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Discovery Learning Model and Props of Statistical Kenik In Improving The Mathematical Communication Ability of Junior High School Students D S Gustiani1, A Irman2, and F M Fadhillah3* 1SMK Bela Nusantara, Jl. Sirnagalih, Cilaku, Kabupaten Cianjur, Jawa Barat 43285 Indonesia 2SDN Cibulakan, Jl Gatot Mangkupraja Desa Cibulakan Kecamatan Cugenang Kabupaten Cianjur Jawa Barat, Indonesia 3SMP Negeri 2 Cilamaya Kulon, Jl. Pulo Putri Desa Sukamulya – Cilamaya Kulon, Karawang 41384, Indonesia *fikamuji21@gmail.com Abstract.

The purpose of this study is to examine the achievement and improvement of junior high school students' mathematical communication ability using discovery learning models and props of statistical kenik compared to students who use ordinary learning, and student activities during learning using discovery learning models and props of statistical kenik to take place. This study used a quasi-experimental design.

The experimental group obtained learning with discovery learning models and props of statistical kenik and control groups obtained regular learning. The instrument used was a test of mathematical communication ability. The population in this study were all eighth grade students of SMP Negeri 2 Cilamaya Kulon Karawang.

With the sample subjects were eighth grade students as many as two classes from the five existing classes randomly selected. The results of this study are: (1) There is achievement and improvement of mathematical communication ability between students whose learning uses discovery learning models and props of statistical kenik compared to students who use ordinary learning; (2) Learning by using discovery learning models and visual aids shows that the learning process is more effective in mathematical problems solving and students can find statistical material concepts.

Introduction The aim in mathematical subject of Junior High School level depens on the students' mathematical abilities. There are some abilities that students' have to owned in the mathematical class. One of them is the mathematical communication ability which is needed in the national curriculum of 2013 that used in Indonesia.

The communication ability is very important for students to have [1–9]. The mathematical communication ability is need to help the students in expressing and implementing their understanding deep in solving the mathematical problem concept and processing the mathematical activity that learnt by students [3,10].

Baroody argue that there are two reasons why does the mathematical communication ability is important for students. The first reason is mathematics as language, which is meant that mathematics is not only the tools of thinking, tools of tinding the concept, solving the problem or making decision, but also mathematics is a valuable tool for communicating a variety of ideas clearly, precisely, and succinctly.

The second reason is mathematics learning as social activity, which is meant that the social activities in the mathematics learning class, but also the tool of students' interactions process implemented to communicate with other students and teacher/lecturer with students [1,5,6,11,12]. The students' mathematical ability in Junior High School level is low [2,8], it is caused the junior hight school students are not accustoming to deliver their opinion or argument to solve the mathematical problem [3].

Moreover, the students usually hard to do the tasks that they have not learn before so that they had a trouble in delivering an opinion or agrument to solve the works. In this case, as a fact shows that the students of junior high school are almost having a lower ability in mathematics. As the result of the mathematics daily assessment for the base competence before, the topic is about a flat side space build and it is taught in VIII class of SMP Negeri 2 Cilamaya Kulon which has 38 students. Almost 22 students of that class seem to be hard in interpreting and doing the task into other buildings.

However, 16 students are finishing the task. Thus, it is only 42 percent of students are able to solve and to finish the task. The main factor of the lower students' mathematical communiation ability is the learning approach used by the teacher. Usually, the teacher is only delivering the subject matters and giving a sample questions without asking students' interaction to give an opinion or analysis.

This is the reason why the students only get the solving based on their teacher way to

solve the problem, it makes the students' creative thinking are not working. There is a way to improve the students' mathematical communication ability such as the students' training test to motivate them in delivering an opinion or an argument by disscussion class with the comfortable learning athmosphere.

Therefore, the learning process should be improved and involve the students to be active to deliver their opinion in mathematical class. the mathematical learning model that can be used to motivate the students' activeness in teaching mathematics is discovery learning model. The discovery learning model is one of the learning models that force students to find out their own concept in learning [13–17].

By implementing the discovery learning model the students are directing to be independent to find new learning concept based on the previous concept they got [17–19]. Moreover, in improving students' creativity in statistical subject, the researcher used the statistical kenik as visual aid to help students in getting their understanding of statistics.

The benefit of discovery learning model assisstance with statistical kenik is the students are being active in learning process, the students are able to find their own concept, the students are being moivate in solving the problem, and the students are having a new athmosphere in interaction process [20]. Experimental Method The research use quasi experimental method, it is applying in the experimental classroom which is used discovery learning model assistance in statistical kenik and the usual learning for the control class.

Before the classes began to have a treatment both of them will get a pretest and after the classes got some treatment they will get a posttest. The frame of this research will be: O _X _O _ _O _ _O _ _Statement: --- : Withdrawal the random classes sampels O : Pretest = postest X : The discovery learning activity assisstance with statistical kenik The reasearch population are the students of class VIII SMP Negeri 2 Cilamaya Kulon Karawang.

The samples are two random classes choosen in the same grades of VIII which the experimental class get the learning activity by using discovery learning model assisstance with statistical kenik. Moreover, the control class get the usual learning activity. The class of VIII B as the experimental class and the class of VIII C is the control class.

The research is implemented in SMP Negeri 2 Cilamaya Kulon Karawang and it is done in five weeks. The instrument used in this research is communicative mathemathic ability

test in the form of six essay questions. The validity, reliability, difficulty level and distinguishing features of the questions used has been tested before.

As the example of the ability questions for communicative mathemathic Junior Hig School of this research is: Indicator : explain a real thing or a picture into an essay and finished it Question: Look at the picture below! / Add some information or sizes on the picture above and then rearrange a relavant essay questions and solve it! Indicator: stating a daily activity by some mathematical symbols or arranging a mathematical event model and finished it.

Question: In a mathematics examination of VIII A class, an average score of female students are 86 while the average score of male students are 74. If the total average score of all students are 83. Make the mathematical model based on the information above afterwards calculating the percentage of female students in VIII A class.

Result and Discussion Result The result of the mathematical communication test consist of pretest and postest. In order to evaluate the rise ability of the mathematical communication between students in the experimental class and control class is showed by the result of pretes, postest and gain, which is counted by normalized gain (gain normalisasi).

The studets ability of the mathematical communication in the experiment class and control class before and after the treatmenr is showed by the result of pretes and postest. Before the analysis, there is a descriptive ability score of pretest, postest and N-Gain in the table as follows: Table 1. The Mathematical Communication Ability Result Research Class _Pretest _Postest _N – Gain _ _ _ x _SD _SMI _ x _SD _SMI _ x _SD _ _Experiment _7.2 _1.97 _24 _19.6

_2.33 _24 _0.7371 _1.471 _ _Control _7.0 _1.93 _24 _17.5 _2.43 _24 _0.6115 _1.505 _ _ The result concluded based on the Table 1 above is that the ability between the experiment and control class are not much different. After the treatment is applying, there is the change of mathematical communication ability in the experimental class which is showed the rise of ability than the control class.

It showed that the rise of mathematical communication ability in discovery learning model assisstance with statistical kenik is better than using the usual learning activity model. In the pretest analysis, the normalized test conducted shows that the data distribution is normal. Continued with the homogeneity variants test. The result shows that homogeneity variants test obtained from the homogeneus data.

Furthermore, the similarity of significance test between the average scores conducted by using SPSS 20.0 software for Windows, as the result of: Table 2. The Similarity of Significance Test of The Pretest Average Scores _ _Research class _N _ x _SD _Sig. _Interpretation _ _Experiment _39 _7.2 _1.97 _0.685 _H0 accepted _ _Control _39 _7.0 _1.93 _ _ _ _ Based on the Table 2 the score result by using t-test is 0.685, which 0.685 > 0.05 with the result that H0 is accepted.

It concluded that tere is no differentiate between the first mathematical communication which use discovery learning model assisstance with statistical kenik by way which use the usual learning activity. In order to find the result of the research, postest conducted after the treatment applied. There is the table which shows the noemalized test by using Shapiro – Wilk based on SPSS 20.0 software for Windows. Table 3.

The Normalized Test Result of Postest Data In Mathematical Communication Ability _ _Research class _N _ x _SD _Sig. _Interpretation _ _Experiment _39 _19.6 _2.33 _0.037 _H0 rejected _ _Control _39 _17.5 _2.43 _0.044 _H0 rejected _ _ Based on the Table 3 significance score from experimental class is 0.037 and the significance score from control class is 0.044, which is shows that both of the class are have the same score of sig. < 0.05 so the result of H0 is rejected.

It shows that the postest samples data have no normal distributing. Both of the classes have no normal distributing population so that the research conducts the non paramatrics test for differentiating both of them by using Mann Whitney test in a postpest of mathematical communication ability by the degree of significance is 0.05.

In this case, the research conducted the party right test by the way to know the better learning process. The hypotheses formulated in a statistical hypothese as follows: HO : μ1 = μ2 (There is no accomplishment of students mathematical communication ability which is used the discovery learning model assisstance with statistical kenik with those usual learning activity) HA: μ1 > μ2 (The accomplishment of students mathematical communication ability which is used the discovery learning model assisstance with statistical kenik is better than the usual learning activity).

The testing criterion as follows: If the score of Sig. (1 – tailed) > 0.05 means that H0 is accepted. If the score of Sig. (1 – tailed) (0.05 means that H0 is rejected. After the Mann Whitney test conducted by using SPSS 20.0 software for Windows, the result gained as follows: Table 4. Significant Test Results Differences in Two Average Postest Scores _ _ _Mathematical Communication Ability Postes _ _Mann-Whitney U _433.000 _ _Asymp. Sig.

(2-tailed) _.001 _ _Exact Sig. (2-tailed) _.001 _ _Exact Sig. (1-tailed) _.000 _ _Point Probability _.000 _ _ Based on he result of table 4 the score of is sig. (1-tailed) with mann whitney test is 0.001. It because the score of Sig (1 – tailed) < 0.05 so that H0 is rejected. By the result of the accomplishment of students mathematical communication ability which is used the discovery learning model assisstance with statistical kenik is better than the usual learning activity.

The analysing and the processing of the n-gain data classes is intended to know the rise of mathematical communication students' ability in experimental class is more significance than conrol class. There is the result of normalized index test of n - gain which is normalized by using Shapiro-Wilk based SPSS 20.0 software for Windows as follows: Table 5. The Normalized Index Test of N - Gain Which Is Normalized _ _Research Class _N _ x _SD _Sig.

_Interpretation _ _Experimen _39 _0.7371 _1.471 _0.693 _H0 accepted _ _Control _39 _0.6115 _1.505 _0.362 _H0 accepted _ _ Based on the Table 5 the significance score from experimental class is 0.693 and the significance score of control class is 0.362, by way the score of sig. > 0.05 so that H0 is accepted. It means that both population are having a normal distribution.

Furthermore, the homogeneity to know is the various data from the analytical samples are homogeneus or no. The homogeneity test result as follows on the table 6: Table 6.The Result of Index Homogeneus N-Gain Test Normalized _ _Research class _N _ x _SD _Sig. _Interpretation _ _Experiment _39 _0.7371 _1.471 _0.829 _H0 accepted _ _Control _39 _0.6115 _1.505 _ _ _ _ Based on the Table 6 the significance score of homogeneus test of Levene Statistic is 0.829, by way the score of sig. > 0.05 it means that H0 accepted.

Thus experimental class variant are homogeneus. Therefore, both classes are normal distributed and have a homogeneus variant, furthermore the differentiate test by using t-test is conducting to know the differentiate the average score between thm by unilateral test.

The hypotheses of unilateral test in n-gain normalized index by t-test as follows: H0: μ1 = μ2 (There is no increase of students mathematical communication ability which is used the discovery learning model assisstance with statistical kenik with those usual learning activity) HA: μ1 > μ2 (The increase of students mathematical communication ability which is used the discovery learning model assisstance with statistical kenik is better than the usual learning activity) In order to know the differentiate between the average score, the researcher use significance degree of 0.05 by understanding these

follow criterion: If te score of sig.

(1-tailed) ? 0.05 so that H0 rejected If te score of sig. (1-tailed) = 0.05 so thatH0 accepted Moreover, after the posttest of matematical communication ability is implemented and the average score is conducting by using SPSS 20.0 software for Windows, the result is conlcuded as: Table 7. The Result of Differentiate Significance Posttest Score _ _Research class _N _ x _SD _Sig.

(2-tailed) _Interpretation _ _Experiment _39 _0.7371 _1.471 _0.00 _H0 rejected _ _Control _39 _0.6115 _1.505 _ _ _ _ Based on the result of Table 7 seen that the score of sig (2 – tailed) is 0.00. "Because, if we want to do the unilateral hypotheses test (1-tailed) so that the score of sig. (2-tailed) should devided into two" [21].

By seeing the table above that the score of sig. (1 – tailed) is 0.00 2 =0.000. Because of the score of sig. (1-tailed) < 0.05 means that H0 rejected. Thus, the researcher conclude that the rise of stucents' mathematical communication ability implemented in discovery learning model assisstance with statistical kenik is better than the usual learning activity.

Discussion Based on the data processing above can be conclude that the rise of stucents' mathematical communication ability implemented in discovery learning model assisstance with statistical kenik is better than the usual learning activity. In case, the research result above is similar with the jugdement that the students who learn by using discovery learning have to do an observation, classification, analogical making, analysis and make a generalisasi of concept. The mathematical individual or group procedure [15].

Based on the observation research in the field showed that discovery learning model assistance with statistical kenik motivate the students for being more active and creative in the process of thinking to solve a problem or find out a new thinking concept in a students' worksheet. It means that students have a big chance to be a creative and to be a thinker.

Besides the teacher can easily motivate the students to learn how to express their ideas directly to the other students, the students become more interesting to have a disscussion with other groups to find out the best answer and solve the problem. Previously, the students of experimantal class and control class get the individual pretest to defect their basic ability in mathematics.

The first test is run fluently althought some of them look little bit confuse and they are not focus at the same time. They are not confidence in answering the questions because

the subject matter is new for them. The implementation of learning steps can be implemented as the teory in the experimental class which use discovery learning model assisstance with statistical kenik is doing by several steps as follows stimulation, problem statement, data collection, data processing, verification, generalization. The first step is stimulation.

The teacher devided students into several heterogeneus groups consist of 4-5 students. The teacher gives a worksheet for every groups and explains the purpose of the learning, the main activity that students should do to gain the aim. Students are observing the daily routine problems in order to motivate students in finding the solution by their own way and their first knowledge.

The second step is problem statement, the teacher give an opportunity to students to identify some relevant problem with the relevant matter and students should identify some daily routine problem that they found in stimulation step and formed it into hypotheses. The third step is data collection, the teacher provide students to collect some relevant information, they with their groups are assigned to collect some relevant information to answer the identificational questions.

Students used the statistical kenik which is provide by the teacher to be used by students in resolving their works. Students write all the information about the statistical matter they found from the stimulation by using the visual model simulation into a worksheet. Moreover, they have to disscuss it with their groups members to solve the problem statement in their worksheet.

The fourth step is data processing, students have to disscuss the statistical matter that they collected and resumed in the previous activity. Students processing all the information from observing data and collecting data. The fifth step is verification, students disscuss the observational result and verify the result of it about the statistical matter with the data or statistical kenik model. The last step is generalization, students present the disscussion result based on the analyrical process.

Students present their works about the statistical matter in classical. Students give their opinion of the presentation and other groups give their opinion and argumentation to the presenter. The students give some argument to the group presenters and others are able to answer the questions given.

It props by an agrument that argue from Markaban [19,22] states that the steps of discovery learning model as follows; (a) formulating an appropriate data problem that given to the students; (b) based on the data, students have to arranging, processing,

organizing and analysing those data; (c) students arranging the suppositon from the data analysis they have done; (d) the teacher can look into the students works; (e) if the works is done and the sureness is found, the validation has to give to the students to be arranged in a verbal languange; (f) moreover, the teacher has to prepare an additonal task or another work in convincing the students understanding of their discovery result.

The learning activity that use a discovery learning model assisstance with statistical kenik in experimental class for about sixth meeting is implemented. For the first meeting, students look enthusiastic in doing their works and they try to give their opinion as well as they can although it is not directly towards to the problem solving. However, some of them seem to be confused because they are not really familiar with the students worksheet.

In the next meeting, half of the students are starting to be an active to give their opinion in the learning activity, they are asking several questions, and those are starting to show that they find some problem solving to solve the problem presented by the teacher. Therefore, the researcher found several problem in this research such as the limitation of time.

The implementation of discovery learning model assisstance with statistical kenik in the experimental class has additional time to be applied because there are some steps that students has to be done such as identification the problem, arrange the hypotheses, do a verification, and all of them need more time and differ from usual leaning process.

The additional time for using a worksheet has to be note too, considering that the teacher and the students have to make a conclusion of the learning process. The students lack in this step impacted to the time missed, so that the teacher has to lead and direct the students. To get the result that the students are serious in finishing the worksheet and it will finished and be solved.

The benefit of using the discovery learning model assisstance with statistical kenik in the experimental class is to make the students work independently, creatively in doing the verification by using statistical kenik. Exercises the mathematical students' ability to be active in the learning process and found their own result, solve the problem independently.

While the lack of using the discovery learning model assisstance with statistical kenik is the used of time which need more time in implementing the model. By using statistical kenik, the leaning activity will be change and different than before, although the lack can be minimized by planning the structural learning activity before, approve the

students in verification process.

Thus, it hard to control the students success and their activities, and then constructing students based knowledge so that the learning process will run smoothly. It props by the other reaserchers that developing the learning tools is a should because it will be facilitated the habit and accomodate the students' character in developing their abilities, in particular to find the statistical concept so that the indicators of students' achievement can be reach [19].

Coclusion Based on the data analysis and discussion, it can be conclude that the students' mathematical communication ability who use the discovery learning model assisstance with statistical kenik is better based on the significance score than the learning process which use usual learning process in the level of significance is 5%.

Acknowledgments Thanks to the head master of SMP Negeri 2 Cilamaya Kulon Karawang who give the researcher opportunity to have a research at the school that he leads. Thank you to the parties who help the researcher in doing the research.
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