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SeDiCreSig Method (See, Discuss, Create, Simulate, Generalize) to Improve Analysis Ability of Elementary School Teacher Students

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ABSTRAK

Rendahnya kemampuan analisis terhadap model pembelajaran akan menjadi hambatan bagi mahasiswa PGSD dalam memilih dan mengimplementasikan model pembelajaran yang cocok dengan materi pembelajaran dan karakteristik siswa. Untuk meningkatkan kemampuan analisis pada mahasiswa PGSD ini maka diterapkan metode SeDiCreSig. Tujuan penelitian ini adalah untuk menganalisis kemampuan analisis mahasiswa PGSD mengenai model pembelajaran inovatif dalam pembelajaran matematika di sekolah dasar (SD) menggunakan metode SeDiCreSig. Metode penelitian yang digunakan adalah quasi eksperimental dengan desain pre test-posttest control group design. Populasi pada penelitian ini adalah seluruh mahasiswa PGSD. Sampel yang digunakan pada penelitian ini adalah 70 mahasiswa PGSD yang terbagi menjadi dua kelas yang mengikuti mata kuliah Magang Matematika. Teknik pengumpulan yang dilakukan pada penelitian ini adalah observasi, pre test dan posttest. Analisis data yang digunakan adalah uji t berbantuan SPSS 23. Hasil penelitian ini adalah adanya peningkatan kemampuan mahasiswa PGSD dalam menganalisis model pembelajaran matematika yang inovatif setelah pembelajaran menggunakan metode SeDiCreSig. Penggunaan metode SeDiCreSig ini memudahkan dosen untuk mengarahkan mahasiswa dalam melatih kemampuan analisis serta implementasi model pembelajaran inovatif khususnya dalam pembelajaran matematika. Keberhasilan pembelajaran metode SeDiCreSig harus ditunjang dengan kegiatan-kegiatan nyata yang langsung dilakukan oleh mahasiswa.

ABSTRACT

The low ability to analyze learning models will be an obstacle for PGSD (Primary School Teacher Education) students in choosing and implementing learning models that match the learning materials and student characteristics. To improve the analytical skills of PGSD students, the SeDiCreSig method was applied. This study aims to analyze the analytical skills of PGSD students regarding innovative learning models in mathematics in elementary schools (SD) using the SeDiCreSig method. The research method used was quasi-experimental with a pretest-posttest control group design. The population in this study are all 5th-semester PGSD students. The sample used in this study was 70 PGSD students divided into two classes taking the Mathematics Internship course. The data collection techniques used in this study were observation, pretest, and posttest. The data were analyzed by the SPSS 23-assisted t-test. The results of this study indicated an increase in the ability of PGSD students to analyze innovative mathematical learning models after learning using the SeDiCreSig method. The use of the SeDiCreSig method makes it easier for lecturers to direct students in practicing analytical skills and implementing innovative learning models, especially in learning mathematics. The success of learning the SeDiCreSig method must be supported by actual activities that students directly carry out.

1. INTRODUCTION

The Achievements of the learning objective can be used as indicators of success in the learning process. One of the goals of learning in tertiary institutions is for students to have good analytical skills (Anggraini, 2018; Hanik, 2020). Analytical skill is the ability to identify and separate components or

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elements of a fact, concept, opinion, assumption, hypothesis, or conclusion and examine these components to see the existence and nonexistence of contradiction (Politsinsky et al., 2015; Syafi'i et al., 2018). Likewise, with the learning objectives in the PGSD study program, namely in the Mathematics Internship course, students must be equipped with good analytical skills toward innovative learning models, especially in learning mathematics.

This analytical ability requires students to understand and explain the interconnectedness in the stages of mathematics courses. Each learning model has its stages and characteristics in implementing the model. In this case, students must be able to explain the steps of their learning, identify learning models and find differences in each learning model (Politsinsky et al., 2015; Rabbani et al., 2019). Students must learn to determine models, similarities and differences between models, and select the basis for the comparative model. The facts show that this analytical ability needs to be improved. This is indicated by the low analytical skills of students occurring in several tertiary institutions, including the analytical abilities of students at one state university are at a low level. Students are weak at higher-order thinking skills, including analytical abilities (Anggraini, 2018; Yusuf et al., 2022). Some students have not been able to combine several facts, integrate concepts, apply, and communicate the results of reasoning. Some students have not been able to analyze and describe the material being taught (Masfingatin & Suprapto, 2020; Wahyudhi, 2020). This low analytical ability also occurs in PGSD students at IKIP Siliwangi Bandung, especially in analyzing various learning models, particularly mathematics learning models that are suitable for application in elementary schools (S.D.). This condition is shown by the low ability to identify models of learning mathematics, compare models of learning mathematics and determine the model that fits the learning needs, especially mathematics in elementary school.

Based on the data above, it is necessary to make intensive efforts to encourage, familiarize and cultivate students with good analytical skills. In this case, the ability that is needed that the ability to analyze the model of learning mathematics that is implemented in learning mathematics in elementary school. To overcome this problem, researchers combined several methods so that the learning steps carried out referred to the combined stages of these methods. This combined method is called SeDiCreSig, a combination of See, Discuss, Create, Simulate, and Generalize. This is what makes the method applied is different from the methods that have been done before.

See is the stage when students have to read teaching materials or find their own material regarding the model's definitions, steps, advantages, and disadvantages. This will motivate students to deploy further investigations. Discuss is a step to direct students to hold discussions with their group mates regarding the model's definitions, steps, advantages, and disadvantages. Discussion activities encourage using knowledge and experience to solve problems (Isnaini et al., 2020; Moma, 2017; Purba, 2018; Unaenah et al., 2020). Create is a step to direct students to make a product, namely the Lesson Plan (RPP). This is one of the steps to accustom students to practice analytical skills (Alifaruzzahro, 2017)(Firdian & Santosa, 2022; Haryadi, 2022). Simulate is an activity that describes situations that are expected to occur in actual events and encourages students to practice analytical skills on understood and implemented material (Alwansyah et al., 2015; Rizaldi et al., 2020). In this activity, students conduct a simulation of learning mathematics. Generalize is the stage of conclusion. The process of concluding can be used as a general principle and applies to all the same incidents or problems, considering the verification results that underlie generalizations (Khoiriyah & Murni, 2021; Watipah, 2020).

Based on the studies above, it is important to learn using the SeDiCreSiG method in the Mathematics Internship course so that students can analyze innovative learning models specifically for learning mathematics in elementary school. Good analytical skills towards innovative learning models make students able to choose and implement learning models that are relevant to the needs of both relevant to learning materials, student characteristics and class situations and conditions. The purpose of this study was to improve the analytical skills of PGSD students regarding innovative learning models in learning mathematics in elementary schools (SD) using the SeDiCreSig method.

2. METHOD

The research method used in this study was quasi-experimental with a pretest-posttest control group design (Creswell, 2017). The population in this study were all 5th-semester PGSD students at IKIP Siliwangi in the 2022/2023 academic year. The sample used in this study was 70 PGSD students who were divided into two classes. The data collection technique used in this study was a literature study. The sampling technique used purposive sampling. The sample was chosen with the consideration that the sample studied in semester 5 and was given the Mathematics Internship course. The pretest was carried out before treatment was given to the subject to obtain information about students' initial abilities to analyze innovative mathematical learning models. Post-test carried out after the treatment. This data was used to see the final ability of students regarding the ability to analyze innovative mathematics learning models and to see the effectiveness of learning using the SeDiCreSiG method. The data obtained from the research are in the form of quantitative data. Quantitative data were obtained from the results of the pretest and posttest by using a test sheet related to the ability to analyze innovative mathematics learning models.

The instrument used in assessing students' analytical abilities towards innovative learning models, especially mathematics subjects, refers to three processes of analysis (Krathwohl & Anderson, 2010), namely students can parse elements of relevant information, determine relationships between the relevant elements, and determine the point of view about the purpose of studying information. The indicators are described in Table 1. Then the evaluation criteria is show in Table 2.

Table 1 . Grid of Assessment of Ability to Analyze Innovative Learning Models

No	Analysis Process	Indicator	Question Item
1	Parse the relevant information	Students are able to describe the steps of several innovative learning models that are analyzed.	1. Find some relevant learning models for learning mathematics in elementary school and describe the steps clearly!
2	Determine the relationship between the relevant elements	Students can choose and determine one of the models relevant to the material and student character.	2. Choose and determine one of the models that is relevant to the material and character of the students in the class where you are doing your internship! give good reasons!
3	Determine the point of view about the purpose of studying an information	Able to make a learning implementation plan using the innovative model steps that have been selected.	3. Make a learning implementation plan using the innovative model steps that have been selected!

Table 2. Assessment Indicators

No	Assessment indicators	Point
1	The suitability of the model and its description with mathematics learning in elementary schools	20
2	The suitability of the selected learning model with needs analysis	20
3	Suitability of the Learning Implementation Plan with field needs:	
	A.Appropriate Learning Model	
	B. Appropriate learning steps	15
	C. Relevant learning media	15
	D.Relevant student worksheets	15
		15
	Total value	**100**

The validity of each item of analiysis ability used in this study was tested using the Pearson Product Moment correlation, then calculating the t-value. The details are explained in Table 3.

Table 3. Validity Test Results

No Item	t_{count}	t_{table}	Information	
1.	0.479	0.444	Valid	Serve
2.	0.499	0.444	Valid	Serve
3.	0.875	0.444	Valid	Serve

Based on Table 3, there are 3 items of reading comprehension instrument which are declared valid. The reliability test used in this study was the Cronbach's Alpha Reliability Coefficient technique, which obtained an alpha α of 0.837 greater than 0.05. Thus the research instrument is declared reliable. The data analysis technique used the t-test with the help of SPSS 23. The normality test was carried out by the Kolmogorof Smirnov test. Homogeneity test was carried out with the One Way Anova test. While the t-test uses the Independent Sample t-test.

3. RESULT AND DISCUSSION

Result

The result concerning the ability to analyze innovative mathematics learning models using the SeDiCreSiG method in the experimental and control classes is described in Table 4.

Table 4. The Score in Analyzing Innovative Learning Models

	Statistic	The study using SeDiCreSiG (N =35)			The use of another method (N =35)		
		Pre-test	Posttest	N-Gain	Pre test	Posttest	N-Gain
The ability to analyze Innovative Learning Models	$\bar{x}$	57.79	77.79	0.50	63.44	64.73	0.03
	%	57.79	77.79	49.89	63.44	64.73	3.17
	Sd	29.34	27.08	0.22	28.49	26.74	0.18

The data in Table 1 shows that the number of samples is 35 students. The average posttest score on the ability to analyze innovative mathematics learning models in the experimental class is 77.79, and the average pretest score is 57.79. With an N-Gain value of 0.50. The average posttest score on the ability to analyze innovative mathematics learning models in the control class is 64.73. It is higher than the average pretest score, which only has an average value of 63.44. The N-Gain value is 0.03. Data processing of pretest and posttest scores to analyze innovative mathematics learning models in this experimental class was started by carrying out normality tests, homogeneous tests, and t-tests. The explanation of results of data processing is explained in Table 5.

Table 5. The Results of Statistical Pre-test Score on Ability to Analyze Innovative Mathematics Learning Models

	Class	Statistical Result			Description
		Normality	Homogeneity	t-test	
***Pretest* scores for the ability to analyze innovative mathematics learning models**	Experiment	0.055 Normal	0.657	0.738	There is no difference in posttest scores in the ability to analyze innovative mathematics learning models in the experimental class and the control class
	Control	0.198 Normal	Homogenic	H_0 rejected	

Table 5 shows that the pretest score for the ability to analyze innovative mathematics learning models for the experimental class for the Kolmogorof-Smirnov normality test has a P-value (Sig) = 0.055 > 0.05 so that H_0 is accepted at a significance level = 0.05. Therefore, the pretest scores for the ability to analyze innovative mathematics learning models in this experimental class are normally distributed. The pretest score for the ability to analyze innovative mathematics learning models for the control class for the Kolmogorof-Smirnov normality test has a P-value (Sig) = 0.198 > 0.05 so that H_0 is accepted at a significance level = 0.05. Therefore, the pretest score of the ability to analyze innovative mathematics learning models for the control class is normally distributed. Based on the Kolmogorof-Smirnov normality test results, the pretest scores for the ability to analyze innovative learning models are normally distributed. Thus, data processing can be continued with a homogeneity test. The results of the homogeneity test of the pretest scores on the ability to analyze innovative mathematics learning models of students of both classes had a P-value (Sig) 0.657 ≥α = 0.05. Thus H0 was rejected at a significance level of α = 0.05. Therefore, the pretest scores for the ability to analyze innovative mathematics learning models in control and experimental classes were declared homogeneous. The table shows the results of the t-test with a P-value score (Sig. 2 tailed) = 0.975 at a significance level α = 0.05 because it was tested in two directions so that 0.738 > 0.05 = α. In such conditions, H_0 is accepted, and there is no significant difference in the pretest score ability to analyze innovative mathematics learning models of students between the control and experimental classes is show in Table 6.

Table 6. The Results of Statistical Post-test Score on Ability to Analyze Innovative Mathematics Learning Models

Posttest scores on the ability to analyze innovative mathematics learning models	Class	Statistical Test			Description
		Normality	Homogeneity	t-test	
	Experiment	0.157 Normal	0.645	0.000	There are differences in posttest scores in the ability to analyze innovative mathematics learning models in the experimental class and the control class
	Control	0.177 Normal	Homogenic	H_0 accepted	

Table 6 shows that the posttest score for the ability to analyze innovative mathematics learning models for the experimental class for the Kolmogorof-Smirnov normality test has a P-value (Sig) = 0.157 > 0.05 so that H_0 is accepted at a significance level = 0.05. Therefore, the pretest scores for the ability to analyze innovative mathematics learning models in this experimental class are normally distributed. The posttest score for the ability to analyze innovative mathematics learning models for the control class for the Kolmogorof-Smirnov normality test has a P-value (Sig) = 0.177 > 0.05 so that H_0 is accepted at a significance level = 0.05. Hence, the posttest scores for the ability to analyze innovative mathematics learning models for the control class are normally distributed. Based on the Kolmogorof-Smirnov normality test results, the two ability scores to analyze innovative mathematics learning models in the experimental class are normally distributed. Hence data processing can be continued with a homogeneity test. Table 7 shows that the results of the posttest score homogeneity test for the ability to analyze innovative mathematics learning models for both classes have a P-value (Sig) 0.463 ≥α = 0.05. Thus H_0 is rejected at a significance level of α = 0.05. Therefore, the pretest scores of the analytical abilities of the experimental and control classes have a homogeneous variance. The table shows the results of the t-test with a P-value score (Sig. 2 tailed) = 0.000 at a significance level α = 0.05 because it is tested in two directions so that 0.000 is divided by two the result = 0.000 <0.05 = α, in such conditions H_0 is rejected. Therefore, posttest scores show a significant difference in the ability to analyze innovative mathematics learning models in the experimental and control classes.

Table 7. The n-Gain score on the Ability to Analyze Innovative Mathematics Learning Models

N-gain scores on the ability to analyze innovative mathematics learning models	Class	Result of Statistical test			Description
		Normality	homogeneity	t-test	
	Experiment	0.067 Normal	0.463	0.000	There is a difference in the N-gain score in the ability to analyze innovative mathematics learning models in the experimental and the control class
	Control	0.000 Normal	Homogenic	H_0 accepted	

Table 7 shows that the gain score for the ability to analyze innovative mathematics learning models for the experimental class for the Kolmogorof-Smirnov normality test has a P-value (Sig) = 0.067 > 0.05 so that H_0 is accepted at a significance level = 0.05. Therefore, the score gain in the analytical ability of this experimental class is normally distributed. The table shows that the N-gain score is the ability to analyze innovative mathematics learning models in the control class. The results of the normality test for the N-gain score for the ability to analyze innovative mathematics learning models for the control class for the Kolmogorof-Smirnov normality test have a P-value (Sig) = 0.00 <0.05 so that H_0 is rejected at a significance level = 0.05. Therefore, the N-gain score of the ability to analyze the control class's innovative mathematics learning model is not normally distributed.

Based on the results of the Kolmogorof-Smirnov test, the N-gain score in the experimental class was normally distributed, while the N-gain score of the control class was not normally distributed. Therefore, the non-parametric Mann-Whitney test can continue that data processing. Table 4 shows the results of the Mann-Whitney difference in the average N-gain ability to analyze innovative mathematics learning models in the experimental class and the control class with a significance level of α = 0.05 with a P-value score (Sig. 2 tailed) = 0.000 at a significance level of α = 0.05 because it is tested in one direction, so 0.000 divided by two results = 0.000 <0.05 = α, in such conditions H_0 is rejected meaning that there is a significant difference in the N-gain score in the ability to analyze innovative mathematical learning models in the experimental class and the control class.

Discussion

The research data shows that applying the SeDiCreSiG method effectively increases students' analytical skills towards innovative learning models in mathematics. This is indicated by the results of the t-test with a value of 0.000. The learning was carried out in 6 meetings in the mathematics internship course. Each student meeting is assigned to study an innovative mathematics learning model, including Contextual Teaching and Learning, Discovery Learning, Inquiry, Realistic Mathematics Education (RME), Problem Based Learning (PBL), and Project Based Learning (PjBL). After that, students are directed to study examples of lesson plans for each model. In this lesson plan, the main focus is the learning steps in accordance with each learning model's syntax. After studying the RPP, students are invited to pay attention to the learning videos of each learning model.

Learning the SeDiCreSiG method is carried out by linking it to cognitive theory, emphasizing meaningful learning, and changing students' attitudes as problem solvers (Putu Dessy Fridayanthi, 2021; Yuwono et al., 2021). In elementary schools, students are guided to solve problems in determining learning models, especially in mathematics. The ability to solve this problem eliminates differences or discrepancies between the results obtained and the desired results. Learning using the SeDiCreSiG method has a significant influence because it involves students directly in problem-solving. Analysis of the learning model, especially in learning mathematics in elementary schools, must pay attention to the activity steps by providing exercises, especially to train spatial reasoning so that students' mathematical abilities become better (Lowrie et al., 2019; Rahayu & Haq, 2021).

The research was conducted by giving the control and experimental classes a pre and posttest to determine the initial ability to analyze. In its implementation, the experimental class was given treatment with the SeDiCreSiG method, while the control class was given treatment with learning using another model. At the end of the study, students in control and experimental classes were given a posttest to see whether there was achievement and improvement in analytical skills in the experimental class or not compared to the control class. After learning using the SeDiCreSiG method, students' analytical abilities became better. This good analytical ability helps students carry out various lecture assignments (Masfingatin & Suprapto, 2020; Nurrohmi et al., 2017), especially in the Mathematics Internship course.

In the first stage, namely the See step, students are assigned to find sources/references and read sources/references related to innovative learning models to have relevant knowledge regarding the innovative learning models to be analyzed. At this stage, students are invited to find their concepts from innovative models that will be studied. The discovery learning model developed requires students to participate actively in learning activities and draw final conclusions independently (Ardyansyah & Fitriani, 2020; Syafi'i et al., 2018). Students learn through active engagement with concepts and principles and encouragement to gain experience by carrying out activities that allow them to discover concepts and principles for themselves.

In the second stage, the Discus step, students discuss and collaborate in groups regarding material that has been read and understood. Through group discussions, students can determine solutions to problems and are able to conclude the results of the discussions they have carried out, think analytically, practice problem-solving, make decisions, and evaluate to arrive at solutions to problems (Damaianti et al., 2020; Salam et al., 2022). At this stage, students and their groups must classify which learning models are relevant and effective for mathematics. This discussion activity allows students to solve problems together effectively (Amna Saleem et al., 2021; Dwi Ananda & Eko Atmojo, 2022). Students will share information about the model being discussed, comment on, and compare any information they find in their group to understand the model being taught. From these activities, a learning community was created in the classroom.

The third stage is Create. At this stage, students are assigned to make lesson plans with activities based on the steps of the chosen innovative learning model. In making learning implementation plans, students need to be directed to determine interesting and fun steps for learning mathematics so that students learn happily without being accompanied by anxiety when studying should also be directed to apply differentiation learning by taking into account the abilities of students (Hilbert et al., 2019; Ramirez et al., 2018). In this stage, students create a Mathematics Intern course product, which will then be applied in class. This step is essential so that the results of the learning model analysis are well understood and students can think critically to solve problems effectively (Aristawati & Budiyanto, 2017; Yuwono et al., 2021). The fourth stage is Simulate. At this stage, students conduct simulations in class to apply the lesson plans prepared with their groups. In this simulation activity, students are divided into tasks. Namely, some become teachers, and those become students. The role of the lecturer in this activity is as an observer. This simulation activity trains students to carry out the actual learning process (Purwaningsih et al., 2020; Rizaldi et al., 2020).

The fifth stage is Generalize. At this stage, students conclude all the stages that have been carried out so that they can draw conclusions and determine an effective model to implement in class, especially for learning mathematics in elementary schools. This stage is vital because it can help improve skills and cognitive processes (Dwi Ananda & Eko Atmojo, 2022; Salam et al., 2022). Students gain knowledge through learning to use the SeDiCreSiG method powerfully by strengthening understanding, memory, and problem-solving skills, helping to strengthen concepts; and formulating hypotheses. The improvement of the ability to analyze specific learning models in learning mathematics in elementary schools is influenced by various activities carried out by students in learning. In this case, direct involvement in every step of the SeDiCreSig method applied. This analytical ability is an ability that will equip students to answer challenges in the 21st century (Kennedy et al., 2015; Tyminski et al., 2021).

The implication of this research is that the SeDiCreSiG method facilitates lecturers' steps in teaching, especially in terms of improving students' ability to analyze. Students also receive exercises in finding relevant learning models, are trained in collaboration and are trained in making learning designs that are appropriate to the needs in the field. The weakness of this research is the short research time which makes the expected results still far from perfect. The increased ability is only in the ability to analyze the learning model, not in the implementation stage in the classroom. For future researchers, it is suggested that when the research is carried out for one semester or more to find out whether the ability to analyze the learning model is related to the ability to implement it in class.

4. CONCLUSION

SeDiCreSiG method effectively increases the analytical skills of PGSD students toward innovative learning models in the Mathematics Internship course. However, in its implementation, the SeDiCreSiG method must be carried out according to the stages: See, Discuss, Create, Simulate, and Generalize properly and supported by varied activities and involving students directly. The weakness of applying the SeDiCreSiG method is that it requires a reasonably long time slot because learning must be in accordance with the stages. The successful application of the SeDiCreSiG method is supported by the broad knowledge and insights of students regarding relevant learning models. Students also need to be given intense analysis of learning models.

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