages from preschool children to high school students (Table 1). It can be seen that the total number of Ts, As, and Ss is over 100.

When we look at the era of the music used in these lessons, it extends from 15,000 years ago to the 21st century. The geographical area and the genre of the music used are from Western classical, various styles of popular music, and music from Asian countries and regions, for example, Indonesia, the Philippines, Vietnam, Nepal and North India. Of course, the most common is Japanese music, especially that containing various ways of creative music making using koto.

Table 1

The lessons conducted under the framework of TAS model from 2018 to 2020

	Date	Title of the Lesson	Grade		T(Teacher)	A(Adviser)	S(Supporter)
1	2018 Feb.2nd	Blues, blues!	5th graders	Elementary	Music	2 MER	2 Jazz Musicians
2	2018 Feb.27th	Creating music using chime-bar and the whole-tone scale	4th graders	Elementary	Music	Composer	4 Music College Students
3	2018.Feb.28th	Let's enjoy samba!	5 year-old children	Kindergarten	Classroom	3 MER	3 MER
4	2018.March 1st	Explore the sounds from Japanese koto	5 year-old children	Kindergarten	Classroom	MER	11 College Students
5	2018.March 9th	Tongaong is fun for all of us!	1st graders	Elementary	Classroom	Musicologist	5 MER, Musicologist
6	2018.May 28th	Let's create music with "mi-sol-la"	5th and 6th combined cclass	Elementary	Music	Composer	Composer
7	2018.June 15th	Developing music based on the Japanese traditional song "Sakura sakura	6th graders	Elementary	Music	Koto player	Koto player
8	2018.Sept. 6th	Let's imagine the Jomon-period music of 15000 years ago!	1st to 6th graders	Elementary	Classroom	Archeologist, MER	24 College Students
9	2018.Sept.13th	Creating music based on the cluster and Murry Shafer's "Epitahp for Moonlight"	6th graders	Elementary	Music	MER	High school choir
10	2018.Sept. 24th	Let's make music using cyclic chord	Correspondence school student	Senior-high	Music	MER	Professionals of pop
11	2018.Oct.1st	Playing and creating music on the renovated gamelan from Indonesia	6th graders	Elementary	Music	Musicologist	teachers around the area
12	2018.Nov. 27th	Let's create music on the basis of graphic notation	1st graders	Junior-high	Music	MER	Students of Education Univ.
13	2018.Dec.10th	Creating music on the prepared koto	3rd graders	Junior-high	Music	MER	
14	2018.Dec.18th	Let's create our own song based on our own haiku	5th graders	Elementary	Music	MER	2 Music College Students
15	2019.June 18th	Gamelan and Debussy	5th graders	Elementary	Music	Gamelan Player	8 University Students / Painist
16	2019.July 8th	Creative Music eploiting the traditional techniques of the Koto	3rd and 6th graders	Elementary	Music	Musicologist	Koto Player
17	2019.0ct.19th	Roots and Shoots	5th graders	Elementary	Music	MER	Students of Education Univ.
18	2019.March,7th	Creating music on the basis of "Musica Ricercata" by Ligeti	4th graders	Elementary	Music	MER	Studntts of Music College Pianist
	2019.Nov.25th	Creating music on the basis of "Musica Ricercata" by Ligeti	5th graders	Elementary	Music	MER	Pianist
19	2019.Nov.27th	Creating music on the basis of "Musica Ricercata" by Ligeti	1st graders	Jinior-high	Music	MER	Pianist
20	2019.Dec.20	Passacaglia	6th graders	Elementary	Music	Musicologist Composer	Pianist/ Violinist
21	2020.Feb.25	Experiencing Classcal Music of North India	3rd graders	Elementary	Classroom	Musicologist	Tabla Player

MER= Music Education Researcher

3 Two music lessons held on the basis of TAS model

3.1. “Gamelan & Debussy”

Here, I would like to show the process of the music lesson “Gamelan & Debussy” in the timeline of events below.

A. On June 08, 2019, a gamelan workshop by Yukitoshi Morishige was conducted in a gamelan studio. University students learned “Qubogiro”, a piece which Debussy is assumed to have heard at the Paris World Exposition in 1889. Morishige participated as the leader of the workshop.

Figure 4

Gamelan workshop in a studio

B. On June 18, 2019, the gamelan instruments were supplied to the elementary school class, and the participants of the gamelan workshop played “Qubogiro.” The trio forming the participants of the TAS model are mentioned in the chart below.

Figure 5

The roles in “Gamelan and Debussy”

Teacher =Asako Hanyuda, Kamioki Elementary School, Saitama

Adviser = Yukitoshi Morishige, a musicologist and gamelan player

Supporter A, B and C = university students who participated the Gamelan Workshop; Noriko Otake, a professional pianist; and Yukiko Tsubonou respectively

Supporter A taught 6th grade children how to play gamelan and "Qubogiro."

Figure 6

Children and supporter A playing gamelan, "Gamelan and Debussy"

C. On June 21, 2019, children created their own music in groups based on the structure of the gamelan music. Only the teacher was in the class.

D. On June 25, 2019, the last lesson of "Gamelan and Debussy" was conducted.

D.1. Children played their own music using mainly gamelan instruments.

Figure 7

Link for a video of the children's gamelan piece

https://www.icme.jp/jd/en07/kodomono_sakuhin.mp4

D.2. Supporter B played Debussy's "Pagoda" which is said to be influenced by gamelan

music.

D.3. Supporters B and C improvised with piano based on the same structure of “Pagoda”, namely, slendro mode on black keys at the high range of the piano and drone of the low range, the same as that performed in “Pagoda.

D.4. The children joined the improvisation using piano and the “Pagoda” structure.

Figure 8

The Video of the Children’s improvisation

https://www.icme.jp/jd/en07/sokkyo.mp4

3.2 Secrets of Koto Music

In this lesson, Children created their own music in groups using the koto based on a combination of both onomatopoeia characteristics of playing the koto and the traditional koto music technique , as shown in Figure 9. The top line shows the onomatopoeia and the bottom line expresses the koto technique used in the lesson.

Figure 9

Onomatopoeia and traditional technique used in koto pieces

Figure 10

English translation of Figure 9

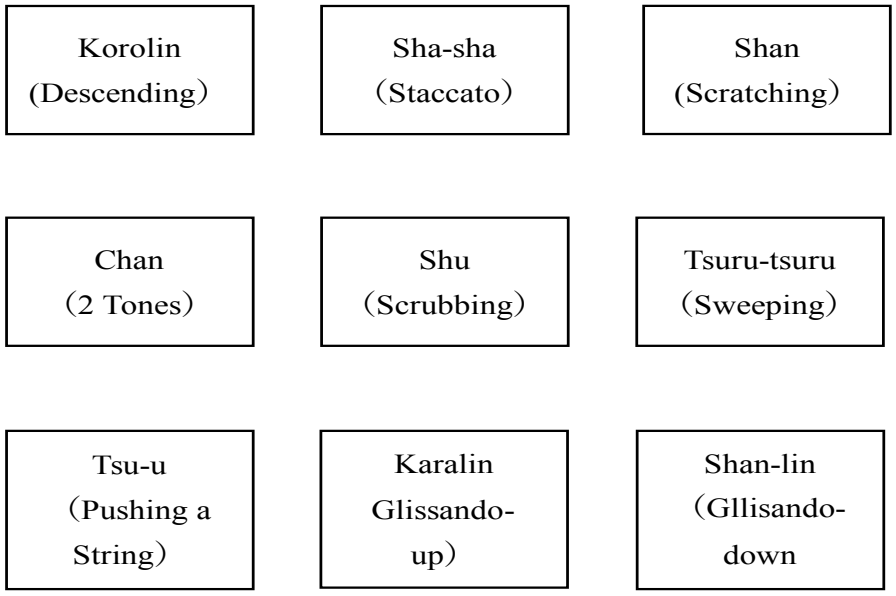


Figure 11

The roles in "Secrets of Koto Music"

Teacher=Komichi Kano, Kitakuritu-Hachiman Elementary School, Tokyo
Adviser= Yukitoshi Morishige, a musicologist and gamelan player
Supporter= Sachiko Yoshiwara, a koto player

The characteristic of this lesson is that T, A, and S participated in deep collaboration through e-mail many times. They examined traditional koto techniques precisely, picked up some of them which seemed suitable for the 5th grade children concerned, and made the new score for the lesson (Figure 7). The score shows diverse techniques of koto and the essential connotation of onomatopoeia in the Japanese language.

Figure 12

Koto playing by the supporter and the children around her, "Secrets of Koto Music"

Figure 13

Children exploring their own music using koto, "Secrets of Koto Music"

4 Symposium on joint research held in October 2019

Tsubonou and other researchers of music education held a symposium on joint research at the JMES conference in 2019 regarding the two TAS model-based music lessons mentioned above. The symposiasts were: Patricia Shehan Campbell (University of Washington); Yukitoshi Morishige (Senzoku Gakuen Collage of music); Kumiko Koma (Chiba university); Mika Ajifu (Tokyo Seitoku University); Kenta Tsukahara (Teikyo University); and Yukiko Tsubonou (Kaichi International University) as the master of ceremonies.

In this joint project, topics focused on the roles of advisors and supporters in the two

music lessons mentioned above.

Yukitoshi Morishige, a musicologist and gamelan player, worked as an adviser for the two lessons. First, he summarized his advice on the "Gamelan & Debussy" class as follows:

1 Use the basic structure of Javanese gamelan music to help children create music.
2 Get a basic understanding of gamelan performance techniques that are completely different from Western music.

Morishige, who, as a musicologist, knows traditional Japanese music very well, also worked as the adviser of the class "Secrets of Koto Music." He mentioned the following:

1 Children create their own music using traditional koto techniques and thereby, not only can create music but also understand koto music better.
2 Children can become interested in all traditional Japanese music through these activities.

Koma focused her research on the advisor role of the TAS model by interviewing the five music teachers, including the two who gave the lessons referred to above, and by asking about the advisor's role of the teachers. Her analysis and result are contained in the paper "Exploring TAS Model by Analyzing the Teacher's Interiew" in this journal.

Ajifu looked into the role of the supporter and summarized it as follows:

1 To stimulate the children by the supporter's sound and music
2 To support the children's activities with the supporter's music
3 To encourage the children

The professional pianist, Otake, who served as supporter B in the class lesson "Gamelan & Debussy" and who played "Pagoda," composed by Debussy, looked back on her experience in Ajifu's interview, saying the following as important to the role:

1 Be stimulated by the children's musical ideas when they created music.

2 Be supported by the children's collaborative attitude and interests.

3 Be encouraged by the children surrounding her when she played the piano.

In other words, the supporter had a significant influence on the children in the class, whereas the supporter herself received the same effect from the children; therefore, a mutually correlated relationship developed.

Tsukahara thought that the two lesson practices were characterized by the fact that children's learning was open to participation in cultural practices and quoted Saeki (1995) by raising the following characteristics:

1 Practice to return to the root of the meaning of things, re-examine and re-taste.

2 Practice to engage with the world as a creator of a new culture.

3 Practice with collaboration.

He stated that this may be in common with the goal of the TAS model, which is to connect schools with society. In addition, he pointed out that when analyzing the roles of the T, A, and S in the two practices from these viewpoints and when observing the T, A, and S, it is important that the three roles overlap and that how they overlap in actual practice is different. Taking advantage of these overlaps, it is concluded that committing themselves to each other's fields would allow the trio to find the significance of the TAS model for shaping a capacity for guiding children's learning to cultural practice.

Last, one of the members involved in the research of TAS model, Akihiko Nakamura, submitted a paper to this journal in which he took the children's questionnaire responses from the three classes in Table 1 (Class no.1, 2 and 7) and evaluated the emotional aspects of them.

Reference

Saeki Y.(1995) Learning as the participation in cultural practices, *Invitation to learning*, University of Tokyo, 1-48.

Tsubonou, Y. (2020) "Provision of class lessons based on the TAS model for fostering children's creativity: with a focus on the roles of advisors and supporters," *Japanese Journal*

of Music Education Research, 49-2, Japan Music Education Society, 53−54

I. 2.

Peer-reviewed Papers in Special Issue

Exploring TAS Model by Analyzing Teachers' Interviews

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Abstract

In this study, interviews were carried out with five teachers to explore the significance of the TAS model. This was done by focusing on the roles of advisors, based on the narratives of the participating teachers. The grounded text mining approach was used for analysis; the results of the C-GTA analysis carried out by the author and the results of text mining via computer were examined together. Consequently, 33 focused codes were derived from the C-GTA analysis, which were classified into the following five categories: "relationship between children and their supporters through music creation," "relationship between teachers and advisors deepened through dialogues," "development of teaching materials and class construction according to the actual statuses of children," "deepening of teachers' thoughts," and "future tasks." Next, during the text mining analysis via computer, the 33 focused codes derived from the C-GTA were reconsidered and summarized into 17 focused codes. Following this, auto coding was carried out. Lastly, I verified through meta-inference whether the results were free of contradictions and problems and whether the phenomena spoken were properly visualized in text. The results suggested that "benefits for children" and "benefits for teachers" were supported by the "deepening of teachers' thoughts" and that these factors influenced each other. The results also highlighted the importance of "future tasks," such as the establishment of a "system for linking school education and experts," like advisors and supporters, as well as the cultivation of "supporters and advisors with an educational perspective." Thus, I was able to reveal from the narratives of the teachers both the significance of the TAS model and its possibilities. However, there are still many problems that need to be overcome in order to spread the TAS model more widely in school education settings. By providing information on its implementation, I would like to contribute to establishing a system through which to construct a new type of class, where teachers have dialogues with local experts and where these two groups understand each other in their community.

Keywords: TAS model, Teachers' interview, Music making, KHcoder, Grounded Text Mining Approach

Introduction

This study is a part of the "Music education linking school and society II: Establishing a collaborative class framework" research project launched by the executive board of the Japan Music Education Society, which was carried out over two years from 2018. In this research project, it was pointed out that when professional musicians participate in class, many of them provide information one-sidedly, leaving music teachers out of the loop (Tsubonou, 2019). Therefore, many attempts have been made in this research to establish a framework, called the TAS model, where the roles of the three parties are clearly defined (i.e., "teachers" play a central role, while music professionals, such as researchers and composers, provide musical advice as "advisors," and performers offer live performances as "supporters") (Tsubonou, 2019).

I have analyzed various styles of class, focusing on A of the TAS model (i.e., advisors) (Koma, 2018). The results revealed that composers, music education researchers, and musicologists all play advisory roles. First, in terms of the role of composers, teachers were able to find teaching materials suited for their classes through the "provision of music" by composers. Next, the role of music education researchers was the "provision of knowledge on how to play and create music." In terms of musicologists, meanwhile, their role involved the "provision of knowledge on teaching material studies." How did the teachers in charge of the class understand the roles of these advisors?

Based on these previous studies, this study aims to explore the significance of the TAS model by focusing on the role of advisors.

Methods

The subjects of the survey were five teachers who implemented a class using the TAS model (Table 1). I orally explained the overview and the purpose of the survey and obtained consent for participating in the survey. The method used for the survey was a semi-structured interview. The average duration of the interviews was 53.2 minutes. I asked the participants to talk about what they had learned by reflecting on their class, mainly in terms of what they found helpful about having an advisor and what the advisors meant for them. The interviews

were recorded with an IC recorder (Voice-Trek V-61, OLYMPUS), and a verbatim transcript was created. A letter in the alphabet was assigned to each teacher in the order that the interviews were conducted when creating the verbatim transcript so that individuals could not be identified. The grounded text mining approach (Inaba & Kakai, 2016, 2019) was used for analysis.

Table 1

Affiliation of teachers and interview duration

Subject	Gender	Affiliation	Years of experience	Duration of interview
Teacher A	Male	Music teacher	25 years	52 minutes 2 seconds
Teacher B	Female	Music teacher	27 years	1 hour 27 minutes 43 seconds
Teacher C	Female	Music teacher	22 years	40 minutes 59 seconds
Teacher D	Female	Homeroom teacher	27 years	50 minutes 5 seconds
Teacher E	Male	Music teacher	16 years	35 minutes

What is a Grounded Text Mining Approach ?

The grounded text mining approach (GTxA) allows researchers to creatively and subjectively analyze data by integrating the results of qualitative data analysis, based on Charmaz's constructivist grounded theory (C-GTA) and the results of text mining analysis, while also ensuring that their analyses are fully grounded in the data (Inaba & Kakai, 2019). This is a type of mixed methods research.

The first phase of the analysis was carried out using C-GTA. C-GTA is a method proposed by Charmaz (2006, 2014) and is a type of grounded theory approach (GTA). Charmaz calls this "objectivist grounded theory," which combines original grounded theory (Glaser & Strauss, 1967) and Glaser's (1978, 1998, 2013) version (Inaba & Kakai, 2019). Objectivist grounded theory assumes that "data itself is a neutral reflection of the reality" (Inaba & Kakai, 2016), while constructivist grounded theory assumes that "data is created by experiences and relationships shared between researchers and research participants" (Inaba & Kakai, 2016). In other words, through C-GTA, researchers aim to "construct stories of research participants based on their narratives, not to present verifiable hypotheses" (Kakai,

2015). Therefore, C-GTA's procedures for coding data are simplified into initial codes, focused codes, and theoretical codes, and the approach emphasizes that researchers immerse themselves deeply in the semantic world of the research participants (Sueda, 2016).

The second phase consisted of the analysis based on text mining. In text mining generally, linguistical analysis is performed on text data, such as morphological analysis and syntax analysis, and then cluster analysis and the visualization of relationships between attributes and words are carried out using multiple classification analysis (Inaba & Kakai, 2011). In terms of the words that the researchers put a spotlight on, the original text can be referenced using the concordance function (Inaba & Kakai, 2011), enabling us to understand the context in which the words were actually used. Then, the researchers define the patterns of the words, called "coding rules," and input them into a text mining tool, which allows for "auto coding," through which codes are extracted automatically from the text data (Inaba & Kakai, 2016). A free software for quantitative content analysis, called KH Coder 3, (Higuchi, 2014) was used in these analyses.

The third phase is meta-inference, which means verifying whether the results of these two analyses are free of contradictions and problems and whether the phenomena spoken are properly visualized in text (Inaba & Kakai, 2016).

Thus, GTxA can qualitatively interpret the narratives of the survey subjects and understand them either quantitatively or visually. In this study, therefore, GTxA was used as an analysis method, assuming that it is in line with the objective of the study in terms of how it is able to interpret the narratives of each teacher and visualize their characteristics.

Results and discussion

Four procedures were carried out for analysis; the process of obtaining an overview of text data was added before the aforementioned three phases–qualitative data analysis based on constructivist GTA, visualization and analysis by text mining, and meta-inference.

Obtaining an overview of text data

Here, I read the verbatim transcript data, interpreted the content, and formed my impressions of the narratives of the subjects. Following this, the verbatim transcript was input

into KH Coder 3, and morphological analysis was conducted after noises (exclamations, such as “wow” and “ah”) had been removed and forcibly extracted words (children’s songs, proper nouns, and so forth) had been designated. The total number of the words extracted was 21,492. The top ten most frequently observed words (number of appearance) were: child (138 times), think (128 times), music (106 times), advisor (92 times), class (78 times), I or my (72 times), say (59 times), supporter (53 times), teacher (39 times), and sound (38 times). Then, co-occurrence network analysis was conducted. Co-occurrent network analysis is a method that allows us to visualize what kind of co-occurrence relations exist among the words that appear in the narratives of the subjects. However, it only explores what kind of co-occurrence relationship there is among the words and doesn’t indicate how characteristic each of the words are. As a result of the analysis, strong co-occurrence relationships were found among nine of the top ten most frequently observed words, with the exception of “sound.” For example, when looking at the context where the word “child” was used, we can see that they mentioned what the class based on the TAS model brought to children, such as “children were surprised when they came to the music room. Children were very excited when I told them we were going to learn Japanese zither” or “the experience of making music gave them more ideas.” We can also see that the teachers felt they were able to grow as a result of the presence of the advisors, such as from the use of the word “I or my,” in contexts, such as “my technical knowledge expanded and my ideas also expanded” or “what I lack musically, like my self-analysis, was complemented.” Correspondence analysis was also carried out. In the correspondence analysis, the words closer to the center of the axes are words commonly seen in the narratives of the participants, whereas the words far from the center of the axes represent words characteristic of the narratives of each participant. The word characteristic of Teacher A was “idea.” The narrative “I can get ideas that I can’t come up with usually thanks to the advisor. My ideas expand, which was very beneficial, I think” shows that the advisor contributed to the expansion of the teacher’s ideas. The word characteristic of Teacher B was “knowledge.” The narrative “teachers only have limited knowledge or skills when it comes to providing a variety of ideas in the area of music creation. It is very effective for children to have an opportunity to learn or expand their knowledge and to be able to experience real

sounds by having a professional musician" shows that the existence of advisors was helpful in deepening the knowledge of teachers and expanding children's knowledge. The word characteristic of Teacher C was "instrument." The narrative "the advisor was there for me, and brought an instrument, which we borrowed for a week. I am very grateful" shows how she felt regarding the instrument provided by the advisor. The word characteristic of Teacher D was "blues." The narrative "it was very different from the time when I studied what to use as a teaching material which led children to the suggestion of learning the blues. The advisor and I studied what to use as a teaching material together. I was also able to learn the fun of the blues thanks to his advice. With a more elaborated class plan with a performer, children could 'learn' more. I couldn't do this by myself" shows that working with the advisor to consider what to use as a teaching material added a new dimension to the class. The word characteristic of Teacher E was "education." The narrative "it's not easy unless they have an educational perspective whether it's singing or instrumental performance. An educational perspective is important for advisors. It is not that interesting if they only talk about skills because playing well isn't the goal here" shows that having an educational perspective is important for advisors. The above analysis highlights the following four points as an overview of the data:

Teachers:

-felt that their classes revolved around children and were supported by the advisor

-felt that they wanted to learn more about instruments and gain musical knowledge from the advisor

-thought that they wanted to study teaching materials with the advisor

-thought it was important that the advisors had an educational perspective.

Qualitative data analysis based on constructivist GTA

Here, I extracted the words considered to be important from the verbatim transcript (initial coding) and sorted them into classifications the initial codes for focused coding. Figure 1 shows an example of coding.

Figure 1

Coding process in C-GTA

Narative	Speaker	Gender	Initial Code	Focused Code
Each of us was aware of our own role, which was important. We all understood what to do and had conversations based on that understanding. So, I asked many questions, which is why I was very much motivated to construct a class spontaneously. Spontaneity is… the TAS system has "I" positioned as the lead. So, in school, teachers realize "that's me" and take a lead. I had a great supporter and an advisor, so I was pushed by them. The advisor widened and deepened my knowledge and gave me new ideas.	Teacher B	Female	Spontaneity, spontaneously, motivated, Teacher	Spontaneity of teachers

Based on the above, I carried out initial coding per paragraph in the narratives and then repeated focused coding. The number of focused codes obtained was 33. I then classified these focused codes into the following five categories: "relationship between children and the supporters through creative music making," "relationship between teachers and advisors deepened through dialogues," "development of teaching materials and class construction according to the actual statuses of children," "deepening of teachers' thoughts," and "future tasks." The categories, focused codes, and initial codes are listed as the results of the analysis (Table 2). I would like to interpret the meanings of these categories using the initial codes (bold letters) included in the focused codes comprising them.

Table 2

Results of Analysis by C-GTA

Category	Focused Code	Initial Code
Relationship between supporters and children through creative music making	Encounter with the real music Children's interest in new instruments Possibilities of instruments realized via the performance by supporters Expansion of technical know ledge thanks to the supporters Expansion of ideas thanks to the performance of the supporters Fun of making music Creative music making everyone can participate in	Thrilled, excited, first time, basic skill, real music, professional, come, can meet, opportunity, traditional entertainment, creative music making, material, touch, expression, observation, secret box, interesting, skillful, know ledge, idea, expand, conversation, possibility, inspired, deepening, variation, blues, improvisation, dialogue, question and answer, catch, fun, tone chime, gamelan, together, etc.
Relationship between teachers and advisors deepened through dialogues	Dialogues with the advisors Expansion of ideas thanks to the advisors Utilization of advisors' know ledge Triangle conversation including the supporters Sharing of the intension of teachers Spontaneity of teachers Equal peers who enjoy music	Musical, complement, help, reach, state, think, convey, discuss, together, children, actual status, dialogue, a lot, conversation, cluttered, spontaneous, spontaneity, motivated, idea, teacher, triangle, use, power, utilization, know how, equal, word, go over, equal footing, intention, share, other self, etc.
Development of teaching materials and class construction according to the actual statuses of children	Suggestion of teaching materials according to the actual statuses of children Class construction according to the actual statuses of children Improvement of music quality Development of new teaching materials Fun themes Tailor-made teaching materials Expansion of the possibilities of teaching materials	Material, possibility, study of teaching materials, graphic notation, music creation, ideal, improvisational, music structure, Debussy, blues, provision of teaching materials, high quality, rich in content, various techniques, traditional techniques, playing style, names, actual status, narrow down, structure, imitation, contemporary, group, swing, jazz, etc.
Deepening of teachers' thoughts	Learning cycle through children's songs Learning mechanism from dots to a line Systematization of teachers' learning Know ledge through accumulation of various experiences of teachers Expansion of know ledge thanks to the advisors Various values of the advisors	Children's songs, lower grades in elementary school, element, gradual, learning, interesting, systematic, theory, what was learned, output, creative, link, drawer, interaction, intentional, gradually, connect, from dots to a line, open, different values, diversity, etc.
Future tasks	System for linking school education and experts System for sending personnel who support teachers Cultivation of advisors and supporters with an educational perspective Cultivation of experts who can be there for teachers Meaning of providing information on implementations Differences from outreach	Japanese instruments, music creation, drawer, know ledge, skill, real sound, encounter, balance, system, fund procurement, generalization, system establishment, group, coordinate, system, sending personnel, invest, retire, active duty, help, be there, educational perspective, expert, cultivation, coordinator, community, connect, outreach, experts side, encouragement, centered around children, record, summary, etc.

In "relationship between children and the supporters through creative music making," we can see that children were **thrilled** and **excited** to see a **professional** musician **come** to

their school and eagerly awaited the **first encounter**. They were able to acquire **technical knowledge**, **come up with** new **ideas,** and take **inspiration** from the performance of the professional musician. They used what they learned to **create music**, and they **enjoyed improvising together** and having **conversations**.

In "relationship between teachers and advisors deepened through dialogues," we can see from the **cluttered conversations** that teachers were able to **utilize the music know-how** of the advisors by having **a lot of dialogues** and **speaking** with them, while the advisors were able to **share** the **intentions** of the **teachers**. We can also see that the teachers showed **spontaneity** or took a lead. This shows that they were on an **equal** footing and they all supported **children** from the **same standpoint**. In "development of teaching materials and class construction according to the actual statuses of children," we can see that the advisors both **offered teaching materials** according to the actual statuses of children and **studied teaching materials** together, which allowed the children to experience **graphic notations** and **contemporary** music, widening their **possibilities** for **high quality meaningful music creation**.

In "deepening of teachers' thoughts," we can see that the teachers were given an opportunity to think about a **gradual** and **systematic** learning cycle, according to growth stages from **lower grades** in elementary school, and to think both how various types of learning become intertwined to create a **line from dots gradually** and how **various values** of the advisors opened the door to music.

In "future tasks," we can see that **fund procurement** is difficult and that even if we want children to **experience real sounds**, there will be a need to **establish a framework or a system** for linking these experts and school education. It will also be important both to **cultivate** human resources with an **educational perspective** when **cultivating** these **experts** and to **record** and **summarize** these implementations, then provide information on them.

Visualization and analysis by text mining

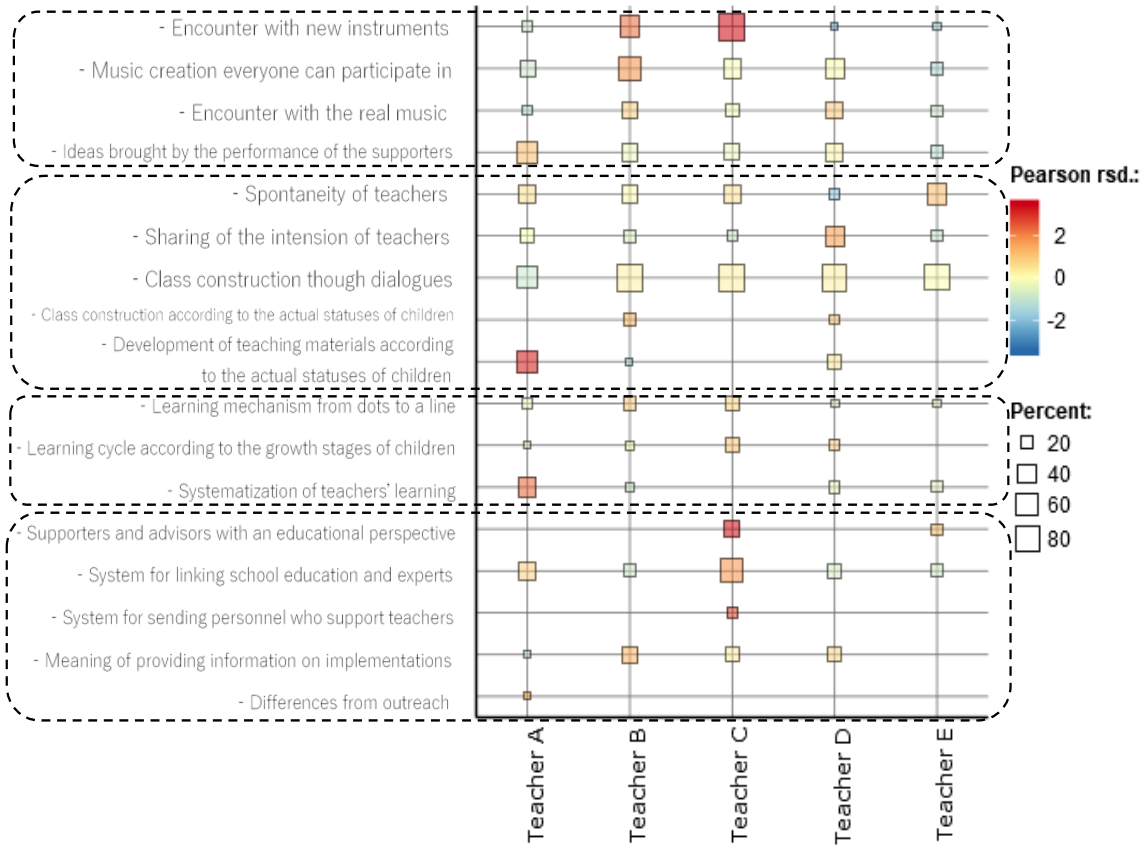
Here, I sorted the correspondence relationships between the initial codes and focused codes revealed via the C-GTA analysis and created coding rules. Some of the 33 focused codes created with the C-GTA can be further integrated. For example, "dialogues with the

advisors," "expansion of ideas thanks to the advisors," "utilization of the advisors' knowledge," and "triangle conversation including the supporters" can be integrated into "class construction though dialogues." Thus, each of the focused codes were reviewed once again and ultimately integrated into 17 focused codes while the coding rules were created. Auto coding was carried out with KH Coder 3 based on the coding rules. "Paragraph" was used as the sentence unit to be analyzed.

Figure 2 shows the visualization of the bubble chart of the relationship between five speakers and 17 focused codes, based on the results of auto coding. The larger the square is, the more frequently the code appears.

Figure 2

Bubble chart of the relationship between five speakers and 17 focused codes



We can see from the chart that all of the teachers frequently mentioned "class

construction through dialogues." We can also see that all of them mentioned "encounter with new instruments," "music creation everyone can participate in," "encounter with the real music," "ideas brought by the performance of the supporter," "spontaneity of teachers," "learning mechanism from dots to a line," and "system for linking school education and experts" to a greater or lesser extent. In other words, we can infer that the teachers' top priority here was thinking about what the initiative of the TAS model brought to children. They also mentioned their own perspectives and ideas about the class, such as "spontaneity of teachers," "sharing of the intension of teachers," and "class construction though dialogues." Based on this consciousness, the teachers more or less mentioned a deepening of thoughts, such as "learning mechanism from dots to a line." The fact that all the teachers mentioned "system for linking school education and experts," like these advisors and supporters, indicates that the establishment of this type of system had been desired in school education.

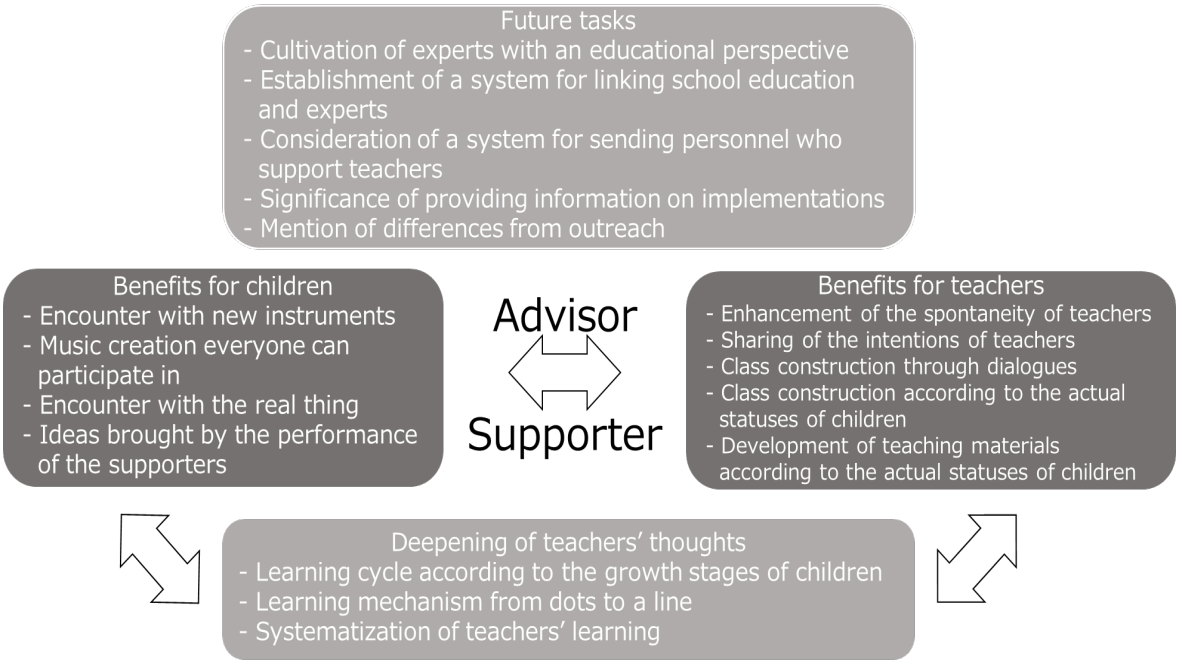
Meta-inference

Based on the "obtaining an overview of text data," "qualitative data analysis based on constructivist GTA," and "visualization and analysis by text mining" carried out so far, I verified whether the results were free of contradictions and problems and whether the phenomena spoken were properly visualized in text. According to "obtaining an overview of text data," the teachers thought that the class revolved around children and was supported by the advisors and that they wanted to both acquire knowledge on instruments and music from the advisors and study teaching materials with the advisors. It was also highlighted that they thought it was important for an advisor to have an educational perspective. In the C-GTA, I was able to classify the results into five categories: "relationship between children and the supporters through creative music making," "relationship between teachers and advisors deepened through dialogues," "development of teaching materials and class construction according to the actual statuses of children," "deepening of teachers' thoughts," and "future tasks." If these categories were classified once again from the perspectives of what was brought to children and what was brought to teachers, the focused codes in "relationship between children and the supporters through creative music making" were all "benefits for children." Because I reviewed the focused codes again and modified them before auto coding,

the categories of “encounter with new instruments,” “music creation everyone can participate in,” “encounter with the real music,” and “ideas brought by the performance of the supporters,” as shown in the bubble chart, are all “benefits for children.” Similarly, I reviewed the focused codes in “relationship between teachers and advisors deepened through dialogues” and “development of teaching materials and class construction according to the actual statuses of children” again in the C-GTA and modified them before auto coding. The categories of “enhancement of spontaneity of teachers,” “sharing of the intension of teachers,” “class construction though dialogues,” “class construction according to the actual statuses of children,” and “development of teaching materials according to the actual statuses of children,” as shown in the bubble chart, can be classified as “benefits for teachers.” These benefits for teachers and benefits for children are supported by the deepening of teachers’ thoughts, such as “systematization of teachers’ learning,” “learning mechanism from dots to a line,” and “learning cycle according to the growth stages of children,” which influence each other. It is therefore a “future task” to establish a “system for linking school education and experts,” like these advisors and supporters, as well as creating a “system for sending personnel who support teachers,” to both cultivate “supporters and advisors with an educational perspective” and reconsider the “meaning of providing information on these implementations,” while mentioning the “differences from outreach.” However, this is a minority opinion. Based on the above, the results of obtaining an overview of the text data, qualitative data analysis based on constructivist GTA, and visualization and analysis by text mining were free of contradictions, and I was able to clarify the significance of the TAS model and its possibilities from the teachers’ narratives (Fig. 3).

Figure 3

Significance of the TAS model and its possibilities as seen from teachers' perspectives



Conclusion

In this study, I examined the teachers' narratives by focusing on the roles of advisors in order to explore the significance of the TAS model. The results show that the teachers considered dialogues with advisors to be important, but to have a dialogue, teachers and advisors must be on an equal footing. The teachers respected the expertise of the advisors and supporters while also wishing to be on an equal footing as peers who enjoy music together with children. This is indeed a reflection of the fact that T, A, and S form a triangular relationship centered around children.

To spread this TAS model in school education settings more widely, there are many problems to solve, such as the establishment of a system for linking school education and experts and the cultivation of experts with an educational perspective, as indicated in the teachers' narratives. However, I would like to provide information on these implementations and contribute to establishing a system for constructing a new type of class where teachers have dialogues with local experts and understand each other in their community.

Additional Note: This study added considerations based on a presentation made at the 50th Annual Meeting of the Japan Music Education Society.

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Evaluation of Emotional Aspects of Students in Music Lessons Based on the TAS Model

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Abstract

The purpose of this research is to clarify the affective influence that a class practice based on the Teacher Adviser Supporter (TAS) model has on the students in music lessons. The study uses the association method proposed by Itoyama and Kamizono (2004) to create emotional vectors for evaluating the emotional aspects of students in TAS practice. This evaluation reveals through the use of emotional vectors areas of the activity that students find difficult and interesting as well as areas that affects them emotionally. The results show that class practices based on the TAS model tend to trigger students' interest in music-making and performance. In addition, few students responded to the stimulus word "uninteresting," revealing that class practices based on the TAS model are emotionally meaningful.

Key words: TAS model, making music, evaluation of emotional aspects, association method, emotional vector,

Introduction

This research covers classes in the project study "Music Education as a Bridge Between Schools and Society," conducted by the Japanese Society for Music Education (JSME) from 2017 to 2019 (Tsubono et al., 2019). Regarding the current situation of music education and outreach programs in Japan, Tsubono et al. (2019) state:

> In recent years, many professional musicians and musical groups have participated in outreach programs, travelling to schools to give free concert performances. These movements have spread into various social organizations. However, most of these programs are neither interactive nor related to the musical objectives of each school's educational curriculum. Moreover, the people who know the children the best in the classroom, their music teachers, rarely play a role in these visiting performances. (p. 57)

In order to remedy this situation, the Teacher Adviser Supporter (TAS) model was developed as a framework for cooperation between schools and society, emphasizing the teacher's initiative and the musician's role in supporting the teacher. The collaborators in the TAS model are a schoolteacher, a music researcher and a composer who acts as an adviser and provides information to the students, and a performer who supports the music children create with their own sounds. Evaluation of emotional aspects is conducted with the TAS model to clarify what kind of affect the class practice has on the students.

Itoyama and Kamizono (2004) propose using the association method to evaluate the emotional aspects of students. This evaluation reveals through the use of emotional vectors areas of the activity that students find difficult and interesting as well as areas that affects them emotionally. The association method involves using a stimulus word (e.g., "red") to elicit response words (e.g., "apple," "cherry," etc.). The evaluation of emotional aspects includes finding out if a class was "Interesting" or "Uninteresting" and determining which parts of the class were "Difficult" or "Easy." I prepared diagrams of emotional vectors which capture the strength of student responses to these four stimulus words to analyze the results.

This study builds on prior research on curriculum development, which includes several examples of the evaluation of emotional aspects using the association method. Itoyama and

Kamizono (2004) conducted an evaluation of emotional aspects in a living environment study of students at Nagasaki University's Faculty of Education. The contents are the productions of "tree climbing monkey," "origami airplane," "disposable chopsticks airplane," and the expression of soundscape by "sound map." Itoyama, Hirabayashi and Goto (2007) studied the emotional aspects of high school freshmen in a Life Design home economics course in Nagasaki Prefecture. In addition, they conducted an evaluation of emotional aspects of nursing science courses for second year students at university and Home Life courses for third-year students at university. Fruya, Suehiro and Itoyama (2008) targeted the first-year students of Nagasaki University's Faculty of Education and conducted an evaluation of emotional aspects in a Life and Cultivation class of living environment studies. Suehiro, Furuya and Itoyama (2009) focused on third-year students of Nagasaki University's Faculty of Education and conducted an evaluation of emotional aspects of cultivation learning in the technical teacher training curriculum. The contents were the cultivation of paddy rice, potatoes, and vegetables. Takahashi, Itoyama and Nitta (2017) targeted third-year students of Nagasaki University's Faculty of Education and conducted an evaluation of emotional aspects in sociology courses. None of these studies were conducted in music classes, and none were targeted at students below the high school level. However, since the main subjects of the research by Tsubono et al. (2019) are elementary school students, including those in music classes, it is necessary to pay attention to the characteristics of the subject and to consider research methods in line with the developmental stage.

The purpose of this research is to clarify the affective influence that class practices based on the TAS model have on students, using emotional vectors and the association method to evaluate emotional aspects.

General Method

Association Method

To implement the association method and evaluate emotional aspects in the subject class, the researcher first distributes a questionnaire to the students covering their activity as shown in Figure 1. The questionnaire includes four stimulus words—"Difficult," "Easy," "Interesting," and "Uninteresting"—and asks students to offer response words as free

descriptions. In the evaluation of emotional aspects, Itoyama (2011) classifies the responses obtained from this process as follows:

C: Response words for definitions, knowledge, and concepts

M: Response words about work, actions, and specific cases

A: Response words for specific activities of learners

I: Response words related to teaching and lectures

E: Response words related to the learning environment

O: Other**,** Z: No reaction (p.73)

Previous research on the evaluation of emotional aspects of students by the association method focused on classes in living environment studies, home economics, technology, and sociology rather than music. In this research, since the class subject is music and the class activities consist of music-making, the response words are classified as follows:

A: Response words for specific activities of learners (e.g., music-making, appreciation, performance)

C: Response words for definitions, knowledge, and concepts (e.g., blues, whole-tone scale, Classical renditions of koto, etc.)

I: Response words for instruction

In: Response words for instruments.

Emotional Vector

The classified response words are summarized in Tables 1-3 for each of the four stimulus words “Difficult,” “Easy,” “Interesting,” and “Uninteresting”. Based on these tables, the emotional vectors shown in Figures 2-4 are created. In these vector diagrams, the x-axis represents “Hard”-“Easy,” and the y-axis indicates “Interesting”-“Uninteresting.” “(D)-(E)” in Table 1-3 denotes the number of response words for “Difficult” minus the number of response words for “Easy,” and “(I)-(UI)” denotes the number of response words for “Interesting” minus the number of response words for “Uninteresting.” The value of “%” on the x-axis is “(D)-(E)” divided by the number of responses and then expressed as a percentage. The value of “%” on the y-axis is “(I)-(UI)” divided by the number of responses and then expressed as a percentage. Drawing an arrow from the origin to the

coordinates created by each evaluation creates the emotional vector. Based on this vector diagram, I reveal how students are emotionally affected by the class.

Figure 1

Questionnaire used in association method (Itoyama, 2011)

If you say "It was difficult" in today's class, What do you think of?	If you say "It was easy" in today's class, What do you think of?
If you say "It was interesting" in today's class, What do you think of?	If you say "It was uninteresting" in today's class, What do you think of?

Note. After the end of the subject class, students write freely in response to each stimulus word.

Experiment 1

Blues, Blues!

"Blues, blues!" was a class practice that took place at Wako City Fourth Elementary School in Saitama Prefecture, Japan on February 22, 2018. There were 80 students between the ages of 10 and 11 years. In the class, two "Supporters"—a jazz pianist and jazz saxophone player—performed a blues tune while two students improvised with call and response every two bars. The students used xylophones and metallophones. The keys of the instruments were marked with sticky notes to help the students identify which keys to play as accompaniment and which keys were improvisational.

Method

After the end of the class, I distributed the questionnaire shown in Figure 1 and allowed the students to write freely in response. I classified the responses obtained as shown in Table 1. The row labeled "C" summarizes the response words for "Blues" in this exercise. Based on this result, I created the emotional vector diagram shown in Figure 2.

Result and Discussion

From the emotional vector diagram in Figure 2, the vector of total responses classified as "Music-making," "Appreciation," or "Performance" (A (total)) is the longest. In particular, the "Music-making" vector (A1) extends in the direction of "Interesting" and "Difficult." In this class practice, it turned out that improvisation and music-making were activities that generated student responses classified as "Interesting" and "Difficult." Some of the specific responses students offered for the stimulus word "Interesting" included: "Having fun making blues"; "Having fun making music with everyone improvised"; "It was a pleasure to be able to create blues with professional musicians"; and so forth. For the stimulus word "Difficult," specific student responses included: "Making music improvised"; "Making music"; "Improvise playing the blues"; and so forth. In addition, because there were many performances by the two jazz musicians, a large number of the student responses were classified as "Appreciation." Such responses for the stimulus word "Interesting" included: "I enjoyed listening to the professional performances"; "I could hear the saxophone"; "It was interesting that the saxophone player was playing cool adlibs and playing"; and so forth. It became clear that students found instructions by the "Teacher" or "Supporter" easy to understand as the "Instruction" responses (I) extended in the direction of "Easy." Specific responses for the stimulus word "Easy" included: "It was easy to understand because the teacher taught me a sample at first"; "When supporters explained blues"; and so forth.

Table 1

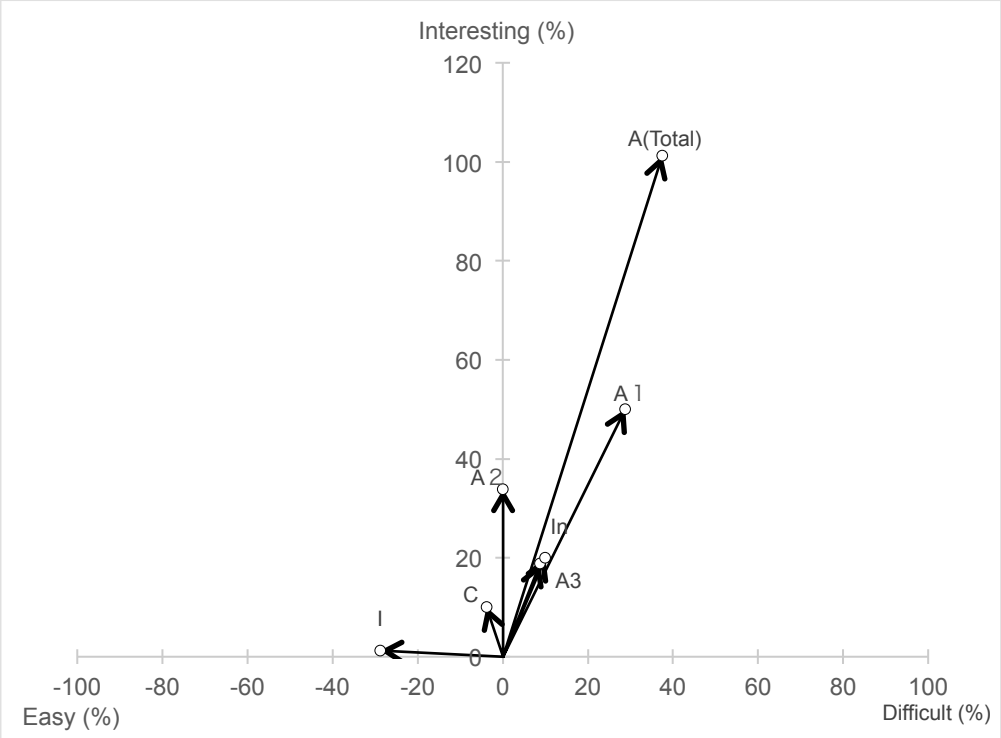
Blues, blues! (80 people)

	Difficult (Di)	Easy (E)	(Di)-(E)	(%)	Interesting (I)	Uninteresting (UI)	(I)-(UI)	(%)
A 1	27	4	23	28.8	41	1	40	50.0
A 2	0	0	0	0	27	0	27	33.8
A 3	11	4	7	8.8	15	0	15	18.8
A(other)	0	0	0	0	2	3	-1	-1.3
A(Total)	38	8	30	37.5	85	4	81	101.3
C	3	6	-3	-3.8	8	0	8	10.0
C(other)	0	0	0	0	2	0	2	2.5
I	0	23	-23	-28.8	1	0	1	1.3
In	8	0	8	10.0	17	1	16	20.0
O	1	1	0	0	2	0	2	2.5
Z	39	46	-7	-8.8	6	75	-69	-86.3

Note. A1: “Music-making”; A2: “Appreciation”; A3: “Performance”; C: “Blues”; I: “Instruction”; In: “Instruments”; O: Other; Z: No reaction

Figure 2

Emotional vector diagram of "Blues, blues!"



Note. Emotional aspects of the students participating in "Blues, blues!" were evaluated using the association method, as summarized in this emotional vector diagram.

Experiment 2

Creating Music Using Chime-bar and the Whole-tone Scale

"Creating music using chime-bar and the whole-tone scale" was a class practice that took place at Kawasaki City Minami Yurigaoka Elementary School in Kanagawa Prefecture, Japan on February 27, 2018. The class included 29 students between the ages of 9 and 10 years. In the class, the composer, Masahiro Sato (Professor at the Senzoku Gakuen College of Music), who acted as "Advisor", played his composition, "Hibiki-no-hamon," with four "Supporters" who were college music students. Then, the students improvised using the chime-bar, which had been arranged in the whole-tone scale for the performance.

Method

After the end of the class, I distributed the questionnaire shown in Figure 1 and allowed the students to write their responses freely. I classified the responses obtained as shown in Table 2. The row labeled “C1” summarizes the responses classified as related to “Whole-tone scale.” The row labeled “C2” summarizes the responses classified as related to “Hibiki-no-hamon.”

Result and Discussion

Examining the emotional vectors in Figure 3, the vector for “Instruments” (In) is very distinctive and is the longest compared to the “Instruments” vectors of other classes. It indicates that the interest in instruments was remarkable, because many instruments that are not usually played were used. Specific responses for the stimulus word “Interesting” included: “The chime-bar was fun”; “I played the chime-bar and other instruments”; and so forth. In addition, responses classified as “Performance” (A3) tended toward “Interesting” and “Difficult.” However, responses classified as “Music-making” (A1) were unlike those of other classes. It could be that students concentrated their attention on the performance of the instruments rather than making music or improvisation. Specific responses to “Performance” (A3) for the stimulus word “Interesting” included: “I played with everyone”; “I was playing various melodies using the chime-bar and feeling the reverberation”; and so forth. For the stimulus word “Difficult,” specific responses included: “Playing the chime-bar together with everyone”; “It was difficult to play at the end of the song”; and so forth. The combined responses to “Whole-tone scale”, “Hibiki-no-hamon” (C (total)), and “Instruction” (I) extended in the direction of “Easy,” indicating the success of the TAS model in this exercise. The specific responses for the stimulus word “Easy” included: “Sounds and melody of the whole-tone scale”; “It was easy to understand the explanation of how ‘Hibiki-no-hamon’ is configured”; and so forth. Specific responses for “Instruction” included: “It was easy to understand what the supporters and advisor explained”; “It was easy to understand because the advisor explained using a television”; and so forth.

Table 2

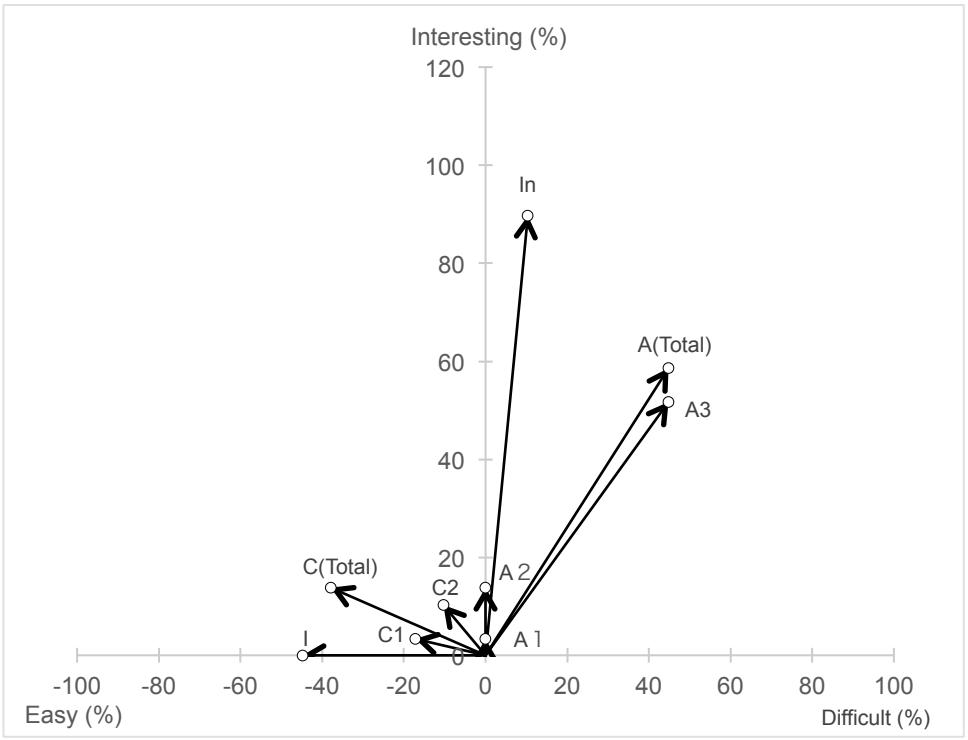
Creating music using chime-bar and the whole-tone scale (29 people)

	Difficult (Di)	Easy (E)	(Di)-(E)	(%)	Interesting (I)	Uninteresting (UI)	(I)-(UI)	(%)
A 1	0	0	0	0	1	0	1	3.4
A 2	0	0	0	0	4	0	4	13.8
A 3	16	3	13	44.8	15	0	15	51.7
A(other)	0	0	0	0	0	3	-3	-10.3
A(Total)	16	3	13	44.8	20	3	17	58.6
C1	1	6	-5	-17.2	1	0	1	3.4
C2	0	3	-3	-10.3	3	0	3	10.3
C(other)	0	3	-3	-10.3	0	0	0	0
C(Total)	1	12	-11	-37.9	4	0	4	13.8
I	0	13	-13	-44.8	0	0	0	0
In	10	7	3	10.3	27	1	26	89.7
O	0	2	-2	-6.9	2	0	2	6.9
Z	13	0	13	44.8	0	25	-25	-86.2

Note. A1: “Music making”; A2: “Appreciation”; A3: “Performance”; C1: “Whole-tone scale”; C2: “Hibiki-no-hamon”; I: “Instruction”; In: “Instruments”; O: Other; Z: No reaction

Figure 3

Emotional vector diagram of "Creating music using chime-bar and the whole-tone scale"



Note. Emotional aspects of the students participating in "Creating music using chime-bar and the whole-tone scale" were evaluated using the association method, as summarized in this emotional vector diagram.

Experiment 3

Developing the Music Based on Japanese Traditional Song "Sakura Sakura"

"Developing the music based on Japanese traditional song 'Sakura Sakura'" is a class practice that took place at Chiba City's Isobe Elementary School in Chiba Prefecture, Japan on June 15, 2018. There were 92 students between the ages of 11 and 12 years in the class. Koto performer, Sachiko Yoshihara (Lecturer at the Senzoku Gakuen College of Music), acted as "Supporter" and performed "Sakura Sakura," a traditional Japanese song. The students learned the classical renditions of the koto used in "Sakura Sakura" and made music in groups of four people using melody, bass, and ostinato along with musical forms such as A-B-C-D.

Method

After the end of the class, I distributed the questionnaire shown in Figure 1 and allowed the students to write freely. I classified the responses obtained as shown in Table 3. For this class, the response classification “C” denoted “Classical renditions of the koto.”

Result and Discussion

As shown in Figure 4, the emotional vectors extend generally in the direction of “Interesting”, while the vector comprised of the total responses to “Music-making,” “Appreciation,” and “Performance” (A(total)) was the longest, as it was in the “Blues, blues!” experiment. The “Music-making” (A1) and “Performance” (A3) vectors both tended toward “Interesting” and “Difficult.” Specific responses classified as “Music-making” for the stimulus word “Interesting” included: “It was fun to make music by myself”; “Making music using the classical renditions of the koto”; and so forth. For the stimulus word “Difficult,” responses included: “It was difficult to make my own music”; “It was difficult for me to make music, because it was difficult and impossible to play by myself if I used many classical renditions of the koto”; and so forth. Specific responses classified as “Performance” (A3) for the stimulus word “Interesting” included: “When playing the many classical renditions of the koto”; “Playing with everyone in the group”; and so forth. For the stimulus word “Difficult,” responses classified as “Performance” included: “It was difficult to change the dynamics of playing the koto”; “It was difficult for everyone in the group to play together”; and so forth. In addition, vectors for the responses classified as “Appreciation” (A2) and “Instruments” (In) extended in the direction of “Interesting.” Students were very interested in the “Supporter's” performance and koto. Specific responses classified as “Appreciation” for the stimulus word “Interesting” included: “It was fun when Ms. Yoshihara listened to ‘Sakura Sakura’ and traditional renditions of the koto”; “’Thousand Cherry Blossoms’ played by Ms. Yoshihara”; and so forth. The vectors for responses classified as “Classical rendition of the koto” (C) and “Instruction” (I) extend in the direction of “Easy.” This indicates that the instruction on classical renditions of the koto within the TAS model was easy to understand. Specific responses classified as “Classical renditions of the koto” (C) for the stimulus word “Easy” included: “Ms. Yoshihara showed me various classical

renditions of the koto and imitated it so I could play well"; "It was easy to understand the classical renditions of the koto because I listened to Ms. Yoshihara's performance"; and so forth. Specific responses classified as "Instruction" (I) included: "It was easy to understand the explanation of the supporter and teacher"; "It was easy to understand that Ms. Yoshihara taught me carefully and carefully the classical renditions of Koto, and that I was advised of the performance"; and so forth.

Table 3

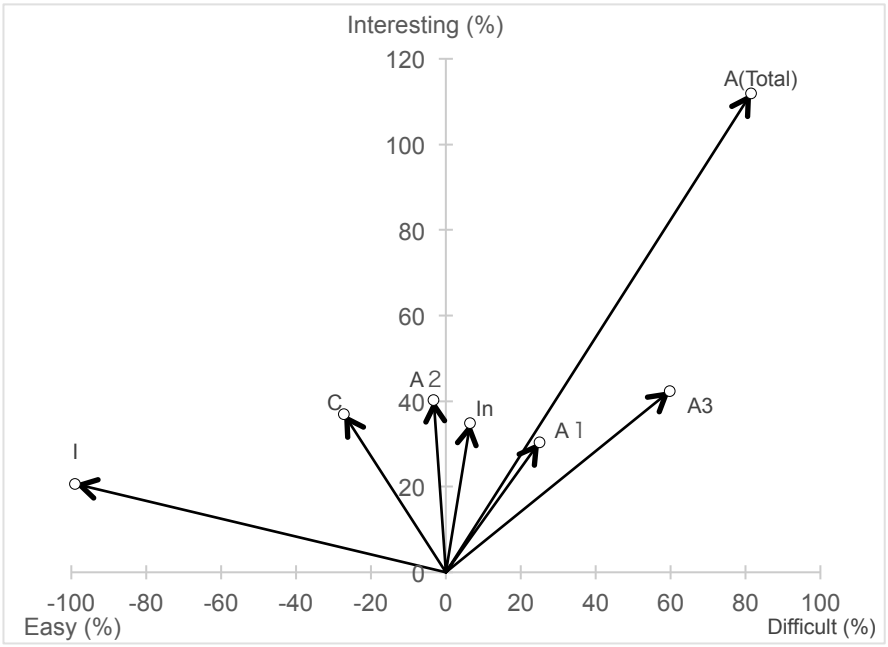
Developing the music based on Japanese traditional song "Sakura Sakura" (92 people)

	Difficult (Di)	Easy (E)	(Di)-(E)	(%)	Interesting (I)	Uninteresting (UI)	(I)-(UI)	(%)
A 1	31	8	23	25.0	30	2	28	30.4
A 2	0	3	-3	-3.3	37	0	37	40.2
A 3	76	21	55	59.8	44	5	39	42.4
A(other)	0	0	0	0	3	4	-1	-1.1
A(Total)	107	32	75	81.5	114	11	103	112.0
C	24	49	-25	-27.2	34	0	34	37.0
C(Total)	1	1	0	0	3	1	2	2.2
I	0	91	-91	-98.9	20	1	19	20.7
In	8	2	6	6.5	32	0	32	34.8
O	2	1	1	1.1	0	1	-1	-1.1
Z	1	4	-3	-3.3	1	76	-75	-81.5

Note. A1: "Music making"; A2: "Appreciation"; A3: "Performance"; C: "Classical renditions of Koto"; I: "Instruction"; In: "Instruments"; O: Other; Z: No reaction

Figure 4

Emotional vector diagram of "Developing the music based on Japanese traditional song 'Sakura Sakura'"



Note. Emotional aspects of the students participating in "Developing the music based on Japanese traditional song 'Sakura Sakura'" were evaluated using the association method, as summarized in this emotional vector diagram.

Summary and Concluding Discussion

In the class practice with the TAS model, the combined responses classified as "Music-making," "Appreciation," and "Performance" (A(total)) indicated that students found these aspects to be "Interesting" and "Difficult" overall. This is potentially due to students being able to participate in the making and performance of the music rather than just observing professional musicians play. However, looking at the emotional vector diagram for "Creating music using chime-bar and the whole-tone scale" (see Figure 3), the vector for responses classified as "Instruments" (In) extends farther than that of "Music-making" (A1). One potential explanation for this finding could be that this class did not perceive this exercise to be an activity for making music and instead focused their interest on the instruments. In future research and practice, classes should be instructed as to which activities

consist of making music. Also, looking at the emotional vector diagram for “Blues, blues!” (see Figure 2), the vector of responses classified as “Blues” (C) does not extend very far. Although the total vector for “Music-making,” “Performance,” and “Appreciation” (A(total)) extends rather far, the findings do not address the acquisition of knowledge or concepts. In future research, I must also examine how students acquire knowledge and concepts in music-making exercises. In this survey, there were few response words related to the stimulus word “Uninteresting,” as only 23 response words were offered by the 201 people surveyed. Specific responses for this word included descriptions like “I only went around once at a time” (Blues, blues!); “There were a lot of groups, so it was not fun to wait that time” (Creating music using chime-bar and the whole-tone scale); and, “It was not fun when everyone's opinions were not mixed up” (Developing the music based on Japanese traditional song "Sakura Sakura"). These response words were often classified as “A(other).” From these results, it is clear that class practice based on the TAS model is emotionally meaningful.

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II

Peer-reviewed Papers

The Emergently Interactive Process of Musical Expression Production between A Music Instructor and A Student

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Abstract

This study theorizes the emergently[1] interactive process of musical expression production between a music teacher and a student. The research questions are as follows: (1) What words do music teachers use to facilitate the emergent process? (2) What is the teacher's intention in uttering these words? (3) What does the student think about modifying his or her musical expression based on the teacher's words? Two female university teachers—a pianist and a soprano vocalist—and two female university students participated in this study. I videotaped the lessons taught by the teachers and interviewed them about their thought process during the lessons and about their impact on the students' performances while watching the videotaped recordings (VTRs) of the lessons. I also interviewed the students about how they modified their musical expressions according to the teacher's instructions. I segmented the scripts from the VTRs and the interview recordings based on their contents and categorized them from the bottom-up using the modified grounded theory approach (M-GTA). From this analysis, I created a model of the interaction between teachers and students for improving musical expression from the viewpoint of "interactive bodily judgment" (Kurashima 2007) by "bodily metacognition" (Suwa *et al.*, 2017). Implications for music teacher training are discussed from the viewpoint of this model.

Keywords: musical expression, group creativity, bodily metacognition

[1] I use the word "emergent" to express a phenomenon by a complex organization of multiple local interactions in a system that cannot be predicted from the behavior of individual elements.

Introduction

Schön's (1987) analysis of a musical lesson by a prominent musician and Fournier's (2011) observations of the collaborative process between a choreographer and dancers showed that expert instruction for performances is characterized by a co-active relationship and improvisation. Further, Meissner (2017) showed that teachers' "enquiries and discussions of musical character" with their pupils improved the latter's musical expressiveness. However, there are few studies on such an emergently interactive thought process between an instructor and a performer that would improve musical expression.

Our previous research efforts (Suga, 2009, 2012, 2017; Suga & Kobae, 2016) also showed that experienced music instructors emphasized drawing out performers' spontaneous and aggressive attitudes for musical expression, while instructors who had relatively less experience in teaching musical performance tended to emphasize precision of performances. These results suggest that accomplished musical instruction is characterized not by the technical mastery of effectively shepherding performers to their definitive goal but by practical decision-making through dialogue under an unpredictable, unstable, and context-dependent situation. The findings reveal new implications for music teacher training by viewing instruction for musical expression as a practical expert's *teaching as improvisation* (Sawyer, 2004).

This study investigates the emergently interactive process of musical expression production between music teachers and a student with a specific focus on the relationship between words and the body.

The research questions are as follows:

(1) What words do music teachers use to facilitate the emergent process?

(2) What is the teacher's intention in uttering these words?

(3) What does the student think about modifying his or her musical expression based on the teacher's words?

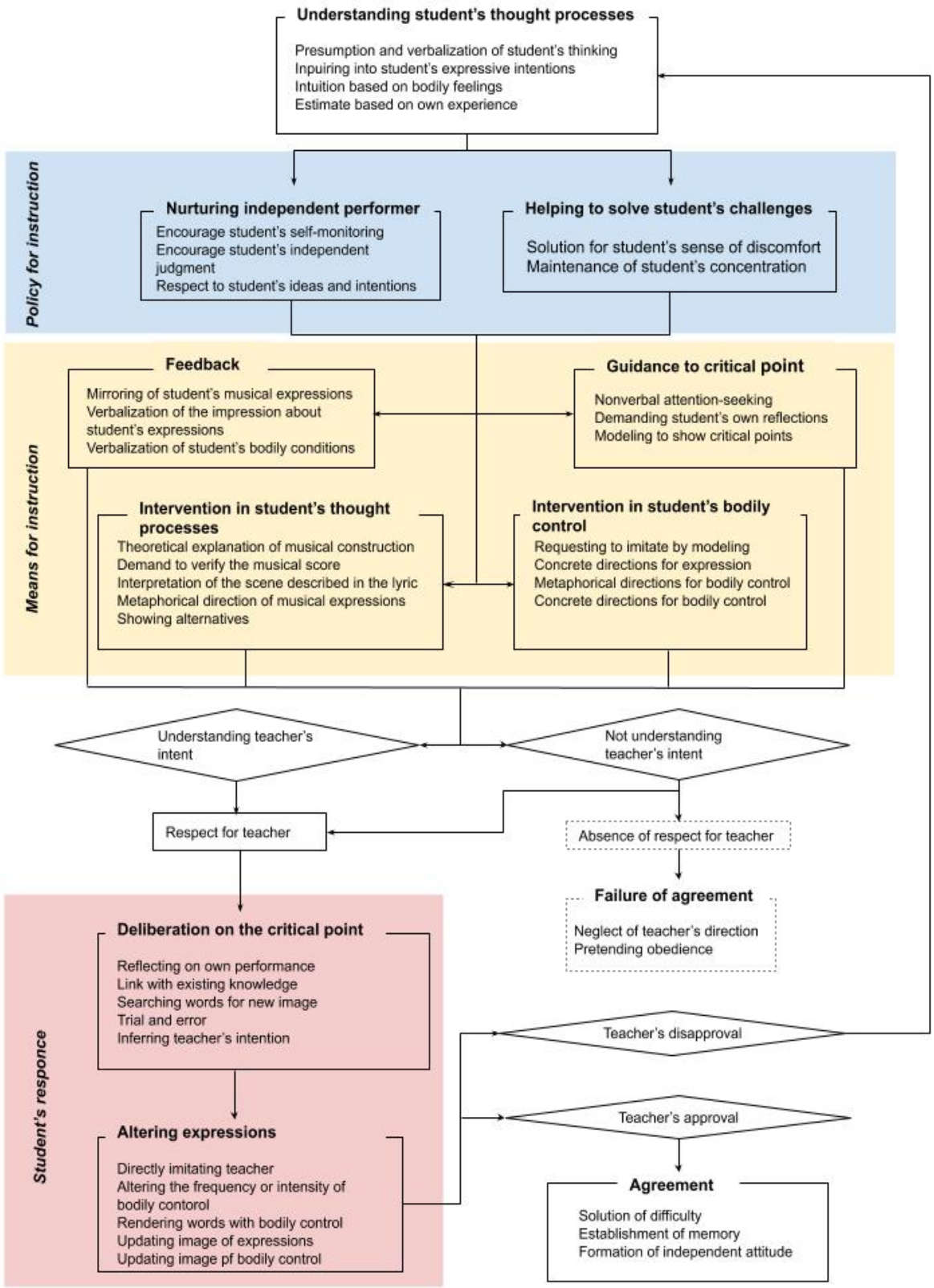
Method

Two female university teachers—a pianist (Mikiko) and a soprano vocalist

(Ikuyo)―and two female university students (Kaori and Harumi) participated in this study. Both of the teachers have over three decades of teaching experience. I videotaped the lesson taught by each teacher and interviewed them while watching video tape recordings (VTRs) asking about their thought process during the lessons and their impact on the students' performances. I also interviewed the students about how they modified their musical expressions according to the teacher's instructions. I segmented the scripts from the VTRs and the interview recordings based on their contents. This study aims to formulate a hypothetical model of an emergently interactive process between a teacher and a performer. To this end, it employs the modified grounded theory approach (M-GTA) (Kinoshita, 2003) as a framework for the analysis of protocol data, including the conversations between the teachers and the students during their lessons and the interviews after the lessons. In particular, I extracted the data related to the theme of the analysis, compiled analogous contents as the variation, and gave them concept names. Furthermore, I produced a concept map incorporating the categorized concepts (Figure. 1).

Figure 1

Concep map of the interactive process between instructor and performer t



Results

I shall report a workflow along with the concept map where [ ] denotes a concept name and < > denotes a category.

Teachers develop <*understanding their students' thought processes*> while listening to their performances. They dialogically develop such understanding by [*inquiring into their students' expressive intentions*], speculating on their [*intuition based on bodily feelings*], or [*estimating based on their own experience*].

Next, teachers decide the means for instruction according to their policy. I observed two policy themes: <*nurturing an independent performer*> where the teacher aims to extract the students' own ideas as much as possible by avoiding direct and concrete instructions; and <*helping to solve performer's challenges*> through clear and concrete instructions. Both teachers participating in the study laid more weight on <*nurturing an independent performer*> to [*encourage student's self monitoring*], [*encourage student's independent judgment*], and [*respect student's ideas and intentions*]. For example, Ikuyo tried to encourage Harumi's self-monitoring of images and emotions swelling within herself by repeatedly asking her questions to enable her to visit an imaginal scene described by the lyrics:

> Ikuyo: From where are you looking at the town Tyndaris? Imagine it. Are you in the town? If you have the image, your voice expression will change.

The teachers' means for instruction can be placed into four categories: (1) <*Feedback*> which includes [*mirroring of student's musical expressions*], [*verbalization of the impression about student's expressions*], and [*verbalization of student's bodily conditions*] to create awareness on students' current conditions; (2) <*Guidance to critical point*> is used to show problematic points in the students' musical expression or bodily movement by [*nonverbal attention-seeking*] or [*demanding student's own reflections*]; (3) <*Intervention in students' thought processes*> is used not to give concrete instruction but to provide clues to encourage the students to think by offering a [*theoretical explanation of musical construction*] or an

[*interpretation of the scene described in the lyrics*], and so forth; while on the other hand, (4) <*intervention in students' bodily control*> is intended to directly impact student behavior, and includes *[requesting to imitate by modeling*], and providing [*concrete directions for expression*], [*metaphorical directions for bodily control*], or [*concrete directions for bodily control*].

The teachers participating in the study used these four means either separately or in combinations. They used <*intervention in students' bodily control*> relatively fewer times as a last resort when the other three means could not produce the desired impact.

The students sometimes understood the teacher's intent on the direct or indirect instructions—and sometimes not. Even when they could not understand, they never directly asked the teachers any questions because of their [*respect for the teacher*] and belief that the teachers' abstruse words contained valuable suggestions. In such cases, students started <*deliberation on the critical point*> of the given instruction by *[reflecting on their own performances*], [*linking with existing knowledge*], or [*trial and error*], and so forth—sometimes in the moment, sometimes until the next lesson.

Students <*altered their expressions*> after the deliberation. Sometimes they directly worked on their body by [*directly imitating the teacher*] or [*altering the frequency or intensity of bodily control*], and sometimes they indirectly worked through words or images by [*rendering the words with bodily control*], [*updating images of expression*], or [*updating images with bodily control*]. When students received their teachers' approval of their new expression, they employed it; otherwise, the whole process was repeated again.

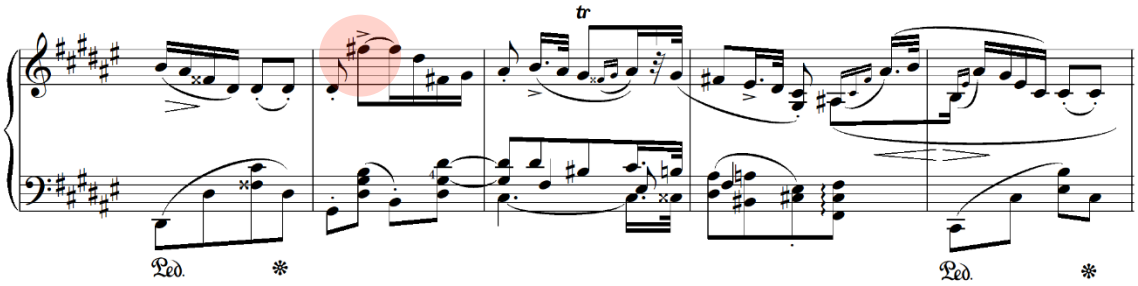
Discussion

Both teachers valued <*nurturing independent performers*>. They encouraged the students to formulate their own ideas and rarely employed direct intervention on the students' bodily control. This result corresponds with my previous research into instruction with three experienced teachers of a group ensemble, where the teachers did not give any clear propositions about tempo settings and dynamics, and instead, they inspired their students' imagination by their vague words to encourage them to formulate their own ideas (Suga,

2017). Therefore, the students had no choice but to reflect on their own performances and try and make mistakes to allow for a possible new expression according to their teachers' words as cues.

Figure 2

Nocturne No.5 F-sharp major, Op. 15, No.2 by Frédéric Chopin



The following is the dialogue between Mikiko and Kaori on how to use one's right hand to play a jumping melody (Score 1). The corresponding concepts are stated after the underlined expressions:

Mikiko: Yes. How do you feel? Your fingering was good. But the sounds? Are you satisfied—[*inquiry into the student's expressive intentions*]?

Kaori: I wonder if I should make it a little bit louder.

Mikiko: Of course, be my guest—[*encouraging the student's independent judgment*].

—*Kaori played the piano again*.

Mikiko: I think your playing was like singing with this kind of voice, "Tah,"—*Mikiko sang huskily*—[*verbalization of the impression about the student's expression*]. When you sing a high note, you use your diaphragm and say inwardly, "I am going to hit it"—*Mikiko picked her forehead skin up with her fingers*—do you not? You did not do that, you know? Try to play with a sense of singing that aims for the F# note by using bodily support—[*metaphorical direction for bodily control*].

—*Kaori played the piano. This time, she slightly delayed the timing of the F# and played it with more accent.*

Kaori explained this scene in a retrospective interview:

Kaori: My former image of the F# note was like a super-wingy airplane track like "Tah!"—*she fleetly waved her right hand over her head*—[*reflection on own performance*]. But when she (Mikiko) said that I needed the image for singing a high note, I felt like I got it. Definitely, I poise to sing the high note and say inwardly, "Now!" I thought it was the same feeling with playing the piano—[*rendering the words with bodily control*].

Interviewer: What did you specifically change for your expression then?

Kaori: I thought it would be quicker to change my image when singing a high note—[*updating image with bodily control*].

Mikiko explained the same scene in retrospect during the interview:

Mikiko: When you sing such a jumping melody, the high note is always delayed somehow. You have to prepare for it. I had the intuition that if she (Kaori) had the feeling then she would be able to express the extension—[*intuition based on bodily feelings*]. I want my students to develop such sensory knowledge. For that, I do not give them my recipe to do it. Instead, I want them to find their sensitivity of breathing or a secret for using their arm—[*encouraging students' self-monitoring*]— because everyone is different.

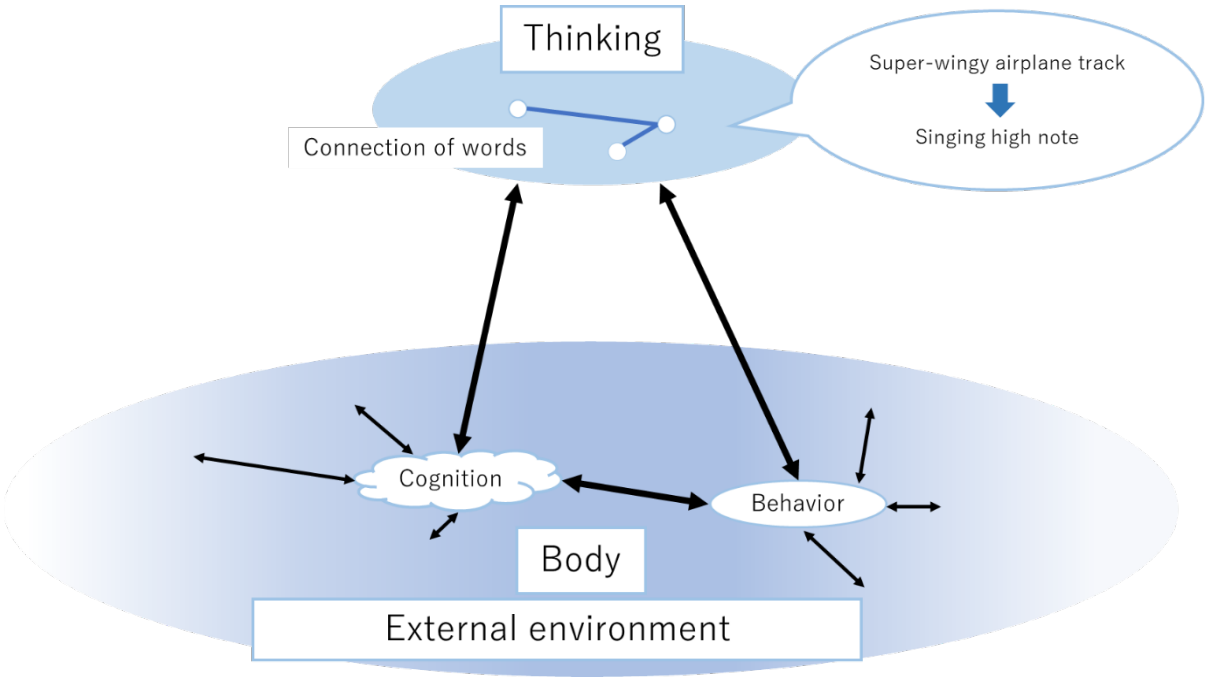
In this scene, it was the bodily image for singing a high note that facilitated the common understanding between the teacher and the student. Mikiko had requested Kaori play the phrase three times. It is noteworthy that Mikiko did not show direct disagreement with Kaori's expression, but instead, encouraged her to think for herself by saying, "I know you have your own idea but you could not render it as you thought" or "How was it? Are you satisfied with it?" Then, Kaori realized Mikiko was not satisfied with her expression, yet she had to explore what she should change and how by herself. After the third repetition, Mikiko

showed the faintness of the student's sound of the F# note by singing huskily and talking about the diaphragm. As mentioned above, she explained the reason for avoiding direct instruction as she thought everyone is different. That is, she tried to share only the direction to attain the sense of an extension of the jumping melody and entrusted Kaori to explore the way of bodily control to get it.

Let us now turn to inferring the student's thought process with regard to the teacher's instruction. Before the lesson, Kaori described the image for playing the F# note as "a super-wingy airplane track." It is likely that she also had a kind of proprioception and a sound image according to the super-wingy airplane track. She started deliberative thinking for a new image of bodily control driven by Mikiko's direction, "when you sing a high note, you use your diaphragm and say inwardly 'I am going to hit it.'" Needless to say, the muscles for singing are different from the ones for playing the piano. It was a projection, a kind of mental operation to displace a category built in one domain towards another working in this phase.

Figure 2

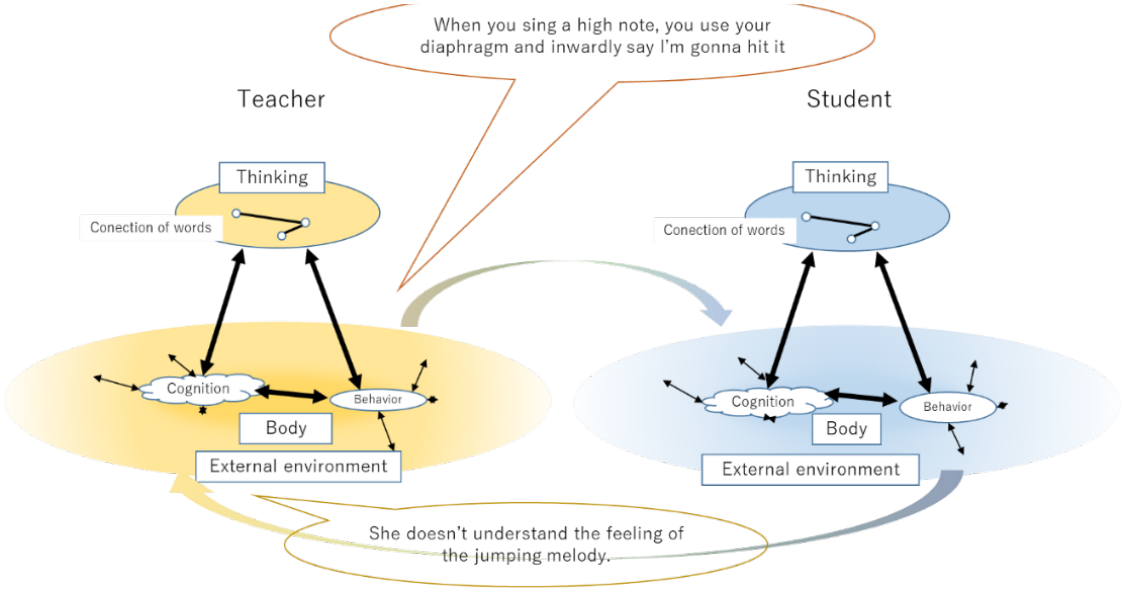
Bodily metacogniton



That is to say the intensity and the mechanism which had been encoded as a set of

Figure 4

Interactive bodily reality



activities for singing a high note impinged on Kaori's behavior to change her musical expression.

Suwa *et al.* (2017) contends that we can elevate our cognition of the relationship between our body and the external environment by "bodily metacognition," to make internal observations and verbalize them. Bodily metacognition is based on the frame of cognitive coupling which considers cognition, behavior, and thinking as equally shaping each other. Suwa *et al.* goes on to say that words have a crucial role in this interaction, and the words uttered by another person can also create a new link to a bodily feeling.

Figure 2 shows Kaori's thought process for playing the jumping melody in terms of bodily metacognition. The behavior for singing a high note corresponds to proprioception, that is, inner cognition of tonus, intensity, timing, and direction for exerting related muscles. The proprioception is conducive to planning a series of actions for playing the piano with imaginal singing through thinking with word connections.

The model of bodily metacognition can be applied to a teacher's thought process as well. In this case, a teacher cognizes sounds and body movements during the student's

performance. These auditory and optical stimuli evoke the teacher's behavioral memories of her own piano performances and her proprioception corresponding to such an experience. Mikiko sang huskily by making associations to a singing body in her mind and the verbal behavior to use bodily support for singing a high note (Figure 3).

Kurashima (2007) describes the understanding of others' changing bodily reality based on sharing an "equal" body that seeks behavioral effectiveness as the "interactive bodily assessment." In other words, our intuitional assessment of others' behavior is derived from our bodily understanding of the relationship between our own behavior and the effectiveness sought through it. Since Mikiko had the confidence that she could share the bodily feeling for singing a high note with Kaori, she used the singing image for her instruction.

As shown above, it can be concluded that teachers' words for instructions can reach students through the interaction of their interactive bodily judgments with bodily metacognition.

Implications for music teacher training

This study showed the model of interaction between teachers and students for improving musical expression from the viewpoint of interactive bodily judgment by bodily metacognition. Good instruction for musical expression requires precise interactive bodily judgment of sounds and movements during a student's performance and the activation of the student's bodily metacognition by choosing words deliberately.

A student's musical expression cannot be improved by conveying target values for dynamics and tempo, because musical ideas are too complicated to be reduced to such particular elements. Besides, bodily controls for performing music are so complicated that individual players—each with a different body—have to figure out for themselves the relationships among valuable parts of the body in a holistic manner. Furthermore, one cannot get the same results with their students by employing the words of another instructor, because the process to understand the progenitor's body to produce the words through one's body is spared, and one cannot therefore share a bodily reality based on sharing an "equal" body for seeking behavioral effectiveness with one's student using such "borrowed words."

Teachers should be competent in bodily metacognition for training on instructional ability before they can encourage students with interactive bodily judgment. In a course of music teacher training at a university, students who aim to teach take lessons for playing the piano, singing, or playing other musical instruments every day. It is likely to result in the development of the instructional ability of music expression from a continuing phenomenological deliberation and verbalization of the thinking process in regard to what words of their teachers brought findings of new critical points and how their behavior and cognition have been changing.

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Various Effects Inspired by Creating Music with Digital Audio Workstation

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Abstract

The recent development of a variety of music software has facilitated the production and playback of music without requiring specialized music expression or knowledge. The present study focuses on students who independently engage in music making using a digital audio workstation (DAW) in their spare time without intervention by teachers or other educators. In this study, the students clarify in their own words various aspects of their musical experience during the creative process; further, the study discusses a) how their recognition of musical expression itself deepens as they alternate between expression using a DAW and human musical expression and b) what learning they acquire through trial and error in this manner. Through the analysis, I clarify that there is a trial-and-error aspect to both listening and getting attached to a sound. In addition, a DAW allows visualization and manipulation of sounds and music, but an absolute lack of musical experience such as listening to and playing with real sounds was predicted. However, the students involved in this study grasp the respective characteristics of digital sound and of sound produced by an individual, and while distinguishing between them, combine them and create new sounds and compositions. The case analysis in this study shows that musical activities using a DAW are organically linked with physical music experiences.

Keywords: activity of creating music, digital audio workstation (DAW), musical experience

Introduction

The trend of establishing and utilizing an Information and Communication Technology (ICT) environment began with the "e-japan strategy" of the then Ministry of Public Management, Home Affairs, Posts and Telecommunications in 2001, and grew into the "u-japan strategy" (the u stands for ubiquitous) and the "smart Japan ICT strategy." Naturally, this tendency has also been incorporated into education at Japanese schools. Research into the provision of such an ICT environment in schools and into relevant tools and their utilization is currently being promoted. ICT has now infiltrated every aspect of our lives, giving rise to questions regarding the kind of developments this will introduce in people's musical experiences and in music education.

Sakai (2016, pp.285-286) commented that now that it is possible to listen to music online via video-sharing and other music distribution services, music is gradually changing from something that we bought and owned to something that we have access to. Thus, for the youth of today, music has become something that they participate in rather than merely listen to. Further, music production software has also made it possible for them to broaden their participation from critiquing existing works to actual creation and transmission.

It is impossible to deny the fact that musical expression and musical creation in the past required skills and that knowledge was a barrier to musical activity for people lacking required skills. It is not difficult to envisage that music production software, which has the advantage of guaranteeing the acquisition of such skills and knowledge, will lead to completely new developments within musical education and activity.

Koizumi (2003, p.259) commented that it is necessary to avoid compartmentalizing pupils' relationship with music into what happens inside and what happens outside school, and instead, to consider the culture of the youth as an integrated whole. If the technological developments surrounding young people outside of their school education are changing the way that they interact with music, then we certainly need to know what they are doing, and furthermore, what kind of musical experiences they are having.

Thus, this study focuses on people who engage in creative activities using a digital audio workstation (DAW) as a hobby. These people are not studying music as a specialty,

and they have received no DAW-related training. Against such a background, what are the musical experiences of these people who create music using a DAW?

Action research on digital technology in music creation has been infrequently conducted since the second half of the 1990s and has recently and suddenly become more common. However, most of these studies have used a DAW with a predetermined aim or method and verified the effect of the project. The present study focuses on students who independently engage in creative activities using a DAW in their spare time and without intervention by teachers or someone similar. In this study, the students clarify in their own words various aspects of their musical experience during the creative process; further, the study discusses a) how their recognition of musical expression itself deepens as they alternate between expression using a DAW and human musical expression, and b) what learning they acquire through trial and error in this manner.

Research Methods

Research Subjects

This study focuses on the nature of musical creation by three third-year university students. None of the three students are receiving specialist education in music but are, however, familiar with DAW-mediated music as a personal pastime and independently create audio files and musical compositions.

Research Methods

The research subjects were interviewed about the process by which they create such audio files and musical compositions, providing the researcher with information about relevant audiovisual data.

The interviews started in May 2018, with four sessions lasting for two or three hours.

To clarify how the research subjects alternate between expression using a DAW and expression unique to humans, the study also includes discussion of case studies in which the participants were asked to input an existing song into the Vocaloid software application and manipulate the data to produce human-like singing.

Ethical Considerations

The consent of the research subjects was obtained after providing them with written and verbal explanation about a) the voluntary nature of interview participation and providing audio-visual data, b) the aim of the study, c) the method of data management, and d) the scope of the use and publication of the data. Thereafter, signed consent forms were received from the research subjects who consented.

Overview of Research Subjects

To provide an overview of the three students interviewed in this study (hereafter, Student A, Student B, and Student C), we share their responses to the following three questions:

i. What kind of musical compositions do you create?

ii. What software do you use?

iii. Under what circumstances did you begin creating music?

Student A

i. What kind of musical compositions do you create?

Influenced by the background music in games that I enjoy, I create my own original pieces. I aim to make music that has singing.

ii. What software do you use?

I use Steinberg's Cubase Elements 8. When creating the lyrics and the melody, I use Yamaha's Vocaloid 4 Editor for Cubase. And I use IA ROCKS as a voice bank. Beside these, I also download and use sound files compatible with Virtual Studio Technology that are available online.

iii. Under what circumstances did you start creating music?

I first purchased relevant software in my first year of university, but I have always been interested in music. When I was in grade 6 at elementary school, I bought the WarioWare D.I.Y. software for my Nintendo DS so that I could create my own games, music, and manga. I was also interested in handling the sequencer in that software. I began to play the guitar in my first year of high school and got involved in band activities. I began to think at first that I

would like to compose music through musical activities. So I bought relevant software as soon as I started university.

When composing, I search online for chord progressions, scales, and differences in rhythm depending on musical genre and ask friends when my own knowledge is insufficient. The fact that I had played guitar in a band is also helpful.

Student B

i. What kind of musical compositions do you create?

I enjoy performing with musical instruments and still belong to a music club. I like music in which a motif is repeated on a loop and I often use that form when I create my own music.

ii. What software do you use?

I use Cubase Artist 8.5. I chose Cubase because when you search for composition software online, Cubase and Sonar come up, and so I thought that if I chose that software, there would be a large number of tips on different websites that would be easy to follow. I do not create songs; I create instrumental pieces.

iii. Under what circumstances did you start creating music?

I began using Cubase immediately after entering university, but when I was in junior high school, I bought “Daigasso! Band Brothers” for my Nintendo DS. Around that time, I became very keen on music from netlabels. Up till then, my only involvement was in classical music.

I enjoyed music computer games, and I always liked electronic music. I also like classical music, but my encounter with musical software was a moment of revelation of a new genre to me.

Every day I search for components for the musical pieces I compose, and a piece begins to take shape when my ideas have solidified to the extent that I can hum a melody and say, “This is what I would like to reproduce.”

Student C

i. What kind of musical compositions do you create?

Rather than composition, I enjoy creating cover versions and remixes. I look at the score of an existing song and translate it into MIDI data. I sometimes also write my own lyrics. My intention is to make the artificial singing voice sound as close as possible to a human voice.

ii. What software do you use?

I use Ameya/Ayame's Utau voice synthetization software. I use Cakewalk[1] to combine the voice singing the lyrics produced using Utau with an accompaniment. I also create the melody. For the melody and the accompaniment, I use Cakewalk.

iii. Under what circumstances did you start creating music?

It began when I first heard some Vocaloid musical pieces in my second year of junior high school. I had the idea of trying it myself and began using the free Utau software.

Episode Analysis

How do the students perceive human musical expression and DAW-mediated musical expression, and what links do they find between the two?

Episode 1 - "Human-like expression"?

First, Students A and C were asked to produce data that sounded like human singing based on the "Momiji" and "Tonbi" songs from the Courses of Study for Elementary School. This was done in order to identify the set of operations they perform when attempting to make Vocaloid singing sound close to human singing.

1) Processing by Student C based on "Momiji": using Utau

Student C conducted automatic processing using the software's auto correction function, listened to the result, and then reprocessed unnatural instances in the following four regards:

・Envelope (processing of the speed of the sound's appearance and disappearance, the length of the sound, accent, and word ending)

・Adjustment of the portamento in pitch

・Vowel blending

・Vibrato

The singing voice originally entered comprised the katakana syllabary, plosions, and voiced consonants without nasal consonants, and therefore, Student C spoke of putting a nasal N sound at the front whenever necessary. For example, the particle "GA" is dulled, becoming "N-GA".

In addition, the lyric "SUSOMOYOU" is entered as "SUSOMOYOO" because this is

considered natural in terms of Japanese pronunciation. However, when entering the lyric as "SUSOMOYOO" and using the auto correction function, in the second half of the last "O," there is a sustained unnatural vibrato; thus, Student C says the vibrato wave is adjusted again in terms of depth, length, entry timing, size of the word ending, and the range of a vowel.[2]

2) Processing by Student A based on "Tonbi": using Vocaloid 4 Editor for Cubase in Cubase

Figure 1 shows the results of applying the software's auto correction function to the "AOZORA NI" section of the line "NAKE NAKE TONBI AOZORA NI" in the lyrics of "Tonbi". In addition, Figure 2 shows the data for Student A's adjustment for bringing the sound close to "human-like expression."

There are many sections in "Tonbi" where the note of a vowel is raised or lowered slightly, and Figure 2 shows how Student A is particularly skillful in expressing these not in the MIDI data but only in the pitch bend. Additionally, the vowel sound "O" in the "ZO" of "AOZORA NI" is corrected by the auto correction function, and to resolve the fact that an accent is attached to the second half of the sound, the vowel sound is removed. Also, a nasal "N" sound is added in front of "NI," making the consonant "N" in "NI" clearer.

Considering Figures 1 and 2, in the "TANOSHIGE NI" section, at the place of "TA", an unvoiced syllable is attached to "A", the "S" and "I" in "SHI" are entered separately, and the "GE" is changed to a nasal consonant.

Figure 1

Autocorrected Data by the Relevant Software（excerpt）

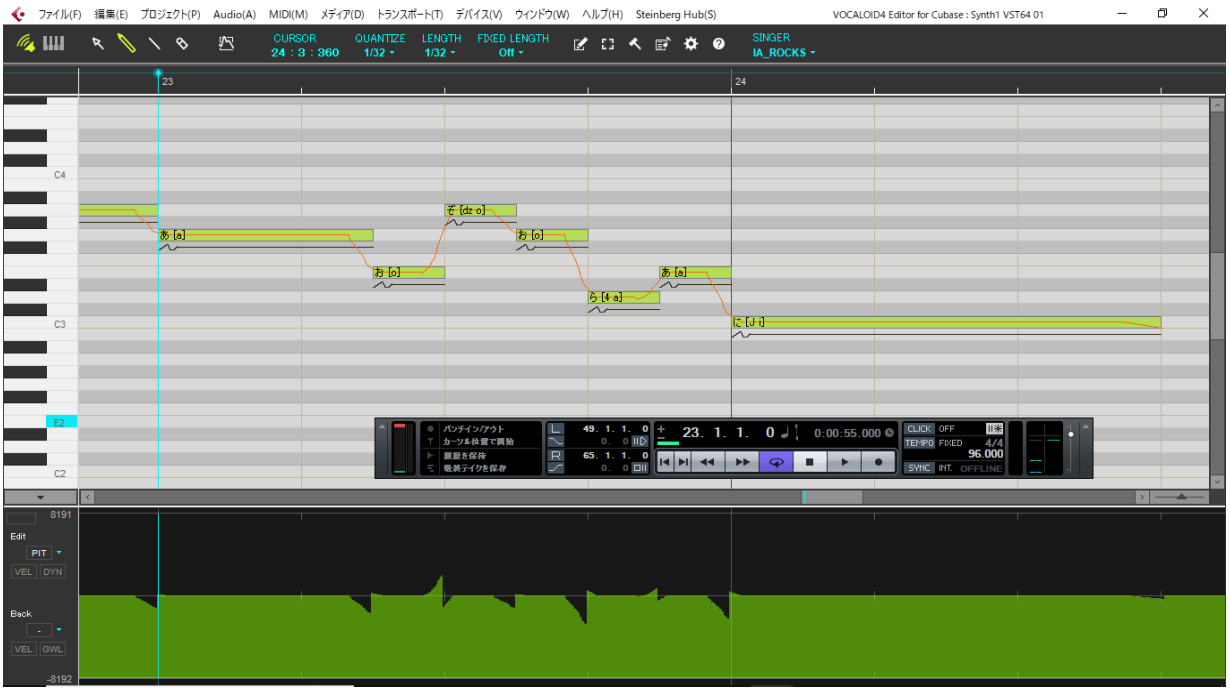
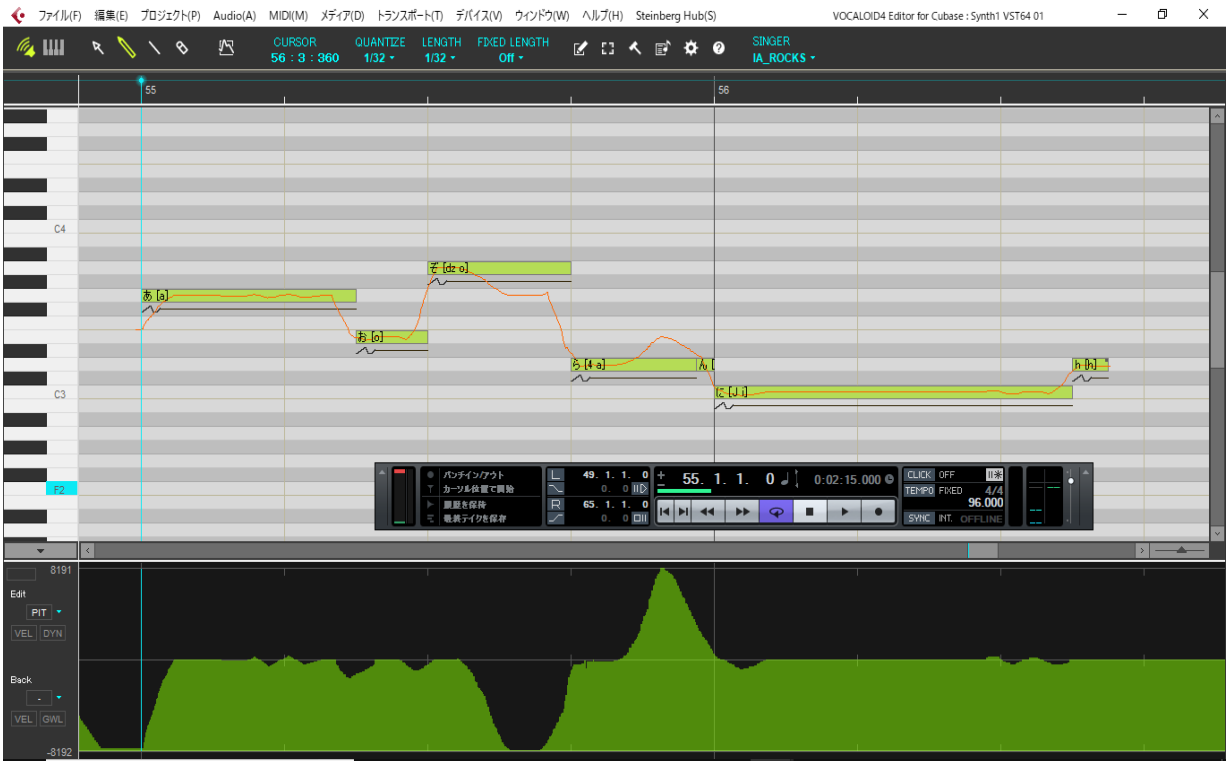


Figure 2

Data Adjusted by Student A （excerpt）



In addition, the pitch of each sound is adjusted to lower the dynamics of the moment in which the syllables in the "TA" and "KA" rows of the katakana syllabary grid are pronounced and to express the interval instability when a human being is singing. Furthermore, Student A says he also focuses on both the inflection and vibrato and corrects the strength and brightness (clarity of pronunciation) for inflection. Sometimes these corrections were made with a crescendo. In their interviews, Student A and Student B gave the example that when they intend to produce the tone of a clarinet, they repeatedly listen to the sound of a real clarinet because they are not happy with the ready-inputted tone. They also said that they repeatedly listened to the natural sound to find out what characteristic was resulting in the desired tone and made fine sequencer adjustments to bring the DAW sound closer to their impression of the sound of an actual clarinet. This shows that these students, having experienced the sound of a real clarinet, did not just use the pre-inputted sound, but instead repeatedly compared and scrutinized the sounds to create their own sound. It is suggested that that this kind of experience provides knowledge such as that utilized in the adjustments made to the voice in "Tonbi".

Episode 2- Comparison of Vocaloid and human voices

After Episode 1, Students A, B, and C were asked again regarding the kind of skills they use when trying to make a Vocaloid voice sound similar to a human voice, to which they gave the following reply:

> When trying to make a Vocaloid sounds human-like, I insert a breath. If there is a quarter note, I insert a breath of sixteenth note long at end of the quarter note (so it would be approx. dotted eighth note) to sound more like human. In order to solve the problem that the sound is interrupted, I control the volume so that the sound disappears gradually.
>
> It is not that it would be better to have a real human being singing; rather, a Vocaloid-like voice sounds better when it is close to a human voice. By referring back to the human voice, I am aiming at a Vocaloid expression that is easy on the ear.

In addition, they made the following comments about adjusting pronunciation:

For example, “DA” is entered for “the,” as it sounds similar to the actual pronunciation, and the beginning of “heart” is entered not as “HA” but as “HE-a”, with the consonant and the vowel pronounced slowly and separately and with the incorporation of an unvoiced sound.

As a rule, I reenter the vowel sound. If I want to make the consonant in “GA” within “UTAGOE GA” clearer, when the velocity parameter is lowered, the consonant is advanced and sounds clearer, and when it is raised, it sounds smoother. If the pronunciation feels congested, I adjust the brightness.

Although Vocaloid singing will inevitably sound more human as ease of listening is pursued, the ideal for these students when listening to Vocaloid singing is easiness on the ear through utilizing Vocaloid characteristics rather than an attempt to replicate human singing. Operations toward such ease of listening include perceiving the vowel and consonant sounds, clarifying pronunciation, insertion of breath (dividing suitably in line with syllables), and changing intervals. In addition, pitch bend operation was seen as important when aiming for human-like expression. In other words, having fully understood the characteristics of a Vocaloid voice, the students analytically grasped the characteristics of vocalization by a real human being and carried out skillful adjustments to express human-like qualities. It is possible that by alternating between the DAW expression and the human expression, the students learned about expression itself.

Incidentally, Student A said that when he himself uses a high voice, it is difficult to build up to a crescendo from a small voice, but this is easy to achieve using software. In addition, he said that Vocaloid sets a specialist voice range according to each featured character, and thus his choice of character is made while considering this.[3] This implies that although he was concerned with human expression, it was an expression unique to a DAW that was being sought.

Episode 3- Unable to create Celtic music

So, what are the notable aspects of the process by which the students use a DAW to freely create music?

Student A stated the following about a time when he attempted to create Celtic music:

Even if I think of a melody, I cannot express it as an actual musical score or enter it as data. When I create music, I choose a theme and first decide to use a certain kind of sound, and then I decide on the tone and instruments. The piece emerges as I move things forward by setting everything up together in a way that seems to be OK and by making various additions.

Although I was composing with the intention of creating music in the Celtic style, what I actually managed to create was something similar to a "Gypsy dance." This is what my friend X called it, anyway. Even so, it was a learning experience. I certainly understood that it was wrong. There was a problem with the chord progression, and the scales and chord progression were too free. I believe that I mastered the characteristics of Celtic music, but it was perhaps too fast. I understand Celtic music, and this piece was clearly not Celtic music. With some corrections, it will probably become Celtic music. I also used the musical instruments that are used in Celtic music.

Student A attempted to create a piece of Celtic music, but someone suggested it sounded like a "Gypsy Dance";[4] student A himself was aware that it sounded different from his idea of Celtic music. The fact that Student A himself named his piece "Irish?", including a question mark, also makes it clear that he was not entirely happy with the work. In addition, given that he seems to have created the piece after grasping the nature of Celtic music, he said, "I don't know how to change this to turn it into Celtic music."

Student A also said that in creating this piece, he had learned the characteristics of Celtic music.

Episode 4 – Use of trial and error to produce Celtic music

Student A：I viewed various Celtic music videos on YouTube, etc. and studied its theory. I did some research both online and by reading books. It has various characteristics, such as the frequent use of sixteenth notes. What's wrong?

Celtic music has various characteristics which I intended to follow, but my piece was different from actual Celtic music.

＜Listening to Student A's musical composition＞

Student A: I created it in C major without sharp or flat notes.

Student B: Really? There seem to be some.

Knowing that the Dorian mode was used in Celtic music, Student A bore this in mind during his creative process. As the Dorian mode used by Student A does not contain any derived notes, it seems that his intention was to make the piece in "C major." [5]

Separately, Student A referred to explanatory videos which could be confirmed with MIDI data on YouTube, such as "Practical Composition Course," and "How to create Celtic music," etc. Starting with the characteristics of composition obtained from these videos, he created his own compositions and listened to them. Then, in order to move his compositions closer to his perception of Celtic music, he repeatedly listened to actual Irish music. In other words, it is obvious that a cycle arose here in which he used his new knowledge to work on his composition, listened to the result, and then went in search of further knowledge.

As we listened to the piece created by Student A during the interview, when Student A said that he had written the piece without using sharp or flat notes, Student B said, "Really? There seem to be some." In response, Student A reviewed the MIDI data on the spot and discovered mistakes in the constituent notes. He immediately made corrections, and we listened to the piece again.

In addition, Student A said that when creating that piece, he "had been obsessed with the guitar." In response to the author's suggestion that this may have involved embellishment, he answered that that may have been the case. However, it had an extremely fast tempo; when the author said, "It is too fast to be understood. How about making it a little slower?", Student A changed the 160-bpm setting to 100 and replayed the piece. During the interview, Student A also showed us a musical composition on YouTube, saying, "This is the kind of thing I really wanted to create." Hearing this model again, Student A said, about his own composition, "It was too fast, I think."

In these situations, Student A was receptive to the opinions of others in his attempt to come close to replicating Irish music and immediately reviewed them in his data and checked how the revised piece sounded. It can be said that such a repeated cycle occurring over an extremely short period is characteristic of the use of a DAW.

However, Student A initially set the speed of his piece at a pace that did not allow listeners to hear the tone of his favorite instrument, the guitar, or to hear the characteristics of his embellishment. In this regard, Student A explained that although he had the impression that Irish music was fast, setting a speed at which the actual performance would be difficult probably made it inadvertently sound like electronic music.

As a result of these revisions, Student A moved closer to the Celtic music sound that he was aiming at. He made skillful adjustments and later reported to the author that in the end, he increased the Celtic feel by changing F to F sharp.

In this Celtic music example, Student A favored the following four points: skillful manipulation of the constituent notes–from Dorian mode to Mixolydian mode; how embellishment is added; characteristic tones of Irish music; and speed.

Two points are worth noting here; first, the student adjusted his composition while comparing it to actual Celtic music, and although he attempted to acquire the knowledge necessary to compose Celtic music, he did not rely on such knowledge but rather focused on listening to relevant music.

Episode 5- Pursuit of expression that is only possible with use of a DAW

Meanwhile, Student B was mainly involved in transposing music on the computer and composing pieces by combining existing audio files with the data input by him. He stated that he listens to audio files, seeks sounds assigned among sound source materials, and uses the ones he likes.

> Student B: (Talking about his own composition) I made changes to “Amen Break” (the popular name for the rhythm pattern of the drum solo in the song “Amen, Brother” and for other materials derived from it) using the so-called loop mash effect and equalizer. Breaking down the wave formation of the drumming pattern into separate elements and switching them around, I created and used an Amen Break-derived form and also reversed the cymbals and used them. I thus created a piece of music that sounded like the background music on a computer game.
>
> ＜Listening to a piece composed by Student B＞
>
> I was aiming for something like “game music,” and created four patterns altered to

be like 8-bit tones and attached them as an epilogue. I changed the quality of the sounds and combined them. Because it seemed wrong to only put them at the beginning, I created a place for them at the end. As this music is on a loop, I used an effect to make changes.

When people try to reproduce my piece, they find that they are unable to. I think that that is what is good about it. People can't reproduce it, but one young person like me, not very well-versed in music, can use various instruments to create a single piece of music.

Thus, from what Student B says, it can be understood that he dared to choose a method of expression impossible for humans. In relation to this, Student A said, "Even though we can approximate it to live sound, it is not live sound; so, that being true, there is a case to be made for keeping it a long way from sounding live."

These factors demonstrate that the students are attempting to match the methods of expression to what they intend to express.

In contrast, when asked what they would do to replicate the sound of a human physically playing a real musical instrument, they answered that with the software automatically matching the sound to the beat, they introduce a random element to the matching. They went on the say that when the desire is to produce a sound similar to that of a real human playing an instrument, randomization is used. Too precise a rendition ends up having a mechanical feel, and thus, randomization is used to mitigate this.

The utterances underlined in this episode imply a pursuit of expression that it is only possible because a DAW has been used.

Episode 6-Creation of an original composition, KAYOUBI (Tuesday) by Student A

On a Tuesday, while the interviews were being carried out, Student A created a composition titled "KAYOUBI (Tuesday)."

Below is a summary of KAYOUBI given by Student A. Figure 3 shows some of the relevant data of this composition.

Using Cubase Elements 8, I selected "using self-recorded sound." The sounds that I recorded myself at the university were the sounds of kicking the floor, scraping

the floor with my foot, hitting a sofa with my hand, and the sounds of a guitar and voices (recorded during a conversation with Student B).” First, I created a rhythm, after which I did things such as adding the recorded clips one by one in time with the rhythm, switching them back and forth, and changing the pitch. Besides this, I worked on my own voice, adjusted its pitch, cut it, copied and pasted it, and then layered the result with the pitch added using MIDI data.

In this piece, Student A used sounds that he had recorded himself but reported that they were influenced by the content from the classes of this study’s author.

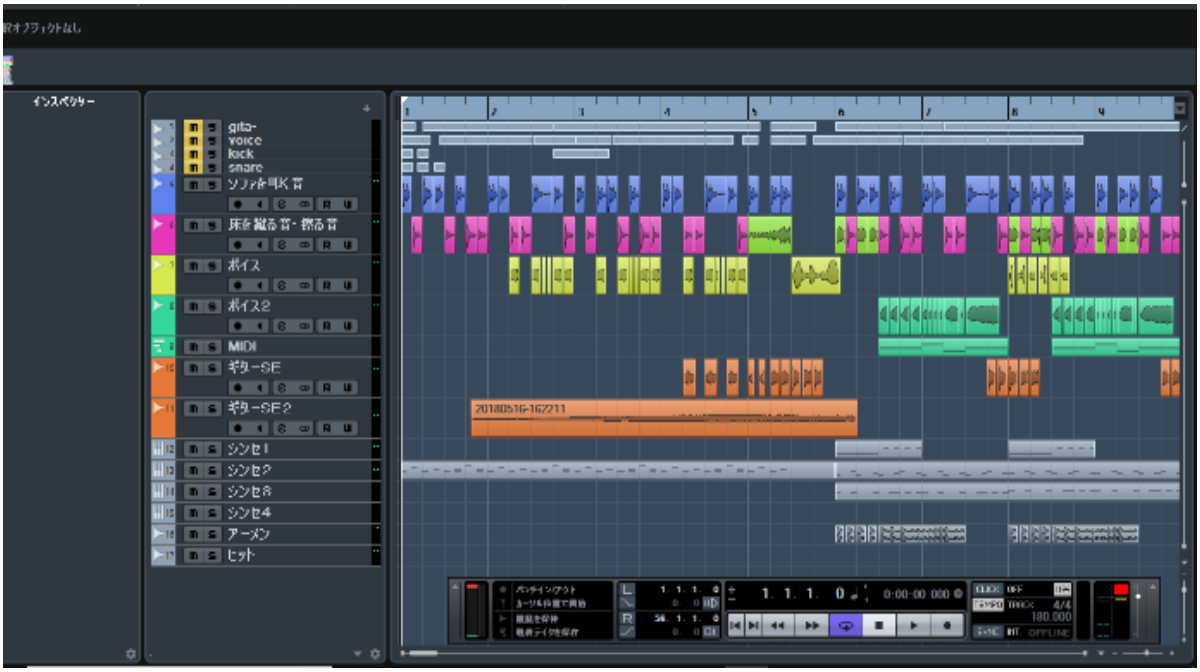
When asked by the author about the timing of deciding that a piece is finished, he answered that he suddenly concludes, “that’s enough now.” In answer to the same question, Student B answered, “Probably, if I thought of doing more, I could, but it is likely to become something totally different. Whenever I change something that I have decided is finished, the changes depend on my mood at the time, and so it becomes something completely different.” In other words, the implication is that neither student had a clear idea of the piece that they were aiming at, but instead used repeated trial and error until they had created numerous patterns and were ready to stop.

As is clear from this, they had no clear criteria of success regarding their compositions. It can be said that by using trial and error, repeatedly creating various sounds, combining them, and then listening to them, they engage in an act of creation based on their own preferences. Further, by trying out new sounds with new technology and listening to the result, they formulate new criteria.

It can be said that the characteristic of being able to easily use the various technology available through a DAW made it possible for the students to create various well-crafted compositions without the limitations of their musical performance skills.

Figure 3

MIDI Data for KAYOUBI (Tuesday) (excerpt) and Audio Link



https://www.icme.jp/jd/en07/tuesday.mp3

Conclusion

Alternating between human expression and expression using a DAW

While creating music using a DAW, which the students were attempting at, the elements making up the sounds were visualized one by one and displayed as data. For example, the students also said that when adjusting vibrato, they listened to the sound of instruments and voices that had been physically produced to find out what wave form to set in order to make the vibrato sound natural. Referring to the vibrato audible in various pieces of music, they used software to manipulate the sound data, but did not keep a uniform wave for all sounds. For each sound, they investigated the kind of wave formation that would be desirable.

DAWs have pre-inputted sound files, and it is indeed a merit that creative activities can be easily performed using these standard materials. However, the students in our study—as

demonstrated by the commentary on the episodes—repeatedly listen to and compare sounds produced using a DAW and the sound of real vocals and musical instruments, while scrutinizing each sound separately and in detail. It is possible that this action arose from the experience of having heard the sounds of real musical instruments and voices. In addition, depending on their perception of the music that they want to create, they chose to either create using the electronic sounds characteristic of a DAW, or by using sound files that were sought and incorporated to be similar to real human voices, musical instruments, and sound instruments.

In addition, they are aware of the role of a sound in longitudinal harmonious resounding when making music with multiple parts. It is probable that this is, in fact, facilitated by the use of a DAW, with which it is possible to try things out and make adjustments, and on which all sounds appear as data that can be confirmed visually.

Their musical experiences using a DAW involved alternation with expression physically produced by real human beings and the creation of new kinds of expressions unique to a DAW, which also contributed toward learning to create human expression.

Approach to knowledge of DAW-mediated creation

In Episode 1, the students referred to online examples and acquired their present knowledge while supplementing it with information from reference books. By doing this, they proactively sought the knowledge necessary for the music that they wanted to create, tested it, and fully utilized it. Any gaps in required knowledge can easily be filled by information that is found online and constantly updated.

In addition, Student A said that he utilized his own guitar experience when using the guitar in his compositions. He also mentioned that if one knows about guitar rendition styles, they can incorporate these into the data; moreover, based on his existing knowledge of guitar rendition styles and tone, he operated the DAW with awareness of volume adjustment, brushing, and bridge muting. He also felt that even when not actually playing the guitar, if he knew a rendition style, he was able to express it. For this reason, he suggested that it is important to already have knowledge of the basic sound qualities to suitably replicate live sound. In other words, it is possible to say that the techniques involved in the creation of

music that are guaranteed by software interact with the knowledge fostered during the experience of physically performing.

Relationships with others

Musical expression in which sounds are physically produced with others bring cooperation, sharing, and mutual adjustment, so its significance is obvious. However, the students' DAW-mediated musical experiences are also more than the internal musical experiences of an individual.

The students in this study are each engaged in creating music using different software. Moreover, they take personal enjoyment from the works that they create and do not publish them online for unspecified people to access. However, they do share their compositions with friends who have similar interests and exchange information about the constant developments in digital technology. In doing so, there is action toward sustainable activities whereby friends listen to each other's compositions for the knowledge and techniques obtained from unknown people online; the technical knowledge used in these compositions is then shared and utilized in each individual's own creative activity. Thus, the participants did not only enjoy creating music alone but also develop their music relating with the other people through listening to and arranging different sounds.

Therefore, it is possible to say that in their personal pastimes, these students played freely with sound, shared their creations with others, and experienced the continuous growth of digital technology first-hand.

Significance as a musical experience

Their musical activity bridges a conventional world, pursuing musical expressions through thorough acquisition of musical techniques, and a new world, playing a piece of music by operating the computer without requirement of any musical techniques. This is nothing other than a move toward a new form of musical expression in which there is a mutual exchange between physically produced sound and sound produced by digital technology, that is, by utilizating technology capable of techniques and sounds that human beings would find hard to produce.

For people without a specialist musical education, there is often no connection between what

is heard and what is seen on a musical score. However, a DAW can link the two. People who in the past have been unable to visually express what they heard are now able to use software to visually present sounds. Furthermore, the visually presented data can even show the individual components of a sound. The visually presented data can be manipulated in detail, and it is also possible to listen to it immediately. What I predicted was absolute lack of students' experiences in listening to the actual sounds and playing the music, by oneself or with others. However, the students involved in this study grasped both of the respective characteristics: digital sound and sound produced by a human, and while distinguishing between them, they combined them and created new sounds and compositions.

Their pastimes and interests involve the help of digital technology and are realized in the form of sound and music. These interests are supported by both knowledge based on experiencing physically produced sound and knowledge shared by other people online. It can be said that a DAW, which allows trial and error operation, a) produces expression that would be impossible through actual physical musical experience, b) opens up one's creativity, and c) makes the expression of new types of music possible. Furthermore, the sounds and music produced by people like the students of this study result in the creation of a new culture by sharing online with unknown people and by updating simultaneously.

This study shows how musical activities as a personal pastime done with a DAW are organically linked to the physical music experiences conventionally. In the future, it is necessary to investigate how music as an educational subject will deal with elementary school children and other students who have had such musical experiences through their own volition and how meaningful musical experiences will be delivered.

Acknowledgments

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Ministry of Internal Affairs and Communications website

HP http://www.soumu.go.jp/menu_seisaku/ict/u-japan/new_outline01.html (viewed on 2018/5/23)

Footnotes

1. This is a type of DAW software that was developed by a company called Cakewalk and was offered for free by BAND LAB.

2. The original Utau data includes special pronunciations (such as "a-maki" and "sui-tan"). This is a recording of the singer's voice and is believed to sound more natural than processed sounds.

3. The voice data here is from a specific rock song character in IA ROCKS, which is particularly good for B2-A4 voices. Incidentally, it includes a library of natural and falsetto voices.

4. By “Celtic music”, Student A is referring to Irish music.

5. Because the component notes contain no derived notes, Student A used the name “C major,” but correctly speaking the Dorian mode from D is indicated.

Acoustic Characteristics of a Nagauta Vocalist and a Mezzo-soprano Vocalist: Visualization of Their Ways of Singing Nagauta Phrases

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Abstract

We attempted to clarify the differences between the voices of a *nagauta* vocalist and a mezzo-soprano. The two vocalists were asked to individually sing the same part from a *nagauta* called "*sambaso*," upon which their voices were analyzed using spectrogram representations. From the comparison of the spectrum, we can conclude that they differed in how they generated vowels for each syllable and how voiced and unvoiced consonants were handled. In other words, the expertise and personality of the performer arose depending on the timbre created in each syllable and the movement between syllables.

Keywords: Traditional Singing, Nagauta, Acoustic characteristic, Sound analysis, Timbre

Background of the study

How is the voice used differently in Western and Japanese vocal music? There are many types of singing in the world, and they are so diverse in terms of physiological voice production mechanisms and acoustic characteristics that they cannot be lumped together with terms such as “singing voice” and “song” (Sakakibara, 2014). Different genres arise from different cultural and social contexts; vocal expressions are shaped by the physical methods used in these contexts, and they give us a diversity of aural impressions. This variety of voices arises more from knowledge and techniques cultivated and accumulated over long periods of time and long-term practice than from differences in the physiological organs that produce the voice (Masino, 2014). There are complex, diverse ways of using the voice toward other parties assumed to exist within various social groups, such as methods of controlling volume, timbre, and intonation, as well as means of pronouncing the consonants and vowels needed to communicate words, and so on. It can be said that the methods of producing sounds and using and sounding the voice are shaped by and passed down within various cultures.

According to Mashino (2014), the fascinating thing about vocal expression is that the individual ways in which people use their voices and the cultural and social aspects of these voices are inseparably linked. On the other hand, Sakakibara (2014) sounds an alarm regarding the fact that, like languages, forms of singing are progressively standardizing around the world. Many forms of singing are in danger of disappearing, presenting us with a number of urgent tasks, including not only cultural transmission and preservation but also the recording and analysis of forms of singing from the perspective of the science of acoustics and the voice.

Turning our attention to school education, a wide range of forms of traditional singing are taught from schoolbooks in elementary and middle schools. Because the great majority of these are learned through oral transmission, traditional Japanese ways of using the voice are diverse, and the diversity of teaching materials is due to the diversity of the voices taught in music education classes. The Course of Study revised in 2008 places increased emphasis on education that infuses tradition and culture, and in music classes as well, a wide range of

Japanese traditional musical practices have been proposed (Ino, 2008; Ino et al., 2014).

However, regarding Japanese traditional singing, because the music course curriculum does not include concrete information on the role of voice production methods and the means of teaching them, it may be said that it is not particularly easy to include teaching materials on traditional singing in classes (Mushiaki, 2006; Terada, 2010 et al.). Because many teachers have studied mainly Western music on the teaching side as well, there is a lack of knowledge and ability related to reproducing the voices (vocalization) of traditional Japanese music.

Also, the Course of Study revised in 2017 uses "forms of traditional Japanese singing such as *minyō* and *nagauta*…in which the characteristics of traditional voices and ways of singing are apparent" as a criterion for selecting educational materials. To deepen the understanding of music culture in Japan, there is a need for instruction to come to grips with the vocal features and expressive techniques of traditional singing. It would seem to be of great educational significance to interact with culture through the voice. What sort of expressive techniques should be used, then, to make a song more "nagauta-like?" Beginning with this question it will be necessary in the future for us to gain an objective understanding of vocal features by visualizing them when establishing traditional music instructional methods.

Review of previous research

Representative studies of singing voices employing visualization include Nakayama et al. (1998, 2006) and Nakayama (2000), in which a database of Japanese singing voices was created. Performers of various genres of Japanese music and the traditional arts sang (or spoke, or recited) common words in varied melodies and phrasings, a song database was created, and then a comparison of the acoustic characteristics of Japanese music and Western music was carried out. By comparing the spectrums of the voices of 72 singers of Japanese and Western music, Nakayama et al. (1998), Tsukitani et al. (2000), and Nakayama (2000) categorized methods of voice production into five patterns based on voice quality and timbre[1]. As a result, Tsukitani et al. (2000) found that, in contrast to the regular, relatively unchanging

quality of vowels and vocal sounds in Western music, the timbres of Japanese music are diverse and do change. Thus, these studies reach the conclusion that such diversity is in fact a main characteristic of Japanese music. These diverse changes seem to result from the "unique means of producing voices and means of transitioning between sounds in various genres of Japanese music with vocals in which there are transitions in voice qualities and timbres or diverse changes in stress" (Nakayama et al. 1998, Tsukitani et al. 2000). However, as the voice often differs depending on the performer even within the same genre, it has become apparent that Japanese music is highly individualistic and has a great diversity of vocal qualities and timbres. While previous studies clarify some of the differences between Japanese and Western music through visualization, doubt remains as to whether songs can be regarded as objectively belonging to particular genres because intonation and pitch vary widely even though the lyrics are held in common.

Also, there is a fascinating study of *kyōgen* by Sakai et al. (2002) that attempts to clarify the detailed factors that determine the acoustic characteristics of singing voices. Sakai et al. also studied the manipulation of vowels by singers, clarifying that *kyōgen* employs forms of expression focusing on fine techniques that are difficult to perceive aurally, including sudden changes in pitch, volume, and phonology within a single vowel and completing the next vowel in advance. Thus, the voices used in Japanese traditional music are complex and diverse, and to clarify the factors that make up such vocal features, it is necessary to analyze numerous examples of performances in various genres from multifaceted micro-perspectives.

Also, Ichikawa et al. (2019), which mentions the acoustic characteristic of a vocalist who attempts to imitate a *nagauta* performer, clarifies that the nagauta performer manipulates the voice in fine ways that the vocalist cannot reproduce simply by imitating what she hears. The study carried out a detailed analysis of temporal changes in vocal features occurring within single vowels, making it clear that through complex manipulation involving simultaneous frequency and amplitude modulation, the nagauta performer creates sounds that are characteristic of nagauta. With regard to Western ways of producing vocals and the production of vocals in traditional Japanese singing, there is often a focus upon head

voice and natural voice, but the study suggests that there are various other differences. The study goes no further than a detailed analysis of single vowels, and with regard to whether a single vowel exhibits the same behavior even in different syllables, it is left to other studies to fill in the gap. Also, the study does not mention means of transitioning between syllables, which would seem to create diverse aural impressions.

Purpose of the study

Based on such previous studies, the purpose of the present study is to carry out a comparative investigation of the visualization of the voices of *nagauta* performers and vocalists and to clarify the differences between these vocal features. Specifically, the study has nagauta performers and vocalists sing the same sections of nagauta and clarify the vocal features of the same vowels in different syllables as well as the differences in the vocal features of transitions between syllables.

Method

Target vocalists

The voices of one *Nagauta* vocalist (hereinafter "A") and one mezzo-soprano vocalist (hereinafter "B") were recorded. Both were female with singing histories in their respective fields of approximately 15 years. In the recording for the present study, the singer-vocalist had experienced singing nagauta strictly by mimicking alone once before, as a collaborator in preliminary research conducted 18 months prior.

Voice recording method

Voice recording was carried out in an anechoic chamber[2] at the Center for Environmental Science in Saitama[3]. In this recording, the vocalists sang in sitting positions. Owing to the installation of the microphones, flooring was laid, and recording was conducted in a semi-anechoic state. A Rion UC-30 microphone, NH-04 preamplifier, and SA-02 multichannel-analysis processor were used for recording. The sampling frequency at the time of recording was 51.2 kHz with 24 quantum bits.

For recording, a total of four microphones were each placed: 1 m from the vocalist's mouth, 0.75 m vertically below, 0.65 m vertically above the first microphone, and 1 m vertically above the top of the vocalist's head. Audio data was recorded simultaneously from the four microphones on a PC via multichannel-analysis processor. In the analysis, data recorded by the microphone in front of the vocalist were used. Each vocalist sang in a seated position when recording *Nagauta*. The height from the floor to the microphone was 1.5 m.

Method and details of recording

Each vocalist was asked to sing the lyrical part of the *nagauta sambaso* "Toto Tarari Tararira." This music was selected because it has a non-high vowel[4] that is difficult to consonantalize and is suitable for a comparison of timbres. In addition, the song has a vowel section of the necessary length for analysis. In order to exclude factors, such as differences in pitch from the perspective of comparison in advance, the vocalists were instructed to align the start of the sound to a single point F.

The recording process occurred as described below. First, A sang "Toto Tarari Tararira", and it was recorded. B listened over a speaker to the sound in a room next to the anechoic chamber (Step 1). Next, A directly presented B with the model singing in the room directly adjacent to the anechoic chamber (Step 2). After listening, B sang the same phrase based on her impression, and this was recorded (Step 3). Just before recording, A told B to "imitate me as much as possible and sing in a nagauta style."

Data analysis method

A spectrogram of the entire target vocalization was prepared for analysis. The analysis conditions were as follows: Time window: Hanning; time window length: 0.080 s; sampling frequency: 51.2 kHz; number of sampling points: 4,096 points. The differences in voice features were visually extracted from the spectrogram, and an instantaneous spectral image was used to numerically identify the changes in the frequency components of the parts where prominent differences were confirmed.

Results and discussion

Spectrogram results

First, we conducted a frequency analysis of the singing voices of A and B, then reported on the results read from each spectrum, then compared and examined the differences between them.

In Figures 1 and 2, the vocal waveform (upper) and the spectrogram (lower) are shown for the part of "Toto Tarari" that was sung[5]. Although there is a method of displaying the vocal waveform by level, in the present study, it is thought that changes in voice are easy to imagine. Thus, a sound pressure waveform that converted the recorded data into a physical value was adopted. In the upper figures showing the vocal waveform, the vertical axes are the sound pressure (Pa) and the horizontal axes are the time (seconds). In the lower figures showing the spectrogram, the vertical axes are the frequency (Hz) and the horizontal axes are the time (seconds), and the color shading patterns are a-weighted sound pressure level (dB) (hereinafter "sound pressure level") The bottom of figures 1 and 2, lyrics are indicated by IPA notation[6].

The phrase "Toto Tarari" contains the three vowels /o/, /a/, and /i/. Although, the formant feature for each vowel was clear for both A and B, during the sustained sounds in A's spectrogram, small and variable fluctuations were observed, while B's spectrogram showed fewer fluctuations in the harmonics and stayed nearly constant. This indicates that frequency modulations were occurring within a single vowel sound for A, while they stayed constant for B. For example, in the /ta: ra: ri/ part of A's spectrogram, while the /ta/ part showed characteristics of the vowel /a/, the vowel /a/ in the /ra/ part showed significant fluctuations in the second to fifth harmonics and in the F2 formant after the 5.15 second mark. On the other hand, in the /ta: ra: ri/ part in B's spectrogram, both /ta:/ and /ra:/ showed characteristics of the vowel /a/, and there were very few fluctuations in harmonics during the sustained vowels.

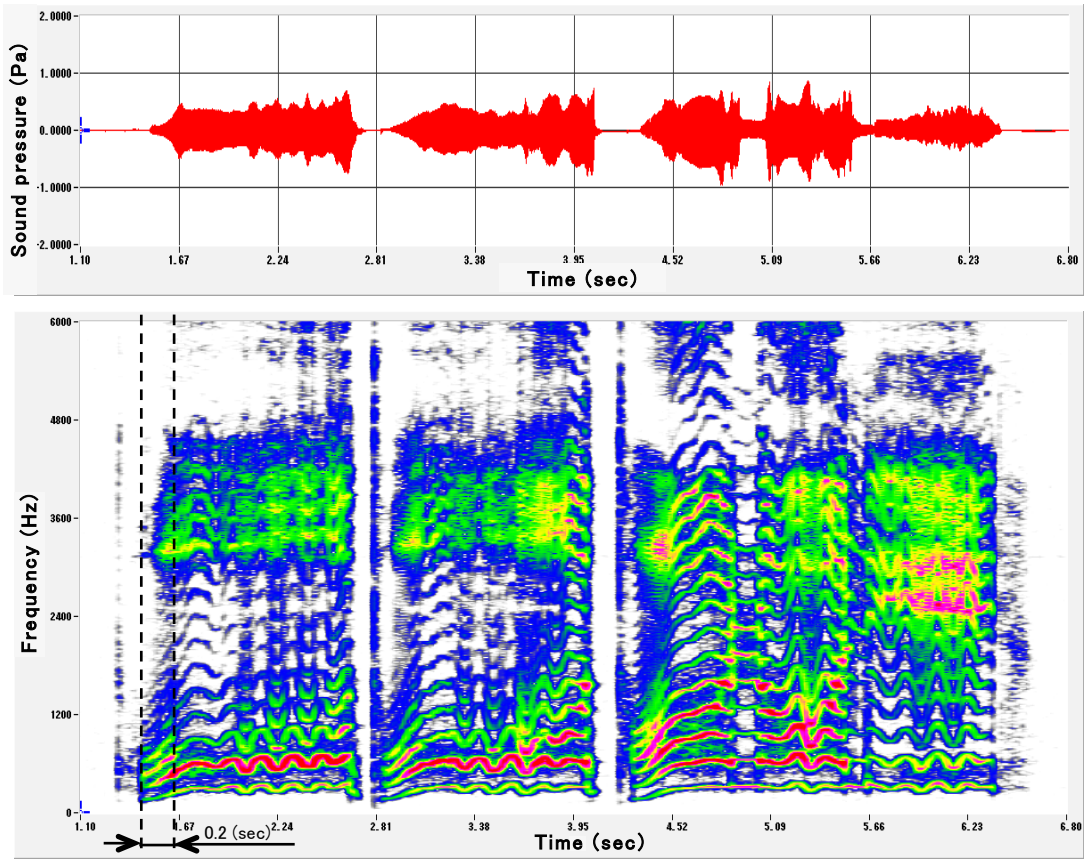
Next, as for comparison of voice features obtained from the spectrograms of A and B, harmonics were observed in the above 4kHz of B. On the other hand, those harmonics were not verified in the A's. The part with a sound pressure level higher than that of B was

observed in A's spectrogram, although there was a difference depending on the syllable between 1.5 kHz from the basic frequency and between 3 kHz to 4 kHz. In addition, the up/down fluctuation of harmonics was conspicuous overall for A, whereas the linear spectrum with little variation was characteristic for B. Furthermore, in the spectrogram of A, a silent section was observed at the transition of each lyric. That is, at the boundary of a syllable but in the spectrogram of B, the silent section length of the syllable boundary was shorter than that of A. At the same time, weak harmonic components up to around 4 kHz could be confirmed for B even in the transition section of /to:/ of the first syllable to the /to:/ of the second syllable, and from the transition section of /to:/ to /ta:/.

To summarize the aforementioned results, from a comparison of the spectrograms as a whole, the following three differences between the vocalists were confirmed: 1) the presence or absence of harmonics with a frequency band of 4 kHz or higher, 2) a difference in the up/down fluctuation of the harmonics of the entire spectra, and 3) a difference in the length of time of discontinuity, according to the silent sections of syllable boundary parts（Ichikawa et al. 2019）[7].

Figure 1

Vocal Waveform and Spectrogram of "Toto Tarari" by A and Audio Link



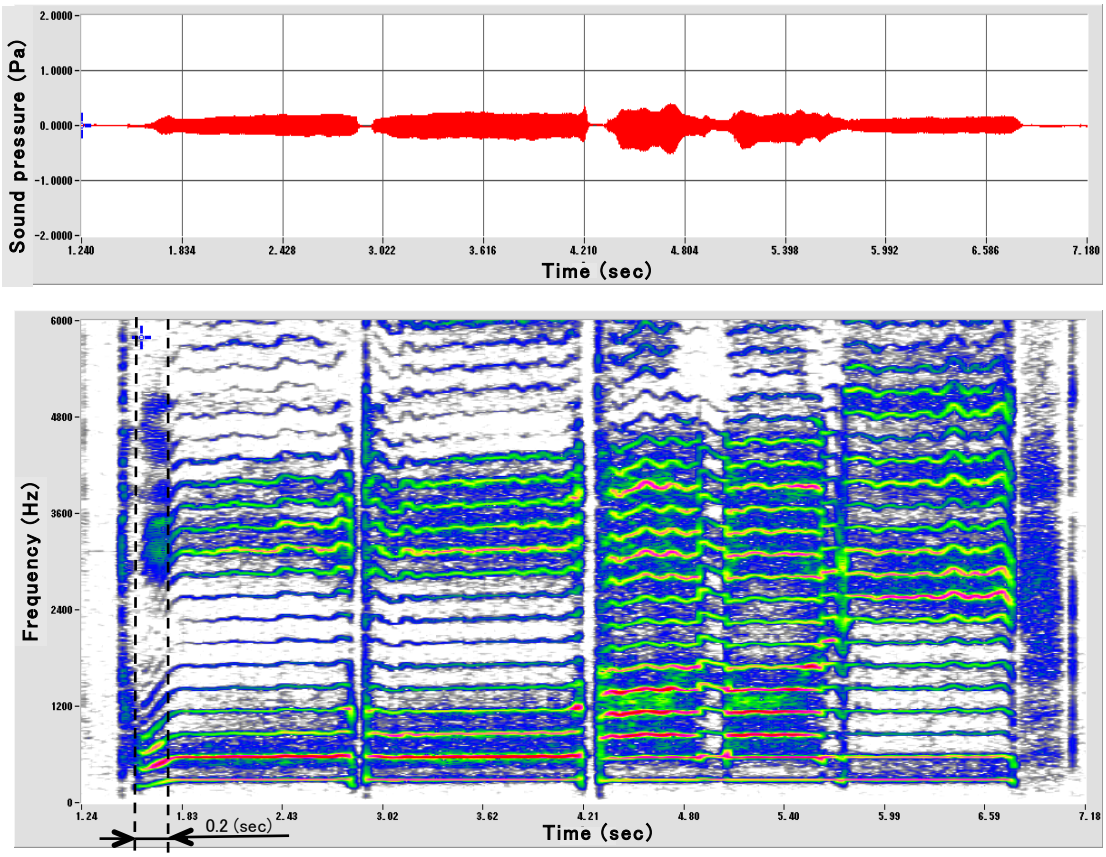
/ t o: t o: t a: r a: r i: /

Note. Upper: horizontal axis shows time (s), and vertical axis shows sound pressure (Pa). Lower: horizontal axis shows time (s), and vertical axis shows frequency (Hz)

https://www.icme.jp/jd/en07/voice_a.mp3

Figure 2

Vocal Waveform and Spectrogram of the First "Toto Tarari" by B and Audio Link



/ t o: to: t a: r a: r i: /

Note. Upper: horizontal axis shows time (s), and vertical axis shows sound pressure (Pa). Lower: horizontal axis shows time (s), and vertical axis shows frequency (Hz).

https://www.icme.jp/jd/en07/voice_b.mp3

Comparison by spectrum

We conducted a detailed analysis of the vowel /a/, wherein we observed a difference when comparing figure 1 and 2. In the phrase “Toto Tarari” the vowel /a/ is contained within two syllables /ta/ and /ra/. Therefore, we extracted the /ta: ra:/ section (approximately 1 second in duration) where the /a:/ vowel is repeated to perform a comparison of the spectra.

Specifically, in order to observe spectral change within the section, the time axis of the voice waveform was divided into four equal parts, and each spectrum at the three time points was examined[8]. Time point I is about 0.4 seconds after the start of /ta:/, time point II is about 0.8 seconds, and time point III is about 1.0 seconds. Time point I is the part of /ta: ra:/ where the syllable /ta:/ is uttered, time point II is the transition period from /ta:/ to /ra:/, and time point III is the section in which the syllable /ra:/ is uttered.

/a/ vowel difference. Figure 3 shows the voice waveform of A in the interval /ta: ra:/. Figure 4 shows the spectrum at time point I. Figure 5 is the spectrum at time point III. Figure 6 is a diagram in which the spectrum at time points I and III are superimposed.

First, comparing /a:/ in the spectrum of time points I and III, where vowels are uttered, it can be seen that the spectrum of A is quite different at each time point. Specifically, there is a big difference in the clarity of peaks observed in the 2 to 4 kHz bands (see boxed lines in figures 4 and 5). At time point I, 13 distinct peaks are observed up to the 4 kHz band. At time point III, six distinct peaks are observed in the band below 2 kHz, but the number of peaks observed in the 2 to 4 kHz bands is reduced to four points, which is less clear than that at time point I. The 2 to 4 kHz bands at time point III don’t show any significant peaks compared to the band components of 2 kHz or less, so the contribution to the entire voice is not high. In other words, /ta:/ and /ra:/ that A sings have different spectral aspects even with the same vowel (see figure 6). This difference is presumed to affect the listening impression.

Figure 7 shows the voice waveform of B in the interval /ta: ra:/. Figure 8 shows the spectrum at time point I. Figure 9 is the spectrum at time point III. Figure 10 is a diagram in which spectrum at time points I and III are superimposed.

On the other hand, for B, a prominent peak was observed in each band up to about 9 kHz at time points I and III. In particular, up to the 4 kHz band, 14 distinct peaks were

observed at time points I and III, and the spectrum was very similar (see boxed lines in figures 8 and 9). In other words, unlike the consideration of A, /ta:/ and /ra:/ that B sings have almost the same spectrum (see figure 10).

We also compared the vowel /o/ in the first syllable and the vowel /o/ in the second syllable from the voices of A and B using methods similar to those employed for the vowel /a:/. As a result, we observed in the voice waveform that the behavior in which the vowel was varied by A was clearly different. Furthermore, in comparing the spectra at all three of the time intervals, we observed that while the overall trend was similar, the peak positions and shapes were different. Meanwhile, no such large variations were observable for B, and spectra comparison at all three of the time intervals showed peak locations and shapes as well as a similar overall trend.

From the above analysis, we could see that for B, all the spectra from the same vowel instances displayed similar features; for A, variations could be observed between the spectra from the instances of the same vowel in different syllables. Ichikawa et al. (2019) showed that, in the voice of A, frequency modulations and amplitude modulations were occurring simultaneously. The new analysis suggested that A was also making minute adjustments in each syllable to manipulate the timbre, even for the same vowel.

Figure 3

/Ta: Ra / Voice Waveform by A

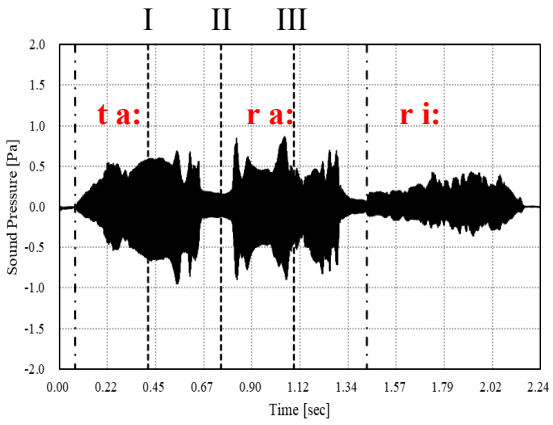


Figure 7

/Ta: Ra:/ Voice Waveform by B

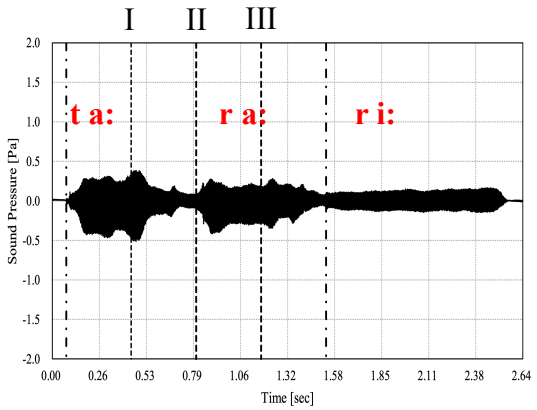


Figure 4

A Spectrum at Time Point I

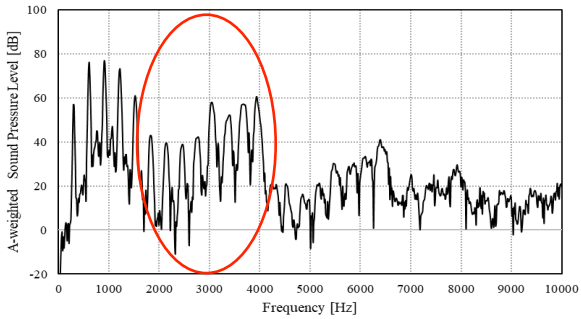


Figure 5

A Spectrum at Time Point III

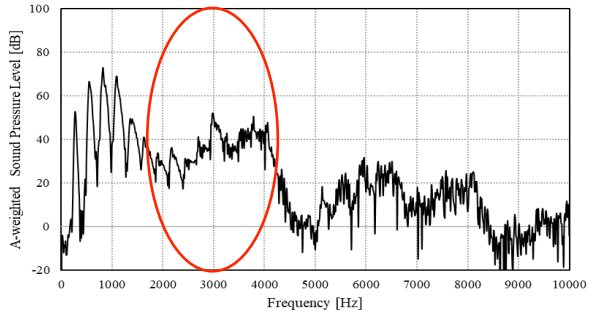


Figure 6

Comparison of Spectrum at Time Points I and III by A

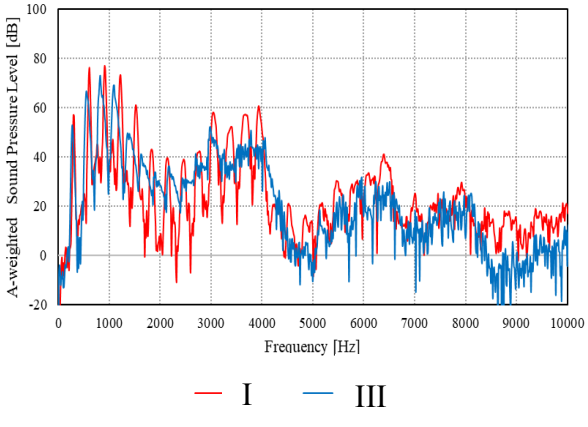


Figure 8

B Spectrum at Time Point I

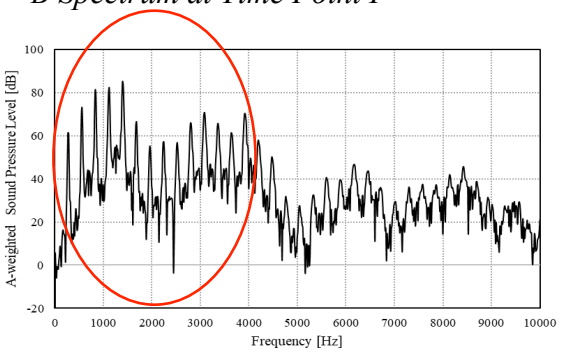


Figure 9

B Spectrum at Time Point III

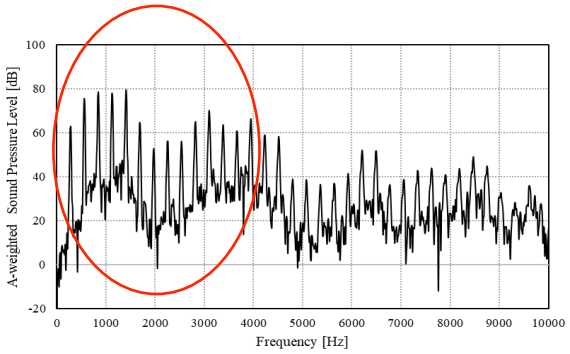
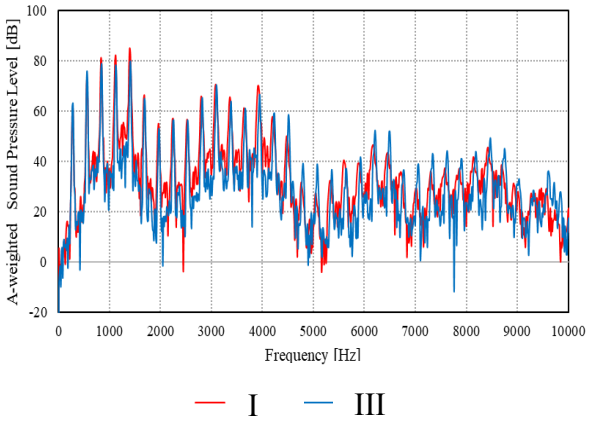


Figure 10

Comparison of Spectrum at Time Points I and III by B



Syllable transition and consonant handling. Next, compare at time point II. Point II is the transition from /ta:/ to /ra:/, connecting syllables. Therefore, it is speculated that point II may affect the listening impression of /ra:/. When both spectra are observed, the ensuing two points can be confirmed as a large difference. The first is the difference in frequency modulation of each peak up to around 4 kHz. In these bands, for A, there is almost no frequency modulation at each peak, and each peak is steep. For B, frequency modulation occurs in each peak after 2 kHz, and it can be said that the steepness of each peak is dull. The second is the difference in clarity of harmonics after 4 kHz. For A, harmonics can be confirmed although the clarity is low after 4 kHz. For B, it is difficult to confirm harmonics after 4 kHz. In other words, for A, there were sections with atypical vowel characteristics containing irregular fluctuations.

Ichikawa et al. (2019) showed that when A sings the transition section between the /to:/ in the first syllable to the /to:/ in the second syllable, as well as the transition section between /to:/ and /ta:/, the silent sections were clarified by stopping the sound completely at syllable breaks. On the other hand, for B, the durations of the silent sections between syllables were shorter. Additionally, in the transition section between /to:/ and /ta:/, weak harmonic components up to 4 kHz were confirmed.

In this manner, we observed differences in the way that A and B sang the beginning of the melody and in the way they voiced the consonants in the transition between syllables. In A's voice, silent sections were sometimes observed in syllable boundaries, while at other times, there were sections with atypical vowel characteristics containing irregular fluctuations. In other words, it could be considered that when A prepares for an unvoiced consonant (/t/ in this analysis), the preparation time causes the silent sections to occur, while when preparing for a voiced consonant (/r/ in this analysis), taking a long duration for the consonant causes sections with unclear vowel characteristics containing irregular fluctuations to occur[9]. In either case, it was inferred that the focus of the singing was placed on the emphasis of the consonant sounds.

On the other hand, for B, taking into account the similarity between the spectra from the /o/ vowel in the first and second syllables and from the /a/ vowel in the third and fourth

syllables, the focus of the singing could be considered to have been placed on keeping the tonal quality consistent for the same vowel, regardless of the intervening consonant type.

Figure 11

A Spectrum at Time Point II

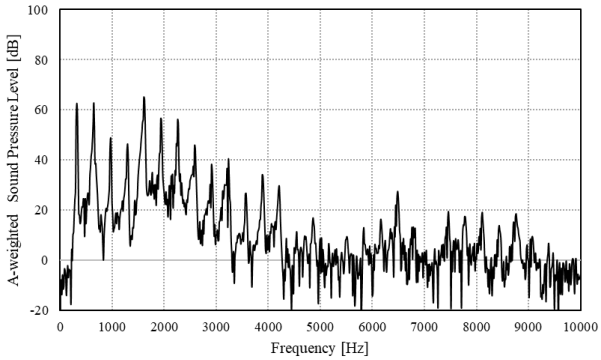
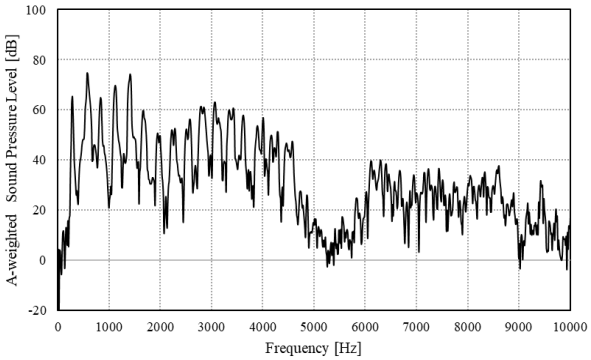


Figure 12

B Spectrum at Time Point II



Conclusion and future issues

Considering the above analysis results, and comparing the voices of *nagauta* player A and vocalist B, the two main points of difference that became apparent were the generation of the same vowel in different syllables and the usage of the unvoiced and voiced consonants in the transitions between the syllables.

Regarding the generation of the vowel sounds, the results suggested that A was minutely adjusting the sound in each syllable to manipulate the timbre, even between instances of the same vowel. Could it be thought that, while A placed importance on the nuance of each syllable, B placed importance on keeping the vowel sounds consistent while connecting the melodies? When transitioning between the syllables, in A's voice, we observed silent sections between syllables on some occasions, while at other times we observed sections with atypical vowel characteristics containing irregular fluctuations. This suggests that A placed importance on singing with an emphasis on the consonants and manipulated the unvoiced and voiced consonants in diverse manners while considering their

relationship with the adjacent vowels. On the other hand, it is suggested that B placed importance on maintaining the tonal quality in each instance of the same vowel, regardless of the intervening consonant type. In other words, the expertise and personality of the performer are thought to be expressed by the way each syllable is given its tone and how the transitions between the syllables are handled. Although this is only a conclusion drawn from one case study, it could become a factor to consider in the teaching and studying of traditional music.

Since the results described above are targeted for one nagauta vocalist and one mezzo-soprano vocalist, the possibility of a characteristic unique to the performer cannot be excluded. For that reason, we believe that it is necessary to test and assess whether the differences in voice characteristics match the actual human auditory impression. We believe that scrutinizing the various characteristics of Japanese traditional singing will lead us to better teaching of Japanese traditional music in school.

Notes

[1] Table 1 shows five spectrum patterns of Japanese and Western singing voices by Nakayama et al. (1998), Tsukitani et al. (2000) and Nakayama (2000).

Table 1

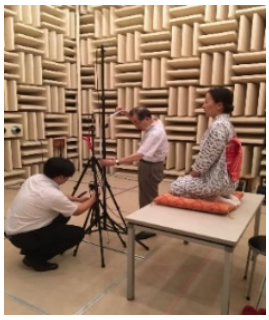
Five Spectrum patterns (by Authors)

	Spectrogram analysis at 3~4 kHz	**Amount of high-frequency components (above 5 kHz)**	**Audience impressions after listening**	**Genre**
Pattern 1	Contains a single peak	Small	Good timbre	Western classic in general,
			Clear voice	Some Noh actors and nagauta singers
Pattern 2	Contains easily identifiable peaks	Large	Good timbre	Some shomyo and kyogen performers
			Harder than 1	koto (Yamada school)
Pattern 3	Contains wide peaks	Small	Good timbre Melodious with throat sound	Some of shomyo/Noh/Kabuki/nagauta shigin
Pattern 4	Contains wide peaks	Large	Various characteristics	Most of Japanese traditional music
Pattern 5	Not applicable			Natural voice/Extremely croaky voice

[2] An anechoic chamber is a special room for acoustic testing that eliminates sound reflections and echoes from its walls, floor, and ceiling, and blocks sounds from intruding from outside the room. Its inner dimensions were 8 m (vertical) × 6.2 m (horizontal) × 5.16 m (height from the floor).

Figure 13

Position Setting Conditions of Vocalist and Recording Equipment in Anechoic Chamber[10]



[3] The sound source recorded at this time is also analyzed by Ichikawa et al. (2019), but in this study, the sound source is released and analysis focusing on different parts from Ichikawa et al. (2019).

[4] Vowels that are easy to utter or sing as consonants are generally considered to be /i/ and /u/ and are referred to as "high vowels."

[5] The voices of A and B, which were analyzed, can be heard in the attached file. The copyright of this sound belongs to the authors and cannot be used without consent.

[6] Phonetic symbols were established by the International Phonetic Association for expressing the sounds of all languages in letters. For example, ":" (colon) indicates an extended sound.

[7] Please refer to Ichikawa et al. (2019) for details of the features shown in each spectrogram.

[8] Generally, the recorded temporal data was captured by the PC as a voltage [V], and the result of converting the temporal data into a physical value (in this case, the sound pressure [Pa]) is shown in Figures 3 to 12. Frequency analysis was performed on this temporal data, and the ratio with respect to the reference value (= 2×10^{-5}) is shown logarithmically. This, multiplied by 10, gives the sound pressure level [dB]. Furthermore, since this is voice analysis, the vertical axis of the spectrum indicates the characteristic sound pressure level of A.

[9] Unvoiced consonants are consonants without vocal cord vibration, and voiced consonants are consonants with vocal cord vibration.

[10] The consent has been obtained from the performer for posting the photos.

Acknowledgments

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Postscript

The *International Journal of Creativity in Music Education* has now been changed to an online version, vol.7. We have also created a new URL shared by a Japanese language journal also published by the Institute of Creativity in Music Education. The merits of the online journal are that everyone in the world can read it and that we can include recordings or videos as appendices. In vol.7, we are glad that the readers will be able to listen to the recordings and watch videos included with the papers.

This special issue of vol.7 is titled “Music Education as a Bridge Between Schools and Society” and includes papers in the first chapter on the TAS model, which was proposed and conducted as a research project under the same title of this special issue by the Japan Music Education Society. On the basis of TAS model, over twenty music lessons have been held from 2018 to present on which the researchers have presented their papers at ICME Summer Workshop (Tokyo, 2019), JMES (Okayama, 2018, Tokyo,2019) , APSMER(Macao, 2019) and on which they will present at ISME(Helsinki, 2020) and others.

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