The Impact of Group Investigation (GI) Learning Models on Sequence and Series: A Study Case Numerical Skills Analysis in Islamic Boarding School

IOP Conf. Series: Journal of Physics: Conf. Series **1467** (2020) 012030 doi:10.1088/1742-6596/1467/1/012030

The Impact of Group Investigation (GI) Learning Models on Sequence and Series: A Study Case Numerical Skills Analysis in Islamic Boarding School

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Abstract. The numerical ability of students needs to be mastered because it relates to speed and accuracy in using basic functions in calculating basic mathematical operations. This study aims to determine the impact of the Group Investigation (GI) learning model on numerical ability. The research method used is Quasi Experimental using a quantitative approach. The instrument used in the form of essay test questions. The data used are the results of the post-test analysed with T test. Based on the data obtained T_{count}= 5,849 and T_{table} = 2,005 because $T_{count} \geq T_{table}$ it means that the numerical ability of students taught with GI learning model is better than the numerical ability of students who were given conventional learning model so it can be concluded that, Group Investigation (GI) learning model has a good impact on students' numerical ability.

Keywords: Group Investigation, Numerical ability, Sequence and Series.

1. Introduction

Numerical ability includes the ability in terms of addition, subtraction, multiplication and division. Numerical ability is an ability related to accuracy and speed in using basic functions and also relates quickly and precisely in calculating mathematical basis calculation operations [1]. Mathematics is one of the lessons to improve the quality of education [2], when the quality of education is good, quality human resources are created for the development of the economic sector [3]. The numerical ability has been studied by previous researchers with the Realistic Mathematics Education (RME) approach with numerical ability as a reference as problem solving [4]. Relationship of numerical ability and learning outcomes [5]. Numerical ability to learning achievement [6]. Relationship of numerical ability with mathematical achievement [7] In improving the quality of education there needs to be an educator movement to encourage students to be more creative in solving problems during the teaching and learning process [8]–[10]. Solving problems in mathematics requires numerical ability [11], the better the numerical ability of students, the better the quality of education. Improving numerical ability needs

to change learning models better. Previous researchers have not examined the numerical ability with GI, so the researchers intend to examine the numerical ability with GI.

One learning model that can improve the numerical abilities of students is the GI learning model [12], because in GI learning students are required to be active in solving problems given by educators by forming groups and discussing together [13]. Previous research on GI learning models can improve learning outcomes. Other studies that also examine the effects of GI besides learning outcomes can also improve critical thinking skills [14]. Researchers furthermore the effects of GI on the ability to read techniques [15]. GI learning in an effort to improve environmental literacy skills [16]. GI learning also improves mathematical understanding skills [17]. GI learning also improves mathematical connection skills [18]. The difference of research that will be conducted with previous research lies in the use of the GI (Group Investigation) learning model on numerical ability [19], because no one has examined the GI learning model on numerical ability [20].

Improving numerical ability in addition to changing learning models that are more interactive requires the existence of learning materials that can hone students' numerical abilities [19]. Appropriate material for sharpening numerical abilities of students is Sequence and Series [20]. Because the material in the Row and Series in addition to improving numerical ability [21], can also improve problem-solving skills [22]. Row material and sequences are used to increase learning activities and outcomes [23]. Row material and series are also used to analyze students' critical thinking skills [24]. Indicators of numerical ability, namely algebra, arithmetic, and series [25] material that includes indicators of numerical ability are Lines and Rows. The novelty of the discussion of this article lies in learning (Group Investigation (GI) which has never been associated with numerical ability, and analyzing numerical ability by using row and sequence material, so the purpose of this study is to determine the impact of Group Investigation (GI) learning models on the ability numeric in row and series material.

2. Method

The type of experiment used in this study is Quasi Experimental with post-test control group design research design (Figure 1).

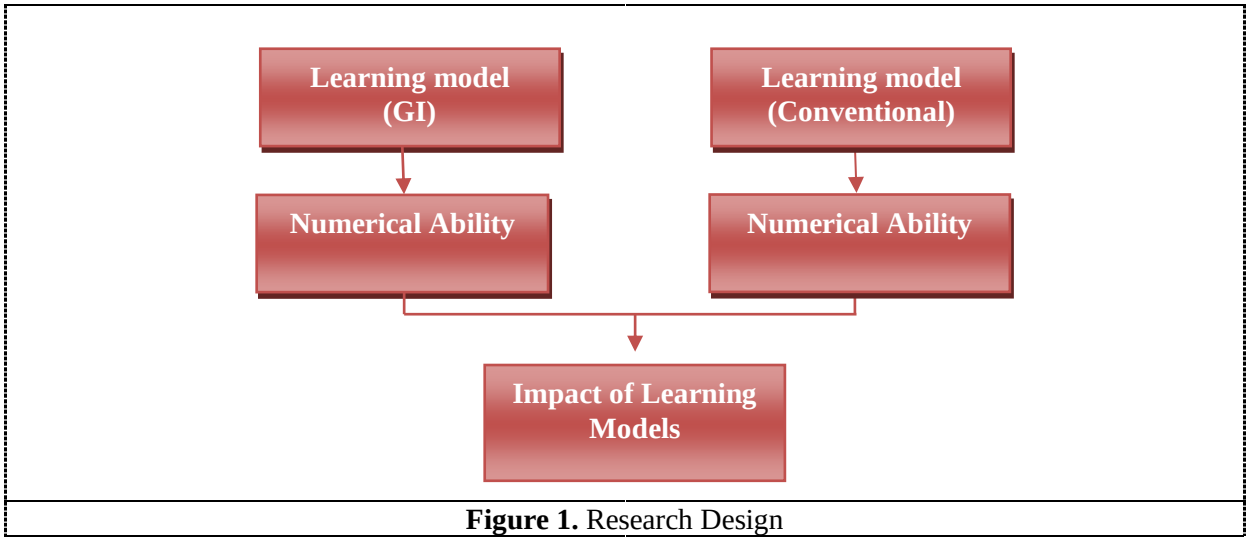

Figure 1. Research Design

The data in this study were obtained through tests, in the form of questions (essays) that were shown to students. Questions are designed to measure the numerical ability of students in the material of the Row and Series [26]. The data analysis test was carried out using the statistical analysis of the T Test [27], which aims to see the impact of the learning model used on numerical abilities. The impact of the

learning model can be measured by calculating the effect size [28] using Cohen's formulation presented by Hake, namely:

$$d = \frac{\bar{x}_1 - \bar{x}_2}{S_{gab}}$$

$$S_{gab} = \sqrt{\frac{(n_1 - 1)\, S_1^2 + (n_2 - 1)\, S_2^2}{n_1 + n_2 - 2}}$$

Information :
$\bar{x}_1$ = the mean of the experimental class group
$\bar{x}_2$ = the mean of the control class group
n_1 = number of sample experimental classes
n_2 = number of sample control classes
S_1^2 = experimental class group variance
S_2^2 = control class group variance

The results of the calculation of effect size according to Cohen'd are divided into several criteria, namely:

Table 1. Effect size result criteria

Large of *d*	Category
$\mathbf{0,8 \leq d \leq 2,0}$	Large
$\mathbf{0,5 \leq d \leq 0,8}$	Normal
$\mathbf{0,2 \leq d \leq 0,5}$	Small

Based on Table 1, the effect size criteria are divided into 3 categories: medium large and small. Large categories are located at intervals $0{,}8 \leq d \leq 2{,}0$, the category is located at intervals $0{,}5 \leq d \leq 0{,}8$ and small categories lie at intervals $0{,}2 \leq d \leq 0{,}5$.

3. Results and Discussion

This t-test is carried out after the fulfillment of prerequisite tests, namely population normality and homogeneity of population variance. From the calculation results, it is found that each group has normal data and both sample groups have homogeneous variance. Because the data is normal and homogeneous, the next step is to do a T-test on the data. The following is a summary of the observation data description:

Table 2. Description of Data Observation

No.	Numerical Ability	
	GI	**Conventional**
$\boldsymbol{n_i}$	28	28
$\boldsymbol{s_i^2}$	138,809	190,814
$\boldsymbol{\bar{x}}$	76,071	56

Based on Table 2, the variance obtained from the GI class is 138,809 and the conventional class is 190,814. The average value in the GI class is 76.071 and in the conventional class is 56. This study was conducted to determine whether there is an influence of the GI learning model on students' numerical abilities. The following are the results of T-tests conducted in the experimental class and control class:

Table 3. T-Test Analysis

Sources	Results
T_{count}	5,849889
T_{table}	2,005
Conclusion	**H_0 rejected**

Based on the analysis results in Table 3, which is getting the results T_{count}= 5,849 and T_{table} = 2,005 then $T_{count} \geq T_{table}$ the conclusion is H_0 rejected which means that there is an influence of the GI learning model on numerical ability. The results that there is an influence of the Group Investigation type cooperative learning model rather than conventional learning models on the process skills and learning outcomes of junior high school students[29].

The previous research supporting this research is that the GI learning model has an effect on students 'critical thinking skills, and experiential learning through Group Investigation (GI) can effectively develop students' environmental literacy skills in aspects of knowledge, attitudes, skills and habits, by implementing a GI-assisted learning model. teaching aids, students' understanding ability will improve[30], mathematics learning with cooperative learning both STAD type and GI type can be used as one of the lessons that can be applied in an effort to improve students' abilities especially the ability of elementary school students' mathematical connections[31], there is a significant influence on the application of the model GI type cooperative learning on student learning outcomes, GI learning is more effective than CI learning in reading EFL understanding of secondary level students, and learning using cooperative learning models active GI type can be used as an effort to improve students' mathematical reasoning abilities, so it can be concluded that the GI learning model in addition to improving some of the things described the GI learning model can also improve the numerical ability of students[32]. It also means that the GI learning model has a good effect on numerical ability. The steps of GI learning are:

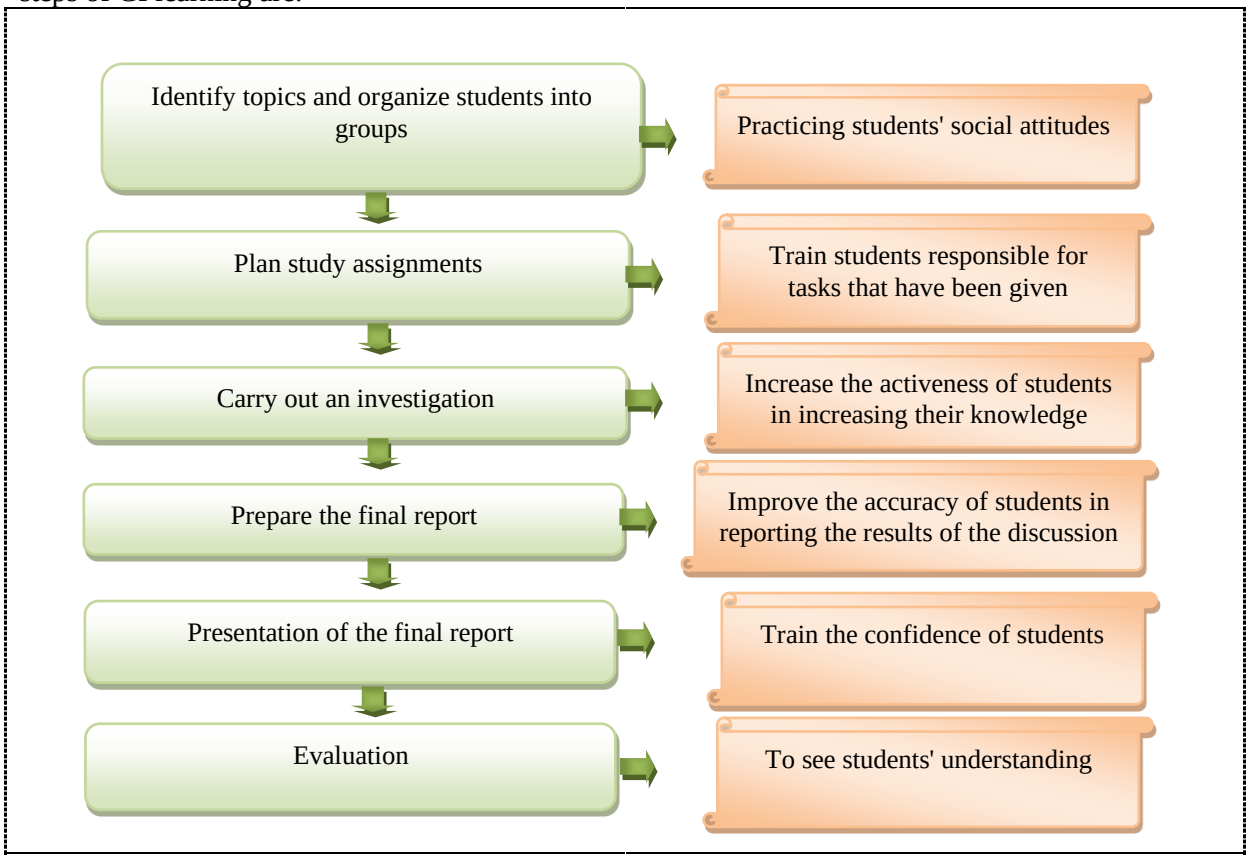

Figure 2. Steps of the GI learning model

Based on the steps of the GI learning model, the GI learning model has a good impact on numerical ability, this is caused by several factors[33]. The factors that cause the GI learning model are better than conventional learning models on numerical ability, namely: The first step, the educator explains the material briefly and divides students into heterogeneous groups, students are divided into several groups according to the topics they can draw a lot this way to improve social attitudes that can work together in groups[34]. The second step, students are required to be responsible for tasks that have been mutually agreed upon in the group[35]. The third step, the educator gives a problem in the form of questions and students must spell in groups. This train to develop their knowledge and think critically in working on the problems given by the educator[36]. The fifth step, group members determine the essential messages of the project, plan what will be reported and how to make their presentations, form an event committee to coordinate the presentation plan, this trains the accuracy of the participants in the lesson before reporting the results of the discussion[37]. The fifth step, the educator calls one group at a time to present the results forward and each group representative (in accordance with the agreement when planning the task) presents the results and the educator gives the opportunity for other groups to respond to the results of the presentation, this trains students' confidence[38]. The sixth step, educators ask students to respond to today's learning then students share feedback on the topic being worked on, teachers and students collaborate in evaluating learning, assessment is directed to evaluate the understanding of concepts and critical thinking skills, this trains the level of concentration[39] and understanding of students[40]. This shows that by applying the GI learning model will have a good impact on the numerical ability of students. Analysis to test the magnitude of the impact of using the GI model using the effect size. The results obtained from the calculation of the effect size is 1.56, then based on the criteria for the effect size results are included in the large category, so it can be concluded that the GI learning model has a large impact on the numerical ability of students[41].

4. Conclusions and Suggestions

Based on the data analysis that has been done, it can be concluded that there is a different effect of the Group Investigation learning model on numerical ability with conventional learning models. From the average value between the experimental class and the control class, it can be concluded that the experimental class with the application of the Group Investigation model is better than the control class with the application of conventional learning models. Based on the implementation and conclusions that researchers have done, the researcher provides suggestions, in applying the GI learning model students should have high motivation so that when students follow the learning process more actively and get better results, and teachers do not only focus on one student, but to all students in the class. So that the classroom atmosphere remains conducive.

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