Development of the *Gradual Brains Stimulation* (GBS) Learning Model in Mathematics Learning

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Abstract. The purpose of this research is to develop a valid, practical and effective learning model that produces a cooperative-based mathematics learning model to improve student learning outcomes and make students more active in learning. this learning model is called *Gradual Brains Stimulation* (GBS). Researchers use the Development research method (R & D) which was sparked by Borg And Gall. Field trials were carried out at SMA Negeri 8 Takengon with a total of 27 students. The research instruments used were validation sheets, practicality sheets, questionnaires, observation sheets and student learning outcomes tests. Validity and practicality analysis was carried out by converting quantitative data in the form of an assessment result score into qualitative data in the form of a standard score on a scale of four. Effectiveness data analysis was carried out by means of *a paired t-test*. This research resulted in developed RPP, LIGBS, LKPD that met the valid, practical, and effective criteria. For validation results, practical, effective as follows: 1) validation of the GBS 3.65 model (valid), 2) validation of RPP 3.79 (valid), 3) LIGBS validation 3.60 (valid), 4) LKPD validation 3.65 (valid), 5) practicality 3.34 (practical), and 6) effective with an average post-test and pre-test in the experimental class which is equal to 80.37 for posttest > from 69.00 for the pretest. Based on the detailed results, it can be concluded that the development of *the Gradual Brains Stimulation* (GBS) model in Mathematics is valid, practical and effective.

Keywords: Gradual Brain Stimulation (GBS), Mathematics Learning, Cooperative Model.

1 Introduction

Education is a very important topic in the development of human resources because it is one of the tools to liberate people from underdevelopment, ignorance and poverty [1][2]. According to Article 1 of the 2003 National Education System Law, education creates an environment and learning process for students to actively devel-

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op their potential for religious spirit, self-control, personality, intelligence, and noble personality.

Considering that education is a long-term capital, it must be recognized that education needs to be prepared, equipped and initiated, but in this case Indonesia is still struggling with the classic problem of education quality. The big picture of this education can be concluded from the existence of learning activities between teachers and students to achieve educational goals that apply to the school curriculum.

Dimyati&Mudjiono states that learning is a process in which people are connected as a single organism in a way that changes knowledge, skills, and attitudes [3]. The process of education and learning is a two-way process between students and educators, and is carried out in the educational process [4]. A two-way relationship between teachers and students is the most important prerequisite for the learning process to take place [5]. In this case, not only the communication of messages in the form of learning content, but also the communication of attitudes and values of the learner [6].

The process of education and learning certainly faces obstacles. This also happens in learning mathematics. Students think that mathematics is not interesting, for students who currently consider learning mathematics to be monotonous, very difficult and boring. This has caused math scores in schools to be still very low, in Indonesia, the math national exam score in 2019 was 39.27, and in Aceh province, the high school national exam score was 32.57, while in Central Aceh, the math national exam score was 33.14. The Ministry of Education and Culture 's 2019 National Education Evaluation Center results report shows that this low mathematics learning achievement occurs in various schools in Central Aceh. One of the schools with low mathematics learning outcomes is Takengon 8 Public High School, even though this school is already graded A. The results of the 2021/2022 first semester exam for Class X show that the average mathematics student is still low. That is, the KKM is 70 and 75. This shows a contradiction between what is expected and what is expected. This really happened.

This should be changed in learning mathematics. Here the teacher should provide an environment and learning conditions that encourage students to be active in it, for example by changing traditional learning methods into methods that can encourage students to be more active. Once again, the learning model plays an important role in the learning process to help students understand the material presented [7]. Mathematics lessons are actually an interesting subject, but in reality math lessons at school are very boring, make it difficult for students, and students are less active in the learning process [8].

Based on initial observations of students at SMA Negeri 8 Takengon in participating in learning mathematics in class, there are very different things, some like it and some don't. Some of the students sitting behind them seemed to be only fulfilling their obligation to continue studying during the lesson. When the teacher asked the students, the researcher could see that most of the students who answered questions and listened to the teacher's explanation were only sitting in the front bench. It can be concluded that students are not very active in learning.

Teachers and students are the main components of learning in the education and learning process. Students are trained to acquire unique skills in the education and learning process so that not only is the teacher the main source of learning, but both teachers and students learn from each other and more than one lesson is needed. Not only in one direction but also from the teacher himself, he can understand the teaching material more deeply and participate actively in class learning.

Based on observations at Takengon 8 Public High School, the learning model used by the teacher in the process of learning mathematics in class only uses discussion and question and answer learning methods or lecture methods that combine models. However, based on observations when the teacher used the discussion method, most students only relied on their friends to make assignments in discussion group presentations. Therefore, researchers are trying to explore the development of discussion learning models in learning mathematics.

In this study the researchers conducted research at SMA Negeri 8 Takengon because this school already had Agredity A and the mathematics teachers at this school applied varied learning models not only conventional so that when this model was developed at this school mathematics teachers in this school there are no more difficulties in its application.

Even though various learning models have been implemented at this school, there are still students who are less active and still rely on their friends, especially those who sit in the back row, they are not even interested in the model used by the teacher. So that a new learning model is needed that can make students who are less active become active and interested in participating in the learning given by the teacher.

This learning model is designed to ensure that students not only interact more actively with their group mates during discussions, but are also responsible for completing the tasks assigned to their groups. This model the researchers call Gradual Brain Stimulution (GBS) this model is also one of the heterogeneous cooperative learning models. This model has several advantages, namely: making students more active in learning, giving stimulation to the brain, changing learning patterns that are not dominant in certain students [9], testing student readiness, training students to understand the material, improving students' cognitive abilities, students are more active in learning really understand while waiting for their turn to be accountable for the results of discussions with their group mates, doing heart exercises, tense and scared because students don't know when they will have their turn to be accountable for the results of their discussions, sharing knowledge between group mates and some other advantages of cooperative learning.

This model consists of 5 people (heterogeneous) but in learning it focuses more on personal responsibility, meaning that each student must be able to master the material provided because the responsibility is not in groups but individually. Students who were previously passive in learning are expected to become active because their attention is focused on learning activities by collaborating and interacting with their group mates. In addition to getting students to be active, this model can also make learning fun and not boring.

This learning model also makes students experience good stimulation (cardiac gymnastics, tension and fear) when waiting for their turn to be accountable for the results of their discussions with their groups. because he gets good stimulation so students will think that he has to be responsible for the results of his discussions and really understand the material given by the teacher [10]. Here GBS also invites students to be more active during lessons so they can improve their academic quality. On the other hand, GBS can also overcome students who tend to be lazy because of the burden of accountability. If the designated student cannot be held accountable for the results of the discussion, the student will receive sanctions. In addition, it is hoped that students with this new learning model students can be more active and motivated in learning Mathematics.

Based on the problems that the researchers have described, this study will examine the development of the Gradual Brains Stimulation (GBS) Model in learning mathematics.

2 Method

This research includes the type of research and development (Research and Development). The product developed in this study is the Gradual Brain Stimulation learning model. The R&D model that will be used in this study is the Model Borg and Gall. The stages in the research used the development method that has been adapted to the Borg and Gall model, namely: (1) Conducting field surveys (2) Mapping Learning Outcomes (3) Selecting Schools / Partners (3) Outreach (4) Conducting observations (5) validation and improvement (6) preparation and formulation of the Grand theory of learning models to be designed (7) Expert validation and revision, (8) Small-scale field trials and product revisions, (9) Large-scale field trials and final products (10) dissemination and implementation [11].

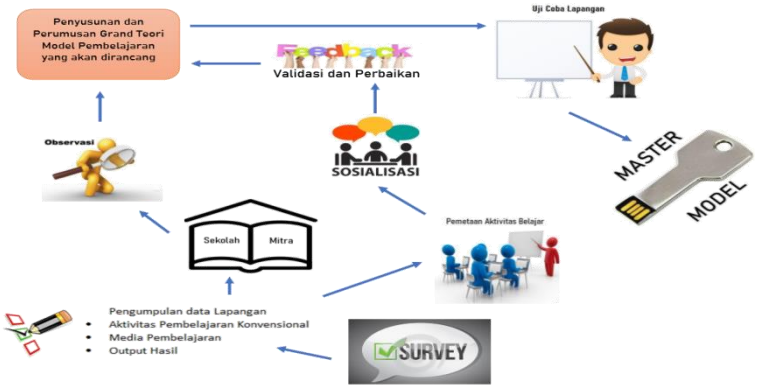

Fig. 1. Design Development Stages

The test subjects in this study were all class X SMA N 8 Takengon, each class numbering at least 20 students as a control class which was selected using purposive sampling [12]. The instruments used in this study were interviews, observation, documentation, questionnaires, and final ability test questions. Validity analysis is based on data from expert validation results to determine the validity of the learning model obtained based on the results of filling out the questionnaire used using a Likert scale. Practicality analysis is based on teacher and student response questionnaires. Analysis of the effectiveness of the Gradual Brain Stimulution (GBS) learning model was carried out using observation sheets on the teacher's ability to manage the GBS learning model, student activity observation sheets, student response questionnaires to the model, and the results of the final test of student learning outcomes through the GBS learning model with the average T test. Hypothesis testing was carried out to find out whether the hypothesis proposed in this study was accepted or rejected. Hypothesis testing is carried out using statistical techniques that match the distribution of the data obtained. Hypothesis testing is carried out by comparing the average value of the initial ability with the average final ability of students in the same class but with different treatments. The process of testing the hypothesis will include the normality test and homogeneity test of variance as a condition for using parametric statistics, namely by using the t-test of means, the regression equation and the coefficient of determination. Calculation of the mean t test, regression equation and the coefficient of determination using SPSS.

3 Results And Discussion

The main results of this research and development are RPP, LKPD and LIGBS (Gradual Brains Stimulation Instrument Sheet) and to find out whether the Gradual Brains Stimulation learning model is valid, practical and effective. This research and development is carried out using Borg & Gall procedures and development that have been adapted to research needs.

The first stage carried out by the researcher was research / data collection, at this stage the researcher collected data in several schools the researcher found that many students were less interested in mathematics, they thought that mathematics was a boring subject and a difficult subject. Meanwhile, the enthusiasm of the students in participating in the lessons varied, some liked it and some did not, some students sat at the back of them as if they were only fulfilling their obligation to stay in class while the lesson was in progress. When the teacher gives questions to the students here it can be seen that the students who answer the questions are the majority sitting in front and listening to the teacher's explanation, it can be concluded that students are less active in learning. Even though various learning models have been implemented in these schools, there are still students who are less active and still rely on their friends, especially those who sit in the back row, they are not even interested in the model used by the teacher. So that a new learning model is needed that can make students who are less active become active and interested in participating in the learning given by the teacher. the teacher uses the discussion method, most students only rely on

friends in the process of making discussion group assignments, this can be seen when students carry out discussions, only a few students master the material being discussed while the others just listen to their friends' presentations.

The second stage is planning, at this stage the researcher takes the initiative to develop a learning model. This model the researchers call Gradual Brain Stimulution (GBS). This model is also one of the Heterogeneous cooperative learning models. dominant in certain students only, testing student readiness, training students to understand the material, improving students' cognitive abilities, students are more active in learning (study first and really until they really understand while waiting for their turn to be accountable for the results of discussions with their group mates). This model consists of 5 people (heterogeneous) but in learning it focuses more on personal responsibility, meaning that each student must be able to master the material provided because the responsibility is not in groups but individually. Students who were previously passive in learning are expected to become active because their attention is focused on learning activities by collaborating and interacting with their group mates. In addition to getting students to be active, this model can also make learning fun and not boring.

The third stage is developing a product draft. There are several things that are done in the product design stage of developing the first Gradual Brains Stimulation (GBS) learning model, compiling the GBS learning syntax, second, compiling the presentation of LKPD and LIGBS, and third, adjusting competency standards and competencies. basic and syllabus based on the 2013 curriculum. The syntax of the GBS learning model is as follows:

Table 1. The syntax of the GBS learning model

Syntax GBS models	Learning steps
Delivery	1. The teacher conveys the goals and motivates students. As well as communicating the basic competencies that will be achieved. 2. The teacher reviews students' prerequisite abilities by asking questions about the previous material 3. The teacher conveys material related to learning that will be studied.
Grouping	1. The teacher divides students into several small groups consists of 5 students in one group. 2. Teacher distributing LKPD to each Student.
Planning	Student plan in a manner together with Friend group about the division of tasks to complete learning topics Which given through LKPD
investigation	Students carry out investigations by collecting information from various sources such as student books and others other, For finish topic learning Which given through LKPD.
evaluating	The teacher evaluates the learning outcomes of the learning materials that have been applied. By giving questions to select students to convey the results of the discussion

Number Selection	1. The teacher gives 1 question for all students from LIGBS. 2. The results of the answers to the questions are used to select the serial number of students who will answer question number 1 on the LKPD 3. If students cannot answer, students are given constructive sanctions (for example: given 1 question from LIGBS and answered personally), if students are correct then the results of the last answer are used to choose the next serial number. And so on until the questions on the LKPD are finished.
Numbering	The teacher numbers students randomly

The fourth stage is the validity test. The validity test consists of 2 parts, namely the product validity test and the post test questions validity test and other instruments that will be used during field trials [13]. The validation of post test questions is intended to obtain assessments, input, suggestions for improvement, refinement of the device, while from a product point of view the validation or product assessment aims to obtain accurate data that is used to make revisions (improvements), set goals for the effectiveness, validity and practicality of the products used [14]. generated. Validation was carried out by filling in the instrument in the form of a product evaluation questionnaire for the development of learning models and a questionnaire for evaluating post-test questions by experts. Product assessment aims to obtain accurate data that is used to make revisions (improvements), determine the effectiveness, validity, and practicality of the products produced. The learning model will be validated by 2 learning model experts, 1 material expert teacher, namely the mathematics teacher at SMP N 8 Takengon. For the benefit test, it was validated by users, namely 27 students of SMP N 8 Takengon class X.

The fifth stage is revision, Product revision is the step taken by the researcher after validating the validator. But thank God the researchers did not get much improvement, only a few instruments such as lesson plans and worksheets for the learning model and the LIGBS could be used without revision.

The sixth stage is the field trial. This product trial was carried out in one trial stage. The product trial was carried out involving class X SMA Negeri 8 Takengon. The product trial was carried out on Saturday 22 January 2022. The trial the product was carried out in class X, with a total of 27 students and thank God no one was unable to attend. However, before the trial phase was carried out, the researcher asked the teacher to provide responses to the lesson plan, LIGBS and LKPD for the *Gradual Brains Stimulation (GBS)* learning model in mathematics learning. The teacher was asked to provide an assessment using a questionnaire. The questionnaire contains statements that must be filled in by the teacher, by giving 4 answer choices, namely: Disagree (TS), Less Agree (KS), Agree (S), and Strongly Agree (SS). The results of the responses briefly regarding lesson plans, LIGBS and LKPD by mathematics teachers are presented in the following table:

Table 2. The results of the responses briefly regarding lesson plans, LIGBS and LKPD by mathematics teachers

EVALUATION	TOTAL VALUE	PERCENTAGE	CRITERIA
RPP	85	88.54%	Very good
LKPD	38	79.17%	Good
LIGBS	39	81.25%	Very good

Before the implementation of the GBS model was carried out before carrying out interactions between teachers and students, like teaching and learning. In the teaching and learning process in the classroom that has been regulated in the RPP, students are divided into 6 groups, each group consisting

of 5 students. Each student gets an LKPD which will be worked on in groups, but they have responsibility for the LKPD that has been distributed to them.

During the learning process the researcher also made observations using activity observation sheets in class, both observations of teachers and students. The results of the researchers' observations on the teacher's ability to plan lessons, carry out learning activities and explain the material are no doubt, the teacher does it very well and skillfully, this can be seen from the teacher's flexibility in teaching and mastery of the subject matter. The teacher's ability to use the GBS (Gradual Brain Stimulation) learning model is quite good, the teacher carries out the stages in the learning model well

While the results of the researchers' observations of students during the learning took place in the form of students' readiness in participating in learning, students' courage in expressing opinions, interacting with teachers and between students was quite good. The activeness of students during learning has increased from before, students are more active in asking questions and students are also active in expressing their opinions and ideas, interactions with teachers and between students are going well and it is seen that students do not rely on their group mates, this can be seen from almost all students understand and master the subject matter.

The seventh stage is product improvement, After conducting field trials to find out the development of the GBS learning model on compositional and inverse function material, the model is said to have very high attractiveness, so no repeat trials are carried out. Furthermore, this GBS learning model can be used as a learning model that can foster and increase students' interest in learning mathematics activities in class, especially the activity of students at SMA Negeri 8 Takengon in learning mathematics activities in class.

The eighth stage is Implementation and Dissemination, At this stage what should be done is the learning model that has been developed is widely applied. In this study, the deployment phase was only carried out in one school, namely SMA Negeri 8 Takengon. The distribution was carried out in class X and Mathematics Teacher at SMA Negeri 8 Takengon. The reason the researcher carried out limited dissemination in this school and class was because the researcher carried out field trials in Class X on compositional function material, the limited time the researcher had and the lack of funds the researcher had.

After undergoing the Borg & Gall Model development process, raw data obtained includes: 1) Data on the validity of the learning device; 2) Data on teaching material instruments; 3) Data about student activity; 4) Data on the implementation of learning syntax; 5) Data on student responses; 6) Data on student learning outcomes; This raw data is then analyzed to find out whether the *Gradual Brains Stimulation model* developed is included in the valid, practical, and effective criteria. The following details the description and analysis of the data resulting from the development of the *Gradual Brains Stimulation model*.

3.1 Validity Analysis

Gradual Brain Stimulation (GBS) learning model was tested in the field, validation was carried out on the Gradual Brain Stimulation (GBS), LIGBS, LKPD and RPP learning models. The validation of the development of the GBS learning model was tested by 2 experts. The validation instrument uses a Likert scale 4. The validator's assessment of the GBS learning model includes several aspects, namely supporting theory, learning development structures, and desired learning outcomes. The validator's assessment of lesson plans includes several aspects, namely learning objectives, learning steps, language and time. The validator's assessment of LIGBS includes several aspects, namely aspects of content feasibility (appropriateness of material with KD, accuracy of material, and encouraging curiosity), aspects of presentation feasibility (presentation techniques, presentation completeness, presentation of learning, coherence and logical thinking), and aspects of GBS learning assessment (Characteristics of GBS learning in Mathematics learning). The validator's assessment of LIGBS includes several aspects, namely aspects of content feasibility (appropriateness of material with KD, accuracy of material, and encouraging curiosity), aspects of presentation feasibility (presentation techniques, presentation completeness, presentation of learning, coherence and logical thinking), and aspects of GBS learning assessment (Characteristics of GBS learning in Mathematics learning). The results of a brief assessment of the validity of the GBS, RPP, LIGBS, and LKPD models by the validators are presented in the following table:

Table 3. The results of a brief assessment of the validity of the GBS, RPP, LIGBS, and LKPD models by the validators

EVALUATION	VALIDATOR	LEVEL OF VALIDITY	AVERAGE	CRITERIA
GBS models	I	88.46%	91.35%	Very Valid
	II	94.23%		
RPP	I	91.67%	94.79%	Very Valid
	II	97.92%		
LKPD	I	93.75%	91.15%	Very Valid
	II	88.54%		
LIGBS	I	87.50%	90.10%	Very Valid
	II	92.71%		

Based on the table above, it can be concluded that the GBS, RPP, LKPD, and LIGBS models are feasible or valid for use in the learning process.

3.2 Practicality Analysis

The practicality of the learning model was obtained from the practicality of the learning model consisting of a teacher response questionnaire and a student response questionnaire and then described using a Likert scale [15]. Student response

data and teacher responses were obtained from teacher response questionnaires and student response questionnaires which were given after the application of the Gradual Brains Stimulation (GBS) learning model in mathematics lessons. The teacher and student response data to the learning model can be seen in the following table:

Table 4. The teacher and student response data to the learning model

No		Practicality Level	Average	Percentage		Criteria
1	Student Response	966	3.58	89.44%	83.00%	Very Practical
2	Teacher Response	49	3.10	76.56%		Practical

Based on the results of the average student and teacher responses that are both included in the practical category, the *Gradual Brains Stimulation* (GBS) learning model is practical to apply to the learning process and the application of *the Gradual Brains Stimulation* (GBS) learning model is easy to apply by teachers with practicality level 3.34. In the table above it can also be seen that based on the aspects assessed, the learning model developed can be said very feasible because the average practicality score of 83.00% withvery practical criteria.

3.3 Effectiveness Analysis

The effectiveness of this learning model can be measured through research instrument sheets which are 4 indicators of learning effectiveness, namely: 1) guide sheets for observing the teacher's ability to manage the GBS learning model. 2) guide sheets for observing student activities during the GBS learning process, 3) questionnaire sheets for student responses to the GBS learning model, and 4) test sheets for student learning outcomes through the application of the GBS learning model [15].

The data from the four indicators will serve as a guideline or benchmark for determining the effectiveness of the GBS learning model in material for compositional and inverse functions in class X SMA Negeri 8 Takengon.

3.4 Observation of the teacher's ability

Table 5. Data from teacher observations managing the GBS learning model

No	Teacher Activity (Value Aspects)	Mark
I	**Preliminary activities**	29
II	**Core activities**	50
III	**Closing Activities**	14
Max Score		105
Gain Score		93
Percentage		89%

Based on the table above, the obtained score is 93 out of 21 indicators with a maximum score of 105 so that the percentage of observations of teacher activity in managing the GBS learning model in the classroom is 89% with the criteria "Very Good".

3.5 Observation of student activity

Table 6. Data from observations of student activities during the GBS learning process

No	Teacher Activity (Value Aspects)	Mark
I	**Preliminary activities**	16
II	**Core activities**	37
III	**Closing Activities**	12
Max Score		85
Gain Score		65
Percentage		76.47%

Based on the table above, the obtained score is 63 out of 17 indicators with a maximum score of 85 so that the percentage of observations of student activity during the mathematics learning process on compositional and inverse function material using the GBS learning model in class is 76.47% with the criteria "Very Good".

3.6 Student response to the model

Table 7. Student response to the GBS model

No	Interval	Frekuensi
1	59 – 63	3
2	64 – 68	8
3	69 – 73	12
4	74 – 78	4
AVERAGE	3,47	
PERCENTAGE	86,71%	

Based on the results of student responses to the GBS learning model in the table, an average value of 3.47 and a percentage level of 86.71% is obtained, the learning model developed to get a response is included in the "Very Good" criteria.

3.7 Results of student learning tests through the application of the GBS model

To determine whether there is an increase in student learning outcomes, hypothesis testing is carried out by comparing the average initial

ability value with the final average ability of students in the same class but with different treatments. Based on the results of the research in the experimental class, there were differences in the results of the answers to the pretest and posttest questions which consisted of 5 essay questions. The description of the results of the students' pretest and posttest in the control class and experimental class can be transformed in Table 3.3.4.1. as follows.

Table 8. Pretest dan PostTest Student Class X SMA Negeri 8 Takengon

No	Pretest	Posttest	No	Pretest	Posttest	No	Pretest	Posttest
1	68	80	10	75	90	19	50	60
2	75	95	11	55	75	20	80	95
3	75	90	12	65	75	21	75	75
4	60	100	13	65	80	22	68	95
5	75	80	14	68	65	23	50	60
6	60	50	15	70	80	24	80	95
7	65	75	16	68	75	25	70	80
8	75	80	17	50	60	26	78	95
9	75	80	18	78	85	27	90	100

From the results above in the columnogorov-smirnov column and it can be **seen** that the significance value is 0.05; for the pre-test of 0.043; and for the post-test is 0.82. Because the significance for all variables is greater than 0.05, it can be concluded that the data on the variables are normally distributed.

From the above results it can be seen that the significance of the Based of Mean Student Learning Outcomes is 0.251. Because the significance is more than 0.05, it can be concluded that the variances of the two or more data groups are the same. So the data in this study have the same variance (the data in the study do not have different data variances), so that one of the ANOVA assumptions is fulfilled or feasible to use, then the data above can be used for further tests.

Hypothesis Test (Paired T –Test)

Table 9. Paired Samples Statistics

		Means	N	std. Deviation	std. Error Means
Pair 1	Pretest	69.00	27	9,985	1922
	Posttest	80.37	27	13,296	2,559

Because the average pre-test is 69.00 and post-test is 80.37, it can be seen that the pre-test value is less than the post-test value. In description, there is a difference between the pre-test and post-test values.

Table 10. Paired Samples Test

	Paired Differences					t	Df	Sig. (2-tailed)
	Means	std. Deviation	std. Error Means	95% Confidence Interval of the Difference Lower	Upper			
Pair 1 Pretest - Post Test	-11,370	9,361	1,802	-15,073	-7,667	-6,312	26	.000

Based on table 4.5 it shows that the (2-tailed) significance is 0.000 <0.05, then Ho is rejected and H1 is accepted, meaning that there are differences in learning outcomes after using the GBS Learning Model (G*radual Brains* Stimulation) in mathematics learning

4 Conclusion

Gradual Brains Stimulation (GBS) learning model in Mathematics lesson. From the results of the research that has been done, the conclusions that can be described in this study are that the *Gradual Brains Stimulation* (GBS) learning model in Mathematics that has been developed meets valid criteria, namely 1) the results of the validation of the GBS Model are validated by a team of experts with an average total 3.65 and the validity percentage is 91.35% withvery valid criteria, 2) the results of the RPP validation which were validated by a team of experts with a total average of 3.79 and a validity percentage of 94.79% with very valid criteria, 3) LIGBS validation results which were validated by a team of experts with a total average of 3.60 and a validity percentage of 90.10% withvery valid criteria, and 4) LKPD validation results validated by a team of experts with a total average of 3.65 and a validity percentage of 91.15% withvery valid criteria.

The Gradual Brains Stimulation (GBS) learning model in Mathematics that was developed met Practical criteria, namely the results of student responses to the model developed were 3.58 and the results of the teacher's response to the model developed were 3.10. From the two responses, an average practicality of 3.34 was obtained with a percentage practicality 83.00% with the criteria of "Very Practical".

The Gradual Brains Stimulation (GBS) learning model in Mathematics that has been developed meets valid criteria, namely 1) the results of observations of teacher activities managing the GBS learning model obtained 89%, 2) the results of student activities during the GBS learning process obtained a percentage of 76.47%, 3) the response results students 86.71%, and 4) Learning mathematics using the GBS learning model can be shown from the results of calculations using the paired t-test, the results

obtained are sig.2 tailed at 0.000 <0.05 with t-count -6.312 which means average -the average before using the learning model is lower than the average after using the developed model, which means that ho is rejected and ha is accepted, namely learning using the GBS model is more effective than learning that does not use the GBS model. From this test there is a significant difference between the average value before treatment (pre-test) and the average value after treatment (posttest) with the average value of the post-test and pre-test in the experimental class, which is equal to 80.37 for posttest > from 69.00 for the pretest. This means that there is a significant difference between the average values before using the GBS model and after using the GBS model.

Based on the results of the research and conclusions above, it can be suggested several things, namely teachers to be able to use the *Gradual Brains Stimulation* (GBS) learning model in mathematics learning as an alternative to learning in the classroom because this learning model is effective and can improve student learning outcomes.

Gradual Brains Stimulation (GBS) learning model needs to be tried out in other schools so that the scope and quality of this learning model can be met because this research has not yet reached the stage of widespread dissemination. This research is only limited to product development so that the level of effectiveness and implementation of the use of the *Gradual Brains Stimulation* (GBS) model still requires further research. This research is also still limited to field tests involving only one school, so it is necessary to carry out further research and dissemination using a wider sample.

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