



APPLICATION OF MATHEMATICAL-BASED ACCOUNTING METHODS WITH THE JIGSAW COOPERATIVE APPROACH

Fitriani Saragih¹

University Of Muhammadiyah Sumatera Utara- fitrianisaragih@umsu.ac.id

Ikhsan abdullah²

University Of Muhammadiyah Sumatera Utara- Ikhsanabdullahumsu@yahoo.com

Abstract

The purpose of this study is to provide refresher in the teaching and learning process by using one of the cooperative learning models by applying the mathematical-based accounting learning method with the jigsaw approach in the hope that it can improve the learning outcomes of accounting students in the Introduction to Accounting I.

This research is a classroom action research (PTK) using two cycles of action, with each cycle consisting of 4 stages, namely: the stages of planning, implementation, observation and reflection. The technique of collecting data uses observation, learning outcomes tests and documentation. Data analysis techniques Data analysis techniques used in this study are descriptive, with the stages of research carried out are making observations, analyzing the tests given, drawing conclusions.

The results of this study are an increase in student learning outcomes by using the accounting method with a jigsaw approach in the Introduction to Accounting I courses both in increasing learning activeness and student learning values.

Keywords: Mathematics-based Accounting Method, Jigsaw

Preliminary

Introduction to Accounting I subject is a compulsory subject for S1 Accounting Study Program students at the Faculty of Economics and Business, University of Muhammadiyah Sumatera Utara which consists of 6 credits and is taken in semester I. This course is a basic course in accounting and provides initial knowledge of students in the field of accounting, so that more understanding is needed to understand the advanced accounting science. So that if you don't understand this course, students will have difficulty understanding other accounting courses.

In giving this course many problems are experienced in the learning process to achieve these competency standards. There are still many students who experience difficulties in understanding accounting and impact many students who do not pass this



course . According to (Ingram, 1998) accounting learning relies more on the shipping process so that the ability of students does not develop in analyzing transactions. And besides, accounting learning is not able to encourage students to connect the learning process with real practice in the field and accounting learning is not able to provide human resources who have adequate competence in the world of practice.

According to the results of the experience carried out by researchers the results of accounting student learning in the introductory accounting course I were not satisfactory. For this reason, efforts are needed to improve students' understanding of accounting introductory material I. One of the efforts made is to use the mathematical (Accounting) based accounting method . This method is an accounting learning method that uses a mathematical perspective that makes it easier for students to record transactions into journals until the preparation of financial statements (Herawati, 2013). Mathematics-based accounting learning develops accounting equations from $assets = debt + equity$ to $assets + expenses + prive = debt + equity + income$. The reason allowed to be this equation is because the equation is a mathematical equation (Warsono, 2010). With this equation, students can easily understand normal positions rather than estimates in accounting. Where the normal position is the basis for understanding and keeping a journal.

In understanding the introduction to accounting I this requires a logical understanding and not memorization, in order to avoid memorization techniques an accounting method is needed. This is supported by research (Nauli, 2011) that the learning outcomes of students who use mathematics-based accounting learning with conventional based accounting learning differ significantly for journaling competency categories and balance sheet preparation. Students who are given mathematics-based accounting learning are better than conventional students.

To overcome these problems the lecturer must be more creative in choosing the right learning method. The learning method that should be used is a method of learning that involves students fully in the learning process so as to create a fun learning environment, active, creative and bi sa collaboration.

One method that involves student participation is cooperative learning methods (Trianto, 2010) mentions the approach to cooperative learning models include: Student Teams Achievement Division (STAD), Jigsaw , Group Investigation (Teams Games Tournaments or TGT), and Structural approaches.

The Jigsaw learning model is a variation of the Collaborative Learning model, which is a group learning process in which each member contributes information, experience, ideas, attitudes, opinions, abilities, and skills that he has, to jointly enhance the understanding of all members. Jigsaw cooperative learning is a type of cooperative learning that consists of several members in one group responsible for the study and mastery of matter capable of teaching the material to the other members in the Team(Faisal & Trilogi, 2016).

From a theoretical point of view, the Jigsaw cooperative learning model has advantages when applied to accounting learning compared to conventional learning models, so researchers are interested in conducting classroom action research with the aim of increasing student learning motivation and increasing students' understanding of a learning material that will later be reflected from increasing student learning outcomes in introductory accounting I.



Literature review

Accounting Learning Outcomes

Learning is an absolute human need. Without learning humans cannot survive because in the process of human life starting from the baby to the old learning process will continue. According (Purwanto, 2002) learning as follows:

1. learning is a change in behavior.
2. Learning is a change that occurs through practice or experience.
3. To be called learning, the change must be relatively steady.
4. Behavior that changes due to learning which involves several aspects of personality, both physical and psychological. Learning is an activity that is physical, mental, intellectual, and emotional to obtain learning outcomes in the form of a combination of cognitive, affective, and psychomotor. accounting learning is a learning activity in the competence of accounting skills (Istiningrum, 2012). From some definitions above, it can be concluded that learning is a process of interaction that results in changes in behavior and morals towards a better direction.

Understanding of Accounting according to (Harahap, 2004) is as follows: "Accounting is a language or business communication tool that can provide information about financial conditions (economic) in the form of financial position, especially in the amount of wealth, debt, capital of a business and the results of its business on certain period of time ". Based on the above understanding of Accounting Learning Outcomes is the level of students' abilities measured through mastery of cognitive, affective, and psychomotor abilities as a result of students' progress in accounting subjects manifested in the form of values and letters.

Accounting Method

Mathematical accounting (Accounting) is not a new concept in accounting learning. Because accounting was first compiled based on simple mathematical logic codified by a mathematics professor, named Luca Pacioli, in his book *Summa de Arithmetica, Geometria, Proportioni et Proportionalita*. Accounting is based on the basic accounting equation (PDA) which consists of three elements, namely: Assets, debt, and equity (Nauli, 2011). Rationalization of the basic accounting equation can be described in mathematical perspective as follows: asset reflect the type of use of funds (*use of funds*), while debt and equity acquisition represents a source of funds (*source of funds*). The core of mathematics-based accounting is that the basic accounting equation is formulated with

$$\text{Assets} = \text{Debt} + \text{Equity}$$

In accordance with the math the formula can change to:

$$\text{Assets} = \text{Equity} \text{ or } \text{Debt} = \text{Assets} - \text{Equity}$$



The reason for this estimation can be moved because this equation is a mathematical equation.

That equation can also be developed into;

Assets = Debt + Equity + Income-Cost , this equation can also be transferred to;

Assets + Expenses + Prive = Debt + Equity + Income

With a mathematical perspective approach, it is easier for students to answer important topics which have thus far been considered as mere provisions or even mere agreements. At least, the application of a mathematical perspective can answer basic questions logically and easily accepted by many people (Warsono, 2010) .

Cooperative Learning (*Cooperative Learning*)

Cooperative learning refers to a variety of teaching methods in which students work in small groups to help each other in learning subject matter. cooperative learning (*cooperative learning*) is an attitude or behavior in work or help among others in the structure of the cooperation organized within the group, which consists of two or more people where succes work is of each member of the group itself *Cooperative learning* can also be interpreted as a joint task in an atmosphere of togetherness among fellow group members (Raharjo, 2007).

According to (Yulianti & Nugroho, 2012), it was suggested that students who learn by using this type of cooperative learning will have high motivation because they are helped by peers. Cooperative learning also results in increased academic ability, increased critical thinking skills, forming friendship relationships, receiving various information, learning to use courtesy, increasing student motivation, increasing positive children's attitudes towards school and learning to reduce bad behavior, and helping students in respecting other people's thoughts.

Cooperative learning consists of several types of methods that can be applied in the teaching and learning process. Each method has different characteristics but the most prominent characteristic is that students are taught by methods that involve the role of students in the learning process by cooperating with each other. Cooperative learning methods according to (Nur, 2005) are:

- 1) *Student Team Achievement Divisions* (STAD)
- 2) *Teams Games Tournaments* (TGT)
- 3) *Jigsaw*
- 4) *Team Accelerated Instruction* (TAI)
- 5) *Cooperative Integrated Reading and Composition* (CIRC).

Jigsaw Cooperative Learning



The Jigsaw Method was developed and tested by Elliot Aronson and colleagues at the University of Texas, and later adapted by Slavin and friends at John University Hopkins , (Sugianto, 2010) . Jigsaw is one of the most flexible cooperative methods (Slavin, 2005).

Jigsaw cooperative learning is a type of cooperative learning which consists of several members in one group who are responsible for mastering the learning material section and are able to teach the material to other members in the group (Akhmad, 2008).

In the implementation of the *jigsaw* method of cooperative learning , the class is divided into several groups consisting of groups of origin and expert groups. The original group is a student parent group consisting of students with different original abilities. The expert group is a group of students consisting of different members of the original group assigned to study and explore a particular topic and complete tasks related to the topic to be explained to the original group.

The implementation of the *jigsaw* method of cooperative learning is carried out through the following steps summarized from Aronson (2000):

1. Form a *jigsaw* group consisting of 5 or 6 students. Group members should be different in terms of gender, culture, race, and ability
2. Appoint one of the students as group leader. The group leader should be chosen as the most mature among the others
3. Divide the material into 5 or 6 parts
4. Ask students to learn one part. Make sure that students only get one part and learn their own parts
5. I give time to students to read the parts so they know what they have to do. In this step students do not need to memorize the material
6. Form a group for a moment (this group is called an expert group. Students who have the same part form a group and discuss so they really understand)
7. Returns students in their original group (*jigsaw* group) respectively
8. Give time to each student to explain what they get in a group of experts and students are given the opportunity to ask questions and ask for explanations
9. Lecturers can walk from group one to group to oversee the process. Lecturers can provide explanatory assistance or intervene indirectly
10. At the end of the lesson students are asked to do a test or quiz so that they realize that the lesson takes place seriously, not just playing.

Method

Action plan

This research is a classroom action research (CAR) which is specialized in classroom activities conducted by researchers with the aim of improving the quality of classroom



learning practices. This study consisted of two cycles. Each cycle consists of four activities, namely: a. planning, b. action (action), observation (observation), reflection (reflection).

Data collection technique

Data collection techniques used in the study are:

1. Observation

The observations were made by the researchers by means of observation and recording of the aspects of the implementation of the components of learning in the classroom at the time of the learning process takes place without disrupting ongoing activities of learning.

2. Learning Outcomes Test

Learning outcomes tests are used to collect data on student learning outcomes, how to improve student learning outcomes after applying cooperative learning methods with a jigsaw approach.

3. Documentation

Documentation is used as a reinforcement of data obtained during observation activities. The documentation used in this study is in the form of data on the number of students, student accounting results, field notes, photographs during the learning activities, syllabus, and SAP and GBPP.

Data analysis technique

The data analysis technique used in this research is descriptive. The stages of research carried out are as follows:

1. Make observations
2. Analyze the tests given
3. Draw conclusions

Results and Discussion

Research result

Learning that has been done so far uses traditional learning. Teaching and Learning process goes monotonous and does not attract the attention of students, Students cannot understand the introductory accounting field I, learning is still *teacher centered* and lack of understanding of lecturers in developing *student centered* teaching methods, so that accounting learning is still conventional. Usually lecturers only use lecture and assignment methods. The lecturer provides material where students just sit down, listen to take notes and do the assignments given. This has an impact on the results of the exams, where only 5 students get an A score. This is reinforced by data obtained from the results of last year's



exam, namely the 2014/2015 academic year from local E accounting in the morning. For more details, can be seen in table 1 below:

Table 1
Student test results (before jigsaw learning)

score score	number of students	Percentage
A = 85 to 100	5 people	10%
B / A = 80 to 84	3 people	6%
B = 75 to 79	10 people	20%
C / B = 70 to 74	5 people	10%
C = 65 to 69	22 people	44%
D / C = 60 to 64	5 people	10 %

First cycle

The subjects in this study were students in accounting for the first semester of class 1 E accounting morning totaling 48 people. In this first cycle researchers conducted 4 activities consisting of:

a. planning

In this stage the lecturer or researcher prepares the syllabus, SAP and GBPP, Preparing learning media or sources in accordance with the material taught and adapted to the accounting method with the jigsaw approach, compiling observation sheets that will be used to determine the learning conditions of students with the application of accounting methods with the jigsaw approach and knowing the activity of students during the learning process and preparing test questions which will be given to determine the level of learning outcomes after applying the accounting method with the jigsaw approach.

b. Implementation phase

At this stage the implementation uses the first cycle which is carried out for 7 meetings.

c. Observation phase

Along with the implementation phase of the professors or researchers conducted observations on the implementation of the method akuntamatika with jigsaw approach. The purpose of this is to determine the suitability of the implementation of the plan of action that has been prepared previously and to determine the implementation of the actions that take place. Observations made in this cycle are related to the activeness of students in the learning process, collaboration in their groups, ability to do assignments. In this first cycle students' activeness has shown an improvement compared to the learning done so far. To be more clearly seen in the table below:

Table 2
active learning (during cycle I)

No.	Description of learning activeness	Number of students	Percentage (%)
1	Active students	29 people	60%
2	Student collaboration	38 people	79%
3	Students can complete the	25 people	52%



test		
The average student learning activeness	27 people	63%

4. Reflection Stage

In this stage researchers analyze and evaluate the results of observations that have been made so that it can be immediately known what actions will be taken. However, even though active students and enthusiasm in the teaching and learning process with the accounting method with the jigsaw approach, the results obtained from this first cycle have not shown satisfactory results because there are still values of C to D / C. Thing this can be seen in table 3 below:

Table 3

Student test results (First Cycle)

score score	number of students	Percentage	Ignorance
A = 85 to 100	22 people	46%	Achieved
B / A = 80 to 84	1 person	2%	Achieved
B = 75 to 79	-		
C / B = 70 to 74	4 people	8%	Not yet reached
C = 65 to 69	18 people	38%	Not yet reached
D / C = 60 to 64	3 people	6%	Not achieved

Based on the observations and results above, it can be concluded that the majority of students have begun to actively participate in the teaching and learning process. Most students have also begun collaborating with their group teams and some students have also been able to complete the tests. learning with accounting methods with this jigsaw approach, but there are still a large number of students who have obtained unsatisfactory scores. For this reason, researchers will carry out the second cycle by doing learning as much as possible with ways to motivate less active groups and still give enthusiasm that successful people must be able to work team, even if there is no point in cooperating with others. That way the smart will try to share their knowledge with less intelligent friends. As well as giving motivation that the success of this team will be determined by all team members rather than determined by individual and reminded that a superior team will get a reward or reward.

Second cycle

The second cycle was carried out after the mid semester exam, namely the 9th meeting until the 15th meeting. The activities carried out are the same as the first cycle, namely: planning, implementation, observation and reflection.

1. Planning stage

In this phase, researchers evaluated the weaknesses committed in the first cycle that led to the first cycle is poorly managed by:

- a. Giving motivation again to groups that are less active in jigsaw learning
- b. More intensive giving an explanation to the expert group that the success of the team is their hard work

c. Give praise to groups that have succeeded and give encouragement to groups that have not succeeded in answering questions

d. Give enlightenment to students that successful people must be able to work in a team and the success obtained is not only from themselves but there is involvement of others

e. Making questions with a language that is easier to understand

2. Implementation phase

At this stage the implementation is the same as that carried out in the first cycle by carrying out methods in accordance with the planning stage .

3. Observation phase

During the implementation of the second cycle the researcher or lecturer observes. Pursuant to the results of observations conducted this second cycle p no students' learning activities and achievement of students has been increased compared to the first cycle, it is seen from the activity asks students tends to increase d an answer student questions clearly and correctly. Student activity percentage can be seen from the following table:

Table 4

active learning (cycle II)

No.	Description of learning activeness	Number of students	Percentage (%)
1	Active students	42 people	87%
2	Student collaboration	46 people	96%
3	Students can complete the test	38 people	79%
The average student learning activeness		46 people	87%

4. Reflection Stage

From the results of the observations it can be explained that the level of activity and collaboration increases compared to the first cycle, as well as the ability of students to answer the tests performed. This can be seen in the table below:

Table 5

Student test results (Second Cycle)

score score	number of students	Percentage	Ignorance
A = 85 to 100	22 people	46%	Achieved
B / A = 80 to 84	5 people	10%	Achieved
B = 75 to 79	18 people	38%	Achieved
C / B = 70 to 74	3 people	6 %	Not yet reached

Discussion



The author conducts the accounting learning method with this jigsaw approach in the hope that even distribution of material mastery can be achieved in a shorter time and this method can train students to be more active in speaking and arguing, Implementing guidance by friends, Creating an environment that values scientific values it will increase the results as expected. With this jigsaw method students can also instill a sense of togetherness between them , mutual respect, respect for opinions others and build good cooperation .

In the teaching and learning process the learning atmosphere is more conducive because they are busy discussing the material that has been taught in the hope that when given questions each group is ready with the answers to be given. And from the first and second cycles, we can see that there is an increase in student activity, collaboration and the ability to answer questions given.

While the results of the tests also showed an increase in results from the first cycle to the second cycle.

Likewise with the increase in results before the accounting method with the jigsaw approach was carried out with the method of accounting methodology using the jigsaw approach there was a very significant increase where there were no students who received C, D / C, D and E as well as this method who get A, B / A and B scores more than learning before using the accounting method with this jigsaw approach.

From the above data it can be concluded that there is an increase in results from before using the accounting method with the jigsaw approach with after using the accounting method with the jigsaw approach even though there is still a C / B value.

Conclusion

Based on the results of the discussion above it can be concluded that:

1. An increase in learning outcomes using the accounting method with a jigsaw approach in the introductory accounting course I
2. During the process of learning the accounting method with the jigsaw approach There was an increase in active learning from cycle one to cycle two from 68% to 87%
3. An increase in the value of the first cycle of the average value of 80 becomes an average of 87 in the second cycle

Suggestion

Based on the discussion and conclusions described above, it is suggested as follows:

1. Before starting the accounting learning method with the jigsaw approach, the lecturer should prepare the questions or tests in a language that is easy to understand so that students are easier to do the questions given
2. The lecturer always gives motivation to students in every learning done so that students better understand the importance of teamwork
3. Minimizing the errors that occur in accounting learning with the jigsaw approach so that the expected results are more maximal



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