

Constructivism-Based Think Create Apply as a Mathematics Learning Model

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Abstract—The purpose of this study is to validate the development of constructivism-based Think Create Apply Mathematics learning model for Class X Islamic School. The product of this development is a constructivism-based Think Create Apply (TCA) mathematical model that is documented in the form of a learning model, Teacher Work Guidelines, Student Learning Guidelines. This model relates to trigonometric material constructivism-based. It is not demanded to gain mathematical abilities, critical attitudes, creativity, and understanding of concept. This type of research is development research. This study uses Plomp model which consists of three phases, namely preliminary research, prototyping phase, and assessment phase. In the preliminary research phase needs analysis, student analysis, curriculum analysis, concept analysis, and analysis of existing models. In the prototype phase, mathematical model of constructivism was based on mathematical material, then formative evaluation was carried out to determine the validity of the model. The results showed that the constructivism-based TCA model was developed that was valid and could be used or practiced in the classroom.

Keywords— *validity, constructivism-based Think Create Apply, problem solving*

I. INTRODUCTION

The Constructivism Approach understands that the essence of learning is human activity for building or creating knowledge by trying understanding knowledge according to his experience. Knowledge itself is imaginary and flexible. Therefore, what humans get is always changeable and incomplete. Human understanding will be deeper and deeper strong if tested with new experiences. This constructivism emphasizes more development of concepts and deeper understanding. According to constructivism, if someone does not construct knowledge active, even though he is old, the knowledge doesn't develop [1].

Learning according to Constructivism theory is to build knowledge gradually, then the results are expanded through limited and sudden context. Knowledge is not a set of facts, concepts, or rules that are ready for taken or remembered. Humans must construct that knowledge and interpret meaning through real experience. that means students will quickly have knowledge if the knowledge is constructed or built on the reality in the community[1]. All human development and behavior is always a process of conformity between behavior and social construction (process of appropriation by behavior). Appropriation means the suitability of behavior with social constructs found in people's lives [12].

Based on interviews with several math teachers in several regions, teachers have learning problems that are almost the same, namely the ability to understand concepts and mathematical problem-solving abilities of students is still not satisfactory. A good teacher will give students the opportunity to think creatively and deeply for their own projects [8]. The teacher tries to use several learning models but his students are still not able to be independent and construct their own knowledge and require a long time while the material to be discussed is still a lot, finally the teacher returns to the conventional way of teacher-centered namely the teacher explains the concept with formulas and examples of the past students are given training. In addition, problems also arise from the models used by the teacher have not been effective to make students' mathematical problem solving abilities increase. The teacher complains that the model applied requires time and long preparation and requires a long preparation. The questions discussed when using the learning model are routine questions that students are able to discuss quickly but have not been able to make students think creatively, for example Think Pair Share (TPS) learning models and Think Talk Write (TTW) models. From the analysis of the constructivism approach, there are also a number of advantages among students that are expected to be able to build a new understanding of the understanding previously possessed.

Based on some of the problems that have been stated above, therefore the author provides a solution by developing a quality learning model. The quality of the learning model in development research is determined by several criteria, namely validity, validity, practicality, and effectiveness.. Therefore it is necessary to make a learning model namely Mathematics Learning Model Think Create and Apply Based Constructivism or simpler according to the needs of students. This model is designed to develop or refine previous learning models such as Think Pair Share (TPS) and Think Talk Write (TTW) described earlier. This model is a constructivism-based cooperative and collaborative learning that gives students the opportunity to think creatively in solving mathematical problems in accordance with their respective experiences and abilities and then given the opportunity to apply the new ideas they get to the problems given by the previous teacher. This model places emphasis on students' creativity in solving problems together (collaboratively). This learning model guides students to have personal and group responsibilities [3].

There are three stages in this learning model, namely Think, Create and Apply. At the think stage, the teacher gives questions or problems to students. The teacher gives a few minutes to think about the answer so that students are

accustomed to thinking before issuing ideas from their personal experiences. Students think of looking for answers independently Step create, after thinking students are asked to be creative to bring out ideas from themselves and then discuss with their group friends, the teacher gives freedom to students to construct knowledge, give and receive the opinions of others. Stage apply, after discussing the results of his thoughts and generating new ideas then the idea is applied to the problems given by the teacher. The reason why learning model is so needed by students is that some teachers are also supported by a need's analysis questionnaire given to several teachers because of the internal needs of Islamic namely the existence of learning model with 3 supporting product books: Rational Model Book, Teacher Work Manual and Student Learning Manual or Student Worksheet so that it will be easier to understand textbooks. Therefore, learning model, which is produced through research and development (design research), has three things: (i) benefits, (ii) scope, and (iii) depth, can be accounted for. Research on development in mathematics learning at Senior High Islamic Jambi level is a relatively new phenomenon, including research on the development of Mathematical Learning Models Think Create and Apply Constructivism-based, even though the problem in mathematics education cannot be solved only by experimental research on learning strategies or methods. Therefore, it is felt the importance of conducting development research with the title "How to Validity Constructivism -Based Think Create Apply (TCA) as Mathematics Learning Model ". The purpose of the study was to determine the validity of the development of Mathematics Learning Model Think Create and Apply based on Constructivism. The product of this development is the validity of a Think Create and Apply Mathematics Learning Model which is documented in book form. This book contains aspects related to Think Create and Apply Mathematics Learning Models that are optimized to emerge the model of mathematics learning principles to improve learning effectiveness. There are five components that are used and function as constituent elements, namely syntax, social systems, reaction principles, support systems and instructional and accompanying effects. This model produces documentation in the form of a book that is equipped with an activity guide for the teacher and a work guide for students in the form of syntax or steps in the learning process. This is to build a social system between teachers and students in their respective roles, strengthening the role of the teacher as facilitator, mediator and teacher's response to students' learning needs. With this problem model it will be easier to plan and implement mathematics learning tasks that have a lot of scope, so that it can develop students' mathematical abilities.

II. METHODS

This type of research is designs research. Based on its purpose, this research design according to Plomp is divided into two, namely development studies and validation studies. This research is included in educational design research with types of development studies [6] since the purpose of this study was to develop a Mathematical Learning Model Think Create Apply Constructivism-Based. This type of research is also the term development research (research and development). A simpler definition according to Sugiyono about research and development is a research

method used to produce certain products, and test the effectiveness of these products [8]. The product produced in this study is a valid, practical and effective model of Mathematics Learning Think Apply Based on Constructivism. Development of Mathematics Learning Model Think Create Apply Constructivism Based uses Plomp development design which has three phases, namely:

1. Preliminary Research
2. Prototype Phase (Development or Prototyping Phase)
3. Assessment Phase

Based on the three phases according to the Plomp development procedure, the form of activities carried out in the development of learning model [6]. All activities in the process of developing mathematics learning Think Create Apply Constructivism-Based [6]. Student who are the subject of research are those in Islamic School 1 and Islamic 2 in the city of Jambi, Islamic 1 becomes a medium level Islamic. Whereas Islamic 2 is one of the private that is a low level Islamic. The selection of Islamic 1 becomes a medium level Islamic, for several reasons. The input of new students seen from the national value (NV) in Islamic 1 is only middle and ordinary Islamic 1 is located on the outskirts of the sample selection is carried out in strata, two classes are chosen randomly from each Islamic level [11]. Classes in Islamic 1 that are at the medium level are selected from two XI Science from 5 classes. Class XI science Islamic School at the low level Islamic was chosen two classes randomly from 3 classes. The types of data in this study are qualitative and quantitative data. Qualitative data is obtained from the results of discussions, observations / observations, and interviews. Quantitative data is obtained from instruments and observation sheets. Jambi city precisely on the border with Muaro Jambi Regency. The input of new students is seen from National Value (NV) scores ranging from high National Value scores to low National Value, with a variety of Islamic from Junior High Islamic (JHS). In terms of economics student have the ability to middle to lower.

The selection of Islamic school 2 becomes a low level Islamic because private Islamic are inputting new students with NV scores from middle to low and some are not accepted in public Islamic. Islamic 2 is managed by a foundation from Jambi Islamic University of Sultan Thaha Saifuddin Jambi and is located in university complex, Telanaipura district, Jambi. The instrument used in this research for data collection is using validation / formatting sheets, observation sheets, interviews, assessment sheets, student response questionnaires, evaluation sheets.

- Prototype validation sheet or format

Validation format is prepared to obtain data that states the content and construct validity of the device / model developed.

- Observation sheet

The observation sheet that is intended is an observation sheet that can be used to find out the practicality and effectiveness of learning model in student wear or implementation and activities, creativity and productivity.

- Interview

Interviews were conducted to obtain data information directly from experts or validators, peers, teachers, education practitioners, students or users and who were involved in collecting data about the existence of products.

- Assessment Sheet or Learning Outcomes

Test Instrument The assessment sheet in question is a structured assessment sheet with learning model through questions that will be used to determine students' mathematical problem-solving abilities by using learning model.

- Questionnaire for student responses

The student response questionnaire was prepared to obtain data about students' attitudes and opinions on the learning model, students' responses to the components, learning implementation and students' responses to the impact of learning with lea.

- Evaluation sheet

Evaluation sheets are prepared to obtain data about student learning completeness as the main data of effectiveness. The evaluation sheet intended is the evaluation sheet of learning outcomes.

- Focus group discussion (FGD)

This FGD is done so that the devices developed are in accordance with the objectives designed. Reveal the meanings and needs and problems that are the focus of development, so that it becomes a complete unity from the shared view of the devices developed or the problems under study.

A. Data Analysis

Data obtained from various instruments were analyzed descriptively, qualitatively and quantitatively to be able to identify the learning tools developed whether they were valid, practical and effective or not. Likewise, to identify whether the instructional material developed can be carried out well in class and can show the results of students' mathematical abilities.

1) Validity

To test the validity of this model, the opinions of experts (judgment experts) are used. The validators / experts were asked their opinions about the model being developed. The developed validation includes contract validity and content validity. The contract validity is the conformity of the model component with the elements that have been determined in the development of the model. The content validation is whether the model those developed are in accordance with the objectives and aspects of learning that are set [10]. The results of the assessment of the device given by the validator are analyzed by the steps adopted by Muliyardi which determine the mean score using the formula:

$$R = \frac{\sum_{i=1}^n V_i}{n} \quad (1)$$

Note:

R = average results of the assessment of experts or validators
Vi = score from the assessment of the i-validator
n = number of validators

Then the mean of all aspects is calculated for device validation using the following criteria:

1. If the average > 3.20 is categorized as very valid
2. If $2.40 < \text{mean} \leq 3.20$ then it is considered valid
3. If $1.60 < \text{mean} \leq 2.40$ then it is considered quite valid
4. If $0.80 < \text{mean} \leq 1.60$ then it is categorized as less valid
5. If the mean is ≤ 0.80 then it is considered invalid

For the development of this device, it is said to be valid if the mean value of the validator is quite valid.

a) Interview

Data obtained from interviews were analyzed descriptively. Data analysis was carried out to describe data from interviews with validators, practitioners, observers, students regarding validity, practicality of the device.

b) Test of Learning Outcomes.

Data obtained from learning outcomes tests were analyzed using a calculation of the percentage of students who met the minimum completeness criteria in accordance with the determination of each Islamic. In addition, students also meet the criteria of completeness in a classical manner, because the percentage of the number of students has reached the specified competence.

B. Discussion group or Focus Group Discussion (FGD)

Discussions involve various parties who can contribute ideas to the device being developed. The results of the discussion were formulated and described as a guide in the development of mathematics learning tools.

III. RESULTS AND DISCUSSION

A. Results of the Preliminary Research Phase

Preliminary research is divided into 3 parts, namely: (1) need and context analysis, (2) review of literature and development of conceptual and theoretical framework for the study are as follows.

1) Results of Needs Analysis for Constructivism-based TCA Learning Model Development

From the results of preliminary research carried out on 2 Islamic School in the city of Jambi it was seen that the implementation of mathematics learning was still carried out conventionally, so that more time the teacher explained the learning material. Furthermore, based on the observations of the learning process that the teacher teaches only uses the worksheet student that have become without lesson plan. Generally, teachers have lesson plan only if they are examined by supervisors, the lesson plan they make is not based on the needs and scenarios that occur in the classroom. The teacher has not focused students' attention so that

students take part in learning activities in the beginning of learning. The activity of raising and maintaining attention is an effort to foster students' curiosity needed in learning activities, lack of opportunities given by teachers to students to actively participate in learning, lack of variation by teachers in learning activities. The teacher is monotone in providing learning material and tends to pursue targets, lack of examples of any important learning concepts or principles, lack of varying sounds, or more high notes in the class that students with low mathematical abilities, teachers teach without learning media. The element of relevance has not been noticed by the teacher.

Based on the preliminary research findings above, it is necessary to find solutions to the problem. One alternative solution to the problem is that it is necessary to design an effective, fun, and mindful study of students' thinking habits, as well as constructivism-based learning as recommended in the curriculum 2013. Therefore, it is felt the importance of developing constructivism-based TCA learning models to improve the quality of mathematics learning.

2) *Results of Curriculum Analysis, Concepts, Objectives and Content of Mathematics Teaching Materials for Class X.*

The problem in the teaching material of rectangles and triangles is how to understand the type and nature of the rectangle, the circumference and area of a rectangle, the type and nature of a triangle, the circumference and area of a triangle and estimating the irregular width of a flat. The problem in the teaching material of the linear equations and inequalities of one variable and social arithmetic discuss how to understand the concept of linear equations of one variable, find the concept of inequality, and understand social arithmetic. The problem with the transformation teaching material is how to understand the concept of reflection, understand the concept of translation, understand the concept of rotation, the concept of dilation and apply transformation to real problems. while the problems in teaching and statistical teaching materials are how to understand statistics and understand empirical opportunities.

3) *Results of analysis of student characteristics*

The interview instrument was used to analyze the students who were used as the sample of the study (the subject of the trial), namely: students of class XA and XC Islamic School 1 at Jambi 2nd semester and students of class XA and XB Islamic School 2 in Jambi .

The characteristics analyzed are related to the origin of the value of the national mathematics examination. Data on student characteristics Based on, it can be seen that all students from Islamic school 1 and Islamic school 2 are from different Junior Islamic. The results of the analysis show that based on the origin of the Islamic the students are homogeneous, because 100% of all students are from middle.

B. *Prototype stage*

Activities at this stage consisted of three steps of activities, namely (1) prototype design, (2) formative evaluation, and (3) prototype vision.

1) *Prototype design*

a) *Book of constructivism - based TCA learning models*

The book of constructivism-based TCA learning models is designed with a structure, namely: Chapter I Introduction, in this section are explained the things that become arguments and the basis of why the importance, benefits, and theories that underlie the construction of constructivism-based TCA learning models. Characteristics of Constructivism-based TCA learning model, this section describes the typical parts of constructivism-based TCA learning models which include syntax, reaction principles, social systems, support systems and instructional impacts as well as accompanying effects. This constructivism-based TCA learning model refers to students' habits of mind, as well as information processing learning models. The model components that are designed and expected to appear also refer to syntax, reaction principles, social systems, support systems and instructional impacts as well as the effects of accompaniment commonly.

Based on the theoretical foundation above, the design of constructivism-based TCA learning model developed follows 5 (five) main components of the learning model, namely syntax, social system, reaction principle, support system, and instructional and accompanying effects [3].

2) *Formative Evaluation*

Formative evaluation techniques (formative evaluation) were carried out to determine the quality of the prototype learning model design results, namely the Model book, Teacher Work Guidebook, Student Work Guidelines book constructivism-based TCA learning model is formative evaluation, namely expert review, focus group discussion (focus group discussion), and field testing (field test) [6]. The experts acting as validators are Postgraduate Lecturer at Padang State University, Mathematics Education Lecturer at Padang State University, Mathematics Education Lecturer at Padang State University, Lecturer at the Faculty of Engineering at Padang State University, of Indonesian Language Education at Padang State University, Lecturer at Padang State University). After the potpie product of Constructivism-based TCA learning model was revised according to the promoter's suggestion and several validators, then given back to the validator to be assessed.

a) *learning model book*

Book validation of constructivism-based TCA learning model consists of 7 aspects of validation, namely supporting theory, syntax, social system, reaction principle, support system, instructional impact and companion impact, and the implementation of constructivism-based TCA learning model. The results of the validation of constructivism-based TCA learning model can be seen in the following description: Results of the Validity Test of Constructivism-based TCA learning model, Validation aspects (1. Supporting Theory, 85.92%, category very valid; 2. Syntax, 84.3 %, category very valid; 3. Social System, 88.21%, category very valid; 4. Reaction Principle, 87 %, category very valid; 5. Support System, 91%, category very valid; 6. Instructional Impact and Impact of Accompaniment, 85.4%, very valid ;7. Implementation of Model, 86.5 %, category very valid). Based the results of the validity test for each aspect of assessment are in the range of 84.3% to 91%, which is in the very valid category. While the mean

percentage of validity aspects of constructivism-based TCA learning model is 86.9% which is a very valid category.

The results of the validity of the theory of supporting aspects of constructivism-based TCA learning model are categorized as very valid with a mean percentage of 86%. This means, the scope of the theory is broad and supports the constructional TCA-based learning model, the language used in the model is good and the book packaging is an interesting model. The results of the supporting theory assessment can be seen in the following description: Validation Aspects (1. Scope of theory, 83 %, category very valid; 2. Learning Theory, 86 %, category very valid; 3. Model Theory, 88 %, category very valid; 4. Language, 83 %, category very valid; 5. Physical Form, 84 %, category very valid).

b) *Constructivism-Based Think Create Apply*

Based on the theoretical foundation, the design of the Constructivism-Based Think Create Apply learning model applied follows 5 (five) main components of the learning model, namely syntax, social systems, reaction principles, support systems, and instructional and accompaniment effects which are described as follows [3].

Syntax:

- **Orientation**

The activities carried out are: a) the teacher attracts students' attention by checking cleanliness and neatness, b) the teacher conditions the class by asking students to read one verse of the Qur'an, translate and understand it, c) the teacher invites to pray or ask Allah SWT so that the knowledge required can add closeness to Allah SWT and knowledge can be used later, d) the teacher communicates the learning objectives and learning outcomes expected to be achieved by students and explains the learning process that students will do in accordance with the constructivism-based TCA Learning Model, e) the teacher divides the learning group to familiarize students with discussion, discussion, sharing, giving assistance, hearing friends without fear of being wrong and being able to accept the lack of friends and friends.

- **Think**

The activities carried out are: a) the teacher shows / shows the phenomenon in the student environment related to the learning material, and asks several questions that aim to explore students' knowledge) the teacher distributes teaching materials, group worksheets (LKK), and observed object models, c) students begin to observe, study, formulate questions and think about what steps will be taken after receiving a group worksheet) students discuss the formulation of questions with their groups to gather information from various learning sources, from the basic knowledge they already have to answer questions that have been formulated, and the teacher has the role of guiding and supervising the discussions conducted by each group, e) Students rethink after gathering information so that what they have done can help answer questions. This is done so that students get used to thinking in solving a problem

- **Create**

The activities carried out are: a) the teacher provides introductory questions so students begin to understand and issue creative ideas to answer questions b) the teacher challenges students to demonstrate their ability to be able to solve problems. c) the teacher assigns students to understand the learning material by collecting data, marking things that are important, identifying problems students start making experiments, making answers according to their respective abilities, doing solutions not as usual,

d) Students discuss problems / questions with groups, make creative answers, answers that can be done out of habit, answers that can raise new questions. Students may complete according to their habits in daily life and discuss with their group friends can and can also finish with the knowledge they have before, e) the teacher always goes around each group to monitor student work, and aids if needed with full sincerity. The teacher realizes that his students are in the learning process, there are those who do not know, some just know a little and there are those who can answer well. These students still expect attention and guidance from the teacher. The assistance provided will make students more excited and not in vain to issue ideas) the teacher gives questions that re-provoke students' ideas so that students solve the problem or question more directed, g) the teacher reminds to think together again in solving questions or problems [12].

- **Apply**

The activities carried out are: a) Students use the results of discussions with groups to complete the formulation of the problem or formulation of questions contained in the Group Worksheets given by the teacher, b) students prepare the results of the discussion to be presented in front of the class, c) the teacher provides facilities and assigns students to discuss or discuss in a classical manner, to communicate the results of discussion / group discussion by asking one group to advance to present the results of the discussion and guidance from the teacher, d) the teacher assigns to other groups responding to the answers of the presenter, e) the teacher continues to monitor and become a facilitator as well as mediating the course of student discussions .

- **Reflection and Evaluation**

The activities carried out are: a) the teacher provides confirmation (reinforcement) of learning material to eliminate student doubts, and instill students' confidence in the truth of the concepts concluded based on the results of the discussion b) The teacher assigns students to formulate material conclusions that have been discussed and provides confirmation of the results of student formulation c) the teacher guides students to conclude the lesson by asking students to express and record important ideas from the results of the discussion about the material discussed, d) the teacher gives awards to groups that have studied and worked well, e) the teacher provides an individual evaluation by providing an Individual Worksheet, f) the teacher reminds students to

get used to thinking, never giving up, honest, creative, creative, confident in solving a problem, and never stop learning / studying, g) the teacher assigns students to work on project assignments and homework from teaching materials or student books, h) the teacher asks students to thank Allah SWT for the learning activities that have been carried out, may Allah SWT provide understanding of the knowledge that has been learned today, I) the teacher closes the lesson by inviting students to say "hamdallah".

Social System

The principle of designing a constructivism-based TCA social system is a combination of social systems that exist in the information processing model family. The social system in the inductive thinking model is. cooperative, the teacher as a coach, coach, counselor, facilitator, reflector, motivator, collaboration or mutual assistance, responsibility for all activities [2].

Organizing students during the learning process applies cooperative learning and collaborative patterns. Students in groups (1) respect each other (4) work together to solve problems (5) ask questions or consult with each other between students who are weak and smart who are fast with slow ones, (6) not selfish / not obscure, (7) freedom to express opinions, dialogue and discussion, (8) dare to try something new, (9) never give up (10) act productively, creatively, effectively and efficiently.

The social system used is creative behavior, discussion, then using problem solving[11].

Principle of Reaction

The reaction principle is designed and is expected to emerge in constructivism-based TCA learning models, then students have a very important role, so that the teacher in learning only (1) facilitates, encourages and mediates, (2) the teacher gives questions or gives students the difficulties (3) the teacher gives the opportunity to other students to give responses and summarize the results, (4) the teacher controls the course of the discussion, (5) the teacher encourages students to keep trying to complete their tasks, (6) the teacher makes a reflection and evaluation. To realize this behavior, the teacher must construct students' knowledge by giving students the opportunity to be creative and try new things freely and openly, looking at the understanding of mathematical objects obtained from the process and the results of problem solving, fixing weaknesses and provoking them to find solutions to real problems [3] .

The social system used is creative behavior, discussion, then using problem solving.

Supporting System

Based on the existing support system in the information processing model family according to Joyce & Weil , it can be seen that the existing support system in the clustering information model also exists on constructivism-based TCA, which was developed into a constructivism-based TCA Mathematics Learning Model and Manual Constructivism-based TCA Student Work , Constructivism-based TCA Teacher Workbook on constructivism-based TCA books are a guide for teachers in managing learning outlined in lesson plans. Constructivism-based TCA book is a guide to the

learning process steps that will be carried out by students consisting of Group Worksheets and Individual Worksheets [3].

In order for this learning model to be carried out in a practical and effective manner, the teacher is required to make a learning design that is interpreted by constructivist learning theory and the value of mathematical soft skills that are manifested in each defined learning step and provide sufficient learning facilities. In this case a model book is developed which contains supporting theories in implementing learning, model components, implementation instructions and all learning tools used such as learning plans, teacher books, student books, student worksheets, abstraction objects from the cultural environment and learning media needed [3].

Instructional and Accompaniment Expected

The instructional impact of implementing constructivism-based TCA Learning Models is: 1). ability to reconstruct concepts and principles.2) logical and creative abilities.3) ability to solve mathematical problems. The accompanying impact that will occur with the application of constructivist-based TCA learning models is: 1). instills thinking habits (Habits of Mind) or HOM students. These thinking habits are the habit of thinking flexibly.2) getting used to constructing knowledge. 3) get used to communicating. 4) think clearly correctly. 5) cooperation. 6) patience of teachers and students [2].

Based on the recapitulation, the results of the validation of the three products, after revision according to the validator's suggestion, are in the range of 86% to 86.8% or in the very valid category, and can also be concluded that all four validators give different opinions for each aspect item that is validated, and the reliability value lies in a very high range. Thus, overall it can be concluded that the product is suitable for use in research.

IV. CONCLUSION

Based on the findings of this development research, it can be concluded that the mathematical learning model of Think Create Apply based on constructivism which has been developed is very valid from the aspect of validity with an average of 4.30. The math book for teacher activity guidelines with an average value of 4.34 is categorized as very valid and the student study guide with an average value of 3.1 categorized is very valid. Thus the Think Create Apply learning model based on constructivism is very well used for learning mathematics in schools to improve mathematical problem solving abilities.

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