

Development of Mathematical Learning Based Contextual Model in South Minahasa Regency

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Abstract

The objectives of this research is to develop a mathematical model of learning based on constructivist learning approach theory, Contextual Teaching and Learning, and Realistic Mathematics Education (RME). Learning model is a plan or a design pattern used for each face-to-face learning in the classroom to establish a learning device. Learning model consists of: (a) syntax, (b) social system, (c) the principles of reaction, (d) support systems, and (e) the impact of accompaniment. The research method used in this research is development research. The development model used is the elaboration model. The development procedure refers to the opinion of Dick and Carey. They are: (1) expert review, (2) Individual evaluation, (3) evaluation of the group, and (4) the trial court. Results of data analysis got : (1) self-assessment: (a) validation of content-based mathematical learning model constructivism, Contextual, and Realistic (KCR), the average assessment validator (3 lecturers) was 3.85 (quite valid); (b) construct validation KCR mathematical learning model, the average assessment validator (3 lecturers) was 3.67 (quite valid), (c) content validation KCR mathematical learning model, the average assessment validator (5 math teachers) is 3, 91 (quite valid), (d) validation KCR construct mathematical learning model, the average assessment validator (5 mathematics teacher) was 3.89 (quite valid), (2) Ratings In Group: (a) the contents of the model validation study of mathematics KCR, the average assessment validator (3 teachers and 5 mathematics teacher) was 4.0 (valid), (b) construct validation KCR mathematical learning model, the average assessment validator (3 teachers and 5 math teacher) is 3.85 (quite valid). Based on the criteria, developed learning model is valid.

Keywords: Development, modeling, mathematics learning, based contextual

1. Introduction

Effort to create a good learning process, will require the knowledge and skills of teachers regarding the approach / model / learning methods to suit the characteristics of the subject matter. One of the problems facing by the math teacher today is almost all of them are math teacher in junior high school who are university graduates under the year 2000, so that the theoretical concept of learning approaches and new models or methods developed from existing theories have not previously applied in the classroom and be understood.

Contextual learning aims to provide students with knowledge that can be flexibly applied (transferred) from one problem to another and from one context to another. It is important in contextual learning in which students really learn from the beginning of knowledge, experiencing, and the context of their daily lives are linked to the concept of subjects studied in class, and then it is possible to implement in their daily lives. In other words CTL approach has the principle of "bring them from their world to our world, then ; take them from our world back to their world" so that students really get to know not only the value but also they appreciate it and the most important thing that they should be able to actualize / practice it. (Rustana, 2002).

Approach Learning in Contextual Teaching and Learning , C-STARS (2002) suggested (a) Contextual Teaching and Learning (CTL), is a conception helps teachers connect content learning materials with real situations and motivates students to make connections between knowledge and its application to the their lives as family members, citizens, and labor; (b) Contextual learning is learning that takes place in a close relationship with actual experience, (c) learning only occurs when students process new information or knowledge in such a way that they seem reasonable and accordance with the frame of mind that is owned (memories, experiences, and responses). Contextual understanding does not mean physically concrete and visible, but also includes the child's mind could imagine. So the real world is still far also contain contextual meanings with prior knowledge of students. There are 7 principles / CTL pillars namely: (a) Inquiry; (b) question, (c) Constructivism; (d) Community Learning; (e) Reflection, (f) Modeling, and (g) Authentic Assessment

Meanwhile, in the view of constructivism learning is characterized as follows: (a) Students are actively involved in their learning. Students learn the material significantly by working and thinking. So students learn how to learn it; (b) New information must be linked with other information so that it blends with the scheme so that students have an understanding of the complex information (materials) occurred, (c) learning orientation is investigation and discovery that is basically problem solving.

The implications of the above characteristic , learning should be sought as follows: (a) Provide a learning

experience by linking existing knowledge so the students can learn through the process of knowledge creation; (b) Provide a variety of alternative learning experience, not all tasks are same. For example, the problem can be solved in many ways; (c) Integrating learning with real and relevant situations involving concrete experience; (d) Integrate learning thus enabling the transmission of social interaction and cooperation with one another or with the environment. For example, interaction and cooperation between teachers and students, and students with students; (e) take advantage of a variety of media including oral and written communication so that learning becomes more effective, and (f) Engage students emotionally and socially so that the subject matter and the student would be interesting learning. The impact of constructivism in learning will be seen in: (a) subject matter, (b) students, and (c) teacher.

Further development of mathematics learning with realistic approach is one of the efforts to improve students' ability to understand mathematics. Suherman (2003) suggests there are five key principles in the 'curriculum' realistic mathematics: (a) Dominated by the problems in context, serving two terms as a source and as a context of applied mathematics; (b) Attention is given to the development of models, situations, schemes, and symbols; (c) Contribution of the students, so that students can make a constructive and productive learning, students produce their own meaning and construct their own (which may be algorithms and rules), and all of that can bring them from the informal to the formal mathematics level ; (d) Interactive as characteristic of the process of learning mathematics, and (e) "interwinning" (make the braid) between inter-topic or subject. The fifth principle of learning (and teaching) according to the philosophy of 'realistic' above is what animates the every activity of learning mathematics.

Development Principles of Learning Mathematics Model

Learning model is a plan or a design pattern used for each face-to-face learning in the classroom to establish a learning device. The learning model consists of: (a) syntax, (b) social system, (c) the principles of reaction, (d) support systems, and (e) the impact of accompaniment.

Learning math by C-STAR (2002) is basically the utilization and environmental realities are understood to accelerate students learning mathematics so they are able to achieve the goal of mathematics education is better than in the past, and it is also necessary, "to make students active ". The effort can be realized by means of: (1) optimizing the participation of elements of the teaching learning process, and (2) optimizing the entire student participation. One possibility is to provide an opportunity for students to be able to find or construct their own knowledge to be mastered.

Tambelu (2005) suggested mathematics learning should proceed from contextual problems, make the students active, the teacher acts as a facilitator, students freely spend his ideas, students share their ideas, teachers help students compare ideas and make decisions about which ideas better for them.

Maesuri (2001) suggest that Principles of Development Learning math Model is as follows: (a) the everyday world should support and motivate student learning, (b) mathematical models of the real world to help students achieve a different direction in abstraction; (c) students are guided to discover mathematics. Students are not only memorizing formulas and applying algorithms but also they are guided to discover mathematics; (d) interactions are important in learning mathematics. Interaction between students, students and teachers, and teachers with teachers is a fundamental part of learning mathematics; (e) Provide sufficient space strategies used by students. Students are trained to listen and appreciate the strategy made by other students; (f) The role and influence of the teacher as a facilitator of learning. Students build math for himself, and optimize other students; (g) Students are expected not to spread too rapidly into formal and abstract mathematics. Students are given enough opportunities to be creative and explore mathematics in a less formal or according to their respective strategies, and (h) contextual examples as the application of mathematical concepts to facilitate students in understanding mathematical concepts in an integrated manner.

2. Method

Methods research is a research & development (Development research). Model of development that will be used in this study is the elaboration model, where the model is the elaboration of a model for managing prescriptions, sintezising, and summarizes the content of learning (Reigeluth, 1987).

The procedures to be used in the development of learning Mathematics model suggest by Dick and Carey (1990), which consists of four steps: (a) expert review, (b) evaluation of individuals, (c) evaluation of the group, and (d) field test. Operations research follows the development-stage process with the following steps: (a) Study (Survey) needs (needs assessment) learning model used junior high school math teachers in the district of South Minahasa North Sulawesi; (b) Perform a literature review theories of teaching and learning, approaches, models of learning mathematics; (c) Designing a draft model of learning in the context of student life in South Minahasa Regency, (d) evaluation / validation draft learning model with 3 mathematics lecturer at Faculty UNIMA according to independent expertise; (e) Evaluation / validation of draft learning model with 15 independent senior math teacher who is in junior high school in South Minahasa regency; (f) Revision of the first draft of the learning

model validation results; (g) Evaluation / validation 3 draft learning model with mathematics lecturer at the faculty of UNIMA range of expertise in the group; (h) Evaluation / validation of draft learning model with 1 group of senior math teacher every group of 10 people; (i) Revision II draft learning model validation results, and (j) Finalization of draft learning model is developed.

The basic framework of mathematical learning model KCR (Realistic Contextual Constructivism),

2.1 Syntax

Tabel 1. KCR mathematical learning model consists of seven main stages

Stages	Teacher Activity	Student Activity
Phase I Introduction	Teacher delivered basic competencies, indicators and learning outcomes, learning objectives, subject matter, and motivate students to become actively engaged in learning activities.	Pay attention and prepare the necessary logistics in the learning process
Phase II Inquiry	<ul style="list-style-type: none"> - Teacher provide opportunities for students to make observations or learning individually the subject matter - Discussing together with friends on the left or right hand the problem they found. - Teacher guide student or some students on the problem they found. 	<ul style="list-style-type: none"> - Observing (reviewing the subject matter) - Analyzing the subject matter - Disclose any questions or problem
Phase III Organizing the student into group studied	<ul style="list-style-type: none"> - Teacher divide students into group of 4-5 heterogeneously - Assisting the group study to make transition efficiently and cooperation. - Distribute worksheets and ask all group to discuss the problem in Students Work Sheet. 	Orderly the students divided into group and discuss the material in Students Work Sheet
Phase IV Guided the work and learning group	The teacher guide the group which have the problem in doing the Students Work Sheet.	Group work questions on problem experienced by the group and report the results of the group work
Phase V Analyze and evaluate the process of resolving the problem in the Students Work Sheet	Teacher ask each group to reflect on or evaluate the result of the group work	Each group make reflexion on their work
Phase VI Evaluation	<ul style="list-style-type: none"> - The teacher asks several group to presented their work on the boards, another group gave response or feedback. - Teacher and all the group together discuss the questions in Students Work Sheet and find out the solution. - Teacher ask all the students to do the task individually (authentic assessment) 	<ul style="list-style-type: none"> - Several groups present the result of the work and other groups respond to the work that exposes the group. - All groups with teachers discuss and plenary the solutions of Students Work Sheet. - All students are doing the task
Phase VII Reflexion	The teacher asks all the students to make summary of the material that has been studied.	All of the students make summary

2.2 Social System

Learning environment and the management system oriented mathematical model of contextual learning is characterized by openness, conducive, democratic process, effective, creative, fun. Contextual math-oriented learning model is based on the philosophy of social constructivism especially social constructivism according to Vygotsky, Realistic Mathematics Education (RME), and Contextual Teaching and Learning (CTL). This learning model emphasizes the construction of knowledge is done individually and co-operatively (group). Cooperative learning teaches students teamwork and collaboration skills. This skill must be owned by the community in which adults work, organizational interdependence with different culture conditions. In addition, it is also very useful in order to help students develop skills in collaboration, critical thinking and help the weak. Although teachers and students perform different stages of learning in a structured and predictable, norm around the subject open inquiry and free expression. Learning environment emphasizes the central role in the learning

process.

2.3 Reaction Principle

During the learning process, teachers should act as facilitators and mentors, which provides assistance to students / groups who have difficulty in solving problems. Some important things to be done in the function of teachers as facilitators and mentors are students mindset examine differences related to the process of resolving questions / issues that do and coaching is done on the troubled group by asking inverse (the Leading Question, Guiding Question, or Clarifying Question).

2.4 Support System

Learning model is supported by: (1) math teachers trained, (2) a collection of mathematics themes , (3) theories of learning and teaching and contextual math problems, (4) lesson plans, (5) Students Work Sheet that contains contextual math problems, and (6) achievement learning test instrument.

2.5 Impact of Instructional and Accompaniment

Learning model developed in this study have instructional for students. Instructional impact of this form of mathematical competence among other achievements include:

- (1) Understand the concepts of mathematics as well as its association with one another
- (2) Understand the usefulness of mathematical concepts
- (3) Select and make the process of problem solving strategies / issues
- (4) Identify and look back at the reasons why solutions and procedures to the right solution.

3. Results and Discussion

Data validation results are analyzed by considering seriously inputs each validator. The analysis process begins by calculating the average value (for the entire validator) from the average value given by the validator for each document to be validated. The average value obtained will be compared with the following validity interval level. Rate level will be getting compared with the level of validity hose as follow.

Tabel 2. Validity hose used in this study is

Hose	Level of validity
$NV \leq 1 < 2$	Not Valid
$NV \leq 2 < 3$	Less Valid
$NV \leq 3 < 4$	Enough Valid
$NV \leq 4 < 5$	Valid
$NV = 5$	Very Valid

Note: NV = Validity Value

The criteria to determine validity of a document that is used is when the validity of the level achieved at least a level quite valid. Once the draft is made learning model developed learning model called KCR (Realistic Contextual Constructivism), an analysis involving experts and professors of mathematics as a senior mathematics teacher at the junior high in South Minahasa Regency. The outcome measure was the content validity KCR with mathematical learning model that assessed aspects are: (a) Supporting Theory; (b) Syntax; (c) Social Systems; (d) The principle of reaction, (e) support systems; (f) Impact of Instructional and Impact Accompaniment, and (g) Implementation of Learning and construct validity KCR Mathematics learning model with aspects assessed were: (a) Components of Learning Model, (b) Supporting Theory; (c) Syntax; (d) Social Systems; (e) Reaction principle; (f) Support systems; (g) Impact and Impact Instructional Accompaniment, and (h) Implementation of Learning.

Analysis result as following:

Tabel 3. Recapitulation of research result validity learning model content KCR Mathematic by specialist (Mathematic Lecturer)

Number.	Aspects Assessed	Assessment Results Validator				
		JR	MS	IK	Average	Information
1	Supporting Theory	4,5	3,5	3,5	3,8	Sufficiently Valid
2	Syntax	4	3,6	4,6	4,1	Valid
3	Social System	4,2	3,8	4,2	4,1	Valid
4	Reaction Principle	4	4,4	4,2	4,2	Valid
5	Support System	4,2	3,8	4,4	4,1	Valid
6	Instructional Impact and Accompaniment Impact	3,8	4	3,8	3,9	Sufficiently Valid
Average					4,03	Valid

Table 4. Recapitulation of research result validity learning model content KCR Mathematic by Mathematic Teacher

Number.	Aspects Assessed	Assessment Results Validator						Information
		1	2	3	4	5	Average	
1	Supporting Theory	3,8	4,0	4,4	3,8	4	4	Valid
2	Syntax	4,4	4,4	4	4	4,2	4,2	Valid
3	Social System	4	3,8	4	3,8	4	3,9	Sufficiently Valid
4	Reaction Principle	4	4	4,4	4,2	4,4	4,2	Valid
5	Support System	4,2	4	4	3,8	4	4	Valid
6	Instructional Impact and Accompaniment Impact	3,8	3,8	3,8	3,8	4	3,8	Sufficiently Valid
Average							4,03	Valid

Table 5. Recapitulation of research result validity learning model construct KCR Mathematic by specialist (Mathematic Lecturer)

Number.	Aspects Assessed	Assessment Results Validator					Information
		JR	MS	IK	Average		
1	Learning Model Components	3,8	4,4	4	4,1	Valid	
2	Supporting Theory	3,5	4,5	4,5	4,2	Valid	
3	Syntax	3,8	4	4	3,9	Sufficiently Valid	
4	Social System	4	4,2	4	4,1	Valid	
5	Reaction Principle	4	4	4	4	Valid	
6	Support System	3,8	4	4,4	4,1	Valid	
7	Instructional Impact and Accompaniment Impact	3,8	4,2	4	4	Valid	
Average					4,06	Valid	

Table 6. Recapitulation of research result validity learning model construct KCR Mathematic by Mathematic Teacher

Number.	Aspects Assessed	Assessment Results Validator					Average	Information
		1	2	3	4	5		
1	Learning Model Components	4,2	4	3,8	4,4	4,4	4,2	Valid
2	Supporting Theory	3,5	4	4	4,5	4	4	Valid
3	Syntax	4,0	3,8	4,4	3,8	4	4	Valid
4	Social System	4	4,4	4,4	4	4,2	4,2	Valid
5	Reaction Principle	3,8	3,8	4	4	4	3,9	Sufficiently Valid
6	Support System	4	4,4	4,2	4	4,4	4,2	Valid
7	Instructional Impact and Accompaniment Impact	4	4,2	3,8	4	4	4	Valid
Average						4,07	Valid	

Discussion

Based on data analysis and expert review from individual math teachers, mathematic learning model validity KCR meet both content validity and construct validity, content validity which tested by (a) expert (lecturer of mathematics), the results of the 6 aspects assessed only the Supporting Theory aspect has average value of 3.8 while the other 5 aspects that the average value of ≥ 4 and overall average value of other sixth is 4.03 and can be considered valid, (b) the result of a math teacher 6 aspects assessed only aspect of the social system average has the average value of 3.9 while the other 5 aspects that the average value of ≥ 4 and the overall average value of other sixth is 4.03 and can be considered valid. For construct validity by (a) expert (lecturer of Mathematics) the results of the 6 aspects assessed value syntax aspect only an average of 3.9 while the other 5 aspects average value ≥ 4 and Overall average value of the sixth aspect is 4, 06 and can be considered valid, (b) the result of a math teacher 6 aspects assessed only aspect of the reaction principle value of an average of 3.9 while the other 5 aspects that the average value of ≥ 4 and the overall average value of the sixth aspect is 4.07 and can be considered valid.

5. Conclusion

Based on findings by considering the limitations of the study, concluded as follows:

1. Learning model which developed that KCR mathematical learning model based contextual content validity tests were conducted by lecturer of mathematics and mathematics teacher declared the result valid.
2. Learning model is developed that models a contextual-based learning of mathematics KCR construct validity tests were conducted by lecturer of mathematics and mathematics teacher declared the result valid.
3. Learning model is developed that is based KCR mathematical model of contextual learning can be used as a model of learning mathematics in school.

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