International Seminar on Student Research in Education, Science, and Technology
ISSN 3047-1532 | Volume 1 April 2024, pp. 431-443

https://www.issrestec.id/
http://journal.ummat.ac.id/index.php/issrestec
Universitas Muhammadiyah Mataram, Indonesia

The Influence of Learning Strategies and Formal Reasoning Skills on Students' Mathematics Learning Outcomes at SMPN 8 Serang

Astuti Handayani[1], Junariah[2], Putriani[3], Jaka Wijaya Kusuma[4]
[1,2,3,4]Universitas Bina Bangsa, Serang, Indonesia jakawijayak@gmail.com

Abstract: This study intends to determine the disparity in mathematics learning outcomes of SMPN 8 Kota Serang students by applying two learning management arts estimated to show significant learning outcomes. The learning tactics applied are the art of contextual learning management (Contextual Teaching Learning) and direct learning tactics (Direct Instruction). This research is a quasi-experimental research with the design of "2x2 Factorial Analysis" conducted at SMPN 8 Serang City. Data on the profile of formal reasoning ability were analyzed with narrative statistics, while the comparative advantages of CTL strategies and on the upcoming learning of mathematics were analyzed with two-track factorial analysis techniques. The results of the data analysis showed, that: (1) In general, there are 40.625% of Class VII students of SMPN 8 Kota Serang who have formal reasoning skills in transition qualifications, 50% with formal qualifications, and 9.375% students with concrete qualifications; (2) the art of CTL management is superior to the art of management in; (3) Formal Reasoning Ability affects the consequences of learning mathematics students; and (4) there is a relationship between formal reasoning skills and learning strategies on the consequences of learning mathematics. Based on the findings of this study, it is recommended to Mathematics teachers to use the art of CTL management in the learning process to improve students' mathematics learning outcomes.

Keywords: Learning Strategy, Formal Reasoning Ability, Mathematics.

Article History:
Received: 21-03-2024
Online : 08-04-2024

A. INTRODUCTION

Complaints and disappointments about the results achieved by students in mathematics are still often expressed and in general students say mathematics is a complex and boring subject because they have to deal with formulas that are difficult to remember in solving math problems. Although students can present a good level of memorization of the teaching material they receive, in reality students do not understand it. Students feel they know what has been learned but when students test do not forget what has been learned (Suryosubroto, 2002: 8).

Mathematics has a relatively significant role in providing many abilities to students to structure thinking skills and the ability to solve dilemmas in everyday life. Based on Soedjadi (2000: 45), mathematics education should pay attention to 2 objectives, namely (1) formal goals, emphasizing logical structuring and personality formation, and (two) material goals, emphasizing the application of mathematics and mathematical skills. The current phenomenon shows that achieving mathematics learning objectives as described above still does not meet expectations. This is indicated by the relatively low quality of student learning outcomes in the national examination of mathematics mastery.

The choice of learning strategies used by the teacher is primarily determined by the nature of the origin of the subjects to be taught and the students' level of formal reasoning ability. In addition, every learning tactic always has a learning syntax carried out by the student and the teacher. Between the syntaxes that one uses the syntax the other has differences. However, experts argue that there is no better art of learning management than any other art. Issue and procedural knowledge that leads to basic skills will be more effective if delivered in an exclusive learning way.

The classic problem that always arises means that the process of learning mathematics in schools still uses a traditional or mechanistic approach, where a teacher actively teaches mathematics, then delivers examples and exercises, on the other hand students listen, take notes, and do exercises given by the teacher. As a result, they have not been able to make the connection between what they learn and how. That knowledge will be put to use. To improve this condition, it is necessary to change the pattern of mathematics learning based on behaviorism which has been carried out in the pattern of mathematics learning based on constructivism similar to contextual learning tactics.

Several previous studies show that the application of contextual learning relatively provides significant differences due to learning in various subjects, especially mathematics. As a result of research in mathematics subjects using the art of contextual learning management provides a significant disparity in learning outcomes compared to expository learning strategies. There is an interaction between learning tactics using moderator variables chosen to be studied. This can be observed in Yani (2009) regarding geometry topics and measurements with circle competency standards with creative sense moderator variables. Similarly, Lumban Gaol's (2007) research in electronics subjects in the topic aspect of Electronic Product Creativity provides that the learning consequences of students using high formal reasoning who are treated using computer simulation learning examples are higher than laboratory experimental learning examples and there is also an impact of the relationship between learning examples and formal reasoning on student learning outcomes.

Each individual is unique, meaning that each individual has different characteristics between one using another. In this thesis, the author chooses the characteristics of students observed from formal reasoning abilities, because the formless object of mathematical study contains operational procedures for discourse logical structures used in solving problems about numbers. In addition, reasoning is an integral part of learning mathematics, because mathematics is knowledge obtained using reasoning (Suriasumantri, 2005: 40).

Sanjaya (2008: 255), argues that CTL is an art of learning management that emphasizes the total involvement of students to find the material learned and relate it to concrete life situations, encouraging students to apply it in life. From the definition above, 3 things must be understood: 1) CTL emphasizes the process of student involvement to find material, meaning that the learning process is oriented to the process of experience, two) CTL encourages students to find relationships between the material learned using concrete life situations, as a result the material they learn will be firmly embedded in the student's memory and will not be easily forgotten, and three) CTL encourages students to be able to apply it in life. Gafur (2003: 1) states that CTL is a holistic learning strategy and aims to motivate students to know the meaning of the teaching material they learn by relating the material using the context of their daily lives so that students have knowledge that can be flexibly applied (transferred) from one context to another.

The philosophy of constructivism primarily determines CTL. According to Slavin (1995:269-270), "The essence of constructivist theory is that learners must individually discover and transform complex information to make it their own. Constructivist theory sees learners Alaihi Salam constantly checking new information against old rules and revising them when they no longer work". Slavin said that the original nature of constructivist learning theory is that learners must discover and transform complex gossip, check new information using outdated laws and revise them when they are no longer appropriate. Constructivism places students in the central role of the learning process (student centered). The role of the teacher is more of a facilitator in efforts to improve the quality of learning.

Killen (1998: 2) named the direct learning tactic using the term Direct Instruction, Indonesian to direct learning: "The direct instruction of management art was specifically designed to promote student learning of procedural knowledge and declarative knowledge that is well structured and can be taught in a step-by-step fashion.". from Killen, Direct Instruction is a learning strategy that is explicitly made to disseminate learner learning discourse procedural knowledge and declarative knowledge that is well structured and can be learned step by step. The original feature of exclusive learning tactics is that the material is delivered verbally in a ready-made, teacher-centered form by applying various exercises." (Sanjaya, 2008:179).

Slavin (2003: 222) also suggests five steps to the syntax of personal learning, which are as follows: 1) Inform learning objectives and lesson orientation in students. in this phase the teacher informs the things that must be learned and the performance of students needed, reviews prerequisite knowledge and skills by asking questions to reveal the knowledge and skills that students, two, have mastered) delivering teaching materials (presentations / demonstrations). In this phase, the teacher provides material, presents news, delivers models, demonstrates concepts and so on, three) provides opportunities for students to practice (structured exercises). In this phase, teachers provide opportunities for students to practice their skills or use new issues individually or in groups, 4) Carry out guided exercises by asking questions to assess students' level of understanding and correct concept errors, 5) Provide independent exercises. In this phase, teachers can give independent tasks to students to enhance their understanding of the material they have learned.

Reasoning is a thinking activity that relies on the theory of cognitive development (Surajio, 2008). One prevalent theory relating to intellectual development is Piaget's theory of cognitive development. from Piaget (Hergenhahn, 2008: 318) every child spreads his thinking ability from an orderly stage. At a particular stage of development there will be specific schemes whose success in each term depends mainly on the previous stage. The cognitive development of children proposed by Piaget consists of four terms, namely: (a) sensory-motor, (b) pre-operational, (c) real operational, and (d) formal operational.

Lawson (1982: 78) defines formal reasoning ability into the capacity (ability) of students aged 11-15 years to perform formal operations which include: 1) Proportional Reasoning. Proportional reasoning is the ability to interpret correlations between variables according to the position and nature of the variable. In addition, the ability of proportional reasoning also has implications for mastery of concepts of complex physical systems that contain poly factors. For example, understanding complex physical systems involves using proportions and ratios. Learners who can reason proportionally can develop proportional relationships between weight and volume, transfer proportional reasoning from two to three dimensions, use proportional reasoning to

estimate the proportional size of an unknown population. By the above opinion, students classified as formal operational terms can understand and answer related questions using proposition and ratio dilemmas, even though they have never been taught about it. In other terms, it can be stated that students who have entered formal operations will have proportional reasoning abilities. Some characteristics of proportional reasoning: a) know the correlation in which two quantities vary together and can see how variation derives one quantity according to the variation of the other quantity, b) recognize unequal proportional relationships in real-world contexts, c) share poly ways to solve proportions or compare ratios that are mainly in an informal way rather than a ready-made algorithm; (two) Variable control is defined as being the ability of students to identify the most perfect variables, especially in solving problems. When a child encounters a problem, he can first see all possible solutions to his mind. Then it will form the mind deductively to solve the best dilemma in a given situation based on the child's consideration; (three) Probabilistic reasoning, probabilistic reasoning occurs when a person uses an issue to determine whether a conclusion is valid or invalid. This reasoning begins with the development of opportunities that develop approximately at the age of 7 to 10 years. At that age, children can distinguish absolute things and things that may happen from the chance calculation. The concept of probability is wholly mastered by the child at the stage of formal operations; (4) Correlational Reasoning, Correlational reasoning is defined as a thinking pattern used by a child to determine the strength of the reciprocal correlation between variables in analyzing a problem; (five) Combinatorial reasoning is the ability to consider all possible alternatives in a given situation. The individual in the formal operations stage when solving a problem will use all possible combinations or factors that have something to do with the problem.

The conflict in this study is formulated as follows: (1) Is there a disparity in mathematics learning outcomes between students taught using contextual learning tactics and the art of direct learning management?; (2) Is there a disparity that will occur in learning mathematics between students who have a level of formal and concrete reasoning ability?; and (three) Is there an interaction between learning strategy and reasoning ability on what will happen learning mathematics?.

B. METHOD

This research is a type of quantitative research, namely quasi-experiments using the design of 2x2 factorial analysis techniques consisting of two variables: learning tactics variables and formal reasoning abilities into independent variables and learning outcome variables into dependent variables. Each variable consists of 2 levels. Learning tactics variables are CTL and di, while formal and concrete levels distinguish formal reasoning ability variables. In this research application, the separation of students' reasoning levels is pseudo because students are not separated between those with formal and concrete levels of reasoning. In each class, some students have formal and concrete reasoning. using thus there are 4 learning groups, namely: (1) groups of students who have a level of formal reasoning ability who are learned using contextual learning strategies, (2) groups of students using a level of concrete reasoning ability taught through the art of CTL management, (3) groups of students who are taught using strategies in and have a level of formal reasoning ability, and (4) a group of students who have concrete reasoning abilities who given treatment using the art of management in. The research design is described in table 1 below.

Table 1. Research Design

Formal Reasoning Ability (B)	Learning Strategies (A)		Total
	Contextual (A1)	Direct (A2)	
Formal (B1)	$\mu_{11} = x_{11}$	$\mu_{12} = x_{12}$	μ1. = x1.
Concrete (B2)	$\mu_{21} = x_{12}$	$\mu_{22} = x_{22}$	μ2. = x2.
Total	$\mu_{.1} = x_{.1}$	$\mu_{.2} = x_{.2}$	$\mu_{..}$ = $x_{..}$

Information:

μ11 = Average Score of mathematics learning outcomes of CTL group students with formal reasoning ability

μ12 = Average Score of mathematics learning outcomes of DI group students with formal reasoning ability

μ21 = Average Score of mathematics learning outcomes of CTL group students with concrete reasoning ability

μ22 = Average Score of mathematics learning outcomes of DI group students with concrete reasoning ability

μ1. = Average score of mathematics learning outcomes of groups of students who have formal reasoning skills

$\mu_{.1}$ = Average Score of mathematics learning outcomes of the group of students who learned using the CTL strategy

μ2. = Average score of mathematics learning outcomes of groups of students who have concrete reasoning skills

$\mu_{.2}$ = Average Score of mathematics learning outcomes of the group of students who learned using the DI strategy

H0 : $\mu A_1 \leq \mu A2$

H_1 : $\mu A_1 > \mu A2$

1. Test Analysis Requirements

Before testing the hypothesis using the anava 2x2 technique, the analysis requirements test is first carried out, namely the normality and homogeneity tests. make the normality test using the Liliefors test technique, while for the Homogeneity Test using the Bartlet test technique (Sudjana, 2002: 466). Normality and homogeneity of data in this thesis are only imposed on dependent variables, namely those that will occur learning mathematics.

2. Test the hypothesis

Hypothesis testing in this study was carried out using the Anava 2x2 technique to test the difference due to learning mathematics between 2 groups of students who were distinguished between students who had formal reasoning and students who had concrete reasoning who were treated with two types of learning strategies, namely CTL tactics and di. Test Criteria: Reject H0 (Accept H1) If Fh > Ft at significant levels of α. The formulation of statistical hypotheses in this study means:

a. First hypothesis
   Information:
   μA1: Average math learning outcomes of students taught with CTL strategies.
   μA2: Average math learning outcomes of students taught with DI strategies.
b. Second hypothesis
   H0 : $\mu B_1 \leq \mu B1$
   H1 : $\mu B_1 > \mu B1$
   Information:
   μB1: Average mathematics learning outcomes of students with formal reasoning.
   μB2: Average math learning outcomes of students with concrete reasoning.
c. Third hypothesis
   H0 : A >< B = 0
   H1 : A >< B ≠ 0
   Information:
   A >< B: Interaction between learning strategies and formal reasoning abilities.

Furthermore, if the test results show an interaction between learning tactics and students' formal reasoning abilities, it is necessary to do further testing (Gene, 1984: 370). This advanced testing is based on many samples measuring students' formal reasoning abilities. The research will result in the same number of students for each level of reasoning, so the researcher uses the Tuckey Test in this thesis.

C. RESULTS AND DISCUSSION

This study examines the disparity due to learning mathematics between two groups of students who are distinguished between students who have formal reasoning and students who have concrete reasoning who are treated with two types of learning strategies, namely the art of contextual learning management and direct learning tactics. The complete calculation of Anava 2x2 can be observed in appendix 7. The compendium that will occur anava calculation 2 paths is shown in the following table.

Table 2. Anava 2x2 Results Summary

Sources of Variation	JK	Dk	RJK	F Count	F Table
Learning Strategies (A)	17,015625	1	17,015625	4,68185727	4.00
Formal Reasoning Ability (B)	31,640625	1	31,640625	8,70593293	
Interaction (AB)	34,515625	1	34,515625	9,49699054	
Error	218,0625	60	3,634375	-	-
Total	301,234375	63	-	-	-

Description: *) = significant

1. First hypothesis

Students taught with contextual strategies and personal learning differ in mathematics learning outcomes. based on the summary that will occur the calculation of Anava 2x2 in the table above, it can be seen that the price of the calculated F value is 4.68185727 at α = 005, while the price of Ftable = 4.00 which means Fcalculate > Ftable so that it gives a decision to reject Ho and accept H1. The results of the hypothesis test using Anava in learning strategies on learning outcomes share that learning strategies have a significant effect on student learning outcomes, where the learning consequences of students who are learned with contextual strategies are higher than using the learning effects of students who are learned using the art of personal learning management, so that the null hypothesis states that there is a disparity due to student mathematics learning Taught using the art of contextual management and direct learning rejected as well as hypotheses of other ways that state there are differences due to learning mathematics, students taught with the art of contextual management and exclusive learning are accepted. Using this, it can be concluded that what will happen is that learning mathematics students who are taught using contextual strategies are higher than students who are taught with the art of direct learning management.

2. Second hypothesis

The difference that will occur in learning mathematics between students who have formal and concrete reasoning skills. according to the summary due to the calculation of Anava 2x2 in the table above, it can be seen that the price of the calculated F value is 8.70593293 at α = 005, while the price of Ftable = 4.00, which means Fcalculate > Ftable so that it conveys the decision to reject Ho and accept H1. As a result of the hypothesis test using ANAVA shows that formal reasoning ability has a significant effect on the mathematics learning outcomes of students, where the mathematics learning outcomes of students who have a higher level of formal reasoning ability than using what will occur learning students who have a level of concrete reasoning ability, as a result of the null hypothesis which states no disparity will occur in mathematics learning students who have a level Formal reasoning skills and students who have a level of concrete reasoning ability are rejected and hypotheses other ways that state there is a disparity in mathematics learning outcomes of students who have a level of formal reasoning ability and students who have a level of concrete reasoning ability are accepted.

Using this, it can be concluded that as a result of learning mathematics, students with a higher level of formal reasoning ability come from students with a concrete reasoning ability.

3. Third hypothesis

The interaction between learning tactics and formal reasoning skills on the consequences of learning mathematics. From the compendium table of calculations Anava it can be seen that Fcalculate > Ftable which means giving a decision to reject Ho and accept H1 as a result it can be concluded that there is an interaction between the art of learning management and formal reasoning ability on mathematics learning outcomes. Therefore, it is necessary to do further testing using the Tuckey Test to see the advantages of applying learning strategies regarding using the level of reasoning ability of students against what will happen to learn mathematics. What will happen the calculation of the Tuckey test is shown in the following table.

Tabel 3. Tuckey Test Calculation

		Ordered Means			
A	Kelompok Perlakuan Yang Dibandingkan	X_{11}	X_{12}	X_{21}	X_{22}
		CTL-PF	DI- PK	DI- PF	CTL-PK
		12,5625	10,125	10,0625	9,6875
B	n	16	16	16	16
	RJK (Error) = MS_e	3,634375			
	S_x	0,476600921			
C	$Q_{12} = Q_{\text{DI-PF dengan CTL-PF}}$	5,245478748*)			
	$Q_{13} = Q_{\text{DI-PF dengan DI-PK}}$	0,131136969			
	$Q_{14} = Q_{\text{DI-PF dengan CTL- PK}}$	0,786821812			
	$Q_{23} = Q_{\text{CTL-PF dengan DI- PK}}$	5,114341779*)			
	$Q_{24} = Q_{\text{CTL-PF dengan CTL- PK}}$	6,03230056*)			
	$Q_{34} = Q_{\text{DI-PK dengan CTL-PK}}$	0,917958781			
D	Q Tabel	$_{(1 - ½α)} Q_{(Ve; j)} = {}_{0,975} Q_{(60;4)} = 3,76$ dengan $α = 0,05$			

Keterangan: *) = Signifikan ; ts = tidak signifikan

Origin due to the calculation of the tuckey test gives that for the group of CTL-PF treatment with on-PF, Qcalculate > Qtable is obtained, which means rejecting Ho at a significant level α = 0.05 as a result of the hypothesis that states there is a disparity due to learning between learners and the level of formal reasoning taught with the art of contextual management compared to exclusive learning tactics has been tested for truth, Where the average score that will occur learning mathematics for formal reasoning skills taught using the art of contextual management is 12.5625 while for concrete reasoning taught with direct learning strategies obtained an average homogeneous value of 10.125

The origin of the calculation of the tuckey test shared that for the CTL-PF treatment group using CTL-PK, Qcalculate > Qtable was obtained, which means rejecting Ho at a significant level α = 0.05 so that the hypothesis that states there is a difference that will occur learning between students using the level of formal reasoning compared to students using concrete reasoning taught with contextual tactics has been tested for truth, Where the homogeneous value that will occur learning mathematics for formal reasoning ability means 12.5625. In contrast, for concrete reasoning it obtains an average-homogeneous value of 10.0625.

From the calculation of the test tuckey shared that for the CTL-PF treatment group with di-PK, Qcalculate > Qtable was obtained, which means rejecting Ho at a significant level α = 0.05 as a result of the hypothesis that states there is a disparity that will occur learning between learners using the level of formal reasoning taught with the art of contextual management compared to using students with concrete reasoning taught using the art of personal learning management has been tested In other words, the average value of homogeneous due to learning CTL-PF is higher than using di-PK, where the homogeneous value for CTL-PF is 12.5625 while for DIPK it gets a homogeneous value of 10.125.

The calculation of the tuckey test gives that for the PF-PF treatment group with CTL-PK, Qcalculate < Qtable is obtained, which means receiving Ho at a significant level α = 0.05 so that the hypothesis that states there is no difference in learning outcomes in the two groups has been tested for truth. From the results of the tuckey test calculations show that for the DI-PF treatment group with DI-PK, Q is obtained < Q table, which means receiving Ho at a significant level α = 0.05 so that the hypothesis that states there is no difference in student learning outcomes with formal reasoning abilities compared to concrete reasoning taught with direct learning strategies is tested for truth. From the calculation of the tuckey test shows that for the CTL-PK treatment group with DI-PK, Qcalculate < Qtable is obtained, which means receiving Ho at a significant level α = 0.05 so that the hypothesis that states there is no difference in learning outcomes between students who have sound concrete reasoning taught with contextual strategies or direct learning strategies is tested for truth.

The interaction between the variables of learning tactics using the variable of reasoning ability on mathematics learning outcomes is necessary to paint an approximate graph showing this relationship's existence. The data analysis results show that the average learning of groups of students who are taught using contextual learning strategies and have formal reasoning is 12.5625. This will be 2.875 points superior to students with concrete reasoning skills (9.6875). While the average learning effect of the group of students who are taught using direct learning strategies and have formal reasoning skills means 10.0625 (0.05 points lower) than using students who have concrete reasoning abilities (10.125), which means that exclusive learning tactics are more perfectly applied to students who have a level of concrete reasoning. The following illustrates the interaction of learning strategies and formal reasoning skills on student mathematics learning outcomes.

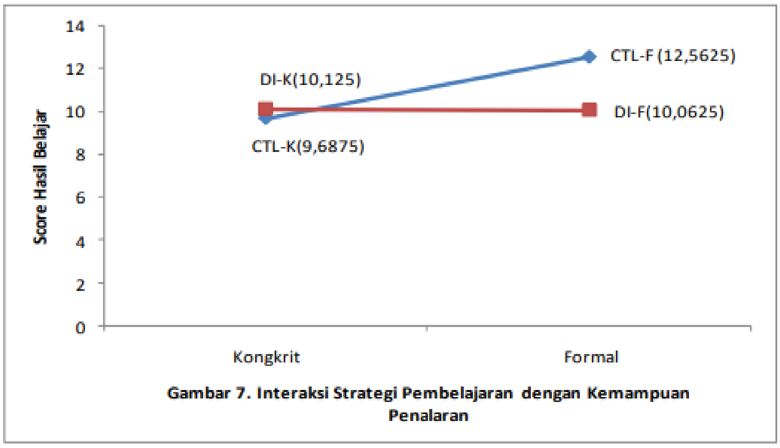

Figure 1. Illustration of interaction between learning strategy and formal reasoning ability on students' mathematics learning outcomes.

After completing learning in class XA using direct instruction tactics and class XB using contextual management arts, it can be seen that the results of learning to the 2 groups are not significantly aligned. This is shown by the result of the F test, where Fcalculate > Ftabel which means Ho is rejected. Using this rejection means that the learning outcomes of students who use the art of CTL management are higher than that in learning students who acquire learning with the art of management DI.

The learning outcomes of students who obtain learning using contextual strategies are superior to using direct instruction learning. This is because learning uses the art of contextual management and LKS as a medium. For teachers, this media can facilitate the delivery of learning materials and students can increase studying activities. Not exclusively, students will actively think and try to find appropriate answers for every conflict that arises, so that the learning process that occurs can cause motivation in students. This aligns with the opinion expressed by Hamalik (1994) that the benefits of media pedagogy means fostering self-effort activities among students. Teaching media can improve the learning process of students in teaching which in turn can increase the learning consequences achieved. In contextual learning, students are divided into several groups to facilitate discussion activities. In this case, the teacher in the learning process functions as a facilitator so that the teacher must be able to change the role of students from consumers of ideas (copying, listening, memorizing) to producers of ideas (asking, answering, expressing opinions). Contextual management has advantages because students experience or observe for themselves, not only the knowledge transfer from teacher to learner.

The art of contextual management in the learning process utilizes various learning resources and can utilize any media to learn. Learning contextual tactics can strengthen students' memory in the material given by the teacher in class, ultimately affecting student learning outcomes. This is in line with Vico's opinion (Suparno, 1997: 24). According to him, a person is said to have known something when he can reveal what elements can build that something. Therefore, knowledge is not a gift from the teacher but the result of the constructing process carried out by each individual. The study's results shared that 50% of students are at the level of formal operational reasoning and 40.625% are in the transition term, and 9.375% are still at the concrete operational level as presented in the picture below.

The term cognitive development of students in the research class showed the formal operational stage using the highest percentage of 50%. This shares compatibility with Piaget's theory of cognitive development considering that the subjects of this study were high school students using the age range of 13-16 years. However, there are still students using concrete developmental and transitional terms. The high percentage at the formal operational cognitive development stage in the study results provides that most students can think formlessly, reason logically, and conclude from the information available. Ad interim 40.625% of learners in the transitional cognitive development stage describe incomplete formal reasoning. Groups using this stage of transitional operational development have been able to think abstractly but cannot escape from concrete objects to gain complete understanding. Students using transitional reasoning have been able to solve math problems in the cognitive domains of C4, C5, and C6 but still need teacher guidance to analyze shapeless objects, so students using transition reasoning can be taught with CTL strategies and the art of management. In contrast to 9.375% of students at the stage of concrete operational development, forming understanding requires natural objects, direct experience in understanding the interrelationships between concepts.

For students with concrete reasoning, it is tough to solve mathematical problems involving the cognitive domain in aspects C4, C5, and C6 because this domain requires the ability to analyze, abstract, and compare relationships between concepts. In contrast, students in this term can only use their thinking skills if they see something concrete and this contradicts using the essence of mathematics with abstract objects. In teaching and learning activities in the classroom, reasoning is needed. Mathematics material and reasoning mean 2 things that cannot be separated, namely mathematical material is understood through reasoning and reasoning is understood and trained through learning mathematics. As a result, if students are forced to learn by using the art of contextual management, they will quickly become bored and give low value due to learning, because this tactic requires students who have at least 4 types of formal reasoning skills to carry out mathematics learning activities. This aligns with Piaget's opinion that knowledge is formed by the subject's active work constructing knowledge. Piaget argued that every individual from childhood already can construct his knowledge.

Knowledge that the child constructs as a subject will become meaningful, while knowledge obtained only through the notification process will not be meaningful. The knowledge is only to be remembered while the completion is forgotten. Therefore, students with concrete reasoning skills are more appropriate if taught using personal learning tactics but limited to cognitive aspects in the domains of C1, C2, and C3 because these tactics are specifically designed to share student learning about procedural knowledge and declarative knowledge that is well structured and can be learned step by step. In addition, students with concrete reasoning prefer simple things, solve dilemmas with synchronous examples, and are reluctant to ask questions or express their ideas about the mathematical concepts they are learning. Armed with the teacher's explanation, from the beginning to the end of the lesson and the sample questions given, it is likely that their learning goals will be able to be motivated to pay attention to the lesson. This situation makes them more active in learning than other students using contextual learning management. Thus, the result of higher learning is obtained by the student who has the ability of formal reasoning compared to the student who has the ability of concrete reasoning.

As a result of data analysis of discourse that will occur learning students using the Tuckey test shows two opposite things where students who have a level of concrete reasoning, are taught using the art of contextual learning management learning outcomes are lower than students who are taught with the art of direct learning management. However, the difference was not significant, as a result it can be said that there is no difference. This finding shows a contradictory finding between mathematics learning outcomes achieved between students who have formal reasoning skills and students who have concrete reasoning skills using the art of learning management. Therefore, learning using direct instruction management is still expected for students with a formal reasoning level. This identifies a relationship between learning strategies and formal reasoning skills on what will happen to students' mathematics learning.

D. CONCLUSIONS AND SUGGESTIONS

Some conclusions are as follows: (1) what will happen is that learning mathematics students who are taught using contextual tactics are higher than students who are taught using direct learning tactics; (2) the mathematics learning outcomes of students who have a higher level of formal reasoning than students who have concrete reasoning; and (three) For students, taught with contextual learning strategies that will occur learning is lower than students who are taught using personal learning strategies. However, the difference was not significant, so it can be said that there is no difference. This identifies a relationship between learning strategies and reasoning ability on students' mathematics learning outcomes.

REFERENCES

Kurikulum dan Pembelajaran. Jakarta: Bumi Aksara Hamalik, Oemar, 1994. Media Pendidikan, cetakan ke-7.

Lumbangaol, Maju .2007. Pengaruh Model Pembelajaran dan Penalaran Formal terhadap Kompetensi Daya Cipta Produk Elektronik Muhibbinsyah .2007.

Psikologi Pendidikan dengan Pendekatan Baru. Bandung: Remaja Rosdakarya Mulyasa, E. 2005.

Menjadi Guru Profesional (Menciptakan Pembelajaran Kreatif dan Menyenangkan). Bandung: Remaja Rosdakarya. Nurhadi .2003.

Pendekatan Kontekstual. Jakarta: Depdikbud Dirjen Dikti Pusat Penilaian Pendidikan Departemen Pendidikan Nasional. 2010.

Laporan Hasil Ujian Nasional Tahun Pelajaran 2009/2010. Jakarta. Depdiknas. Rezeki, Robbi. 2004.

Pengaruh Strategi Pembelajaran dan Kreativitas Terhadap Riduwan. 2006.

Belajar Mudah Penelitian untuk Guru, Karyawan, dan Peneliti Pemula, cetakan ke-2. Bandung: CV Alfabeta Sagala, Syaiful. 2003.

Pembelajaran Berorientai Standar Proses Pendidikan. Jakarta: Kencana Slavin, Robert E. (1995).

Soedjadi .2000. Kiat Pendidikan Matematika di Indonesia, Jakarta: Depdikbud.

Metode Pengembangan Kognitif, Jakarta: Universitas Terbuka Surajio .2008.

Filsafat ilmu dan Perkembangannya di Indonesia, Jakarta: Bumi Aksara. Suriasumantri, Jujun S .2005.

Filsafat Ilmu Sebuah Pengantar Populer. Jakarta: Pustaka Sinar Harapan Suryosubroto. 2002.

Yani, Ivo. 2009. Pengaruh Pendekatan Pembelajaran dan Kemampuan Berfikir Kreatif Terhadap Hasil Belajar Matematika Siswa Paket B