THINK OF CREATIVE STUDENTS IN MATH PROBLEM SOLVING: ACADEMIC SERVICE QUALITY AND INTRINSIC MOTIVATION AS MODERATOR VARIABLE

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CTL approach
conventional approach
verbal reasoning
scientific writing ability

ABSTRACT

The objective of this research is to find out the difference between instructional approaches and verbal reasoning on students' scientific writing ability. It was conducted at Indonesian Language Study Program, Faculty of Teacher Training and Education, University of PGRI Palembang. This research employed the experimental method using 2x2 factorial Anova test, with 43 students chosen randomly through multi-stage sampling technique. The results of this research indicates that: (1) the group of students taught with the contextual teaching and learning (CTL) approach has better than taught with the conventional one, (2) the group of high-level verbal reasoning students taught with CTL approach has better than taught with the conventional one, (3) the group of low-level verbal reasoning students taught with the CTL approach has lower than taught with the conventional one, (4) there is an interaction effect between instructional approach and the level of verbal reasoning on students' scientific writing ability.

INTRODUCTION

According Munandar (2007: 2) creative thinking is the ability to explore a range of possible answers to the problem. This suggests that the assessment of a variety of possibilities for the answer in solving a problem is a hallmark of creative thinking. So think creatively characterized by their ability to solve a problem with a lot of answers or ways.

Tuttle and Paquette (2008: 139) says that the goal in mathematics learning is the development of
problem-solving ability.Based on these opinions shows that solving the problem is one of the goals in mathematics. resulting in the cracking process can encourage people to be creative.

According Pehkonen (1997: 64)

> If we want to gather the reason given in the mathemathical literature to support problem solving, we Might put them into four catagories:
>
> a. Problem solving developes general cognitive skills
> b. Problem solving fosters crativity
> c. Problem solving is a part of the mathematical application process.
> d. Problem solving motivates pupils to learn mathematics.

It shows that troubleshooting can encourage creativity.

According to Torrance (Silver, 1997) to measure creative thinking ability tests can be done through three components: fluency, flexibility and novelty. According to Silver (1997) indicators of creative thinking is as follows:

Table 1: Indicators Thinking Kreeatif

Indicator	Description
Fluency	The ability of students to produce correct answers
Flexibility	The ability of students to solve problems in a variety of different ways
Novelty	ability of students to answer in a way that is not normally done bystudent

AccordingSiswono (2008: 31) the level of creative thinking disefinisikan as follows.

A. Level 4 (very creative)

Students are able to demonstrate fluency, flexibility, and novelty in solving problems.

B. Level 3 (creative).
Students are able to demonstrate fluency and novelty or student is able to demonstrate fluency and flexibility in solving problems.

C. Level 2 (quite creative)
Students are able to demonstrate the novelty or flexibility in solving problems.

D. Level 1 (less creative)
Students are able to demonstrate proficiency in solving problems.

E. Level 0 (creative)
Students are not able to show the three components of creative thinking.

Components of creative thinking in solving problems that used in this study has the following definition.

- ❖ Fluency in solving problems is kemampusn students answer more than one alternative answers are diverse and true. Answer is said to be diverse if the answer given to follow a certain pattern.
- ❖ Flexibility in problem solving is the ability of students to answer in a different way with the previous answer.
- ❖ Novelty in problem solving is the ability of students to answer more than one alternative way or the answer is true and is not usually done another student or one way or the answer given is not usually done by other students.

According Siswono (2008: 35) states troubleshooting is a process or an individual effort to respond or overcome barriers or obstacles when an answer is not yet apparent. In other words, the least problem solving involves creative thinking of students.

Motivation is closely linked to a purpose and motivation may also affect their activities. In terms of learning, motivation is the driving force for learning. Sri Hapsari (2005: 74) divide motivation into two types: intrinsic and extrinsic motivation by defining the two types of motivation were as follows namely intrinsic motivation is a form of encouragement of learning that comes from inside a person and does not need stimulation from the outside, whereas extrinsic motivation is encouragement learning that comes from outside oneself.

With regard to learning activities have the nature of intrinsic motivation are more important because of the driving forces pushing someone in learning than extrinsic motivation. The desire and effort to learn on the initiative itself would result in maximum learning, while extrinsic motivation is encouraging to learn from outside himself.

According Thursan (2008: 29), a student who has an intrinsic motivation to be active learn on their own without prompting teachers and parents. Intrinsic motivation of the students in the study would be stronger if it has extrinsic motivation.

In a process of learning in Higher Education, creative thinking of students will be realized if the student has the academic ability, academic support services are good quality and a strong boost in itself (intrinsic motivation). Definition of academic service learning in the curriculum according to (Rosita et al in Susanto, 2014: 91) is a systematic effort to facilitate the education of learners master the curriculum content through prmbelajaran process so that they are able to achieve competency standards applied. The quality of academic services is the ratio between academic services customer perceived quality of academic services expected or stakeholders (Pakpahan in Susanto, 2014: 91). If the perceived quality of academic services to equal or exceed the quality of service expected in the service quality is said.

Quality of service is determined by the academic quality lecturers and academic quality of the university. In the view of Alma (in Andayani, 2015: 6) the good professor must have 1). Scientific competence 2). Mastery of the methods of teaching 3). Emotional control 4). Discipline.

In the literature different, Layola (2013: 19) revealed several academic service quality indicators.

1. Ability and knowledge (competency) lecturer in giving lectures.
2. Behavior front of the class lecturer polite and trustworthy.
3. Experience teaching faculty (teaching more than three years).
4. Academic qualification of lecturers qualified to teach students (have positions and academic degree)

Thus the student with the provision of academic ability is good and highly motivated to solve problems and to receive academic services of institutions that good,

it will have a level of creative thinking that is good.

RESEARCH METHODS

Research type is the type of research conducted qualitative research. The research was conducted in STKIP PGRI Sidoarjo.

Target / Subject Research

subjects of this study were students of Mathematics Education 2014 class A, semester 6 with number six students. Selected categories of six students with two high mathematical ability, mathematical ability was two, and two low math ability is taken from the value of final exams courses Analytic Geometry.

Data, Instrument and Data Collection Techniques
Data collected by a matter of mathematical problem solving tests, questionnaires related to learning motivation, academic service quality questionnaires and interviews. Tests of problem solving is a matter of three essays about the geometry of the material. Problem-solving test aims to identify the level of creative thinking of students and given to each subject study with the same type of questions. Questionnaire learning motivation and academic services provided to determine whether there is an impact on the level of thinking mahasiswa.Wawancara aims to check the validity of the data (triangulation) or, to reinforce the identification of the level of creative thinking of students in solving a mathematical problem solving based on test results and the results of the questionnaire. The instrument used in this study there are two main instruments and supporters.

Data Analysis Techniques

technique of determining the validity of data using triangulation techniques implemented by comparing the test data, the results of questionnaires and interviews conducted by researchers. The data analysis technique consists of three grooves of data reduction, data presentation and conclusion.

RESULTS AND DISCUSSION

The subjects were six students with high math ability as a category two, two-capable medium mathematics, two mathematical ability is low. Subjects were asked to complete a problem-solving test consists of three questions with the material geometry then subjects were asked to fill questionnaires learning motivation and academic service quality questionnaire. Furthermore, researchers examined the response of the subject matter of problem solving and results of questionnaires. Furthermore, researchers analyzed answers to the subject by examining the response of the subject, by looking at the aspects of fluency, flexibility and novelty as well as the results of learning motivation questionnaire and a questionnaire quality of academic services. The questionnaire results were scored and categorized. For motivation to learn, there are three categories: high motivation, medium and low medium quality academic services as well, there are three categories namely academic service quality was good, sufficient and less.
To view the validity of the data conducted the interview. Based on the results of the study it can be concluded the results of the identification of the level of creative thinking and learning motivation of the six students who are subject to the following.
Table 2. Results of learning motivation and creative thinkinglevel

Ability Mathematics	Name	Learning Motivation Level	Creative Thinking Level
High	MZN	Medium	4
	CW	High	1
Medium	MH	High	3
	IS	High	3
Low	LN	High	0
	AZ	Medium	0

Subjectson behalf of MZN (high math ability). The results of mathematical problem solving test subject answers satisfy all level indicators think that fluent, flexible and novelty, while the result of learning motivation questionnaire, MZN included in the category of moderate learning motivation and MZN obtain a good quality of academic services. At the time of the interview MZN able to explain the questions asked by the researcher to the right and the corresponding answer (fulfill all indicators of the level of creative thinking) and corroborate the results of tests of problem solving. So that researchers can mengidentifakasi that MZN are at level four (4) highly creative thinking.

Subjects on behalf of CW (high math ability). The test results of mathematical problem solving CW answer only meet one indicator of the thinking that is fluent alone while the CW learning motivation questionnaire results included in the category of high learning motivation and CW obtain a good quality of academic services. At the time of the interview CW was able to explain the questions asked by the researcher which CW answer only to support and encourage one indicator of the level of creative thinking that is eloquent. The questions related to the indicators of flexibility and novelty CW lack of understanding, so that researchers can identify that the CW is at a level of 1 (one) think less creative.

Subjects on behalf of MH (math ability was). The test results of mathematical problem solving answers MH fulfill two level indicators think that is fluent and flexible, while the result of learning motivation questionnaire MH included in the category of high learning motivation and MH get a good quality of academic services. At the time of the interview MH able to explain the questions asked by the researcher which MH answer two indicators to support and encourage creative thinking level is fluent and flexible. The questions related to recency indicator MH lack of understanding, so that researchers can identify that MH is at level three (3) levels of creative thinking.

Subjects on behalf of IS (capable of being mathematics). The test results of mathematical problem solving answers IS fulfills two level indicators think that is fluent and flexible while learning motivation questionnaire results IS included in the category of high learning motivation and IS getting a good quality of academic services. At the time of the interview the IS was able to explain the questions asked by the researcher which answers the IS support and strengthen two-level indicators of creative thinking that is fluent and flexible. The questions related to recency indicator IS less understand, so that researchers can identify that the IS are at level three (3) levels of creative thinking.

Subjects on behalf of LN (low math ability). Mathematical problem solving test results do not meet all the answers LN think the level indicator is fluent, flexible and novelty, while the result of learning motivation questionnaire LN included in the category of high learning motivation and LN get a good quality of academic services. At the time of the interview LN unable to explain the questions asked by the researcher which is where all the answers LN less support and strengthen all indicators of the level of creative thinking. So that researchers can identify that the LN at the level of 0 (zero) level is not creative thinking.

Subjects on behalf AZ (low math ability). Mathematical problem solving test results do not meet all the answers AZ level indicators think that is fluent, flexible and novelty, while the result of learning motivation questionnaire AZ included in the category of moderate learning motivation and AZ get a good quality of academic services. At the time of the interview AZ unable to explain the questions asked by the researcher which is where all the answers AZ less support and strengthen all indicators of the level of creative thinking. So that researchers can identify that AZ was at the level of 0 (zero) level is not creative thinking.

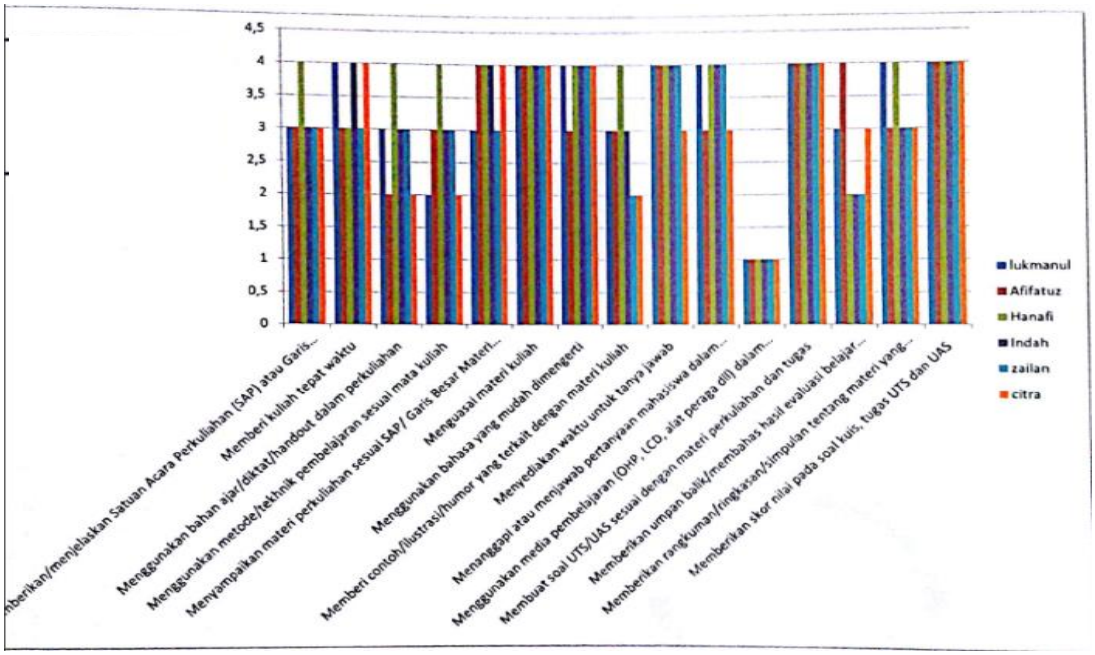

Figure 1. Graph Questionnaire Results Academic Services

Based on the identification of the level of creative thinking math student of 2014 batch A sixth semester one student concluded that high math ability, learning motivation high and get a good academic services gentleness at the level of less creative thinking. One student high mathematical ability, the motivation was and get a good academic services at the level of very creative thinking. Two students are capable of mathematical being, the motivation high and get a good academic services at the level of creative thinking. Two students are capable of low mathematics learning motivation high and medium and got a good academic services are at a low level of thinking.

Conclusions and Recommendations

Based on these results it can be concluded that high math ability students do not always have to think very creative level, although supported by a high learning motivation and academic services are good. However, the students with high math skills could also have a very creative thinking level, although only have motivation to learn who was. While the students with medium and low math skills have a level of creative thinking and creative or creativity ability is directly proportional to math skills.

In this case the researchers concluded that the mathematical abilities can not be used as a measure definitively determine the level of creative thinking of students. Likewise, motivation and academic services are not entirely be the main factor determining the level of creative thinking of students, but it still has an effect.

In this case the researchers advise, student motivation and academic services need to be increased to provide support students to enhance their level of creative thinking. Based on these results it can be concluded that the students capable of high mathematics

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