Learning arithmetic with back sound music classic romantic

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Abstract. This study is based on our previous research results, that classical music can improve the mathematical intelligence of elementary school students. But the learning model used has not been studied, therefore done further research to develop the model of learning mathematics with back sound classical music of the era romantic. The research method used is Design-Based Research (DBR). Development using four stages, adoption and modification of Reeves development design. Research subjects were the same teachers and students in the previous study. The study was conducted for eight months. The product of learning model is named Romantic Learning Arithmetic Model. The result of the research shows that the Romantic Learning Arithmetic Model is started from the beginning activity which is opening and conditioning learning, giving motivation to learn, doing apperception and learning orientation; the core activities of presenting learning, giving learning direction, independent learning experience, and presentation of learning outcomes, and the final activities of evaluation, follow up, and closing.

1. Introduction
The Regulation of Minister of National Education No. 22 of 2006 states that mathematics should be taught since elementary school to equip students with logical, analytical, systematically, critical, creative, and cooperative abilities [1]. Mathematics is taught to students so that students can grow and survive. In this era, things are always changing, uncertain, and highly competitive. If children are not equipped or not familiar with these skills, they will be left behind. By using the ability to acquire, manage, and utilize information, children will grow into strong, intelligent and talented human beings. One of the intelligences that should be developed is logical-mathematical intelligence which is one of the goals of mathematics learning activities at schools.

There are several notions of mathematical intelligence or logical-mathematical intelligence according to experts. Logical-mathematical intelligence is the ability to handle numbers, calculations, patterns, logical, and scientific thinking [2]. Logical-mathematical intelligence is related to counting activities or using numbers in everyday life [3]. Logical-mathematical intelligence is an intelligence that includes the ability to perform mathematical calculations, logical thinking, deductive and inductive thinking and makes logical patterns and relationships [4]. Logical-mathematical intelligence is one's ability to calculate, measure, and consider propositions and hypotheses, as well as complete mathematical operations [5]. Referring to some intelligence definitions conveyed by experts, intelligence is not only focused on academic ability but also includes the ability of a person both physically and psychologically working simultaneously to solve problems, adjust one’s self, respond to stimuli appropriately and correctly. Someone is said to have intelligence when he can solve problems encountered in his life and able to produce something useful for humanity.
Education practitioners, academics, and researchers in the field of mathematics continue to improve mathematical intelligence. For instance, a research conducted by the author in 2016 about the influence of classical music background in learning mathematics. The results of this study prove that the use of classical music background in learning mathematics can improve students' mathematical intelligence [6]. The improvement of mathematical intelligence was proven by the improvement of students' learning outcomes manifested in their ability to solve arithmetical problems.

The use of music background for learning activities is a new idea, especially for the classroom teacher where the research was conducted. Teacher needed to adjust to new approaches, strategies, methods, and techniques to align with the conditions of the classroom setting where the classical music background was integrated. Adjustments made by the teacher have formed a model of learning with classical music background intervention, especially on the arithmetic material.

The learning model has always been a topic of interest for researchers. This is not an unimportant trend. It is because the role of the learning model is so important as a guide in learning. According to Trianto "learning model is a broad and comprehensive approach and can be classified based on learning objectives, syntax (pattern sequence), and the nature of the learning environment" [7]. Learning model as a conceptual framework is used as a guide in learning" [8]. Conceptual framework means there are several components in it. Those components are the approach, strategy, media and instructional technique. It should be understood that in a learning model there are components of approaches, strategies, methods and techniques that form a particular pattern according to the structure of materials learned to achieve the learning goals. Differences in the composition of choosing and using approaches, strategies, methods and techniques will form a new learning model [9].

The learning model is an important learning component. Learning model becomes a guide for teachers in carrying out learning activities. The appropriate learning model is a model of learning tailored to the situation and condition of students and the classroom environment. Therefore, the important point of this development research is to find an algorithmic arithmetic learning model that is accompanied by classical, romantic music that can improve the mathematical intelligence of elementary school students. Therefore, the results of this study can be disseminated for teachers in elementary schools as an alternative solution in improving arithmetic learning outcomes and mathematical intelligence of elementary school students.

2. Methods
The method used in this study was a DBR (Design-Based research). Barab & Squire state that DBR is "a series of approaches, with the intent of producing new theories, artifacts, and practices that account for and potentially impact learning and teaching in naturalistic settings" [10,11]. The design of the development consists of four stages resulting from adoption and modification of Reeves's development design [10]. These four stages are problem identification and analysis, program prototype development, program testing and implementation, and reflection to obtain the expected design principles and address the emerging problems. More details are shown in figure 1.
Problem identification, problem analysis, and needs analysis were conducted in the first stage. For instance, identifying learning components used as well as the phenomena that occurred during the learning process using classical music background. Researchers analyzed the approaches, strategies, methods and learning techniques utilized. Researchers also analyzed the disadvantages and the advantages resulting from the treatment done by the teacher during the learning process. In addition, researchers also conducted analysis of learning materials as well as conducting literature review at this stage.

The second stage was the development of mathematical, algorithmic learning model. The researchers processed and organized the data that is the analysis results in the first stage. Researchers investigated relationships and patterns as materials for the model design that will be developed. The theories that supported the development of learning model became the basis of the development of algorithmic arithmetic learning model using classical music background. Relationships and patterns between approaches, strategies, methods and instructional techniques used during the learning combined with theories became an experimental product of algorithmic arithmetic learning model using classical music background.

The third stage was the process of testing and implementation. The first test was the content test performed by the experts. Although the design of the learning model was based on theories, the content test process was still conducted by the expert lecturers. This test was a form of evaluation and acceptance of input before testing by the research subjects or implementation in the field. The next testing process was carried out by teacher and students in the real environment and learning situations. During this process, researchers conducted observations by using observation sheets, field notes and video recorders. All kinds of phenomena that occurred during the testing process were evaluated. Evaluation results turned into a reference for the product improvement. The testing involving the study subjects was repeatedly conducted, at least in three cycles.

The last stage was a reflection. The data, which was in the form of a recording of all the phenomena that occurred during the testing process, were analyzed. Researchers also sought solutions to overcome shortcomings of the designed learning models. Finally, the research product reached the final stage and was ready to be published through research reports and articles published in the journal of education.
3. Results and Discussion

3.1. Observation Results
Mathematics learning activities by using classical music background of the romantic era conducted in 6 meetings. Each learning consisted of beginning, middle, and ending activities. Here is an explanation of each activity undertaken by the teacher.

3.1.1. Beginning activities. At meetings 1 to 6, the teacher always performed the same beginning activities. These beginning activities took around 8 to 19 minutes. Learning began by praying, tidying students’ clothes and chairs as well as tables, motivating them, and performing apperception. The teacher gave learning motivation, reviewed learning material from the last meeting and ensured that students still remember it, as well as connecting past material to the material that would be learned. This stage was called the apperception and orientation stage. All activities in this beginning stage were considered as good habits. Therefore, researchers did not change this habit.

3.1.2. Middle activities. These activities lasted for approximately 70-80 minutes. Based on teacher adjustment to classical music background, learning processes were always marked by the delivery of learning materials by the teacher so that it appeared that the learning processes were teacher-centered. However, sometimes, the teacher also associated learning with students’ daily lives. Mostly, the teacher explained the material by using a whiteboard. Then the teacher presented a problem and explained the solution to the problem. After that, the teacher gave the students a chance to ask questions, and the teacher asked a question for the students to test their understanding. Then, the teacher instructed the students to solve a problem given by the teacher by discussing it with their seatmate. During the discussion, the teacher guided and directed the students. To provide clearer guidance, teachers occasionally invited students to work on the problem together by discussing and writing the explanation on the whiteboard. The next stage, the teacher provided a chance for the students to experience independent learning. Students were allowed to work independently or in groups without the teacher's guidance. Students in one group shared information regarding how to solve mathematical problems. This learning activity always happened at every meeting during the research. Based on this, it can be understood that teachers always used training methods, group discussions and presentations.

3.1.3. Ending activities. These activities usually took about 10-15 minutes. In this activity, the teacher performed evaluation either in written or non-written forms. The test questions given were always based on the existing questions on the book, or occasionally the teacher created questions instantly. Homework was always a follow-up of the learning activities. Based on the observation, the activities at the end of the lesson are summarized into evaluation, follow-up and closing activities.

3.2 The Design of Romantic Arithmetic Learning Model
Based on the analysis of the results of this study, the design of algorithmic arithmetic learning model is summarized into several stages, namely, beginning, middle and ending activities. Beginning activities consisted of opening and conditioning of learning situation, providing learning motivation, and apperception and orientation stages. The opening and conditioning of a learning situation were the activities in which the teacher guided prayer, called the register and reminded the students to tidy their clothes and tables. Then, the stage of giving learning motivation was the stage in which teacher to give inspirational words to encourage the student learning spirit. Apperception and orientation were the stages in which the teacher checked the student's initial ability, briefly revisited the previous lesson and connected it to the material that will be studied at that moment.

The middle activities consisted of presenting learning materials, giving learning guidance, providing an independent learning experience, and presenting results of the independent learning. The stage of learning materials presentation was the activity in which the teacher explained the subject matter in detail, both through oral and written explanation. In this stage, the teacher also demonstrated how to solve a mathematical problem. The stage of giving the learning guidance was the stage in which students
were invited to solve the application problems based on the learning materials that had been presented by the teacher. The teacher gave guidance on how to solve a problem and use mathematical formulas. In this process, communication between teacher and students took place in the form of asking and answering questions related to solving math problems. Students were also allowed to discuss with other students. The next stage was to provide an independent learning experience in which students worked on a math problem without the teacher’s guidance. Student could still work in groups to discuss and exchange information. The last stage in this activity was presenting the results of independent learning in front of the class. The teacher might invite anyone or ask each group representative to present the results by writing them on the board. Providing an independent learning experience and presenting its results were interrelated activities and might be done more than once. After the students worked on a math exercise independently and followed by the presentation activity, the activities might be repeated for the second time.

The ending activities consisted of an evaluation of learning activities, follow-up activities, and closing activities. The teacher asked students to work on evaluation questions at the end of the learning activities. After that, the teacher did follow-up activities such as giving homework. Then the teacher closed out the lesson. The details of whole activities were written on the lesson plan (RPP) according to the teacher’s findings. The RPP was created according to the rule of PP No.22 of 2016.

3.3 Validation Test and Implementation Test

The design of the algorithmic arithmetic learning model with classical music background was implemented into a lesson plan (RPP) and then executed in the classroom. The RPP was created by considering basic competencies and indicators of achievement. As stated in Permendikbud No. 22 of 2016 on the Standard Process of Primary and Secondary Education, that basic competencies and indicators of achievement are part of the RPP component.

Table 1. Steps of Romantic Arithmetic Learning Model.

| Activities                      | Steps                                      | Details                                                                 |
|--------------------------------|--------------------------------------------|-------------------------------------------------------------------------|
| Beginning                      | Opening and conditioning of learning       | Teacher guides students for praying.                                    |
|                                |                                            | Teacher calls the register.                                             |
|                                |                                            | Teacher asks students to tidy the position of the tables and chairs as well as the students' clothes. |
|                                | Giving learning motivation                 | Teacher increases students' spirit of learning.                         |
|                                | Performing Apperception and                | Teacher guides students to revisit the lesson that has been studied and explain the relationship with the material that will be studied at the moment. |
|                                | Learning Orientation                       |                                                                         |
| Middle                         | Presenting the learning materials          | Teacher presents the material directly.                                 |
|                                |                                            | Teacher and students ask and answer questions to each other related to the learning materials. |
|                                | Giving learning guidance                   | Teacher presents problems based on learning materials.                  |
|                                |                                            | Teacher gives an example of how to solve the problems.                  |
|                                |                                            | Teacher guides students to revisit the related previous materials.      |
|                                |                                            | Teacher and students perform communication on how to solve the problems. |
|                                | Providing an independent learning experience| The teacher provides math exercise for students.                         |
|                                | Presenting results of independent learning | Students are allowed to work in groups.                                 |
|                                |                                            | Students present the results of independent learning in front of the class |
|                                |                                            | Teacher and students discuss the results of independent learning.        |
| Ending                         | Evaluation of learning activities          | Teacher instructs students to work on evaluation questions.              |
|                                |                                            | Teacher assesses the results of the evaluation test and scores them.   |
|                                | Follow-up activities                       | Teacher gives students homework.                                         |
|                                | Closing                                    | Teacher ends the lesson.                                                |
The design of the mathematical algorithmic learning model with classical music background in the form of stages and description of the process and its RPP was tested first by the researchers. The researchers, who are also experts in the field of primary school education, considered its suitability with the curriculum, adjusted the material to the level of students, followed the sequence of learning steps, and considered the suitability of the content including the learning objectives, the implementation, and the evaluation instrument. The researchers also discussed the RPP with the teacher that would implement it and then revised it. After the lesson plan with the mathematical algorithmic learning model with classical music background had been completed, its use was tested by the research subjects. The researchers named the algorithmic arithmetic learning model as the Romantic Arithmetic Model.

3.4 Reflection
The implementation of the romantic arithmetic model ran quite well. The results of the evaluation show that the fifth-grade students in the treatment group had a higher mathematical intelligence than the students in the control group who did not use the romantic arithmetic model. All stages could be implemented by the teacher, and the students could also follow the learning steps without significant obstacles. However, there was a shortcoming occurred in the learning planning that is the instrument of independent learning questions designed by researchers and verified teacher was not proportional in terms of number. At first, students would be asked to work on the independent learning test twice with each section consisted of 5 questions. However, because students spent more time than expected, the test was carried out only once. It was because the researchers estimated that if the test was conducted twice, it would exceed the allocated time.

Overall, the stages of romantic arithmetic model were in accordance with the systematics and attitude of teachers in arithmetic learning by using classical romantic music background. There was no change in the stages of the romantic arithmetic model. Several improvements were made only in the lesson plan and the implementation of learning, namely, considering the problem difficulty, the number of questions, and the ability of students.

4. Conclusion
Romantic Arithmetic learning model is an algorithmic arithmetic model that is accompanied by classical music background, particularly from the romantic era. The stages or of this learning model are beginning activities including opening, learning conditioning, giving learning motivation, and performing apperception and orientation. Then, the middle activities consisting of presenting learning materials, giving learning guidance, providing math exercise, and presenting work results. Finally, the ending activities consisting of evaluation, follow-up, and closing.

In the beginning activities, the teacher performed the opening stage by guiding students for praying, calling the register, and asking students to tidy the position of the tables and chairs as well as the students’ clothes. In the motivation stage, teacher increased students’ spirit of learning. In the stage of apperception and orientation, the teacher asked, reviewed and linked the material that had been studied or obtained by students with the material to be delivered. In the middle stage, the teacher presented learning materials in the form of conceptual delivery and explanation on how to solve the problem. Then the teacher guided the students to solve the problems. The next step was providing exercise without giving guidance on how to solve the problem. Finally, students were given the opportunity to present their work on the whiteboard while the teacher assessed it. The last two activities might be done more than once. The ending activities were indicated by the evaluation and follow-up activities in the form of giving test questions and homework.

The whole stages of the romantic arithmetic learning were accompanied by classical romantic music. There was no alteration to music, either volume level, equalizer and others. This model is a learning model based on direct learning, and applies many exercises.
5. References

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