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Designing of Holistic Mathematic Education Model Based- "System Among" at Low Grade Elementary School

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Abstract. The purpose of this study was to develop a model of Holistic Mathematics Education (HME) among systems based on low-grade primary school students so that students have a solid foundation when entering a higher behavior. This type of research is design research developed by Plomp to have three stages, namely the preliminary research, development or prototyping phase, and assesment Phase. This research resulted in a model Holistic Mathematics Education (HME) -based system is among the primary school students low grade consists of 10 stages, namely 1) Recap through the neighborhood, 2) Discussion groups by exploiting the environment, 3) Demonstration Group, 4) Exercise individuals, 5) mathematical modeling, 6) Demonstration of individuals, 7) Reflections, 8) impressions and messages, and giving meaning, 9) Celebrations and 10) A thorough assessment. Furthermore, this model also produces 7 important components that should be developed teacher, namely 1) constructivism, 2) the nature of nature, 3) independence, 4) parable, 5) inquiry, 6) cooperation, and 7) strengthening. This model will produce a model in the form of books, student books and teacher's guide book as a support system that can help users in its application.

1. Introduction

This study will develop a model Holistic Mathematics Education (HME) among systems based on low-grade primary school students, because of the need to develop early mathematical concepts in class early so that students have a solid mathematical foundation when entering a higher level [1]. HME model development among systems based on low-grade primary school students is one way that is effective and can improve students' mathematical ability, motivation to learn, and foster the values of character in students. Some research says that interest and motivation, as well as character development is very influential on student learning outcomes [2-5]. Furthermore, Lovat, et al [6]; Newmann and Associates [7]; Bryk et al [8]; Bryk and Schneider [9]; Benninga et al [4]; Berkowitz et al [10], also explains that values education can provide an opportunity to deepen the relationship of



teachers and students, making learning more effective, and can create the atmosphere of a good learning environment. Watson [5] also stated that given character education at the primary level provides a long-term positive influence in the lives of students. For that, the development of models of mathematics learning in a holistic manner, which is based system is among the primary school students a low grade, because through this concept of learning not only develop cognitive aspects, but also the potential emotional, social, psychomotor, aesthetic, spiritual and very useful for students for their lives later, as described by Watson [5].

This model rests on the concept of holistic education which is a concept of education that develops students' potential in a harmonious whole (integrated and balanced), include the potential for intellectual, emotional, psychomotor, social, aesthetic, and spiritual. Through the concept of holistic education, the learning of mathematics can help students develop the full potential of individuals in a learning environment that is fun, exciting, democratic and humanist through experience in interacting with the environment. This is confirmed by Bernold et al [11] and Lovat, et al [6], that the holistic teaching can help students who have the diversity to be successful, and to make learning more effective.

In the model HME-based system is among the students a low grade will be developed a concept that can make the learning of mathematics more meaningful and interesting, as well as customized developmentally elementary students a low grade because of the model HME-based system among students will be given experience in interacting with its environment through mathematics, so it becomes more realistic mathematics for students. With a system based among teachers as tutors to educate children on the basis of independence and freedom so that students can grow as nature. Firdiansah and Agus [12] also explained that the system among educates students how to: 1) provide freedom to the students, 2) keep children from learning stress and force, and 3) embed the nature of freedom is very important to make the child's personal bolder students in learning. Among system also means guiding the child with love and put the interests of children, so that children can develop in accordance with his nature. With a pleasant learning stage is expected to develop the full potential of students, whether intellectual, emotional, spiritual, psychomotor, social and aesthetic, so as to foster the values of character for students and improve understanding of mathematical concepts, as well as student motivation.

2. Literature Review

2.1 Concept of Holistic Education

Holistic Education is the concept of education that develops the potential of the child's physical, emotional, social, spiritual aesthetic, and intellectual [13,14]. Holistic paradigm can be defined as a holistic perspective in perceiving reality. Minded holistic view overall aspect means more than the parts, patterned systemic, integrated, complex, dynamic, non-mechanical, and non-linear. Thus a holistic is a point of view which states that overall as a whole is more important than its parts, while in education, holistic is an educational philosophy that comes from thinking that it is basically an individual can find the identity, purpose, meaning of life through his relationship with society, spiritual values and the natural environment. Based on the concept of holistic education, it is necessary to develop a holistic concept of mathematics education for learning mathematics not only develop cognitive aspects, but also the social, emotional, psychomotor, aesthetic, and spiritual. With a holistic mathematics education is expected to make learning math become a fun, exciting, and humanist through experience gained from the surrounding environment, and is expected to

foster the values of character for students that are very useful for the rest of their lives. This holistic concept of mathematics education grounded in Gestalt theory which looks at things as a whole. On the basis of Gestalt theory, then the students will easily formulated the idea with its own language, can easily think about his experience so be creative and imaginative, and students have the opportunity to try out new ideas (Tytler in [15])

2.2 System Among

Systems Among is how education is used in the Taman Siswa education system requires teachers for the purpose of considering and importance that nature-iradatnya children without forgetting all the circumstances surrounding it. The cornerstone of the system lies in the motto among *Tutwuri Handayani* which means providing freedom, opportunity, attention and guidance that allows the child or the young generation at the initiative themselves and on their own experience to develop along the lines of the personal nature of each [16]. Tutors only an impact from the rear when there are students out of education. If it is associated with the learning of mathematics then by the application of methods among students will be guided and given the freedom to solve the problems they encounter in math as long as it does not get out of math concepts. With this kind of learning will enhance students' understanding in mathematics for students directly experience the learning process. As described by [17] that the provision of direct experience will improve and facilitate students to the learning content. This concept is grounded in humanistic theories because, according to this theory, the purpose of learning to humanize humans. Humanistic theories including the Constructivists, because this theory involves cognitive and affective behaviors [18].

2.3 The concept of Model Holistic Mathematics Education (HME) Among System Based on Low Grade Elementary School Students

Model HME among systems based education is a concept that is most appropriate to the lower grade elementary school students. Basically the age range of low-grade primary school students still see everything as a whole (holistic) so that learning is still dependent on concrete objects and experiences that happened. By looking at the nature of education low grade primary school students are then mathematics must be taught in concrete terms to students so that students are able to interpret the purpose of learning mathematics. For that we need a model that is able to develop the full potential of students, and foster the values of character for students so that learning mathematics becomes meaningful for students. One model that suits karakteristik low grade primary school students is a model-based HME Among Systems.

HME models based on this system will be awarded among the corresponding mathematical problems with the potential of students, so that the problem is given not only able to develop the cognitive aspects but also the spiritual, emotional, social, aesthetic, and psychomotor. In solving the problems of a given student is given the freedom to solve problems. From the problems students are able to work closely with members of the group and mutual appreciation and respect his fellow group members. In this case the student is guided to be honest, tolerant, disciplined, democratic, creative, communicative, curious, as well as learning to interpret their lives later on. With the character is formed, it will be able to develop the full potential of students, whether intellectual, social, emotional, psychomotor, aesthetic, and spiritual. Furthermore, with a system based among the learning of mathematics will be more meaningful and attractive to students because the foundation of the system among lies in the motto *Tutwuri Handayani* which means providing freedom, opportunity, attention and guidance that allows the child or the young generation on the initiative himself and on his own experiences to developing along the lines of the personal nature of each. Teachers act as

guardian. Based on these explanations, then the model HME among systems based on low-grade primary school students is grounded in behavioristic theory, cognitive, and humanistic. In behavioristic learning theory, to learn whether or not a person depends on factors conditionally granted by the environment. For it was on this model *apersepsi* through the neighborhood is the first phase of which should be applied in teaching teachers. Furthermore, in the cognitive learning theory more emphasis on learning is a process that occurs in the human mind. Learning is a process of one's efforts to acquire a new behavior changes as a whole as a result of his own experience in interaction with the environment [19]. Humanistic theory also strongly supports this model, because this model emphasizes the goal is not only cognitive aspects but also create human character. In humanistic theories explained that humans are basically different from each other, so that they can be independent and choose and organize their lives as among the system concept underlying this model.

3. Methodology

Development Sistem based HME models Among Low Grade Elementary School uses a design development Plomp [20], which has three stages or phases, namely: 1) Preliminary Research; 2) Development or Prototyping Phase; and 3) Assessment Phase.

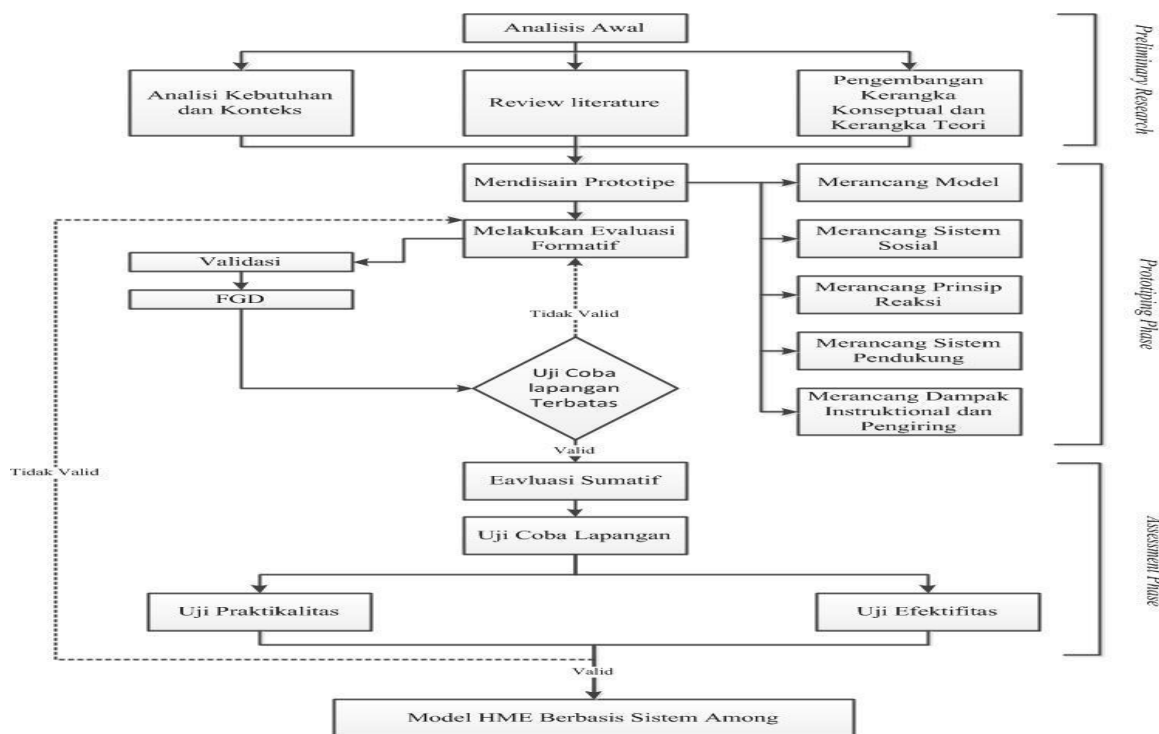


Figure 1. Procedure Development Model-based HME Among Systems (Modification of Plomp [20])

In this study, researchers only discuss until the stage or Prototyping Development Phase, the prototype design stage. Here are the steps being taken to or Prototyping Development Phase.

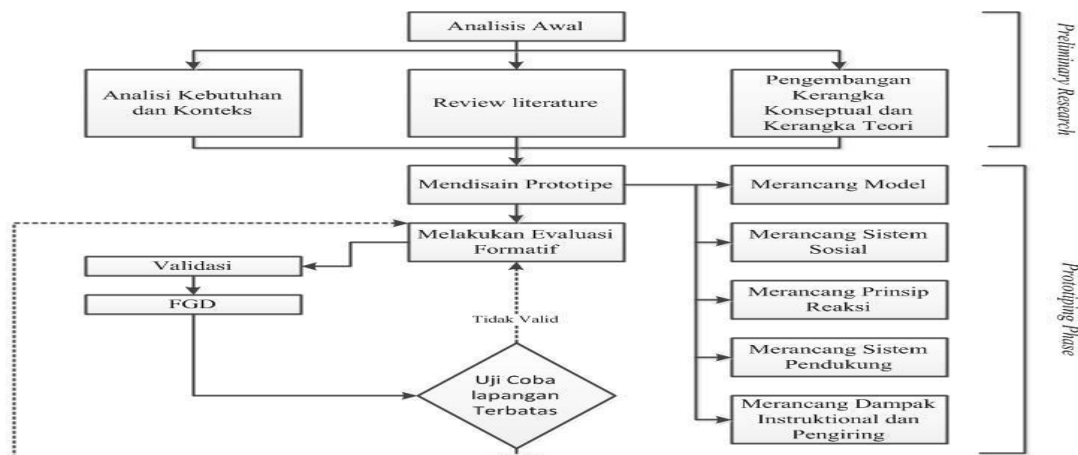


Figure 2. Procedure Development Model-based HME System Prototyping Among until stage Phase (Modification of Plomp [20])

4. Results and Discussion

Based on research carried out at the preliminary stages of research and prototyping phase which is the first and second phases of design development Plomp [20], then the results are as follows:

1) Preliminary research

a. Analysis of the needs and context

At this stage of the initial investigation the need for HME models based on the SD Class System Among Low. From preliminary studies have been conducted in several primary schools in the District of Pantai Cermin data showed that generally the teachers still use the conventional model of learning in which students are not actively involved in the learning process. This affects the motivation and understanding of math concepts students because they are used to receive and memorize the course material. Furthermore, in the models used have not seen the values of the desired character, such as curiosity, self-confidence, hard work, creative, democratic, and cooperation. This is because students do not participate actively in learning so that students generally only receive what is described by the teacher. In the model used by students are not taught to solve mathematical problems in groups, so the social potential students are less well developed. Furthermore, based on the objectives and course content lower grade elementary mathematics shows that the material presented in abstract still so difficult to comprehend grade students is low given the low grade primary school age are in the concrete operational stage of development.

b. Literature review

Based on the analysis of theory and concepts associated with the model-based HME among systems, this model rests on behavioristic theory, cognitive, and humanistic. This model is also based on the concept of holistic education where the concept was developed potential of children as a whole, both the potential for intellectual, emotional, social, psychomotor, aesthetic, and spiritual. This is in accordance with the characteristics of low-grade elementary school students. Furthermore, the characteristics of elementary school students a low grade, the concept among is one concept that is very suitable to be applied for this concept lies in the motto Tutwuri Handayani which means providing freedom, opportunity, attention and

guidance that allows the child or the young generation on the initiative himself and on his own experiences to develop along the lines of the personal nature of each.

c. Development of the theoretical framework

Based on a needs analysis and literature review, it is developing the theories that support the model HME-based systems among, including the theory of holistic education system among, learning theories underlying the models of HME-based systems among, and other theories that are relevant to HME models among systems based on low-grade elementary school students.

2) Prototyping phase

In this study, carried out the prototype stage to the stage of the initial product revision. From the results of the design was done until the prototyping phase (development phase Plomp), there are five aspects which are designed among other things, 1) modeling, 2) designing a social system, 3) designing principles of reaction, 4) design a support system, 5) designing impact instructional and accompanist. Based on the initial draft of which has been designed, there are several aspects that need to be fixed in accordance with the suggestion of several validators. Here are some suggestions 7 validator on a model that has been designed (3 votes mathematics education expert, 1 person linguist, one person early childhood education experts, and the first person of character education expert).

Table 1. Suggestions to the Draft Preliminary Validator HME Model Based System on Elementary Students Grades Among Low

No.	Preliminary Draft	Recommendations of Validator
1	Draft Model	a) Each syntax is designed to be explained clearly why it is very important stages in the developed model. Present theories relevant to a syntax that is designed to support the model b) Each supporting component model that is designed to be supported with relevant theory that these components really can support the model of
2	social systems	describe a concrete example, so that the social system which is expected to be seen clearly
3	principles reaction	Describe concrete examples, so that the reaction principle expected in the model seen
4	support system	Describe clearly support system that can support this model and adapt to the characteristics of low-grade elementary school students.
5	cover design	Cover customized products produced with the characteristics of low-grade elementary school students
6	language used	Use simpler language so easily understood by a low-grade elementary school students.

Based on the results of the initial validation, then obtained some very useful overview for the repair of the product. From the results of these improvements, obtained 10 syntax supports this model, including: 1) Recap through the neighborhood, 2) Discussions with utilizing the environment, 3) Demonstration group, 4) Exercise individuals, 5) Mathematical modeling, 6) Demonstration of individuals, 7) Reflections, 8) impression, and messages, and giving meaning, 9) Celebrations and 10) A thorough assessment. Furthermore, as a supporter of the model was developed seven components that need to be applied to teachers so that these models can be done well, including: 1) Constructivism, 2) The nature of nature, 3) Liberation, 4) Parable, 5) Inquiry, 6) Cooperation, and 7) Strengthening.

Based on these components seventh, early learning teachers must be able to construct the student's knowledge of prior knowledge that has been held. This is very important because it is based on the theory described by Piaget and Vygotsky, increased knowledge of the construction of learning and learners, not something that is fed from the others. So with that, the need for teachers to construct knowledge so that students more familiar with the material being studied. Furthermore, the nature of nature is a second component to be developed teacher is one aspect among systems that support the concept introduced by Ki Hajar Dewantara [21]. According Dewantara, that the essence of man as a creature of God is one with the nature of Nature. Through this component, the learning process adapted to developmentally lower grade students and teachers guide and direct students with a sense of love, compassion and affection in accordance with the concept among systems. On the concept of independence, the teacher gives freedom to students to complete math problems given in accordance with the material being studied. Teachers guide and direct students to avoid misconceptions. According Dewantara in Pranarka [22], independence implies that life should be filled with happiness and peace. This is consistent with the concept of the model-based HME among systems. In the parable of components, the teacher must be able to illustrate the problems which are abstract to the concrete so easily understood by a low-grade students, for low-grade student is still at the pre-operational stage concrete. Benefits parable method are: 1) Contains elements interesting and fun, 2) Clarify meaning by associating an abstract to something concrete, 3) Encourage a positive attitude, and 4) Leaving a negative attitude [23]. Next on the component inquiry, the teacher invites students to find their own solutions to problems are given. In this component of the teacher can invite students to undertake the following activities: (1) observation, (2) ask, (3) submitting allegations (hypothesis), (4) the collection of data, and (5) inference. By that stage, it will enhance the students' understanding of the material provided for students are directly involved in learning as described by De Potter [17]. Further cooperation component also needs to be developed by teachers to support the model HME among systems based on low-grade primary school students, because of good cooperation skills, then it will also be able to develop the potential of the social, emotional, psychomotor, aesthetic, and spiritual. Strengthening which is the last component in the model is also important to be applied teacher. According to the theory Skinner (in Ruseffendi [24]), reward and reinforcement has a very important role in learning. Therefore the importance of strengthening in mathematics learning for learning mathematics is no longer a scary subject for students, but a lesson fun.

Based on the syntax and components of the model that has been described, it will further strengthen the HME models among systems based on low-grade primary school students, because the syntax and the components designed in accordance with the concept of holistic education and among system concept introduced by Ki Hajar Dewantara. Syntax and these components are also designed according to the characteristics of low-grade elementary school

students, so this model is really suitable to be applied for low-grade elementary school students.

5. Conclusion

Based on the results of the initial validation of the model has been designed, then the resulting 10 stages HME models support among systems based on low-grade primary school students, namely: 1) Recap through the neighborhood, 2) Discussions with utilizing the environment, 3) Demonstration group, 4) Exercise individuals, 5) mathematical modeling, 6) Demonstration of individuals, 7) Reflections, 8) impression, and messages, and giving meaning, 9) Celebrations and 10) A thorough assessment. Further models of HME-based system is among the primary school students a low grade also resulted in seven key components that should be developed teacher, namely: 1) Constructivism, 2) The nature of nature, 3) Liberation, 4) Parable, 5) Inquiry, 6) Cooperation, and 7) Reinforcement.

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