



Design Construction: Application of Musical Intelligence Test for Students in Elementary School

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Abstract. Musical intelligence is one part of multiple intelligences theory forward by Howard Gardner. Children with musical intelligence can recognize tones, imitate rhythms, and make simple arrangements. Some of the influences of musical intelligence include helping children develop their intellectual, emotional, creative, reading, language, behavior, and social skills. Musical intelligence in children needs to be known early on to support its development. However, the tools which measure children's musical intelligence rarely found. The purpose of this study was to design and build a musical intelligence test application for students in elementary school. This application is based on Android using the Multimedia Development Life Cycle methodology. The stages in the multimedia methodology include concept, design, material collecting, assembly, testing, and distribution. The resulting learning application can determine the level of children's musical intelligence with the guidance of teachers and parents at the beginning of using the application.

Keywords: Musical Intelligence, Application Test, Elementary School.

1 Introduction

Various studies have been conducted to protect the influence of musical intelligence to development child's knowledge dan skills. According to Gagner in Djohan [1], musical intelligence is the ability to feel, distinguish, transform, and express musical forms. People who have this intelligence are very sensitive to sounds and sounds, environment, and music. Some of the influences of musical intelligence include helping children develop their intellectual, emotional, creativity, reading skill, spoken language, behavior, and social skills.

Based on the research conducted by Simamora [2] found that music treatment had significant effects to increase verbal creativity, especially reading skills in third-grade elementary school students. The products resulting from musical creativity include; 1) composition, namely the concept and selection of sound forms to be presented; 2) presentation and improvisation, namely the application of sound forms that have been prepared to be presented; and 3) analysis, namely the process of understanding and expressing sound forms in written or spoken language.

Someone who has musical skills usually learn music from various sources. After mastering some music, they will feel dissatisfied with the music that they have mastered. They will continue to recycle or arrange existing music. This proves that musical intelligence will also continue to enhance one's creativity. Musical intelligence also affects a person's emotions. Music will stimulate brain cells located in the cingulate cortex or limbic cortex in the brain. A study in America showed that music with high or fast beat stimulate the brain waves so that the heart beats faster. Meanwhile, music with a slower and quieter beat will create other effects such as increasing concentration for a long time and helping the body relax.

While the Directorate of Elementary Schools, the Director General of PAUD, Basic Education, and Higher Education of the Ministry of Education and Culture revealed that musical intelligence provides several benefits for children, such as 1) educates the brain, music can foster intelligence and improve children's memory because when children listen to music, their brain cells work more actively; 2) grew motor skills and coordination, playing a musical instrument can train children's eye-hand balance and motor skills; and 3) improves academic performance, musical intelligence can increase students' test scores.

Students in elementary school are an ideal age for developing their musical intelligence. There needs to have a test to gauge a child's level of musical intelligence. A review of the literature revealed that there aren't many musical intelligence tests available, particularly those written in Indonesian. Music Lab is one of the applications for testing music on websites. The School of Psychology at Yale University and the University of Auckland (in New Zealand) are where The Music Lab is hosted (in New Haven, as a part of the Yale Child Study Center). This tool, however, is not intended specifically for kid-friendly musical exams. The sole menu for evaluating children's musical aptitude is "Kids' Music Quiz." In the end of the Quiz, they will get the final score. However, the number of quizzes is still very limited.

Mudjilah [4] has been developed the musical intelligence test in her study. The tests were in the form of working on questions and performance tests. This test has weaknesses including requiring a lot of question sheets and it takes a lot of time to carry out the test. Based on this study, there were three aspects of the musical intelligence exam, the ability to recognize, imitate, and respond to rhythmic, a tone, and melodic elements of music. The children's musical intelligence exam consists of seven tests, including the ability to discriminate between notes, rhythms, and melodies as well as imitate tones, rhythms, and melodies, as well as respond to rhythms.

Based on discussion above, musical intelligence had important benefits for children. The level of intelligence needs to be known early on by parents and teachers. However, musical intelligence measurement tools rarely to development. This study was to design and build a musical intelligence test application for elementary school students. The results of the test can be used to make recommendations to parents and teachers for maintaining on kids' musical progress. Parents and teachers are expected to assist and educate children so that their growth would advance after learning about the children's degree of intellect.

3 Method

The method of this study used multimedia Development Life Cycle. Based on Luther in Binanto [5] method, multimedia methodology consists of six stages, namely Concept, Material Collecting, Design, Assembly, Testing, and Distribution. The research instruments used in collecting data included interviews, literature studies, and tests. Interviews and literature studies were carried out at the concept stage to analyze field conditions, determine goals and who is the user of the child's musical intelligence test application. While the test is used after the application has been developed. An overview of the instruments and indicators can be seen in the table below.

The subjects of the research were fourth-grade elementary school students. The students were study at SD Supriyadi 02 Semarang, totaling 20 students. The average age of the subjects is 9 to 10 years. Subjects have been equated based on an academic level, social conditions, and school accreditation. To develop suitable concepts for learning apps, researcher did observation in teaching and learning process, did need assessment and study some literatures which related to music applications test. The researcher created several diagrams during the design phase, including use case diagrams, activity diagrams, and class diagrams, to generate specifications on the program's architecture, style, look, and material needs.

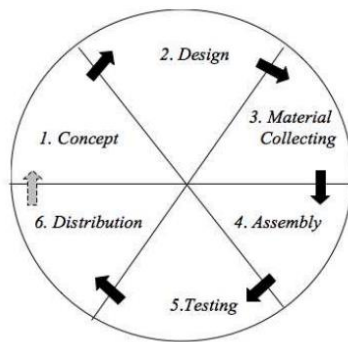
Table 1. Interview Guide Grid with Student and Teacher

No	Variable	Indicators	Number of Items	Item Number
1	Knowledge of music in their environment	Children's interest in music	3	1, 2, 3
		Children's knowledge with songs in their environment	4	4, 5, 6, 7
2	Musical intelligence	Skills/experience playing a musical instrument	3	8, 9, 10
		Children's skills in composing songs	5	11, 12, 13, 14, 15
		Support for musical intelligence	4	16, 17, 18, 19
3	Music application used	Music application that is often used by children	4	20, 21, 22, 23

Table 2. Musical Intelligence Test Grid

Group	Type of test	Number of Items
Dichotomous	Tone distinguishing test	3
	Rhythm distinguishes test	3
	Melody distinguishing test	3
	Tone imitation test	3
Polytomous	Rhythm imitation test	3
	Melody imitation test	3
	Rhythm responds test	2

The test format was designed with seven tests divided into two data categories, namely the dichotomous group and the polytomous group. Dichotomous is obtained from a test with two right and wrong answers, while polychotomous is obtained from a test with four answer choices or four categories. The dichotomous group tests include tests of distinguishing tones, distinguishing rhythms, distinguishing melodies, and imitating tones using software specifically designed for this test. Meanwhile, the polytomous group test is a test of imitating rhythm, imitating melody, and responding to the rhythm. The research steps use a multimedia methodology as shown in Figure 1.

**Fig. 1.** Application Development Methodology

The concept stage is the stage for determining the goals and who are the users of the program. Design is the stage of making specifications regarding program architecture, style, appearance, and material requirements for the program. The Material Collecting stage is the collection of materials according to the needs that are being worked on. These materials include clip art images, photos, animations, videos, audio, and others which are obtained free of charge or by ordering from other parties following the design. The assembly stage is the stage of making all objects or application materials. The Testing phase is carried out after completing the assembly stage by running the

application/program and seeing whether there are errors or not. On Distribution, the application will be stored in a storage medium. If the storage media is not enough to accommodate the application, compression of the application will be carried out. This stage is also called the evaluation stage for the development of finished products so that they are better.

5 Result

5.1 Concept

Data collection in the field used interviews about the conditions of interest of fourth-grade elementary school students in learning the art of music and the use of music applications. Interviews were conducted from 6 to 13 March 2023 with 20 students and a teacher of grade IV of SD Supriyadi 02 Semarang. Based on the results of the interviews, some data were obtained regarding the current conditions of class IV SD in terms of musical intelligence, namely; First, almost all students like listening to music and singing. Of the 20 students, there were 18 students said they liked listening to music and singing, while 2 students said they did not like it. Second, almost all students said they could play the instrument. There were 17 students who said they could play musical instruments, while 3 students could not play musical instruments. Third, some fourth-grade elementary school students have been able to compose their own songs. Fourth, the average student stated that their parents supported them in music. There were 19 students who stated that they supported it and a students stated that their parents did not support. Fifth, learning the art of music has been implemented in learning. There were 19 students who stated that there was music learning in grade IV elementary school. The following is a graph of gadget applications that are often used to play and listen to music.

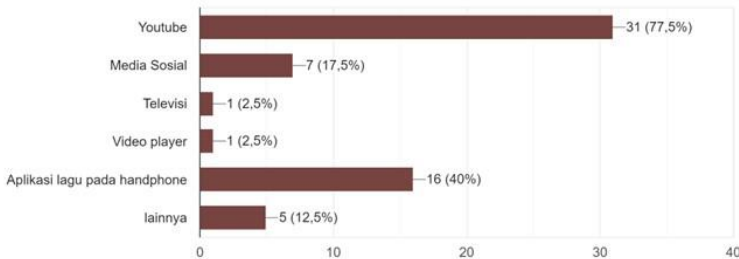


Fig. 2. The Music Application used by students of Grade IV Elementary School

The most digital platform used by teachers and students to get music and songs is only Youtube. This platform has a drawback, namely the use of the system is only one way. Students can only hear and see content about music on YouTube. They don't measure their musical ability with this platform. Thus, an application is needed to measure the development of the level of musical intelligence.

5.2 Design

At the design stage, the researcher made several diagrams such as use case diagrams and activity diagrams to make specifications regarding program architecture, style, appearance, and material requirements for the program. In this use case diagram, the researcher displays the modeling of the application to be built where the user can access some of the features provided in the application. In this modeling, the user or users can see the initial appearance, see information on how to use it, and start playing the application. The flowchart of this application can be shown in Figure 3.

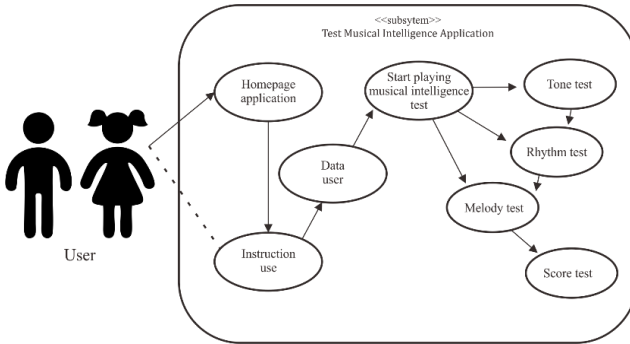


Fig. 3. Use case diagram of Test Musical Intelligence Application

The Activity Diagram in the musical intelligence test application intends to show the sequence of activities in running or operating the application. User activity can be seen in Figure 4.

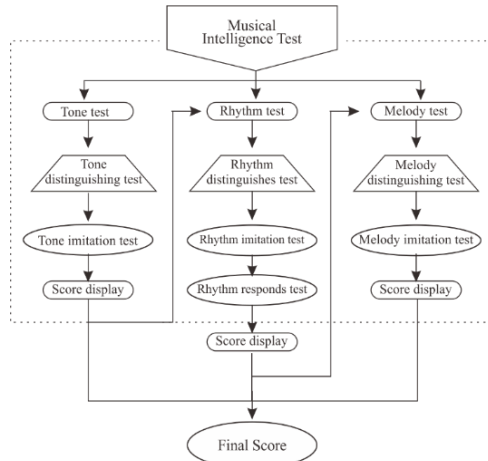


Fig. 4. Activity diagram of Test Musical Intelligence Application

5.3 Assembly

Researchers used the Eclipse application to build applications that can interact with users or users specifically for children aged 9 to 11 years by using several supporting features on Android, namely text to speech which is an audio module that can read text and produce audio.

The illustrations and font types adapted to children growth. Illustrations use more shapes and colors that many children like. While the type of font used is “Abalone Smile” which seems cute and easy to read. Examples of illustrations and fonts can be seen in Figure 5.



Fig. 5. Icon dan font type of Musical Intelligence Test Application

5.4 Testing

In this stage, the researcher tests the application that has been made by displaying several views of the application that has been built. In the initial appearance of the application, the user is given four menu choices, namely Your identity, Tone Test, Rhythm test, and Melody test. User identity is needed to provide data that can be analyzed further. Meanwhile, on the Tone Test, Rhythm test, and Melody test menus, there are five exam questions each. The initial appearance of the application can be seen in Figure 6.

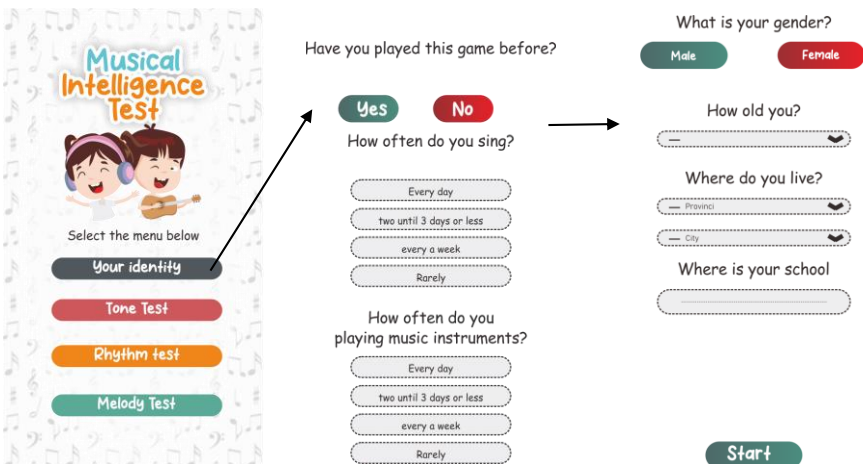


Fig. 6. Start display of Test Musical Intelligence Application

In the tone test menu, the user will be given instructions how to do the test. Before starting the test, users can also try a trial test so that during implementation the user already understands how it works. The tone test display can be seen in Figure 7.

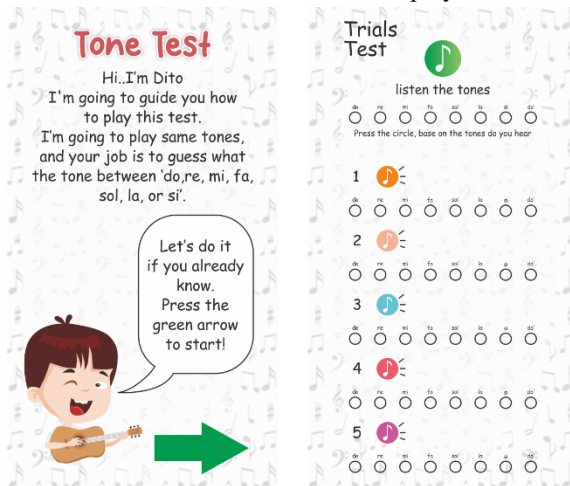


Fig. 7. The display of Tone Test Menu

In the rhythm test menu, the user will be given several songs that are played according to the tempo on the metronome. The user must choose the right tone circle and on the tempo line that has been provided. The number of tones selected according to the tempo will determine the score obtained. In this menu there are five test questions, ranging from songs with medium tempo to high tempo. Examples of rhythm test questions can be seen in Figure 8.



Fig. 8. Samples of Rhythm Test

5.5 Distribution

After testing the application, the researcher then conducted an evaluation to test the use of the application on the research target, namely children aged 9 to 10 years. In this evaluation the researcher distributed 20 evaluation questionnaires which aimed to get responses and conclusions about the applications that had been built. The following is a table of evaluation results regarding children's responses to interest in using the application. Of the 20 questionnaires distributed, all children felt interested in using the application which can be seen in Table 3.

Table 3. Table of Interest Evaluation Results

Choice	Correspondent	Percentage
Yes	20	100%
No	0	0%
Total	20	100%

7 Discussion

Based on the study in this research, the use of technology is very possible to use in supporting musical intelligence. Research by Ouyang M [6] with the title "Employing Mobile Learning in Music Education" developed a mobile-based application called ChordIQ. ChordIQ application is an interactive learning tool to learn about solfeggio. Solfeggio is a term that refers to playing scales, intervals, and melody exercises with syllabi solmization, which is playing musical notes using notation symbols (Stanly in Sumaryanto [7]). Some of the important findings in this study include that mobile-based music learning applications are effective in teaching various age groups, and student interest, and academic performance increase with technological innovation and materials in the application.

According to Sigit [8], Children of this generation are very comfortable with technology. Elementary school students in Indonesia generally accustomed to using various technologies, especially mobile applications. This research tried to develop an android-based musical intelligence test. Android can run by using a mobile. It intended that elementary students will have higher motivation and understanding. The musical intelligence test application designed in accordance with student development is proven able to attract students' attention. They play many times to get higher test

scores. Images, logos, writings and mascots make it easier for them to understand the musical tests displayed in the application.

8 Conclusion

Based on the research that has been done, the following conclusions are obtained:

- a. The musical intelligence test application works fine, all the features used like Text to Speech, Handwriting Recognition, audio, animated images, and views all work with Good.
- b. The musical intelligence test application can be used to detect students' intelligence level in elementary school.
- c. The students of Elementary school were able to use the application musical intelligence test well. They looked happy and interested in playing the application this with the guidance of the teacher at the beginning application usage.

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References

1. Djohan. (2020). Psikologi Musik. Yogyakarta: PT. Kanisius.
2. Simamora. (2018). Pengaruh multimedia pembelajaran dan kecerdasan musikal terhadap hasil belajar. *Journal of Information and Communication Technology in Education*: DOI: <https://doi.org/10.24114/jtikp.v5i1.12525>
3. Grimonia, Eya. (2014). Dunia musik sains – musik untuk kebaikan hidup. Bandung: Nuansa Cendekia.
4. Mudjilah. Hanna Sri. (2014). Developing Musical Ability Test for Children. Dissertation. Yogyakarta: Graduate School, Yogyakarta State University, 2013.
5. Binanto I. (2010). Media Digital-Dasar Teori dan Pengembangannya. Yogyakarta: C.V Andi.
6. Ouyang M. (2022). Employing Mobile Learning in Music Education. *Educ Inf Technol* (2022). <https://doi.org/10.1007/s10639-022-11353-5>
7. Sumaryanto, F. Totok. 2007. Pengembangan Instrumen Pengukuran Kemampuan Solfegio, Tesis (tidak dipublikasikan), IKIP Jakarta
8. Sigit Purnama. (2018). Pngasuhan Digital untuk Anak Generasi Alpha. *Jurnal Al Hikmah Proocedings on Islamic Early Childhood Education Vol. 1, April 2018*. Krishnan et al. (2014). Musical Intelligence: Explication, Measurement, and Implication for Consumer Behavior. *Journal of Consumer Marketing*: DOI: 10.1108/JCM-01-2014-0843.

9. Andy, (2013). Perancangan Aplikasi Penilaian Perkembangan Bahasa Anak Berbasis Android. Developer.android.com. (2016a). Android Studio Overview. Retrieved January 5, 2016, from <http://developer.android.com/tools/studio/index.html>
10. Gardner, Howard. (2003). Kecerdasan Majemuk. (Terjemahan Drs. Alexander Sindoro). Batam Centre: Interaksara.

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