

# Gallery Walk Learning on Algebra II: Implementation and Result

Yanita and Admi Nazra

Department of Mathematics, Universitas Andalas, Padang, Indonesia

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Abstract: This paper reports about classroom action research in the academic year 2017-2018, involving an undergraduate student who took the Algebra II, one of the compulsory courses in the 6th term in Department of Mathematics, Faculty of Mathematics and Natural Sciences in Andalas University. In this research using one of cooperative learning method, i.e. gallery walk learning. The objective of this paper is to increase the ability of the student to understand the course material of Algebra II. We found that this method is working successfully.

## 1 INTRODUCTION

One of the learning outcomes expected from a Mathematics graduate is that students are expected to understand well the concepts and characteristics of mathematics related to Linear Algebra. The students are also expected to have a critical attitude and always have the curiosity to question the reasons behind the emergence of definitions and theorems/entries in Linear Algebra in particular and in mathematics in general. To realize these achievements, the Mathematics Department put it into a course entitled Algebra II.

Algebra II, 332 PAM Code (in some universities in Indonesia named this subject as Linear Algebra) is one of the compulsory subjects in the Department of Mathematics, Faculty of Mathematics and Natural Sciences. This course weighs four credits with a duration of 2 meetings in one week, with one meeting duration of 2 credits (2 x 50 minutes). Besides, this course has one meeting for a two credit duration tutorial. The tutorial is also taught by the lecturers of Algebra II. So in one week, there were three meetings, with two times face-to-face lectures by giving the material agreed upon at the Semester Learning Plan and one tutorial.

The material in this course includes vector spaces, determinants, linear transformations, characteristic values, and characteristic vectors, and inner product spaces. In the Elementary Linear Algebra, the basic thing that is needed is numerical calculations carried out based on the properties presented. The evidence carried out are still simple. In Algebra II, although

numerical calculations are still used, the discussion of the study emphasizes algebraic structures. During the tutorial meeting, it is usually done by giving and discussing questions, as well as discussion of material that is considered to need further explanation still.

In this course material, there are algebraic structures. The evidence is often confusing for students; this is obvious in the logic flow given by the students when answering questions, both during training and exams. Another thing that supports this statement is that there are still many students who take this course have an unfavorable final result, as shown in the following picture: (Algebraic score 2 even semester 2016/2017 academic year, A = 15.56%, A- = 15.56%, B+ = 8.89%, B = 17.78%, B- = 8.89%, C+ = 6.67%, C = 8.89%, D = 17.78% , E = 0%). From this data, it can be seen that the value below B is 42.22%.

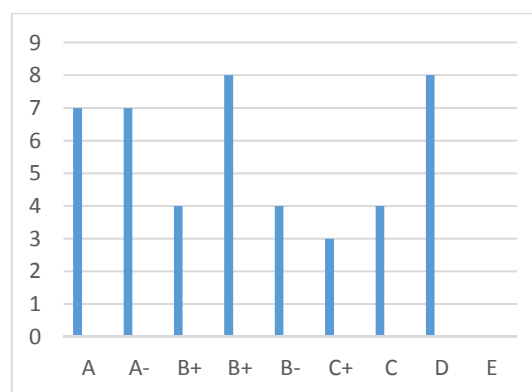


Figure 1: Distribution of Algebra II Value on Even semester 2016/2017.

A class action research was carried out to overcome this problem. The development of learning is focused on improving Algebra II learning methods. Indeed, regarding the Teaching and Learning Process (PBM), at a glance, this course seems to have run following the Semester Learning Plan (RPS). For example, the teaching materials have been developed through the creation of lecture handouts for each meeting and the availability of the textbooks is guaranteed as they can be found in the library and can be accessed freely on the internet. However, the ability of students to understand the theories contained in textbooks cannot be done by students without prior information from the lecturer. Therefore, theoretical subjects such as Algebra II are not very appropriate if only using Student Center Learning (SCL) methods such as Collaborative Learning, Discovery Learning & Small Group Discussion. There must be another companion method if this SCL method is used.

During this time, the lecturers of Algebra 2 still employ Teacher Center Learning (TCL), the conventional method, where a teacher is the focus of learning. Lecturers explain almost all material, and students understand by understanding the nature (in the form of theorems, entries, effects or propositions) and discuss the questions. This method is considered still relevant to meet the knowledge needed by students in studying Algebra 2. However, the weakness of this method is that students become passive, not too curious and only receive from lecturers.

In this study, the TCL method is maintained because this method is still necessary for students to understand the theories in the subject matter (Ping et.al, 2018; Jalani and Sern, 2015; Eden and Ackermann, 2018), such as in Algebra II. To reduce the passivity of students and also to increase students' curiosity about the existing material, the team of the lecturers (as the researchers) also applied Gallery Walk learning method as an implementation of Student Center Learning (SCL) learning method. This method was chosen because it was considered able to increase learners' response and curiosity towards the material given (Rodenbaugh, 2015; Bowman, 2005; and Francek, 2006). Besides, this method is also able to engage students' in the class activity and increase cooperation between students in seeking knowledge.

## 2 METHOD

This research is conducted directly in a class for one semester, i.e., Semester VI of the 2017/2018 academic year. It involves students who take Algebra

II courses. This research was carried out following the steps below:

1. This research is quantitative research, which employed participation observation method and used statistical description. The researchers acted as observers and students as observed objects. The focus of this research is to see the influence of SCL Gallery Walk learning method on students' comprehension of the teaching material. The researchers have prepared a series of discussions in the previous stage.
2. Research Limitation: This study is limited to the relationship between Teacher Center Learning (TCL) and Cooperative Learning (SCL) learning models, namely Gallery Walk on Algebra 2 subjects. The rubric used in this study is a descriptive rubric and perception scale.
3. Data and Data Collection Methods: The data used in this study are primary data. Students as objects are observed, given several tasks done during tutorial hours and lectures. Data is obtained by observing the results gained every time a task is given. The same assignment is assigned individually to each student. The process of collecting data is done at each lecture.
4. Data Analysis Techniques: This research is a classroom action research, so the data analysis technique is descriptive.

Table 1: Task Assessment Rubric.

Ability to complete assignments		
Grade	Score	Performance Indicator
Very low	≤ 20	There is no clear discussion to write down the task in question (included in this category that does not collect tasks)
Low	21 – 40	Some discussions are explained, but only a small part and only translate what is written in the textbook
Sufficient	41 – 60	The discussion presented was clear enough, covering the entire task order, but less innovative (in the sense of only translating textbooks)
Good	61 – 80	The discussion is quite clear, covers the whole, but not too broad (in a sense, there are some that are more than just translating textbooks)
Very good	≥ 81	The discussion is clear, covers the whole, innovative and broad.

The first step is dividing the participants into groups. As the total number of students is 44 people, each group consists of 5 students, except one group has 4 students. This is done to see the comparison of the values obtained with and without the gallery walk learning method.

Each group has a leader. The selection of the leaders is based on the nine values that are considered high obtained by students. The aim is that each group has at least one person who has "more knowledge/understanding" than the other members. The leader for the group of four members is determined randomly.

Etymologically, Walk Gallery consists of two words, namely gallery and walk. The word gallery is translated from the English Dictionary, meaning the exhibition and walk means walking or walking. In the Big Indonesian Dictionary, the exhibition means an activity to introduce something like a product, work or idea to a crowd. For example, painting exhibitions, batik exhibitions, book fairs, and others. Based on the meanings in the two dictionaries, the Gallery Walk learning method has the following meanings:

The Gallery Walk learning model is a group learning model or cooperative learning methods (Bowman, 2005). Cooperative learning is learning in which the system learns and works with small groups, which amounts to 4-6 people collaboratively so that it can stimulate students to be more eager and passionate about learning. From this definition, it can be concluded that cooperative learning is a way of learning in the form of small groups that work together and are directed by the teacher/lecturer to achieve the expected learning goals (Suprijono, 2011).

A gallery walk is a way to assess and remember what students have learned during learning (Silberman, 2011). This method is good to be used as it can develop cooperative learning and active learning and give mutual appreciation and reflection in learning. Moreover, this method is called a gallery walk as gallery learning is a way to assess and remember what has been learned (Bowman, 2005).

Steps for the gallery walk learning model

- 1) Students are divided into groups
- 2) Groups are given the plain paper or HVS paper
- 3) Determine the topic/theme of the lesson
- 4) The work of each group is posted on the wall / on the board
- 5) Each group revolves around and observes the work of other groups
- 6) One representative from the group answered what was asked by other groups
- 7) Correction of work together

8) Lecturers give clarifications and conclusions  
The purpose of gallery walk learning, in general, is that each group member has the opportunity to contribute to them and listen to the opinions, views, and thoughts of other members (Bowman, 2005). While specifically, this method aims as follows:

- 1) Attract students to the topics they will learn
- 2) Provide opportunities for students to show their knowledge and beliefs about the topics they will discuss
- 3) Inviting students to find deeper things than the knowledge they have gained.
- 4) Allows students to develop knowledge and skills, such as thinking, researching, communicating and collaborating in gathering new information
- 5) Providing opportunities for students to sort out, process and present new information and understanding obtained
- 6) Provide opportunities for students to determine for themselves how to demonstrate what they have learned

This gallery walk learning model has the following advantages:

- 1) Students are used to building a culture of cooperation to solve problems in learning.
- 2) Synergy occurs to reinforce understanding of learning objectives.
- 3) Familiarize students with respect for the work of friends.
- 4) Activating students' physical and mental during the learning process
- 5) Familiarize students with giving and receiving criticism.

### 3 RESULTS AND DISCUSSION

Because the observations were made after the midterm exam, at the beginning of this section a figure of the first quiz score, assignments and midterm / final semester exams was given.

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Based on observations, the researcher developed an assessment which is based on certain criteria made by the researcher. They are assignments carried out individually and in groups, quizzes, and final semester exams. The assessment system for assignments is carried out based on the rubric in Table A, while for the quizzes and final semester

examinations are on the value weight obtained from the students' answers.

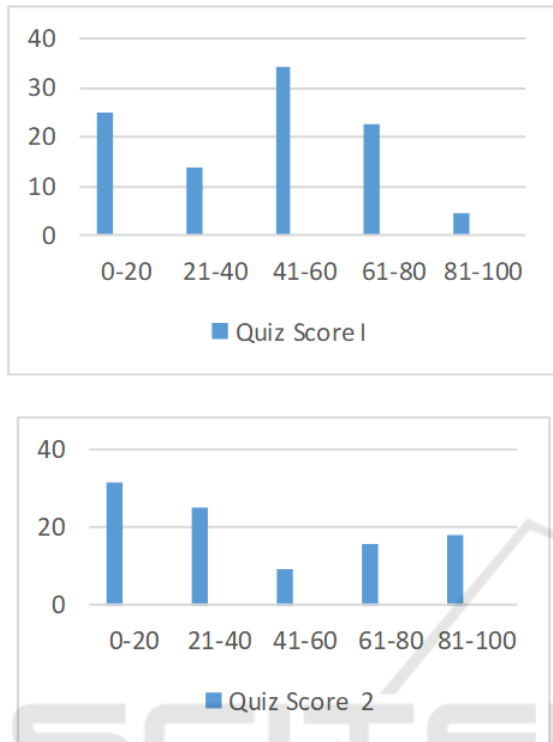


Figure 2: Percentage of I Quiz Score 1 and Quiz Score 2 of Algebra II.

The individual and group assignments are collected at a specified time; 50% reduction of value applied for a late submission. Individual assignments and group assignments are assessed by finding the average value of the work done outside the lecture/discussion hours and re-tested after the assignment sheet has been collected. Students who were not present at the discussion for reasons that were not clear resulted in a reduction in group values. Students who are not present at the quiz and final semester exams with unclear reasons are given 0 (zero) value.

The following are the results of the assessment based on the rubric in Table A and the calculation of the quiz and the final semester exams.

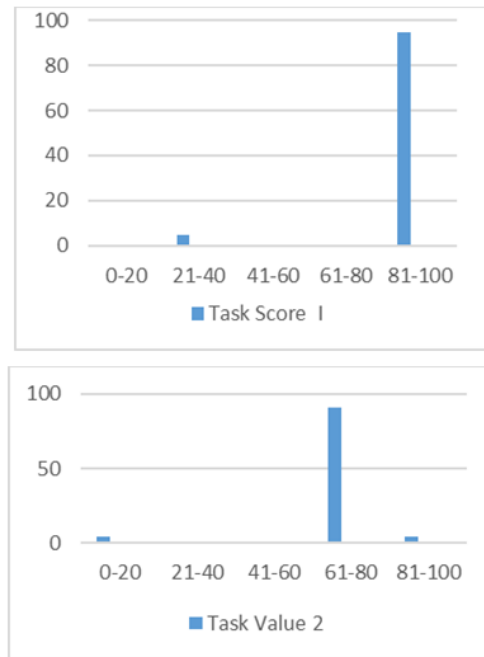


Figure 3: Percentage of Task Score 1 and Task Score 2 (individually).

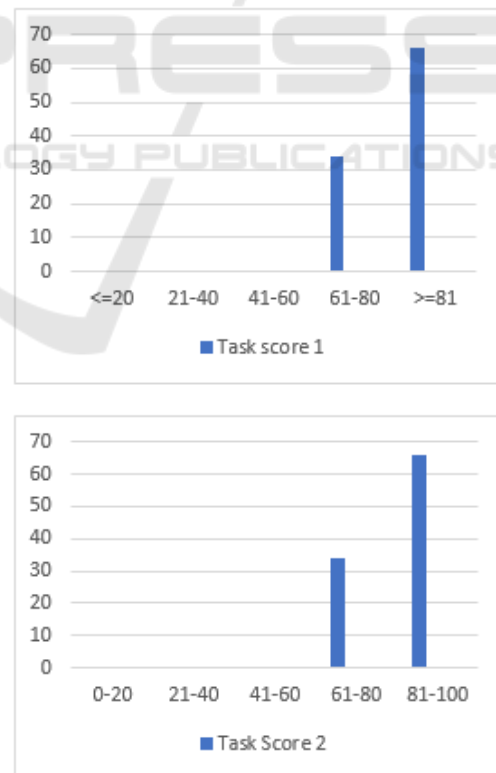


Figure 4: Percentage of Task Score 1 and Task Score 2 (in groups).

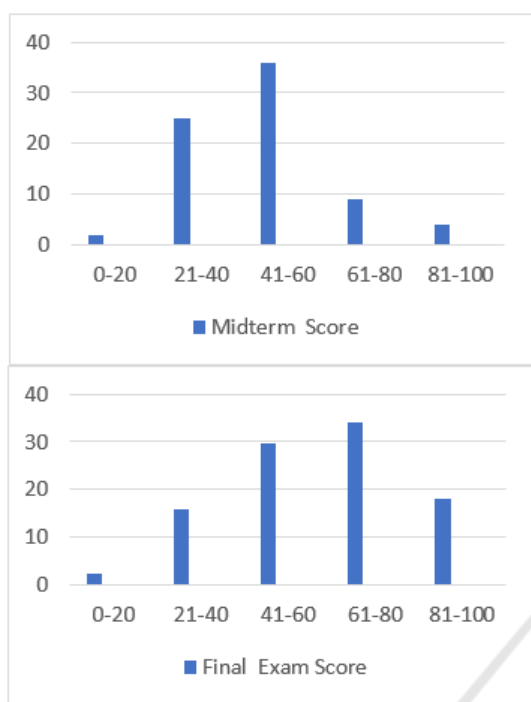


Figure 5: Percentage Midterm Score and Final exam Score of Algebra II.

#### 4 CONCLUSIONS

The method of gallery learning is carried out with one of the objectives to increase student understanding of the material in the Algebra II course. Understanding of the lecture material can be seen from the answers to assignments, quizzes and scheduled exams (Midterm and final exam). Figure 1. shows that the value of the quiz that was held before the midterm exams and before the final exam has a significant difference. Quiz I was given before the midterm exam, where the learning is without gallery walk method. Quiz II is administered after the mid-term when the learning applied gallery walk method. For a value of 0-20 even though it has increased, this is because many students get 0 (zero). Zero value means the students did not take the quiz, not because of the acquisition value. The value 81-100 score means there is a significant increase, which is 5% to 18%. Other values experienced an up and down. This research was considered successful when referring to the result shown by Figure 4. It appears that in general, the students' grades have increased. Although the values of 0-20 and 21-40 still exist but they have decreased from 25% to 16%. The value of 41-60 also decreased from 36% to 30%. It means that

fewer students get 21-40 and 41-60 values. Moreover, the values 61-80 and 81-100 have increased 9% to 34% and 5% to 18% respectively. It means that there are more students got good grades; the increase in compared to the midterms exam is quite significant. In general, based on the result presented from Figure 2. to Figure 5. and the analysis for the graph, the implementation of gallery walk learning method is considered successful enough to improve the students' comprehension of material used in Algebra II course.

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