Fine Arts International Journal, Srinakharinwirot University
Volume 18, No. 2, July - December 2014

A Study of Analytical and Critical Thinking Behaviors About Music

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Abstract

The purposes of this study are 1) to study analytical and critical thinking behaviors about music of students aged 12 to 13; 2) to study the factors affecting children's behaviors; and 3) to synthesize the classification of analytical and critical thinking behaviors about music. The research employed a qualitative case study approach. Data was collected from participant observation, video recording, field notes, interviews, and participants' assignments. The results showed that analytical thinking behaviors were classified into two levels: 1) single musical concept and 2) superficial reasoning. Critical thinking behaviors were classified into three levels: 1) several musical concepts; 2) superficial reasoning; and 3) logical reasoning. Three main factors affecting participants' behaviors were instruction methods, attitudes, and motivations. Five levels of analytical and critical thinking behaviors about music were synthesized: unpresented data, single musical concept, several musical concepts, superficial reasoning, and logical reasoning.

Keywords: behaviors, analytical thinking, critical thinking, music

Introduction

Thinking is the most important qualification for human being. As a result the advancement of technology and innovation suddenly increase, thinking as a prime determiner assists an individual to engage reliable information. Influenced by former experiences, stimulations, and environment, thinking process affects the competence of problem-solving and the evaluation of various alternatives (Bjorklund, 1989; Mayer, Pintrich, & Wittrock, 2001).

In the area of music instruction, it directly associates with thinking skills. When students engage in music experiences, it is crucial for students to employ thinking skills both of theory and practice. Music teachers should encourage students to evaluate their own performance and peers'. This includes citing music terminology. Significantly, they have to explain reasons to clarify the evaluation and to accept the different viewpoints from friends. The thinking skill which encompasses offering logical information and justifying reasons is analytical thinking. In addition, encouraging students to evaluate and to make decision involves critical thinking. Importantly, critical thinking relies upon setting criteria and music information to support decision making (DeTurk, 2002).

Analytical and critical thinking about music can be exhibited through students' behaviors. Students were able to identify and compare the similar and different attributes of music components through discussion. Furthermore, offering primary themes or the techniques used in musical works supports them to identify key music elements. Analyzing errors in knowledge or the use of reasoning enhances students to improve reasoning and also develops their musical skills. Analytical thinking is integrally related to critical thinking in terms of the proficiency of reasoning to support decision making and investigating the elements which underpins core issues. To perform critical thinking behaviors, students are able to evaluate friends' performances and compositions including self-evaluation for compositions and performances. Importantly, they have to support decision making with explicit evidences and logical reasons (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956; DeTurk, 2002; Marzano & Kendall, 2007; Mayer et al., 2001).

To deeply understand analytical and critical thinking behaviors, investigating factors is vital. In this study, I limited the factors affecting students' behaviors in classroom which can be classified into three types. First, instruction methods involve the procedure of instruction (Khemmani, 2009). They relate to students' learning and it is integrated with music content for transmitting to children. Six instruction methods were applied: induction, deduction, demonstration, discussion, game, and case. Secondly, attitude involves affection which can be divided into five stages (Krathwohl, Bloom & Masia, 1973): 1) receiving involves the students' attention to stimuli; 2) responding involves the reaction to particular stimuli and the willingness to respond. This level is under interest; 3) valuing involves the reaction to stimuli because of concerning with the worth of that phenomenon. Students associate with the value of knowledge; 4) organizing involves concerning with the relationships of different values. This also focuses on bringing the values together and comparing their significance; and 5) characterizing involves human's behaviors. Value influences personality and stimulates the demonstration of behaviors. Finally, I proposed motivations which were influenced from outside or extrinsic motivation (Brophy, 2004). Four kinds of motivations were used: teacher's expectations, casual ascription, reward, and admiring words.

Thinking skills relate to cognitive development. The suitable ages which fully develop in concrete thinking are children aged 12 to 13. They are classified in Formal Operation Stage as Piagetian theory (Piaget as cited in Slavin, 2009). They begin to think more logical and think like scientists. Their thought is abstract, idealistic, and logical (Halonen & Santrock, 1996). Cognitive development influences children to rapidly learn music content. Due to engaging in the period of critical thinking, they can select their favorite pieces by their own. Moreover, they choose to maintain music instruction because they appreciate it (Suttachitt, 1998). I, therefore, selected to study the children aged 12 to 13 because the skill of reasoning is developed and they begin to engage in abstract thinking.

Although thinking is beneficial to music learning, the relevant research in Thailand is limited in number. The existent research focuses on studying the outcomes from music instruction between experimental and control groups (Chandransu, 2001; Krasinhom, 2007; Plitakul, 2009). Producing the academic sources in musical thinking is insufficient. Furthermore, the obvious framework indicating thinking behaviors is not existent. I realized a need to begin the study focused on analytical and critical thinking behaviors about music including investigating the factors affecting those of behaviors. Also, this study provides the classification of analytical and critical thinking behaviors about music based on SOLO taxonomy (Biggs & Collis, 1982) which is a systematic way to explain the student's performance. The taxonomy consists of five levels: 1) prestructural level: the student misses the point and repeats the question;

2) unistructural level: student presents a relevant aspect of task with no relationship between facts or ideas; 3) multistructural level: two or more aspects are proposed. The relationships between the information are missed; 4) relational level: the presented in formation are integrated into a structure; and 5) extended abstract level: student can respond beyond the given information. They can generalize to abstract principle. Consequently, this classification of those behaviors can be used as an assessment tool to measure the level of analytical and critical thinking behaviors about music in classroom.

Objectives

There are three purposes of this study as the following:

1. To study analytical and critical thinking behaviors about music of children aged 12 to 13.
2. To investigate the factors affecting children's behaviors.
3. To synthesize the classification of analytical and critical thinking behaviors about music.

Methodology

A qualitative case study was employed for this study to portray six participants aged 12 to 13. The participants were selected based on five criteria: 1) they were born in 2000-2001; 2) they continued music instruction since kindergarten; 3) they studied in the same curriculum and same level; 4) The scores from analytical and critical thinking about music test were between X±SD; and 5) they were permitted from parents with signing consent form. The data were collected from five sources: observation, interviews, video recordings, field notes, and assignments. All participants were conducted in a weekly one hour general music lesson for six months, May-October 2013, by me. I designed music lesson plans comprising of five stages (Gagné & Briggs, 1974; McCarthy as cited in Campbell & Scott-Kassner, 2006; Jensen, 2000): 1) introduction involves getting students' attention and exploring students' interest and knowledge base; 2) thinking immersion is to stimulate students' curiosity. Students engage in thinking process; 3) relaxation deals with students' emotions; 4) thinking extension employs critical thinking; and 5) conclusion deals with students' opinions and their expressions.

For data analysis, it simultaneously occurred with data collection. The data was organized by transcribing and discriminating data from many sources based on setting themes. Also, I looked for the emerging themes which identified participants' behaviors and factors. I traced the behaviors of each participants and factors activating their behaviors. I classified the similar and different factors influencing the behaviors. Analytical table and descriptive data were presented. After that, data were concluded and interpreted with supporting theories. Finally, the classification of analytical and critical thinking behaviors about music was synthesized.

Results and Discussion

1. Analytical thinking behaviors about music

Analytical thinking behaviors about music were divided into three parts: discriminating, finding relationships, and organizing principles. There were four musical elements, rhythm, melody, harmony, and musical form, with 17 behavioral objectives.

The results showed as follows:

Minnie: Minnie obviously demonstrated the skill of discriminating. Attention and concentration toward instruction supported her to observe the teacher's performance and well responded. She could suddenly percept musical materials from listening, reading, and analyzing. This assisted her to actively analyze. Minnie loved participating in group activities but she was shy. Attending group activities enhanced her to gain experiences. She could relate former experiences to incoming knowledge such as applying repeat markings in music. Occasionally, she

Table 1 Behavioral objectives for analytical thinking about music

Analytical thinking behaviors	Musical elements			
	Rhythm	**Melody**	**Harmony**	**Form**
Discriminating	1. Classify musical works into the categories of simple and compound times.	1. Label major and minor scales with specifying the kind of minor.	1. Identify chord progression names and their functions.	1. Label music sections in binary and ternary forms. 2. Distinguish musical phrases through movement followed by applying repeat markings.
Finding relationships	2. Compare the attributes of simple and compound times in columns. 3. Discuss about the attributes of regular rhythmic patterns and syncopation.	2. Symbolize the relationships among degrees within scales.	2. Match tonic (I) and dominant seventh (V7) chords with analyzing chord progressions in a musical work. 3. Discuss about cadences.	3. Identify the techniques of modified musical phrases with giving reasons. 4. State the techniques of modified musical phrases through game playing.
			4. Identify cadences in a musical work.	
Organizing principles	4. State time signature with offering the way to acquire answer.	3. Specify tonic and modulated keys in a musical work.	5. Present the way chord progressions are organized in a musical work.	5. Discuss about the benefits of learning musical form with giving reasons.

needed some suggestions such as analyzing minor scale and secondary dominant chord. When I gave her little guidelines, knowledge was retrieved.

For finding relationships, Minnie could present the relationships between musical elements such as comparing between simple and compound times by sketching. She always proposed her ideas and responded to me. In contrary, when asked to present the opinions in front of friends, she was not confident and speechless. I supported her to make her feel comfortable and she presented better. Actively did she participate in group activities, she could relate the existing experiences to learning activities. This fostered her to discuss and exchange knowledge with her teacher and friends. On the other hand, Minnie carelessly completed assignments. I suggested her to analyze errors and she could correct the answers. Moreover, the capable of reasoning was needed to improve.

For organizing principles, reasoning was developed when performing the skill of organizing tonality. She could cite the rules of cadence to support her thinking. To discuss with her teacher and friends, she proposed her ideas together with raising examples to clarify the data. However, I had to support her and assure her knowledge occasionally because she felt

frustrated when facing with a new assignment.

Kate: Kate was able to show the skill of discrimination since the first learning activity. She actively participated in group activities but sometimes lost concentration. To engage with group discussion, she cooperated with her team member in terms of sharing and exchanging knowledge. Perceiving music by listening and reading, Kate suddenly discriminated major and minor scales. Obviously, Kate loved to learn chord progressions. She paid attention while singing harmony with friends. She was skillful to analyze chord progressions in music but she was confused in secondary dominant chords. Musical forms were accurately distinguished.

For finding relationships, Kate sometimes did not pay much attention to lesson. She occasionally required for teacher's support. However, she exactly compared the differences between simple and compound times. She accurately analyzed scale structure and chord progressions. Especially, she suddenly and accurately analyzed cadences by hearing and reading music. Reasoning was presented when analyzing the techniques of modified musical phrases.

For organizing principles, Kate discussed about time signature and tonality with my assistance. She could perceive the concept of tonality without specifying details. The reasoning was improved when grasping the main idea of chord progressions. She exactly analyzed chord names and their functions together with analyzing how chord progressions were organized in music. She related content in class to her practicing for discussion about musical forms.

Tee: Tee obviously displayed the skill of discriminating. Subdividing main beats of simple and compound times was clearly presented. He often participated with group discussion and was confident to propose his answers. Not only did Tee distinguish the sounds of major and minor scales but he also specified the kind of minor scale. Moreover, he accurately analyzed primary chords but secondary dominant chords confused him. The analysis of musical forms was needed to introduce sometimes.

For finding relationships, Tee always responded to group discussion such as making comparison between simple and compound times and explaining the structure of major and minor scales to friends. For homework, he sometimes ignored. He analyzed musical elements with citing information learned in class. Game playing motivated him to get a reward so he tried his best to analyze the techniques of modified musical phrases. However, he was not satisfied because he could not accomplish the goal.

For organizing principles, although Tee's reaction to discussion was very active, he quickly responded without reviewing answers several times. The skill of organizing was needed some suggestions from his teacher and friends such as organizing tonality. Being skillful in analyzing chord progressions, grasping the main idea of chord progressions composed in music was not difficult for him. In the contrary, Tee was not able to transfer the existing knowledge to new situation. So, he had no ideas to discuss the benefits of learning musical forms.

Ann: Ann unclearly performed the skill of discrimination. Responding was needed to stimulate such as calling her name or inviting to share opinions. She had no role in group discussion though her friends asked for her ideas. Ann was able to analyze chord progression names but chord functions were mistaken. Musical forms were analyzed under my support.

For finding relationships, Ann could display the skill of finding relationships under my assistance. She felt nervous when she was asked for sharing experiences. She took time to think before responding to me. However, she was responsible for homework such as comparing the attributes of simple and compound times in columns and analyzing cadences. The analysis of scale structure is needed to improve due to ignoring key signature. Ann accurately identified the techniques of modified musical phrases but having a shortage of reasoning.

For organizing principles, Ann hardly manifested

the skill of organizing principles. She only organized tonality by writing in music score. Organizing time signature and grasping main idea of chord progressions were not found. For discussion, her answer relied upon a short answer without clarifying.

May: May's skill of discrimination was displayed with my assistance. Discriminating timing and distinguishing major and minor scales were presented with my suggestion. She tried to respond when having discussion but she was not confident. To analyze harmony, she was complicated with analyzing secondary dominant chord. Musical form accurately and suddenly identified.

For finding relationships, May accurately compared timing by writing. She participated with discussion to propose her ideas but she hesitated. Additionally, analyzing scale structure was accurate. She was not able to explain the differences among harmonic, melodic, and natural minor scales. She was proficient in analyzing harmony and the techniques of modified musical phrases. However, reasoning was not clearly presented.

For organizing principles, May displayed no reaction for time signature and tonality. Being skillful to analyze chord progressions, May exactly organized the main idea of chord progressions in music. Asked for sharing knowledge with friends, May unsmoothly communicated. She played a role in discussion about musical forms after seeing friends' participation.

Mint: Mint took time to think before performing the skill of discrimination. She was able to perform the behavior of discriminating timing and scales with my support. She inactively reacted with her teacher and friends. She was not responsible for chord progression assignment and neglected to correct errors. For analyzing musical forms, she was still needed my assistance.

For finding relationships, Mint would propose her ideas when stimulated by me. She carelessly did assignments so some errors occurred. She hesitated to analyze the structure of scale and I occasionally introduced her. She inaccurately analyzed chord progressions. Additionally, explaining reasons for the techniques of modified musical phrases was not manifested.

For organizing principles, Mint seldom performed the skill of organizing principles. She could organize time signature with my suggestion. Organizing tonality and specifying main idea of chord progressions in music were not displayed. When invited to share experiences about musical forms, she had no reaction.

Analytical thinking behaviors could be subdivided into two groups: 1) single musical concept involved performing the skill of discriminating and finding relationships of musical elements with frequent support. Organizing musical elements was not involved. For discussion, participants in this group seldom proposed opinions or responded with an answer without elaborating. When being asked for response, a short answer was presented with no explaining; and 2) superficial reasoning involved distinguishing and comparing the similarities and differences of musical elements with occasional support from the teacher. Presenting knowledge in discussion relied upon two or more relevant ideas but reasoning was insufficient or simple. A participant in this group can draw on friends' knowledge and discovered new data from friends. Sometimes, the connection of information was missed. When errors occur, some suggestions from the teacher and friends stimulated to recover knowledge.

2. Critical thinking behaviors about music

Three behaviors were established: 1) mentioning musical elements with elaboration; 2) Reflecting advantages and disadvantages with reasoning; and 3) offering suggestions for improvement. Participants were required to write seven essays and one interview. For the interview, participants were asked to reflect their compositions with open-ended questions for 30 minutes.

Table 2 Behavioral objectives for critical thinking about music

Critical thinking behaviors	Items for criticizing	Assignments	Times
1. Mentioning musical elements with elaboration.	Friend's composition	Essay writing	1
	Self-evaluation for composition	Interview	1
2. Reflecting advantages and disadvantages with reasoning.	Friend's performance	Essay writing	5
3. Offering suggestions for improvement.	Self-evaluation for performance	Essay writing	1
			Total = 8

The results showed as follows:

Minnie: Minnie employed musical elements learned in class to evaluate compositions and performances. She initially listed the topic of musical elements without justifying reasons. To criticize her own composition, she reflected the strength and weakness by involving her feeling. Moreover, she proposed the way to improve her work. Minnie realized not only rhythm, melody, and harmony but also musical forms and the modified musical phrases when criticizing friends' performances. Furthermore, she suggested the useful ways to solve problems of playing skill. For the last time to criticize friend's performance, melody and harmony were merely mentioned without reasoning and reflecting ideas. To criticize her own performance, she only mentioned harmony and the errors occurred during performance. Again, she did not involve reasoning to clarify criticizing.

Kate: Kate criticized friend's composition with superficial information. She cited few musical elements: rhythm, melody, and harmony. Apparently, she reflected opinions and evaluated her composition with supporting reasons when she was interviewed. She cited the inspiration and identified relevant arguments of music. To criticize performance, she identified problems of performance together with offering the alternative ways which applicable for improving. Kate intended to criticize her own performance. She detailed from the beginning to the end of her performance. She integrated the content learned in class with her experiences. The options to solve problems conformed to the occurred problems. The suggestions were beneficial to playing skill.

Tee: Tee was not able to integrate musical knowledge as the basis of critical thinking. He displayed no musical elements and had no ideas to evaluate his own composition and friends'. He prepared nothing for interviewing the progression of his musical work. To criticize friends' performances, Tee mentioned problems with no explanation. Repeated words were found. For critical thinking about his own performance, description about music was given before evaluating but the incorrect information was presented. He further explained the causes of problems during performing. The strength and weakness were superficially proposed. He cited only rhythm and melody.

Ann: Ann's critical thinking relied upon harmony and the modification of musical phrases. She mentioned a reason for scoring friend's composition. To criticize her own composition, she did not prepare herself for interviewing. She had no ideas to create her composition. For criticizing friends' performances, she identified the problems with no detail. Mentioning expressions and dynamics was presented in criticizing her own performance. Moreover, she reflected strength and weakness.

May: Reasoning and identifying details were insufficient for May's critical thinking. She mentioned melody and dynamic for criticizing. She criticized as

listing the topic of musical elements and only evaluated whether it was good or not. For interview, she had no ideas to present her composition. For criticizing her own performance, inconsistent information was found.

Mint: Mint only evaluated friend's composition whether it was good or not. She also gave some incorrect information. For interviewing, she had no ideas to create her musical work. Her composition did not progress at all and she did not correct some errors that I introduced. To criticize performance, she cited articulations and dynamics together with recommendation to improve but still lacking of details. Apparently, Mint made progress in critical thinking about her own performance. She explained her performance in each section of composition. Identifying problems and consequences was presented. She further suggested the ways to improve but it did not correspond to problems.

Critical thinking behaviors were divided into three levels: 1) several musical concepts involved listing only the musical elements without explaining. The strength and weakness were presented without reasoning. The information was incorrect and recommendation to improve was not found; 2) superficial reasoning involved mentioning musical concepts with supporting strength and weakness. Simple recommendations for improvement were proposed; and 3) logical reasoning engaged in citing musical elements with giving details. This included providing explicit evidences. Moreover, it involved citing the other musical works applied for creating composition. This also embraced proposing strong information of strength and weakness with logical reasoning. The recommendations for compositions and performances were applicable.

The factors influencing analytical and critical thinking behaviors about music

There were three main factors affecting the behaviors of analytical and critical thinking about music: instruction method, attitudes, and motivations.

1. Instruction methods

I selected instruction method to provide music instruction by realizing behavioral objectives and considering proper instructions. Six instruction methods were employed in this research: 1) induction was mainly used for this research. This method promotes analytical thinking. Attention is crucial for driving curiosity. To learn new music knowledge, learning from familiar songs will enhance the application of knowledge. Participants were encouraged to discover knowledge or principles through musical works such as assigning them to find ternary form composition from piano repertoires or compositions; 2) deduction was used when less timing and assisted participants to perceive principles of music content before manipulating. I also summarized key idea of music knowledge with class discussion. For example, I introduced them to observe the sound of key changing, chord progressions, and cadences when modulating. The variety of examples were provided; 3) demon-

Table 3 Levels of participants' behaviors

Participants		Analytical Thinking behaviors	Critical Thinking behaviors
1.	Minnie	Superficial	Several
2.	Kate	Superficial	Logical
3.	Tee	Superficial	Superficial
4.	Ann	Single	Superficial
5.	May	Superficial	Superficial
6.	Mint	Single	Superficial

stration was involved when I acted as a model in moving activity. Also, writing essay for critical thinking needed examples to illustrate. Participants observed the process and imitated what I did. To give explicit instruction, I explained the procedure together with demonstration; 4) game playing was used to create enjoyment in learning and stimulated the behaviors of inactive participants. I provided game playing to enhance chord progressions and the techniques of modified musical phrases because most participants confused with them. Rules and rewards were set to challenge participants. This method could elicit all participants' behaviors; 5) discussion was one of important parts in this study. This method was employed through providing music instruction. I gave participants opportunities to exchange music knowledge and music experiences through discussion. To summarize new music experiences, discussion was provided. For this study, some participants exhibited difficulties when being asked to offer ideas about music. It is necessary to support them information and raised them examples; and 6) case was used for critical thinking behaviors. To criticize friends' performances, experiencing various cases allows participants to face with different problems in music. This encouraged participants to discover the solutions suitable for diverse situations. I used this method together with discussion to offer opinions about cases. Moreover, allowing students to learn from each other and accepting different information enhance them to acquire broader perspectives.

2. Attitudes

Attitudes

To detect attitudes, I employed five levels of affective domain based on Krathwohl and his associates (Krathwohl et al., 1973) as a framework to interpret the level of attitudes. The results indicated that participants' attitudes ranged from the level of receiving to the level of valuing. Receiving is the lowest level of affective domain. Participants attended to participate with learning activities and listened to the other's ideas but they did not respond. The highest level for these participants was valuing. Attitude and appreciation were engaged in this level. Only one of participants was in this level and she had intrinsic motivation. The curiosity in music content encouraged her to discover new knowledge. Furthermore, integrating the existing knowledge with practicing promoted the capability of knowledge transferring. Consequently, she exhibited the progression of analytical and critical thinking behaviors.

3. Motivations

Motivations here refer to motivations influenced from outside or extrinsic motivations. For this research, there were four kinds of motivations affecting participants' behaviors: 1) teacher's expectation activated students' behaviors. Primarily, I informed participants about objectives, learning activities, and evaluation including the advantages from learning music content. Significantly, giving feedback involved not only scoring or grading but also justifying reasons; 2) causal ascription involved the expectation of outcomes in the future and affected emotions. One of participants expected to complete the goal because the task was not difficult for him. However, he could not do it and he tried to search for causes to explain the outcomes; 3) reward was the most effective motivation for participants. It was used to challenge participants in game playing including the increment of the speed for assignments. I found that all participants completed assignments within limited timing; 4) admiring words were employed when participants accurately exhibited the expected behaviors. Also, I used admiring words to make diffident participants feel convenience to propose ideas. I used them with justifying reasons to clarify the causes I admired. I further found that when one was praised, it affected the other participants to improve behaviors.

The classification of analytical and critical thinking behaviors about music

Five stages for analytical and critical thinking

Table 3

SOLO Taxonomy (Biggs & Collis, 1982; DeTurk, 2002)	Analytical and critical thinking behaviors about music
1. Prestructural level - No musical concept. - Fail to accurately respond to the assignment.	1. Unpresented data - No musical concept - No plans for composition and no reflection of advantage and disadvantage points. - No role in discussion. - Giving incorrect information.
2. Unistructural level - Citing a single musical concept. - Unsophisticated conclusions reached hastily.	2. Single musical concept - Distinguishing and finding relationships of musical elements with frequent support. - Demonstrating little analysis of the relationships between musical elements. - Listing only the topic of musical elements without explaining. - Proposing the strength and weakness without reasoning. - A lack of reasoning.
3. Multistructural level (low) (Chan et al., 2002) - Presenting two or three independent aspects related to question without elaboration.	3. Several musical concepts - Two or three musical aspect cited in criticizing without elaboration.
4. Multistructural level (high) - Presenting several musical concepts and providing multiple evidences - Do not present a unified argument.	4. Superficial reasoning - Distinguishing musical elements and finding relationships of musical elements with occasional support from teacher. - Some suggestions from teacher and friends can help to recover knowledge. - Several musical concepts mentioned in criticizing with extending details. - Information is independently presented. - Engaging in superficial reasons and simple recommendations.
4. Relational level - Offering higher musical concept (form, orchestration, or style) and present unified arguments. - Incorporating evidence from several concepts to convince answers.	4. Logical reasoning level - presenting how musical elements are related. - Engaging in reasoning. - Relating knowledge in classroom with practicing or knowledge transferring. - Citing musical elements with explicit evidences. - Proposing strong information of strength and weakness with reasoning. - The recommendations for compositions and performances were applicable.
5. Extended abstract level (sophisticated level of critical thinking) - Mentioning three lower music concepts (medium, dynamics, and tempo) and three higher music concepts (form, tonality, and musical function). - Discussion about musical purpose far beyond the bound of assignment. - Reference other works or sources.	N/A

behaviors were synthesized based on SOLO taxonomy (Biggs & Collis, 1982; C.C. Chan, Tsui, M.Y.C. Chan & Hong, 2002; DeTurk, 2002)

Discussion and Conclusion

1. Analytical thinking behaviors about music

The findings showed that participants' behaviors can be classified into two levels: single musical concept and superficial reasoning. Both of these levels related to unistructural and multistructural level under SOLO taxonomy (Biggs & Collis, 1982; DeTurk, 2002). Participants in single musical concept could not engage in reasoning. They were willing to attend and follow my instruction but response was needed to stimulate especially discussion. They replied a short answer when being asked. Moreover, some of them hardly practiced music at home and asked for quitting music lesson. Some studies reveal that negative music attitude increases with advancing grade level (Bowless, 1998; Mizener, 1993; Phillips, 2003). Moreover, Siebenaler (2008) found that positive attitude toward music school primarily decline with the fifth graders. From data, I do not mean that music teachers should ignore to promote positive attitude. What I mean is music teachers should provide learning activities that are meaningful and enjoyable to students including seeking for instruction methods suitable for diverse students.

For participants in superficial reasoning level, they always cooperated with learning activities and exposed their feelings. They tried to seek for evidences to illustrate what they said such as providing examples, explaining the method for acquiring answers and so forth. Cooperating with learning activities did not mean they either loved to learn music or had positive attitude. In contrast, they complained that they were lazy to practice and was bored of difficult tasks. Their parents forced them to continue learning music. There was one participant who had positive attitude toward music instruction but she felt frustrated with difficult assignments including less time to practice but she loved to learn music especially group lessons. Importantly, there was a participant who loved to composition and curiosity in music lesson because she intended to try her best to create her own musical work. I found that she engaged in explaining superficial reasons when being asked to do assignments.

2. Critical thinking behaviors about music

The results from studying critical thinking behaviors can be categorized into three groups. The first group was several musical concepts. The behavior involved listing only two or three musical elements with no explaining. Without details, the strength and weakness were proposed. The second group of critical thinking behaviors was superficial reasoning. This group involved citing several musical concepts with elaboration. The information independently presented. Strength and weakness were proposed with simple reasons. The final group was logical reasoning. It embraced providing musical elements with supporting evidences. Logical reasoning was employed to illustrate the strength and weakness. Offering suggestions to further musical works corresponded to problems. These three groups related to multistructural level (low), multistructural level (high) and relational level under SOLO Taxonomy in order (Biggs & Collis, 1982; Chan et al., 2002; DeTurk, 2002). This can be seen that I separated multistructural level into high and low level. Based on Biggs & Collis (1982), SOLO Taxonomy originally consists of five levels: prestructural, unistructural, multistructural, relational, and extended abstract levels. This taxonomy was then modified to reduce ambiguity and more precise by Burnett, Trigwell, and Prosser (Burnett, 1999 cited in Chan et al., 2002; Trigwell & Prosser, 1991 cited in Chan et al.). They added three sub-levels to multistructural and relational levels respectively. Consequently, the level of several musical concepts has been supported by multistructural level in low degree.

All participants did not want to do this research task with two reasons. First, I used case method to

teach them. This meant every participant had to demonstrate their own musical works in front of their friends. The last reason was it involved essay writing and interview. They had to employ music content they learned in class as basis to evaluate compositions and performances. Importantly, I focused on reasoning and rational evidences. I seriously focused on criticizing since the third month of gathering data. Prior to writing essay, I intended to prepare different musical experiences from learning activities followed by discussion. To teach critical thinking, students had to employ musical elements as a basis to evaluate including experiencing several musical sources. Primarily, all of participants had no idea to write and was confused. I, therefore, guided the items to write and demonstrate some sentences. They tried to follow my instruction and provided supporting evidences to clarify their information. However, critical thinking does not involve whether the accuracy of performance or musical works but it embraces musical evidences or making judgments based on reasoning to support evaluation. For participants in several musical concepts, they gradually developed to provide musical evidenced. Giving feedback and demonstration were vital to support them. In my opinion, maturity is an important element for teaching thinking skill. Although students aged 12 to 13 was categorized under formal operational stage (Piaget cited in Slavin, 2009), cognitive development of some children was overlapped between concrete operational and formal operational stages. Hence, the development of reasoning or abstract learning did not fully developed. However, some of them clearly exhibited the reasoning. This depended upon experiences, knowledge background, and the skill of reasoning.

3. The classification of analytical and critical thinking behaviors about music

I synthesized the classification of analytical and critical thinking behaviors about music based on SOLO taxonomy (Biggs & Collis, 1982; Chan et al., 2002; DeTurk, 2002). The classification was categorized into five levels: 1) unpresented data level relies upon presenting no musical concept; 2) single musical concept level involves mentioning a musical concept or a short answer; 3) several musical concepts level involves listing only the topic of musical elements without explaining; 4) superficial reasoning level involves stating several musical concepts with explanation and superficial reasoning. The argument is not unified; and 5) logical reasoning level engages reasoning to support information. The recommendations for compositions and performances were useful for improvement. These five stages were beneficial to the assessment of analytical and critical thinking behaviors about music. They increase sophisticated levels as SOLO taxonomy. I also applied the modified version of SOLO Taxonomy by Burnett, Trigwell, and Prosser (Burnett, 1999 cited in Chan et al., 2002; Trigwell & Prosser, 1991 cited in Chan et al.) to the stage of several musical concepts to make it more precise. In this study, I focused on analytical and critical thinking behaviors but it was able to utilize the other kinds of thinking. Primarily, teachers have to establish the expected thinking behaviors and to determine clear definition. For example, if teachers expect to teach creative thinking, they have to investigate its definition and to find basic theory to support. After that, behavioral objectives are determined. In addition, this classification was synthesized based on my participants' behaviors aged 12 to 13. Consequently, they could not reach the level of extended abstract thinking (Biggs & Collis, 1982) because of the limitation of cognitive development. Consequently, if music teachers apply the classification to high school students or undergraduate students, their thinking levels may be possible to reach extended abstract level. In the same way, if you applied the classification to lower elementary, their behaviors may range from prestructural to multistructural levels. Moreover, music teachers can use the classification with individual lesson.

Recommendations

The starting point for teaching musical thinking is music teachers. Many music teachers always expect for product, performance, more than process. They sometimes ignore to realize that product results from thinking process. Studying the program for music teacher training is required. The program should cultivate music teachers to understand the importance of thinking skills. Significantly, devising music lesson plan based on thinking skills including the application in real situation is crucial. Also, the program should be followed up and evaluated from experts.

For the field of music in higher education, designing teaching model emphasizing on musical thinking is suggested. Students in this level select major subject to be advantageous to their careers after graduation. It fosters systematical thinking and knowledge transferring. The teaching model will be concrete guidance for music teachers who involve higher education to provide effective thinking based instruction.

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