

# Education Quarterly Reviews

**Hastuti, Tity, Nuraini, Feby, Suyono, Akhmad, Yuliani, Sri, and Hartanto, Dicki. (2019), Implementation of Think-Pair-Share (TPS) Cooperative Learning Model to Improve the Economic Learning Achievements. In: *Education Quarterly Reviews*, Vol.2, No.1, 135-143.**

ISSN 2621-5799

DOI: 10.31014/aior.1993.02.01.46

The online version of this article can be found at:  
<https://www.asianinstituteofresearch.org/>

Published by:  
The Asian Institute of Research

The *Education Quarterly Reviews* is an Open Access publication. It may be read, copied and distributed free of charge according to the conditions of the Creative Commons Attribution 4.0 International license.

The Asian Institute of Research *Education Quarterly Reviews* is a peer-reviewed International Journal. The journal covers scholarly articles in the fields of education, linguistics, literature, educational theory, research, and methodologies, curriculum, elementary and secondary education, higher education, foreign language education, teaching and learning, teacher education, education of special groups, and other fields of study related to education. As the journal is Open Access, it ensures high visibility and the increase of citations for all research articles published. The *Education Quarterly Reviews* aims to facilitate scholarly work on recent theoretical and practical aspects of Education.



ASIAN INSTITUTE OF RESEARCH  
Connecting Scholars Worldwide



# Implementation of Think-Pair-Share (TPS) Cooperative Learning Model to Improve the Economic Learning Achievements

Tity Hastuti<sup>1</sup>, Feby Nuraini<sup>2</sup>, Akhmad Suyono<sup>3</sup>, Sri Yuliani<sup>4</sup>, Dicki Hartanto<sup>5</sup>

<sup>1</sup> Universitas Islam Riau, Indonesia. E-mail: tityhastuti@edu.uir.ac.id

<sup>2</sup> Universitas Islam Riau, Indonesia. E-mail: Febbynuraini0902@gmail.com

<sup>3</sup> Universitas Islam Riau, Indonesia. E-mail: akhmadsuyono@edu.uir.ac.id

<sup>4</sup> Universitas Islam Riau, Indonesia. E-mail : sriyuliani@edu.uir.ac.id

<sup>5</sup> Universitas Islam Negeri Sultan Syarif Kasim Riau, Indonesia. E-mail: dicki.hartanto@uin-suska.ac.id

## Abstract

The aim of the research was to determine the improvement in economic learning achievements of senior high school students in Pekanbaru, Indonesia through the application of the cooperative learning model of the think-pair-share type with comic media. This research was conducted from July 19 to August 7, 2017. The subjects of this study were 36 students consisting of 16 male students and 20 female students. This was a classroom action research (PTK) with 2 cycles. The data collection technique was done by giving a final test at the end of each cycle and to observe the activities of students and teachers during the learning process using observation sheets. The data were analyzed descriptively. The findings concluded that the cooperative learning model of think-pair-share type could improve the students' economic learning achievements. The improvements could be found in the first cycle with an average percentage of 86% and 83% with classical mastery, then this improved more in the second cycle with an average percentage of 90% and with classical mastery of 94%. The teacher activity in the first cycle is quite perfect criteria with the percentage of 17, 5% and increased in the second cycle with perfect criteria with the percentage of 23, 3%. Then the increase in student activity in the first cycle was 82, 5% and increased in the second cycle by 95, 5%. From the above findings, it can be concluded that the application of the cooperative model of think-pair-share type along with comic media can improve economic learning achievements.

**Keywords:** Think-Pair-Share, Media Comics, Learning Achievement

## 1. Introduction

Education is an effort or effort made consciously and planned to increase the value of the behavior of a person or society, from a certain situation to a better one. Education plays an important role in the provision of quality of human resources, besides it determines the success or failure of human resources development because quality education will produce qualified human resources. Thus, education occupies an important position in the development and progress of a nation. The goal of national education will be realized, one of which is the process of teaching and learning activities through formal education in schools and non-formal education.

According to Ayeni (2018) that the state government in collaboration with other relevant stakeholders in education sector should employ an adequate number of qualified teachers, provide adequate learning facilities and materials, and organize capacity building workshops to improve principals' and teachers' skills in strategic management for sustainable improvement in students' academic performance.

Education is inseparable from the learning process carried out, because the learning process is one of the curriculum activities carried out by educational institutions in providing knowledge to their students so that students can achieve educational goals, namely good learning achievement. In order to achieve the goals of education and learning well, there is a need for changes in teaching and learning activities, and Economics is part of the education curriculum which also has an important role in efforts to improve the quality of education. Given the importance of studying economics, it is necessary to have serious handling, in this case, is the improvement of the quality of learning Economics departs from achieving better learning achievements.

The identification of problems included that many student scores were under minimum scores (KKM), students are less interested in reading books and less active students. The research objective was to improve students' economic learning achievements in economic subjects through cooperative learning of Think-Pair-Sharing by comic media.

According to Slameto (2003: 2) that learning is a business process carried out by a person to obtain a change in new behavior as a whole, as a finding of his own experience in interaction with his environment. The teaching and learning process takes place in a condition called educational interaction, the end of the interaction will be obtained learning achievements. Learning achievements have an important role in the learning process. The process of evaluating learning achievements can provide information to teachers about student progress in an effort to achieve learning goals.

Cooperative Learning Model is learning of students in developing their understanding and attitude in accordance with real life in society so that working together among fellow group members will increase motivation, productivity and learning gain (Solihatin and Raharjo, 2007: 5). While according to McCloud in Fauziyah (2010), comics are images that convey information or produce an aesthetic response for people who see it.

From the phenomena, previous researches and theories as above, it can be concluded that comics are media that can share information with their readers.

## **2. Method**

### **2.1 Research Design**

This research is Classroom Action Research. According to Sanjaya (2009:26) that Action Research is a process of studying learning problems in the classroom through self-reflection in an effort to solve these problems by doing various planned actions in real situations and analyzing each influence of treatment that is. The subjects of this study were 36 high school students of SMAN 10 Pekanbaru, consisting of 16 male students and 20 female students. This research will be conducted in June 2017 until completion.

### **2.2 Data Analysis**

The data analysis technique used in this study is descriptive analysis, aimed at describing data about the activities of teachers and students during the learning process and data about the mastery of economic learning achievements in students.

Student learning activities are students' responses to the activities of teachers who carry out learning activities using the TPS cooperative learning model which includes 6 indicators with 36 students and uses 5 classifications with the following criteria:

$$P = f / N \times 100\% \text{ (Sudjono, 2006: 43)}$$

*Description :*

P = Percentage Number

F = Frequency of student activity

N = Number of students

**Table 1.** Intervals and Categories of Student and Teacher Activities

% Interval	Category
91 – 100	Very Good
90 – 80	Good
79 – 60	Enough
≤ 59	Less

Source: Purwanto in Yuliardani (2009: 40) modified by researchers based on KKM

Teacher activity was obtained from the teacher's observation sheet in the implementation of the TPS type cooperative learning model including 6 indicators and 5 classifications by giving a score of 1 to 5. The maximum score is 30 (6 × 5) and a minimum score of 6 (6 × 1), then the following interval:

$$\text{Interval} = \frac{\text{Maximum Score} - \text{Minimum Score}}{\text{Classification Number}} \text{ (Juwairiah, 2009: 26)}$$

Analysis of data about the mastery of student learning achievements is done by comparing the scores of student learning achievements that follow the application of the cooperative learning method type Think-Pair-Share with the minimum mastery criteria (KKM) applied which is 80.

Based on (KKM) set by the teacher of Economics study, it is said to reach (KKM) when getting learning achievements  $\geq 85$  and students are said to complete individually. Data on mastery of student learning achievements both individually and classically will be analyzed using the following techniques. The level of mastery of student learning individually is measured using the formula:

$$PI = \frac{R}{SM} \times 100\% \text{ (Purwanto, 2004: 201)}$$

*Description :*

PI : Percentage of mastery in individual learning

R : Score obtained by students

SM : Maximum score

The level of mastery of student learning is classical. Class success is achieved seen from at least 85% of the number of existing students and students master the subject matter with a maximum value of 85, and classical mastery can be measured by the formula:

$$PK = ST / N \times 100\% \text{ (Purwanto, 2004: 201)}$$

*Description :*

PK : Percentage of classical learning mastery

ST : Number of students completed

N : Number of all students

### Performance Indicators

- Learning achievements. The ability of students individually to absorb the subject matter given is at least achieving minimum scores (KKM) mastery  $\geq 85\%$ .

- Classical learning mastery reaches  $\geq 85\%$  of students in that class have completed individual study or scored  $\geq 80$ .

### 3. Research Findings and Discussion

#### 3.1 Research Findings

##### 3.1.1 Preparation / Planning Phase

In this preparation phase or at the planning stage, the researcher prepared an instrument consisting of learning tools and data collection instruments. Learning devices consisted of Syllabus, Learning Implementation Plans (RPP) which were guided by syllabus made in accordance with the TPS, LKPD (*Lembar Kerja Peserta Didik/Students' Work Sheet*) and Comic learning model prepared by the researcher. In this preparation stage, the teacher first introduced the learning system to be used, namely Think-pair-sharing with comics at the subject of the learning.

##### 3.1.2 Implementation Phase

At the stage of implementation of the action in this study carried out in 2 cycles. Each cycle consisted of 2 meetings and 1 repetition.

###### a) Implementation of Cycle I

###### 1st meeting (Wednesday, July 19, 2017)

The implementation of the action at the 1st meeting was held on Wednesday, July 19, 2017, with 36 students present. The allocation of learning time provided at the first meeting is 2 x 45 minutes, the material to be discussed and taught at this meeting was "the notions of economic development, economic growth, economic development goals, patterns and stages of national development, success and failure of Indonesia's economic development" guided in RPP-1.

The teacher provided reinforcement on the results of the discussion. The activity of students at the time of sharing was not good enough. In the teaching and learning process today the activities of students as a whole were also not well implemented. For student activities can be seen from the observation sheet of student activity.

At the end of learning the teacher gave conclusions from the material that has been studied. Then the teacher gave an award in the form of applause to the group that completed the task correctly and correctly and the group that dared to appear and read the results of their assignments.

###### 2nd Meeting (Monday, July 24, 2017)

The second meeting in the first cycle was held on Monday, July 24, 2017, with 36 students present. The material discussed and taught at this meeting was "economic growth and the factors that influence economic growth" which were guided by RPP-2 and the allocation of learning time at the second meeting is 2x45 minutes.

At the end of the meeting, the teacher gave a conclusion to the learning subjects. Then the teacher gave an award in the form of applause to the group that completed the task correctly and correctly, and the group that dared to appear and read the results of their assignments. Before the teacher closed the learning activities, the teacher explained to the students that at the next meeting a cycle I would carry out exam I. It was expected that students prepared themselves to learn the material they had learned at the previous meeting.

###### b) Implementation of Daily Examination I in Cycle I

###### 3rd meeting (Wednesday, July 26, 2017)

Based on the learning achievement data in the first cycle, it was obtained information that of the 36 students to achieve the minimum mastery criteria (KKM) as many as 30 students (83.3), while for students who had not reached KKM as many as 6 students (16.6%) with the percentage of classical mastery amounting to 0%. Then it

can be concluded that the learning achievements in the first cycle had not achieved classical mastery which was 85%. For students who had not yet reached the KKM, they must follow the remedial to get minimum mastery.

### **c) Implementation of Cycle II**

#### **1st Meeting (Monday, July 31, 2017)**

The 1st meeting in the second cycle was done on Monday, July 31, 2017, with 36 students present, and the same allocation of learning time was provided, namely 2 x 45 minutes. The implementation of a class action in the second cycle was to improve the weaknesses contained in the implementation of the action in the first cycle in accordance with the results of reflection, at the first meeting in the second cycle of learning activities began with warming up about the factors that influence economic growth. Furthermore, the teacher continued the lesson based on RPP-3 with the material to be taught at this meeting, namely the "APBN / APBD and State / Regional Revenues and Expenditures."

The first activity during the learning process took place, namely by greeting, attending students. The teacher conveyed an apperception about the previous lesson, namely national development is a series of efforts carried out continuously in all areas of life of the community, nation, and state to lead to a better situation. The short-term goal of national development was to improve the standard of living, intelligence, and welfare of the people who were more just and prosperous and more equitable and to lay a strong foundation for the next stage of development. Then wrote down the topics of learning namely, APBN / APBD, then shared comic media, and conveyed the learning objectives that students must achieve namely students were able to know the influence and importance of the budget for the central and regional governments, students were also expected to know the sources of state income and APBN / APBD.

#### **2nd Meeting (Wednesday, August 2, 2017)**

The implementation of the second meeting in the second cycle was carried out on Wednesday, August 2, 2017, with 36 students present, with the allocation of learning time provided at the second meeting of the second cycle was still the same, namely 2 x 45 minutes, material that was discussed and taught at this meeting to discuss the APBN / APBD and State / Regional Revenues and Expenditures based on RPP-4.

At the end of learning the teacher gave conclusions from the material that had been studied. Then the teacher gave an award in the form of applause to the group that completes the task correctly and correctly and the group that dared to appear and read the results of their assignments.

#### **Implementation of Daily Examination 2 in Cycle II (Monday, August 7, 2017)**

Implementation of daily test 2 in cycle II was held on August 7, 2017, with 36 students present. The daily test questions I were in the form of the objective as many as 10 questions and essays of 5 questions, which were done individually in a predetermined time which was 90 minutes. The implementation of the daily exam was conducted on Monday, August 7, 2017. The daily results of the exam were examined and given a score based on alternative answer keys. After the learning achievements data on the daily test 2, obtained by students who have graduated in the excellent category as many as 25 students (69.4%). The good categories were 9 students (25%), enough categories were 2 students (5.5%), and the poor categories was 0 student (0%).

Based on the learning achievement data in cycle II, it was obtained information that of 36 students who achieved minimum mastery score (KKM) as many as 34 students or equal to (94.4%), while for students who had not reached the minimum mastery as many as 2 students or equal to ( 5.5%), with a percentage of classical mastery of (94.4%). Then it can be concluded that the learning achievements in the second cycle have reached the standard of classical mastery which is 85%. For students who had not reached the minimum mastery criteria (KKM), they must follow remedial (improvement) to obtain individual mastery.

### **3.1.3 Observation Phase**

From the observations in the first meeting there were some information obtained such as, learning activities that had led to the cooperative learning model type TPS were quite good, but the attention of each student's teacher was not maximal, other than that students were still not ready to receive lessons, students had not actively asked

for difficulties to the teacher, and students cannot respond to the results of the discussion. So that makes them a little awkward in conducting discussions. While the second meeting was informed that the TPS type learning activities were good, the teacher's attention of each student was good enough even though not yet fully, students were ready to receive lessons. Students have begun to show courage in expressing their opinions and responding to the results of group discussions.

Then, from the observations at the meeting of the second cycle, the cooperative learning model of the TPS type that was applied had proceeded as desired. Students have also been able to work together with good enthusiasm and show a sense of togetherness in the group. In addition, teacher activities that guide students so that teaching and learning activities run well so as to produce good learning achievements.

### 3.1.4 Reflection Phase

From the observations of researchers, during the action for the second meeting. Inappropriate planning like the teacher was not maximal in monitoring students, the teacher's attention to each student is also not optimal, when working on the LKPD, the implementation time was not in accordance with the initial planning, there were still many students who were not on time in collecting their assignments, lack of good cooperation with group members, because students are accustomed to working in collaboration with close friends and lack of renewal between them, making them a little awkward in conducting group discussions.

Then, plans carried out by researchers to improve actions were that the teacher must guide and monitor students as carefully as possible so students can be active in learning activities, good time management is needed to organize learning activities especially in terms of time utilization. So that it is in accordance with the RPP and Optimizing the learning atmosphere that leads to the TPS type cooperative learning approach.

Based on the results of observations during the action in the second cycle, the results of reflection in the second cycle were the learning process did well, students are already active and enthusiastic in learning activities, effective use of time when learning activities take place, so that it runs according to planning, development of the value of students' social skills. This can be seen where students have been able to mingle, cooperate very well and show a sense of togetherness in the group, and the learning atmosphere has led to the TPS type cooperative learning approach and learning achievements achieved by students improved.

After completing the teaching and learning activities through Think-Pair-Share learning model steps that included the reflection phase, the students' performances in doing the tests had shown better improvement. The line graphs below present the students' achievements during the test in cycle 1 and 2.

**Table 2.** Students' Achievements in Cycle I and Cycle II by Implementing *Think-Pair-Share* Cooperative Learning Model with Comic Media

Cycle	Students' Number	Quantity of Passed Students	Quantity of Not Passed Students	Percentage of learning mastery	Categories
Before Action	30	23	13	63%	Not Pass
Cycle I	36	30	6	83%	Not Pass
Cycle II	36	34	2	94%	Pass

Source : Research Data, 2017

Student learning mastery in economic subjects in the first cycle with the application of TPS methods accompanied by comic media can be found from the less students who did not pass the test while learning mastery of students in the second cycle has increased, only 2 students have entered C category or not completed. Classically complete with 94%.

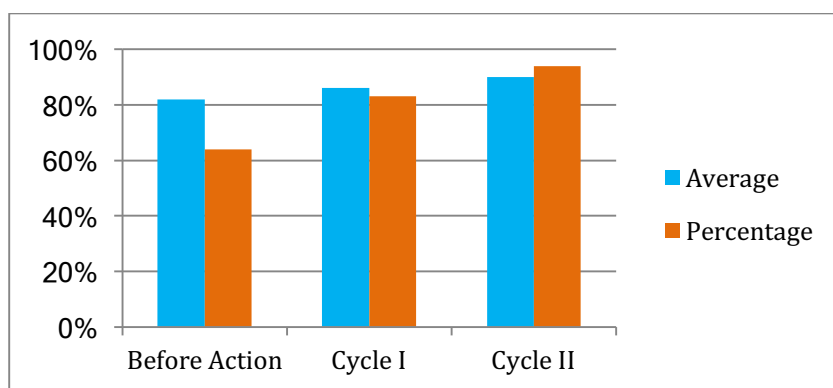
The learning mastery before action research, the cycle I and cycle II showed improvement. Before the program, there were still many students who had not yet finished or entered into category C, and there were 13 students. In the first cycle, there was a decrease in students entering the C category, namely, there were 6 students, but classically it was not completed, because the classics obtained were only at 83%. But in the second cycle,

students experienced a very good increase in learning achievements, students who entered category C were only 2 students, and the classical number was 94% which meant completing classically.

#### 4. Discussion

After analyzing the data about the application of the Think-Pair-Share type learning model with comics, the discussion of the study was presented. From the analysis of the data shows that there was an improvement in student learning achievements on economic subjects after the class action was carried out through cooperative learning type Think-Pair-Share. This can be seen from the increase in individual learning achievements and the mastery of classical learning achievements before and after the action research cycle I and cycle II. The value of classical student learning achievements before PTK was 64%. The low student learning achievements before action research because the teaching and learning process carried out was still centered on the teacher, so students tended to be passive and were less active in learning. The lack of students' desire to read books and listen when the teacher was explaining learning material, lazy students record material explained by the teacher. This was reinforced by Djamarah and Zain (2010: 46), in teaching and learning activities, teachers are not only fixated by using only one method, but teachers should use a variety of methods so that the learning process is not boring and can attract students' attention so that the learning process goes well.

**Graph 1.** Comparison of Students' Achievement Scores Before Action, Cycle I and Cycle II



The cognitive scores of the cycle I and cycle II was obtained from daily test scores. The percentage of daily tests in the first cycle is 83%, but there are still 6 students who have not yet reached KKM which is 80. While the percentage of student learning achievements in the second cycle has increased to 94% with an increase of 11% due to students already active in the learning process, students have started to want to read learning media and students are willing to cooperate in working on assignments in their groups.

According to the Ministry of Education and Culture in Trianto (210: 241) the mastery of student learning is done in a classical manner if a class has achieved a score of 85% of the number of students who complete and students who are said to complete individually if they have achieved the minimum mastery criteria (KKM) 80 set by the school.

By setting the cooperative learning type Think-Pair-Share (TPS) with comics, students will be interested in reading, active students and willing to cooperate in completing group assignments given by the teacher. Because in the type of Think-Pair-Share cooperative learning students are required to be involved in working on the students' worksheet together, students are asked to think about the answers to the questions, and then students discuss with their partners then each group will present the results of the discussion. Thus students are accustomed to being responsible and collaborating in groups so that they will be able to foster confidence in each student.

In carrying out the actions in this study, of course, there are still weaknesses that the teacher does. In cycle I the teacher is not optimal in monitoring students at the time of the pair, causing the class to become noisy and



students not serious in attending the lesson. The teacher has not been able to process time well, so when working on the LKPD, the implementation time is not in accordance with the planning of the time that is guided by the plan for implementing the learning.

While in the second cycle the learning process went well. Utilization of time has been effective when learning activities took place so that it runs according to planning.

The findings were the same with Suryanti (2012) in Indonesia that concluded that the cooperative learning model of Think-Pair-Share type could improve student economic learning achievements and Hastuti (2013) found that the cooperative learning model of the Think-Pair-Share type can improve student learning achievements. Then, the study by Hamdan (2017) from Jordan concluded the findings of the study that there were statistical differences in grades of students due to group variable at the significance level (0.05), and the differences were in favor of the experimental group and there are statistical differences due to gender at the significance level (0.05) in favor of females. Therefore, the study recommended to entry (Think – Pair – Share) strategy within the teaching strategies used by students during the teaching and the involvement of teachers in training courses on (Think – Pair – Share) strategy. The study by Raba (2017) from Palestine supported the findings that think-pair-share strategy plays a positive role in improving students' oral communicative skills, creating a cooperative learning environment and enhancing students' motivation to learn better.

From the data analysis above, it can be found that student learning achievements in cycle I and cycle II showed that the application of the Think-Pair-Share (TPS) cooperative learning model with comics could improve student learning achievements on economic subjects. The findings of this action analysis support the hypothesis proposed if applied cooperative learning with the Think-Pair-Share approach along with comics can improve student learning achievements in Economic subjects.

## 5. Conclusion

Based on the results of the research and discussion it can be concluded that by applying the Think-Pair-Share cooperative learning model accompanied by Media Comics can improve the economic learning achievements on the subject of economic development, economic growth, and APBN / APBD. The student learning achieved the percentage of 83% at cycle I and an increase of 94% in the second cycle.

Finally, this study recommended implementing TPS (Think – Pair – Share) cooperative learning model within the teaching strategies used by students during the teaching and the involvement of teachers in learning processes on economic subjects in high schools.

## References

- Arikunto, S. 2006. *Prosedur Penelitian Suatu Pendekatan Praktik*. Jakarta : Publisher PT. Rineka Cipta.
- Ayeni, Adeolu Joshua. 2018. Principals' Strategic Management and Students' Learning Outcome in Secondary Schools in Ondo State, Nigeria. In: *Education Quarterly Reviews*, Vol.1, No.1, 28-46. ISSN 2621-5799 DOI: 10.31014/aior.1993.01.01.5 <https://www.asianinstituteofresearch.org/>
- Fauziyah, Ana. 2011. Unsur-Unsur Komik. <http://mafauziyah.wordpress.com/2011/11/25/unsur-unsur-komik/>
- Hamdan, R. K. Ahmad. 2017. The Effect of (Think – Pair – Share) Strategy on the Achievement of Third Grade Student in Sciences in the Educational District of Irbid, Jordan. *Journal of Education and Practice* [www.iiste.org](http://www.iiste.org) ISSN 2222-1735 (Paper) ISSN 2222-288X (Online) Vol.8, No.9, 2017
- Hastuti, Nengsih. 2013. Penerapan Pembelajaran Kooperatif dengan Pendekatan Think-Pair-Share Menggunakan Handout untuk Meningkatkan Hasil Belajar dan Interaksi Siswa pada Mata Pelajaran Ekonomi Kelas VIII<sub>a</sub> MTS Diniyah Puteri Pekanbaru 2012/2013. Thesis in Accounting Education Program, FKIP, UIR Pekanbaru.
- Purwanto N. 2004. *Prinsip-prinsip dan Teknik Evaluasi Pengajaran*. Bandung : Publisher PT. Remaja Rodaskarya.
- Raba, A. A. A. 2017. The Influence of Think-Pair-Share (TPS) on Improving Students' Oral Communication Skills in EFL Classrooms. *Creative Education*, 8, 12-23. <http://dx.doi.org/10.4236/ce.2017.81002>

- Salvin, E. Robert. 2009. Cooperative Learning Teori, Riset dan Praktik. Bandung : Publisher PT. Remaja Rosdakarya.
- Sanjaya, Wina. 2008. Strategi Pembelajaran Berorientasi Standar Proses Pendidikan. Jakarta : Publisher Kencana.
- \_\_\_\_\_. 2013. Penelitian Pendidikan Jenis, Metode dan Prosedur. Jakarta :Publisher PT. Pustaka Media Group.
- Slameto. 2013. Belajar dan Faktor-Faktor Yang Mempengaruhi. Jakarta : Publisher PT. Rineka Cipta.
- Solihatini dan Raharjo. 2007. Cooperative Learning. Jakarta : Penerbit Bumi Aksara.
- Sudjana, Nana. 2009. Penelitian Hasil Proses Belajar Mengajar. Bandung : Publisher PT. Remaja Rosdakarya.
- Sudjono, Anas. 2006. Pengantar Statistik Pendidikan. Jakarta : Publisher PT. Raja Grafindo.
- Suryanti. 2012. Penerapan Pembelajaran Kooperatif Tipe TPS untuk Meningkatkan Hasil Belajar Ekonomi Siswa Kelas X<sub>1</sub> SMA Negeri 1 Ujung Batu Kecamatan Ujung Batu 2011/2012. Thesis in Accounting Education Program, FKIP, UIR Pekanbaru.

### Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal. This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/3.0/>).