# DEVELOPING LEARNING MODEL OF ARCSI WITH SCIENTIFICAPPROACH

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## *Abstract*

*This research, starting from some of the problems found in the SMP / MTs. in the city of Bukittinggi and Agam district, the teachers have not designed the learning process of mathematics motivated, learning process and learning tools developed by teachers not facilitate yet the learners to reconstruct their own knowledge, and the learning process that teachers still conventional, so that the result of learning from mathematics students still low, and the learning process is not designed with a scientific approach as mandated by the curriculum 2013. Based on the matter is necessary to develop a learning Model ARCSI scientific approachwhich is valid, practical, and effective.The purpose of this research generally is to provide a model of ARCSIlearning with scientific approach which is valid, practical and effective.*

*This type of research is based on the design research by Plomp (2013) with three stages of development: (1) Preliminary Research , (2) prototyping, and (3) the assessment phase. The sample in this research was the students of class VII$_1$ SMP Negeri 7 Bukittinggi, class VII$_1$ SMP Negeri 1 Ampek Angkek, and Class VII $_1$ MTs PPM Diniyah Pasia Agam district. The technique of sampling is purposive sampling. Data collection techniques using instruments of observation, as well as the achievement test and questionnaire motivation to gain validity, practicalities, and the effectiveness of the models developed. Data were analyzed using descriptive qualitative statistical methods and inferential statistics to look at the motivation and learning outcome of mathematics learners.*

*Developing Learning Model of ARCSIwith Scientific Approach are a model of book, Teachers'guideline book (PKG), and students'guideline book (PKPD). The achievement of the results show the model and device models supported systems tool fulfill the validity, practicality, and effectiveness. Then ARCSI learning model with a scientific approach that is developed has higher effectiveness than conventional learning model implemented by teachers at schools.*

*Keywords: ARCS model of motivational strategies, Islamic Values, Scientific Approach, and learning models ARCSI.*

**PRELIMINARY**

Expectations of national education is for teachers actively involved in efforts to improve the quality of education, especially the quality of teaching and learning outcomes. The learning process that expected is motivated learning and teachers have a character-based Islamic noble values in the Holy Quran of muslim and the hadith of Prophet Muhammad. Similarly, demand for educational needs at the present time, learners should be able to think critically and able to find or reconstruct mathematical formulas through a pattern of scientific method (scientific approach).

But in reality, less motivated learners and lazy in learning, so that influential in low mathematics learning outcomes of students SMP / MTs. Neither the learning patterns held teachers have not been able to: (1) increase the learners attention of the subject matter and connecting the material with the benefits in the lives of learners daily, (2) increase the confidence of the students to the materials that provided by the teacher, (3) realizing satisfaction learners in the learning process and the material they studied, (4) motivation and learning outcomes of mathematics learners still low, (5) the process of mathematics learning in the classroom is still patterned traditional, (6) the book learners, and worksheets used by teachers in schools not lead learners to actively construct knowledge, and (7) have not been guiding learners to maintain motivation during the learning process of mathematics. (Rahayu, 2015: 215; Observations February 2016).

Supposedly, a teacher in the learning process can change the learning environment so that students can motivate themselves (Keller: 1987b). One model motivation strategy that was developed specifically for the field of education, namely motivation strategies Model ARCS *(Attention, Relevance, Confidence, Satisfaction)* (Keller,1983; Keller and Kopp(1987:2-9). Model ARCS motivation strategy is based on four pillars primary, the first three of which *(Attention, Relevance, confidence)* is essential to create the motivation to learn, and the fourth *(Satisfaction)* is important to make learners feel confident and satisfied with what they have learned. the strategy of motivation models ARCS regarded as one of the most important methods to increase the motivation of learners to learn and can be applied in the process of learning and teaching materials.

Islamic values (based on the Holy Quran and Hadith) need to be introduced to the teachers, so teachers in implementing the learning process should be modeled after the learning is done by the Prophet Muhammad. Namely his conscience and a genuine feeling when educating others, and use all his time to educate everyone with sincerity (Elfindri 2010; Ashori et al., 2012).

Based on the existing problems, one solution so effective learning of mathematics in schools and learners are motivated to learn, would need to develop a model of learning that is motivated and Islamic nuances. The learning model developed is a learning model ARCSI *(Attention, Relevance, Confidence, Satisfaction, Islami)*with a scientific approach.

ARCSI learning model with a scientific approach considering various concepts of learning theory and the theory of ARCS model of motivational strategies, and in the learning process by applying the teachers are expected to teach Islamic values, as well as the learning process using a scientific approach. The primary issue in this research is "What is the process and result of learning model development ARCSI with scientific approach which is valid, practical, and effective?

**REVIEW REFERENCES**
**Strategy of ARCS Motivation Model**

Educational figures such as Mc Clelland (1985), Bandura (1977), Bloom (1980), Weiner (1986), Fyans and Maerh (1987) conducted various studies on the role of motivation to learn. Research findings show intrinsic and extrinsic motivation as a factor that a lot of influence on the process and learning outcomes of students. While Popovich (2000) states that motivation is an important quality that reflects the success in learning and performance. Motivation is the main cause to move forward, and help solve the task.

ARCS model of motivational strategies were created because due to the lack of a guide to improve the quality of the teaching and learning motivation.Furthermore, according to Mills (2004) and Hyland (2006) that the ARCS model of motivational strategies explain how students will try and learn more persistent longer if they are motivated to do so. Keller (1987b) states, a special teacher may not motivate someone. However, one teacher may change the learning environment so that learners can motivate themselves.

Further stated that the ARCS model of motivational strategies is a systematic model in the form of motivating instruction (Small, 2000). The model has been used extensively in learning (Means et al. 1997; Shellnut, Knowlton & Savage 1999; Song & Keller 2001; Hyland 2006). Model ARCS has also been applied in some kind of arrangement of teaching (instructional settings) such as computer-based instruction (Keller & Suzuki, 1988), textual material (Keller et al, 1987), instructor led formal lecture (Visser et al, 1990) and online assessment (Hyland, 2006).

Based on those opinion in terms of improving and maintaining the intrinsic motivation of learners, the best strategy that the teacher can do is how a teacher can design the model, guide learners, and the learning process that can maintain and increase the intrinsic motivation of learners. The way of teaching is also a motivation for students to love math. Moreover, if the teacher can always analogize abstract math concepts into everyday life that can be felt by learners. This will make the learners can better reasoning in the learning process. So in implementing the learning process needs to create an atmosphere that can maintain the attention and enthusiasm of learners to remain enthusiastic in participating in learning. For that we need strategies to make students excited or attention in the learning process, feel useful, can hook into the subject matter of everyday life, enjoys the subject matter, and can assess the capabilities themselves.

**Theory of Learning Support**

Theories of learning that supports the development of learning model is ARCSI with a scientific approach. a) learning theory of David Ausubel, b) learning theory Piaget, c) learning theory Jerome Bruner, d) learning theory Vygotsky.

**Components Learning Model ARCSI**

Learning Model ARCSI with Scientific Approach consists of five draft of the principles that contribute to motivation. Further explanation of these concepts are as follows.

**a). Attention**

In the process of learning, teachers should try to arouse the attention of learners before any learning activity undertaken. The purpose of motivation is to maintain a careful attention by the learners. Teachers need to introduce motivational strategies that can perpetuate the attention of learners during the learning process. To attract attention, the teacher can start teaching by providing problem that can lead to a desire to know more again, or even providing something unexpected by learners.For example, learning to use audio, video, animation can to attract the attention of learners at the beginning of the lesson. Featuring two opposing facts may also attract the attention of learners. Learning to use a computer, it is necessary to design learning segments are short, dense and interactive.

### b). Relevance

Driscoll (2000) said"this concept is important considering, research indicates the more familiar something is, the more relevant the learner perceives it to be".The use of games, simulations and animated graphics that is relevance to learners' experiences may also generate interest for this activity is felt relevant to learners. Easily understood language needs to be used on any part of the learning. So also with examples and concepts being letrelevant with experience of learners. While the material is relevant to learners are successful motivators to learning (Hardre, 2001; Moshinkie, 2001 at Hyland 2006). Teaching strategies corresponding to the profile of learners also need to be used, (Popovich, 2000; Hyland, 2006; Barry & Pitt, 2006).

### c). Confidence

According to Mills (2004), by providing free learning strategies, through practical skills and training, slowly will cause confidence to the students. Feedbackfrom teachers in learning can also generate belief to students. Keller (1983a) states that "providing feedback helps students to develop an internal attribution for success".

### d).Satisfaction

Motivation of learners can be conserved if the learning materials according to the needs of learners. According to Mills, 2004; Baker; 2004, and Small (2000), namely: satisfaction consists of three aspects namely: intrinsic motivation, extrinsic rewards and equity. Bakker (2004) suggests that intrinsic motivation a positive contribution to the learning process and the quality of learning. In particular, a highly motivated learners who are intrinsically more creative, and have an effort to remember the memorable teaching materials that have been studied, and have satisfactory academic achievement (Koestner, 1984; Ryan et al, 1995). Furthermore, Baker (2004) states "extrinsic motivation Refers to activities engaged in as a means to an end such as, to gain reward or avoid criticism, rather than for the satisfaction of the activity itself". Meanwhile, according to the Small (2000), using an extrinsic reward as norm satisfaction improvement involves positive reinforcement andfeedback motivated. Extrinsic rewards may be a provision praise, reward in the form of symbolic and real, and gift-giving (Mills, 2004). Using extrinsic rewards in response to the correct answer and do not criticize for a wrong answer, can help learners understand that mistakes are made is a learning opportunity or opportunities to improve themselves.

### e). Islami

The teacher is the importantly factor in the effort to improve education quality, especially the quality of teaching and learning outcomes. The process of education provided in schools will result in the optimization of talent and potential learners. So when teachers implement the learning process, teachers should be able to find a standard of behavior and attitudes to become a well-educated. Learning ethics already exists in the Holy Qur'an and the Hadith. According to Zubair (2009: 27) that ethics can deliver people are able to be rational, conscious and critical in forming its own opinion and act in accordance with the beliefs and habits, so that the autonomous man as a whole can truly accountable for the opinions and actions selection.

Furthermore Elfindri,et al. (2010); Ashori (2012); and Danim (2012). Stating how the Prophet Muhammad. communicate, behave yourself, and motivate his companions in the learning process that he did. As for the skills that can be applied in the learning process in the school is:.

1. Master's in communication; (a) looked interlocutors ( expected teacher looked at his interlocutorand learners look to the teacher); (b) calling students by name; (c) clearly and slowly when talking; (d) using gestures; and (e) starting from the public, then detailed by the comparative method.
2. Teacher in the act; (a) humble; for example, teachers listen when students ask; (b) Gentle in teaching; (c) angry when there are mistakes made by learners; and (d) putting people who want to ask first

Based on the discussion, the mathematics learning is packaged in Islamic mathematics teacher in the learning process to apply / pay attention to ethical values that have been exemplified by the Prophet Muhammad. derived from the Qur'an and Hadith. While the approach used is a scientific approach. Scientific approaches used is based Permendikbud no.81a 2013 annex IV, namely: (a) observing, (b) ask, (c) collect information / experimental (try), (d) associate / processing information, and (e) to communicate.

The direct impact of the application of this research is to enable learners to reconstruct the concepts and principles of mathematics through problem solving and used to resolve the real problems in the environment of the learners. Students understanding of the mathematical objects built on the cultural experience and learning experiences that have been previously owned. Meaningfulness of learning that gave birth to understanding, and understanding the underlying ability of learners to transfer knowledge in problem solving, critical and creative thinking.

In addition to the impact of the above, learners are accustomed to analyze logically and critically give an opinion on what is learned using learning experience previously owned. Individual reception of the differences that occur (different mindset, understanding, vision and ability), and the growing collaboration skills among learners. Retention of mathematical knowledge possessed learners can last longer because learners actively engaged in the discovery process.

Impact companion that will occur with the application of learning models ARCSI with this scientific approach is that learners are able to rediscover the various concepts and rules of mathematics and mathematics realize how high benefit for life so that he does not feel alienated from their surroundings. Mathematics as a science is no longer seen as the result of thinking outside world but is on the cultural environment of learners that are useful in solving the problems in the cultural environment.further an other impact is the tentative nature of science,

science process skills, autonomy and freedom of thought learners, tolerance of uncertainty and non-routine problems.

**Research Methodology**

    **a. Types of Research**

        This type of research is the research design. The procedure uses a model development Plomp (2013) as shown in Table 1 below.

Table 1. Phase Development ARCSI Learning Modelwith Scientific Approach

| No. | Development phase | Criteria | Activity | Description of Activities |
|---|---|---|---|---|
| 1. | Preliminary Research | Emphasis on the validity of the content | Needs Analysis and context | Initial investigations need ARCSI learning model with a scientific approach |
| | | | | Collect a variety of information, including: the conditions of learners, curriculum and learning tools that are being used. |
| | | | 'Review of Literature | Analyze the theories and concepts associated with learning model development ARCSI with Scientific approach. |
| | | | Development of a conceptual framework and theoretical framework | Designing and developing a conceptual framework and theoretical framework for learning model ARCSI with this scientific approach. |
| 2. | Prototyping | Practicality and effectiveness | Designing Prototype | Designing learning model ARCSI with a scientific approach. |
| | | | Formative evaluation | To test the validity of (expert validity, focus groups and field test) to the prototype. |
| | | | Revision | Revised the prototype is based on the results of formative evaluation. |
| 3. | Assesments | Practicality and effectiveness | Summative evaluation | Assess whether the user in the field can use the product and intends to apply in mathematics, and to test whether the product is effective. |

Source: Modified by Plomp (2013)

**b. Test and Subject Test Products**

Product trials intended to collect data that can be used as the basis for setting the level of the practicality and effectiveness of the product in the form of learning model ARCSI approach to scientific and support systems, namely 1) the book Working Guidelines teacher (PKG), and 2) Worksheet Students (LKPD) and teaching materials. To see the effectiveness of the products developed, then needed two classes as a sample, the experimental class and control class. Selection of sample classes conducted by purposive sampling from a population of learners SMP / MTs of Bukittinggi City and Agam districts.

**3. Type Data**

The type of data that is required in this research are as follows.
a. Qualitative data results, that are: (a) data from the validation research; (b) Data from the questionnaires to teachers and learners; (c) data on the discussions and observations), and
b. Quantitative data obtained from the inquiry result, observation sheets, and achievement test.

**4. Data Collection Instrument**

The instrument used to collect data is the instrument at a preliminary stage, the validity of the instrument, the instrument practicality and effectiveness of instrument-based learning model learning device ARCSI with a scientific approach. The instruments used were developed by the Focus Group Discussion (FGD).

**5. Data AnalysisActivity**

a. Analysis of the data at a preliminary stage
  Analysis of the data at a preliminary stage, namely data reduction, data presentation and conclusion. Data reduction is the process of selecting, focus and transform raw data obtained through observation, inquiry, and questionnaires / interviews.
b. Analysis of the validity and reliability of the learning device
  1. Alpha reliability test using the formula; used in a test the reliability of internal consistency test by using anova formula. Test reliability between the weighing carried out to determine the level of assessment between assessors that one with others.
  2. Analysis ofinquiry Practicality Learning Tool
  1) Practicality of inquiryof learning device described by data frequency analysis technique using the formula: : $P = \frac{R}{SM} 100\%$(Purwanto, 2004: 102)
  4. Analysis of Observation Sheet in carrying out of RPP
  5. To illustrate the results of observations of data in carrying out of RPP use descriptive techniques.

c. Analysis of Effectiveness Learning Tool
  The analysis of the effectiveness of learning model ARCSI with a scientific approach and supporting learning device by the analysis of inquiry data learning motivation and learning outcomes of students.
  1) motivation questionnaire

From the data that has been filled questionnaire motivation of learners. The questionnaire was structured in the form of Likert scale. Questionnaire motivation towards learning mathematics with a technique described frequency analysis of data by the formula:

$$P = \frac{R}{SM} \, 100\%$$

2) Motivation questionnaire data analysis and achievement test

Data obtained through questionnaires motivation and learning outcomes processed mathematics inferential statistics. Based on the research design, the statistical test used was ANOVA test *(Analysis of Variance)* and followed by Tukey's test to look at the effectiveness of the model Learning ARCSI with Scientific Approach.The hypothesis to be tested to see the value of the effectiveness of the model are as follows.

a) May difference mathematics learning motivation among learners MTs. PPM Diniyah Modern Class $VII_1$ Learners Class $VII_1$ SMP N 7 Bukittinggi, and Learners classes $VII_1$ SMP N 1 Ampek Angkek Agam.

b) Mathematics learning outcomes $(Y_1)$ learners with Learning Model Using ARCSI with Scientific Approach $(A_1)$ rather than a result of learning mathematics $(Y_2)$ learners with the use of conventional Learning Model $(A_2)$, specifically for groups of Class VII SMP N 7 Bukittinggi $(B_1)$

c) Results of learning mathematics $(Y_1)$ students with the use of ARCSI Learning Model with Scientific Approach $(A_1)$ rather than a result of learning mathematics $(Y_2)$ learners to use Learning Model Conventional $(A_2)$,specifically for groups of Class VII SMP N 1 Ampek Angkek Agam.

d) There are differences in mathematics learning outcomes $(Y)$ learners Among Learners SMP N 7 with SMP N1 Ampek Angkek ARCSI Model Special for groups with a Scientific Approach $(A_1)$.

e) Thereare differences in mathematics learning outcomes $(Y)$, Participants learners among students of SMP N 7 with SMP N 1 Ampek Angkek, specifically for groups Conventional Model $(A_2)$.

## Results and Discussion
## 1.Results
## a. Stage Introduction Research *(Preliminary Research)*

1) Analysis of Development Needs Learning Model ARCSI with Scientific Approach.

2) Analyze Purpose and content of Mathematics Teaching Materials Class VII SMP / MTs. Semester 2. Based on the analysis of the purpose and content of the learning in this research the subjects were used as test subjects is rectangular and social arithmetic.

3) Analyze the Characteristics of Students; data on the characteristics of learners can be seen in Table 2 below.

Table 2. Characteristics of Students SMP / MTs. Academic Year 2015/2016

| Schools and Class | Which school are you from | | Mean Value UN Mathematics | Standard Deviation |
|---|---|---|---|---|
| | SD (%) | MI (%) | | |
| SMP Negeri 7 | | | | |
| VII $_1$ | 100 | 0 | 95.621 | 13.7758 |
| VII $_4$ | 100 | 0 | 72.478 | 15.367 |

| SMP Negeri 1 | | | | |
|---|---|---|---|---|
| VII $_1$ | 100 | 0 | 88.100 | 3.0703 |
| VII $_2$ | 100 | 0 | 83.447 | .9581 |
| amount | 100 | 0 | 84.4115 | |

The results show that based on the origin of school learners homogeneous, because 100% of all students are from the State Primary School and Elementary School of Islam (SD / SDIT). While based on the National Examination mathematics, mathematical abilities of students are also homogeneous, because each school has a mean that is not much different, that is class VII $_1$ was 95.621, 72.478 is a class VII in SMP N 7 Bukittinggi. As for the SMP N 1 Ampek Angkek Mean Value math for grade VII $_1$ is 88.1, and the mean grade VII $_2$ is 83.447. This means that learners have enough stock for researching mathematics at secondary school (SMP), as teaching material at SMP is the continuation and development of teaching materials in elementary school (SD).

**b. Review of Literature and Theoretical Framework Development**

Based on the analysis and review of the literature, formulate theories, concepts and materials are required, as summarized in Table 3 below.

**Table 3. Results of Analysis Theories, Concepts and Materialsin Learning Model ARCSI with Scientific Approach**

| Theories, Concepts and Teaching Materials | | Author |
|---|---|---|
| Construction Model | Syntax | Joyce and Weil (1992: 2011) |
| | principle reaction | |
| | Social system | |
| | Support system | |
| | Impact Instructional and Companion | |
| Development Model | Preliminary Phase | Plomp (2013) |
| | prototype Phase | |
| | Assessment Phase | |
| Motivation | Attention | (Keller, 1984; 1987), (Keller & Suzuki: 2004) |
| | Relevance | |
| | Confidence | |
| | Satisfaction | |
| Islamic values | Islamic values are sourced from AlQur'an and hadith. | (Depag: 2003), (Ashari: 2012), (Elfindri: 2010) |
| Scientific approach | Observe | Director General of Education (2013: 10-11) |
| | Ask | |
| | Try | |
| | Reasoning | |
| | Communicate | |
| Teaching materials | Four terms and Triangle | (Kemdikbud, 2013: |

| | Social arithmetic | 2014) , Sukino (2009). |
|---|---|---|

## 2. Stage Prototype

Components ARCSI learning model developed by the scientific approach, as Figure 1,below.

**SYNTAX LEARNING**

1. Orientation
2. To facilitate the learners to observe.
3. 3.Formulate a question about the observed phenomena.
4. Collect information to answer questions.
5. Deliberation group to associate / process information.
6. Deliberation class to communicate / present the results of deliberations.
7. Confirmation (reinforcement) learning materials.
8. Reviewing instructional material

**PRINCIPLES OF REACTION**

1. Provide support
2. Provide Guidance
3. Provide facilities
4. Provide opportunities for learners to reconstruct and express the result of thought.
5. Provide an explanation / help.
6. Provide an assessment

**Learning Model ARCSI with Scientific Approach**

**SOCIAL SYSTEM**

1. Fasilitator
2. Motivator
3. Mediator and Reflector
4. Supervisor in the Activity
5. Cooperation and mutual help
6. Responsibility

**SUPPORT SYSTEM**

1. rational book of learning model ARCSIwith a scientific approach.
2. The manual work of teachers in the form of RPP.
3. Handbook for Working Students form LKKPD (Group Activity Sheet Learners) and Worksheet Individual Learners (LKIPD)

**IMPACT OF INSTRUCTIONAL**

1. Ability Reconstruct concepts and principles
2. Ability to analyze logically and critically.
3. The ability to collaborate across learners

**IMPACT BRIDESMAIDS**

1. Rediscovering the various concepts
2. The nature of scientific tentative
3. The scientific process skills.
4. Autonomy and freedom of thought
5. The values of tolerance
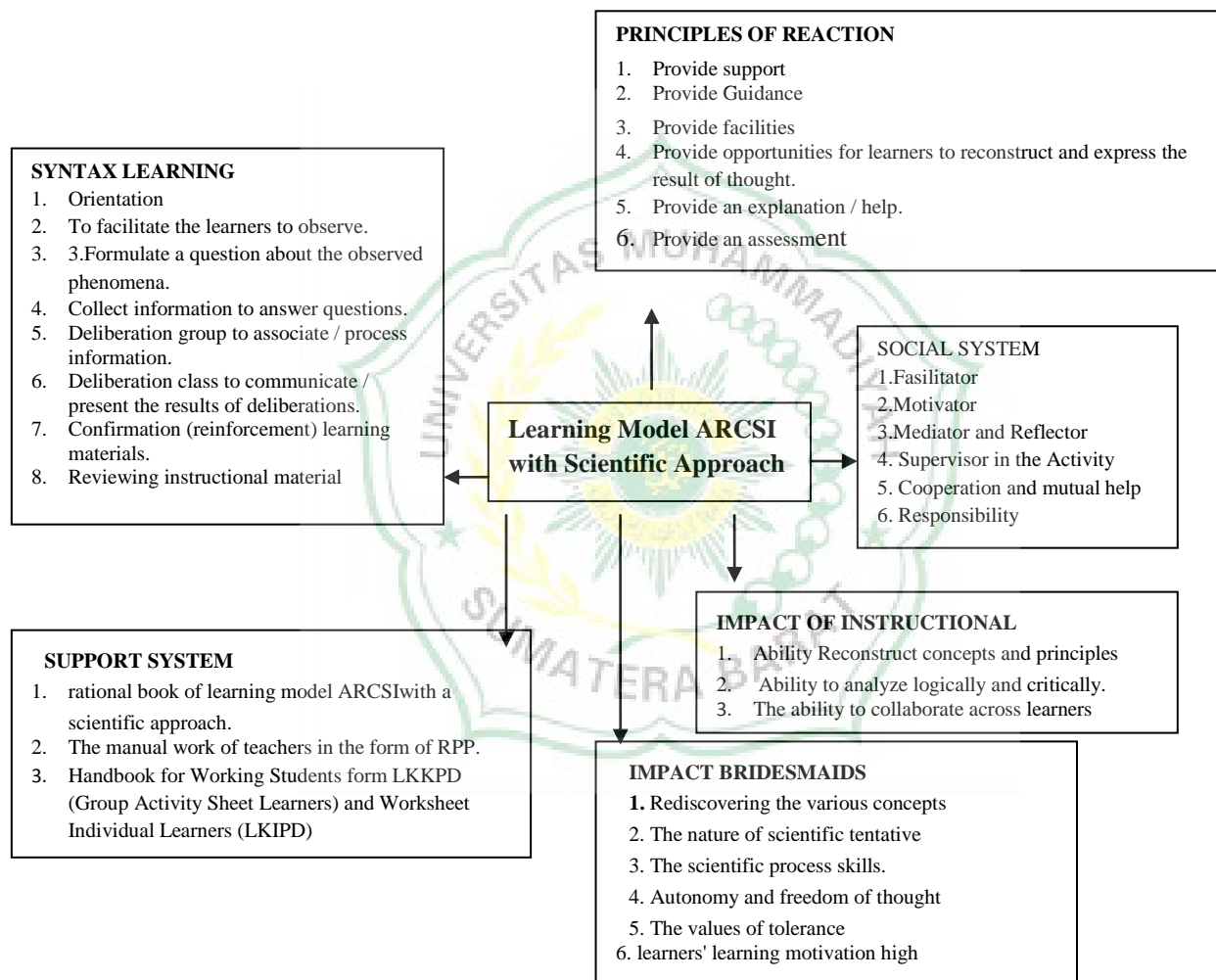6. learners' learning motivation high

Figure 1. Component Model Learning ARCSI with Scientific Approach

### a. Assessment Stage Products

Recapitulation of the calculation of validity test three products can be seen in the following table 4 below.

Table 4. Summary of Results Validation PrototypeLearning ARCSI with Scientific Approach

| No. | Product | mean | % | Category | Compliance Test Between Validator | Reliability Between Evaluator |
|---|---|---|---|---|---|---|
| 1. | book Model | 4.36 | 87.40 | very Valid | There are differences between the validator validation results | $R_{11} = 0.8387$ (Correlated Very High) |
| 2. | books PKG | 4.41 | 87.72 | very Valid | There are differences between the validator validation results | $R_{11} = 0.8374$ (Correlated Very High) |
| 3. | books PKPD | 4.34 | 86.88 | very Valid | There are differences between the validator validation results | $R_{11} = 0.7094$ (Correlated Very High) |

Based on Table 4 above, it can be concluded that the products eligible for use in research.

**b. Revision Prototype**

FGD *(Focus Group Discussion)* dated 6 April 2016 to repair the prototype can be seen in Table 5 below.

Table 5. Results of FGD for the Product Model
Learning ARCSI with Scientific Approach

| No. | Product | Suggestions for Revision |
|---|---|---|
| 1. | Book Model | a. The book title corrected models<br>b. Cover book model is created in order to attract<br>c. Book design models are made more attractive in order to book the nicer models<br>d. Spaces in the book should be lumped models in order to better<br>e. Create a design image models<br>f. In Chapter IV is divided into two components: (a) The process of developing the model, (b) *Focus Group Disscusion*<br>g. Letters used Times New Roman 11 pt size, and spacing between sentences of 1.5 spaces.<br>h. The research of theory in the book improved models |
| 2. | Handbook for Teachers Working (PKG) | a. The book title PKG repaired<br>b. PKG book cover is made to be attractive, and cover with the picture associated with teaching materials. |

| | | |
|---|---|---|
| | | c. PKG book design made more attractive in order to book better PKG |
| | | d. PKG spaces in the book had to be made in order to better |
| | | e. Steps in learning syntax and activities of teachers and learners more simplified, making it easy to understand. |
| | | f. Write down the time for each lesson |
| | | g. Letters used Times New Roman 11 pt size, and spacing between sentences of 1.5 spaces. |
| | | h. Make Indicator in RPP adjusted with Candy Processing Standards on 103 2014. |
| 3. | Handbook for Working Students | a. Title of book PKPD repaired, should be able to provide information |
| | | b. PKG book cover is made to be attractive, and cover with the picture associated with teaching materials. |
| | | c. PKPD book design made more attractive in order to book better PKPD |
| | | d. Spaces in the book PKPD should be equated in order to better |
| | | e. The symbols used in order to include |
| | | f. Write down the time for each of the learning process on LKKPD and LKIPD |
| | | g. Letters used Times New Roman size 11-12 pt, and spacing between sentences of 1.5 spaces. |

Based on the advice of the validator and the practitioner, the revision of the resulting product, after being revised, the product obtained is valid in terms of content and construct. The products have been valid is the one used in the third phase of the research phase of assessment (test the practicalities and effectiveness of the product).

## 3. Phase Ratings
### a. Test Practicalities
Conclusion The results of test analysis practicality Learning Model ARCSI with Scientific approach can be seen in the table below.

Table 6. Conclusions practicalities Test ResultsLearning Model ARCSI with Scientific Approach

| No. | Instrument | Indicator | Trial 1(%) | Trial 2(%) | Trial 3(%) | Mean (%) | Category |
|---|---|---|---|---|---|---|---|
| 1. | Observations Implementation of Learning Process | syntax | 87.64 | 91.72 | 91.67 | 90.34 | very Practical |
| | | Social system | 96.67 | 86.10 | 92.22 | 91.66 | very Practical |

| | | principle reaction | 81.99 | 84.44 | 85.57 | 84.00 | very Practical |
|---|---|---|---|---|---|---|---|
| 2. | Books practicalities PKG By Teachers and Practitioners | | - | - | - | **82.60** | very Practical |
| 3. | Books practicalities PKPD By Students | | - | 80.45 | 71.33 | 75.89 | Practical |

Based on Table 5, it can be concluded that the results of the analysis of the development of Learning Model ARCSI Approach Scientific at the stage of testing the practicalities give an idea that these three aspects of the assessment obtained percentage value practicality with the category of practical and very practical, so that the testing process need not be repeated, so that the next process is expanded into a test of effectiveness.

**b. Test Effectiveness**
Conclude the effectiveness test as shown in Table 6 below.

**Table 6. Conclusion Results of Effectiveness Test In Class Experiment**

| No. | | Instrument | % | Category |
|---|---|---|---|---|
| 1. | | Motivation Questionnaire Math In ARCSI Learning Model with Scientific Approach | | |
| | a. | Attention | 66.29 | Effective |
| | b. | Relevance | 61,33 | Effective enough |
| | c. | confidence | 65.86 | Effective |
| | d. | Satisfaction | 64.07 | effective |
| | | Mean | 64.39 | Effective |
| 2. | | Value of learning outcomes From LKIPD | | |
| | a. | Mean | 75.017 | Effective |
| | b. | Percentage | 75.017% | Effective |
| **2.** | | Learning about the test results | | |
| | **a.** | SMP N 7 Bukittinggi | 65.096 | Effective |
| | **b.** | SMP N 1 Ampek Angkek | 57.62 | quite effective |
| | | Mean | 61.38 | Effective |
| | **c.** | Hypothesis Test Results | | |
| | | 1 ) The results of learning mathematics ($Y_1$) between the use of Learning Model ARCSI with Scientific Approach ($A_1$) rather than a result of learning mathematics ($Y_2$) with the Learning Model Conventional ($A_2$), specifically for groups of Class VII SMP N 7 Bukittinggi ($B_1$). | | |
| | | 2) Results of learning mathematics ($Y_1$) between the use of Learning Model ARCSI with Scientific Approach ($A_1$) rather than a result of learning mathematics ($Y_2$) with the Learning Model Conventional | | |

| | | (A $_2$ ), specifically for groups of Class VII SMP N 1 Ampek Angkek Agam. |
| | | 3) There are differences in the results of researching mathematics taught by Learning Model ARCSI with Scientific Approach between Learners SMP N 7 Bukittinggi with SMP N 1 Ampek Angkek Agam. |
| | | 4) There are differences in the results of researching mathematics taught by Learning Model Conventional among learners SMP N 7 Bukittinggi with SMP N 1 Ampek Angkek Agam. |

From Table 6, it can be concluded that the Learning Model ARCSI with Scientific Approach has been in effective category.

## 2. Discussion

This discussion is directed to look at the achievement of the validity of research results, practicality and effectiveness Learning Model ARCSI with Scientific Approach.

**a. Learning Model Validation ARCSI with Scientific Approach**

Test the validity of products is an aspect of the quality of the products produced in the research development ARCSI Learning Model with Scientific Approach.The development process Learning Model ARCSI with Scientific Approach at this stage of the validation test found that three products namely books Learning Model ARCSI with Scientific Approach for each group of items, namely: (a) aspects of supporting theory the mean 4.3 (86%) by category very valid, (b) the aspect of syntax learning model the mean of 4.32 (85.43%) categorized as very valid, (c) aspects of social systems mean learning model obtained 4.36 (87.22%) to the category of very valid, (d) aspects of learning model reaction principle the mean was 4.45 (89%) to the category of very valid, (e) aspects of supporting system obtained a mean 4.50 (90%) to the category of very valid, (f) the impact of instructional aspects and impacts Bridesmaids learning model obtained a mean of 4.30 (85.9%) to the category of very valid, and (g) the implementation aspect of learning model obtained a mean 4.3 (86%) with a very valid category. Based on the test results the validity of the learning model ARCSI approach scientific shows that the product fit for use to be tested for the next phase of the research.

Another argument supporting the validity of the results of the learning model ARCSI with Scientific Approach to fourth validator provide a variety of different answers for each item. Neither the other arguments that support the validity of the test results in this research are:

1) The results of data analysis showed that the research product development learning model ARCSI with Scientific Approach fulfills the fundamental assessment in the development of learning models, namely the existence of logical consistency between the models of the model expectations and reality. This is in accordance with the opinion of Nieeven (2013) that the learning model designed must show their logical consistency between the models of the model expectations and reality. Model expectation means that the learning model can be used, and models of reality means that the learning model can be used.

2) This validity test results also illustrate the use of the technique have been using their product evaluations raised by Tessmer (in Plomp; 2013), the expert review andfocus group discussion . Based on this theory that the validation expert ( expert review ) categorized and placed in the position of the second level in the formative evaluation techniques Tessmer (1993). According Tessmer (in Plomp; 2013) conducted a validation product specialist ( *expert review* ) have levels of resistance are better than other techniques. But the products

have been validated experts, still have to be revised, so that the product has a stronger resistance against the revision.

3) Validity test results showed that all three products under development learning model ARCSI with Scientific Approach has met the criteria of *state of the art* knowledge. Aspects of the *state of the art* is consistency and relevance among the products produced. Then do the content validity and construct validity of the product. Consistency and relevance of the model is found in every book. This result proved by content validity and construct validity were carried out by experts and practitioners. Average aspect of *state of the art* according to Nieeven (2013) that the construct validity is the logical linkages between content validity and consistency.

**b. Learning Model Practicalities ARCSI with Scientific Approach**

Test practicalities were conducted:

**1) On Mathematics Learning Process Learning Model ARCSI with Scientific Approach**

The results of data analysis and research on the learning process illustrates that the syntax, the social system and the principle of learning models ARCSI reaction with Scientific Approach performing well. The findings of this research are to be used in the learning process with mean total keterlaksanaan syntax learning models for each grade sample, the MTs. Modern Diniyah PPM 87.64% categorized as very practical, SMP N 7 Bukittinggi 91.89% categorized as very practical, and SMP N 1 Ampek Angkek 89.71% categorized as very practical. Similarly, for the social systems in the learning model ARCSI with Scientific Approach was found there, and good adherence to the social system in the learning model so that used in the learning process, is evidenced by the results of their research findings to an experimental class, namely the MTs. Modern Diniyah PPM 81.33% categorized as very practical, and SMP N 7 Bukittinggi 86.11% categorized as very practical, as well as SMP N 1 Ampek Angkek 92.22% categorized as very practical. As for the principle of the reaction has been performing well with the very practical category. category for each class of experiments, the MTs. Modern Diniyah PPM 824% to the category of very practical, SMP N 7 Bukittinggi 84.44% categorized as very practical, and SMP N 1 Ampek Angkek 85.57% categorized as very practical. These findings showed good adherence to the principle of learning models ARCSI reaction with Scientific Approach so that used in the learning process.

These results demonstrate the fulfillment of the quality of the learning model ARCSI the Scientific Approaches that have been, defined, and developed. Because teachers can carry out the role for each component model of learning well. for example, serves as a mentor teacher, facilitator, reflectors, motivator, cooperation and responsibility with very practical. It can be seen from the mean adherence to the social system for each of the sample schools, the MTs. Modern Diniyah PPM 81.33% categorized as very practical, SMP N 7 Bukittinggi 86.11% categorized as very practical, and SMP N 1 Ampek Angkek 92.22% categorized as very practical.

Based on observations and consultations with observers and practitioners, the reflection is done for each class of samples is as follows.

a.. MTs. PPM Diniyah Modern Pasia Ampek Angkek.

1) The first meeting, reflections do is (1) the teacher should always raise the motivation of learners in group activities, (2) teachers need to explain in advance the learning process

Learning Model ARCSI Approach Scientific, (3) the teacher should give a reward for the group's work and (4) teachers need to provide reinforcement for the work of the group, after the process of communicating in the form of presentation.

2) Meeting II, reflective undertaken for further improvement is the teacher needs to pay more attention to the activities of learners during group deliberation, and the teacher gave more motivation for learners to work optimally for each activity.

3) Meeting III, reflective for improvement at the third meeting of this are (1) the teacher should pay attention to learners in analyzing problems and provide guidance when needed, (2) to provide reinforcement teachers should also train students to analyze problems with mathematical symbols ,

4) Meeting IV; reflective for improvement next learning process is motivated teachers need to be given to students at all times so that the learning process can be motivated.

5) Meeting V; results of consultation between teachers, observers, practitioners, and researchers to reflective is that the implementation of the learning process for each phase of learning should really keep a predetermined time so that the learning phase well underway, as well as the prize should be given to each member of the group so that learners more eager to work in groups.

b. SMP N 7 Bukittinggi

1) The first meeting, reflections do is (1) the teacher should always raise the motivation of learners in group activities, (2) teachers need to explain in advance the learning process Learning Model ARCSI Approach Scientific, (3) the teacher should give a reward for the group's work and (4) teachers need to provide reinforcement for the work of the group, after the process of communicating in the form of presentation.

2) Meeting II, reflective undertaken for further improvement is the teacher needs to pay more attention to the activities of learners during group deliberation, and the teacher gave more motivation for learners to work optimally for each activity.

3) Meeting III, reflective for improvement at the third meeting of this are (1) the teacher should pay attention to learners in analyzing problems and provide guidance when needed, (2) to provide reinforcement teachers should also train students to analyze problems with mathematical symbols ,

4) Meeting IV; reflective for improvement next learning process is motivated teachers need to be given to students at all times so that the motivation of learning process can be defended.

5) Meeting V; results of consultation between teachers, observers, practitioners, and researchers to reflective is that the implementation of the learning process for each phase of learning should really keep a predetermined time so that the learning phase well underway, as well as the prize should be given to each member of the group so that learners more eager to work in groups.

6) Meeting VI; The learning process for each phase of the group's activities, the need for variation form of present issues that are of increasing concern learners to discuss it.

c. SMP N 1 Ampek Angkek

1) The first meeting, reflections do is (1) the teacher should always raise the motivation of learners in group activities, (2) teachers need to explain in advance the learning process Learning Model ARCSI Approach Scientific, (3) the teacher should give a reward for the group's work and (4) teachers need to provide reinforcement for the work of the group, after the process of communicating in the form of presentation.

2) Meeting II, reflective undertaken for further improvement is the teacher needs to pay more attention to the activities of learners at the time of deliberation group, and the teacher gave more motivation for learners to work optimally for each activity.
3) Meeting III, reflective for improvement at the third meeting of this are (1) the teacher should pay attention to learners in analyzing problems and provide guidance when needed, (2) to provide reinforcement teachers should also train students to analyze problems with mathematical symbols ,
4) Meeting IV; reflective for improvement next learning process is motivated teachers need to be given to students at all times so that the motivasion of learning process can be defended.
5) Meeting V; results of consultation between teachers, observers, practitioners, and researchers to reflective is that the implementation of the learning process for each phase of learning should really keep a predetermined time so that the learning phase well underway, as well as the prize should be given to each member of the group so that learners more eager to work in groups.
6) Meeting VI; The learning process for each phase of the group's activities, the need for variation form of present issues that are of increasing concern learners to discuss it.

**b. Practicality Handbook for Teachers Working (PKG) According Practitioners**

Results of research on the practicality of the handbook of teacher (PKG), which is filled by twelve practitioners, suggests that the eighth aspect of votes obtained range of practical value and very practical. PKG practicalities book by teacher / practitioner with a mean of 82.47% with a very practical category. the results of the analysis provide for the physical aspects of the assessment form is still in the category of practical with mean 73.40%, while for aspects of the assessment in terms of the benefits of getting maximum mean that 90% categorized as very practical. Similarly to other aspects of assessment, such as user aspects, objectives, syntax, materials, worksheets, languages all in the span of a very practical.

Based on the analysis, it suggests that the book PKG has been assessed and considered eligible for use in research in general, and in particular can be used in the learning process and provide benefits for teachers.

**c. Practicality Handbook for Working Students (PKPD) ARCSI Learning Model with Scientific Approach According to Students**

Results of research on aspects of practicality Handbook Working Students (PKPD), illustrates that the eighth aspect of the assessment for the first trial that has been filled by students of class VII $_1$ SMP N 7 Bukittinggi was 80.42% categorized as very practical, whereas according to the practicalities learners based on the results of testing 2 was 71.33% with a practical category. It can be concluded that the Learning Model ARCSI with Scientific approach is feasible for use in further learning.

3. **Effectiveness of Learning Model ARCSI with Scientific Approach**

Based on the data analysis at this stage of effectiveness test illustrates that all three aspects of the assessment obtained percentage value effectiveness with effective category, namely (1) the results of questionnaire analysis motivation to learn math learners class trials with four indicators ( *attention, relevance, confidence and satisfaction* ) is 64.39% with the effective category, (2) further motivation questionnaire data from students learn math three classes of experiments analyzed by Anova statistics one goal pathways to see the difference in the

motivation to learn math students for each grade test. Based on data analysis motivation to learn mathematics is obtained: $F_{count} = 0.0115 < 3.143 = F_{(0.05; 2; 64)}$ . So it can be concluded that there is no difference between the motivation to learn math students of class VII $_1$ MTs. PPM Diniyah Modern Pasia, Learners Class VII-1 SMP N 7 Bukittinggi, and Learners classes VII-1 SMP N 1 Ampek Angkek Agam.

Based on an analysis of LKIPD test results can be concluded that the average value of mathematics learning outcomes for each learner LKIPD testing an experimental class at 1 (6 meetings) is 74.49% (effective), trial 2 (five meetings ) is 75.54% (effective). While the mean for all trials was 75.015% in the effective category.

Similarly, based on the analysis of the results of students learning mathematics experimental class and control class illustrates that the experimental class 1 the class VII N 7 Bukittinggi the mean 65.10, while in the mean control class 32.60. Similarly to the experiment 2 the class VII $_1$ SMP N 1 Ampek Angkek the mean 57.62, while in the control class VII grade $_2$ obtained mean 44.38. In terms of learning outcomes appear to mean that the learning outcomes of the experimental class is better than the control class. This means learning model application ARCSI with Scientific Approach a positive impact on learning outcomes of mathematics learners.

Based on the Standard Deviation (SD) can be concluded that both the experimental class has a value that is more diffuse than the control class. While the minimum score for an experimental class 2 (Class VII-1 SMP N 1 Agam district) lower than the control class 2 (Class VII-2 SMP N 1 Agam district). This is due at the time of the final exam students are not working optimally test questions.

Based on the analysis of learning outcomes obtained that both the experimental class 1 to class 1 controls normal distribution of data and the data variance homogeneous, nor for the experimental class 2 and class 2 controls normal distribution of data and the data variance homogeneous. As for the hypothesis test concluded that: (1) there are differences between the mean mathematics learning outcomes significantly between students of Class VII SMP N 7 Bukittinggi with students of Class VII SMP N 1 Ampek Angkek Agam district. It shows there is significant influence on learning outcomes of school mathematics learners, (2) there are no differences between the mean mathematics learning outcomes significantly among learners who are taught by Learning Model ARCSI with Scientific Approach to the model used by teachers in the school. It showed no significant influence of the learning model to the learning outcomes of mathematics learners in terms of school learners, (3) there are differences in the effect of a significant interaction between the school (SMP N 7 Bukittinggi and SMP N 1 Ampek Angkek Agam district) and Learning Model (ARCSI with Scientific approach and models used by teachers in school).

While based on the testing of the effect of simple ( *simple effect* ) with the statistics Tukey test, it can be concluded: (1) There are differences in learning outcomes math Significant among Usage Model ARCSI (A $_1$ ) and Conventional (A $_2$ ) student of class VII SMP N 7 Bukittinggi; ( 2) There are differences in learning outcomes mathematics Significant among Usage Model ARCSI (A $_1$ ) and Conventional (A $_2$ ) student of class VII SMP N 1 Ampek Angkek Agam district; (3) There are differences in the results of researching mathematics taught by learning Model ARCSI approach Scientific among learners SMP N 7 Bukittinggi with SMP N 1 Ampek Angkek Agam; (4) There are differences in the results of researching

mathematics taught by learning Model Conventional among learners SMP N 7 Bukittinggi with SMP N 1 Ampek Angkek Agam

Based on the description of the results of data analysis can be concluded that the application of Learning Model ARCSI Approach Scientific has been in effective category in general, but specifically there that describes the results are quite effective, especially for learning outcomes experimental class 2 (Class VII $_1$ SMP N 1 Ampek Angkek) , this is due to the learning process before the learners have not trained for a scientific approach to the learning process, as mandated by the curriculum in 2013.

Based on the findings of the two classes of experiments in this research, namely; mathematics learning motivation questionnaire data, LKIPD and math achievement test can be concluded that the Learning Model ARCSI with Scientific Approach has been a practical and effective to be implemented in the next field.

**Limitations Research**

Based on the analysis of research that has been done, there are several limitations to this research. Limitations of this research are as follows.

1. The resulting product is limited to the book Learning Model ARCSI with Scientific Approach, book Working Guidelines Guru (PKG), and the Employment of Students Handbook (PKPD).
2. Teaching materials are discussed in PKG and PKPD still limited to the subject of rectangles and triangles, and social arithmetic, not all teaching materials for Class VII second half.
3. The resulting product trials are still limited to three schools, namely MTs. PPM Diniyah Pasia, SMP N 7 Bukittinggi, and SMP N 1 Ampek Angkek Agam. Stages of product trials in the field in skala broad or implementation is not done at this stage of a more extensive due to limited time and funds to conduct extensive trials.

**Conclusion and Suggestion**

Based on the findings in this research, it can be conclusions about ARCSI Learning Model developed by Scientific approach is valid, practical, and effective.While the results of hypothesis testing to see the effectiveness of the model are as follows.

1. There are differences between the mean mathematics learning outcomes significantly between students of Class VII SMP N 7 Bukittinggi with students of Class VII SMP N 1 Ampek Angkek Agam district. It shows there is significant influence on learning outcomes of school mathematics learners.
2. There were no differences between the mean mathematics learning outcomes significantly among learners who are taught by Learning Model ARCSI with Scientific Approach to the model used by teachers in the school. It showed no significant effect on the results of the learning model of learning mathematics learners in terms of school learners.
3. There are differences in the effect of a significant interaction between the school (SMP N 7 Bukittinggi and SMP N 1 Ampek Angkek Agam district) and Learning Model (ARCSI with Scientific Approach and models used by teachers in school).
4. Mathematics learning outcomes of students of class VII $_1$ (Class experiment) is better than the mathematics learning outcomes of students of class VII $_4$ (Grade Control) SMP N 7 Bukittinggi.

5. Mathematics learning outcomes of students of class VII $_1$ (Class experiment) is better than the mathematics learning outcomes of students of class VII $_2$ (Grade Control) SMP N 1 Ampek Angkek Agam.
6. There are differences in the results of researching mathematics taught by Learning Model ARCSI with Scientific Approach between Learners SMP N 7 Bukittinggi with SMP N 1 Ampek Angkek Agam.
7. There are differences in the results of researching mathematics taught by Learning Model

Conventional among learners SMP N 7 Bukittinggi with SMP N 1 Ampek Angkek Agam.
Based on the conclusion suggested the following things.
a. To apply the learning model ARCSI with scientific approach required of teachers who have a scientific outlook, ARCS motivational strategies, and Islamic character, as well as energetic and enthusiastic in the learning process.
b. Teachers in applying the learning model ARCSI with a scientific approach should really consider learning the syntax has been formulated.
c. To get the instructional model and its quality device,expert validation theoretically quite yet. Therefore, researchers need to continue the trial of the second stage is doing the assessment phase of the summative evaluation stage to judge whether the user in the field can use the product and intends to apply in mathematics, and to test whether the product is effective.

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