

Problem-Solving, Think Pair Share and Lesson Study Approach for Improvement of Practical Skill of Vocational Students

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Abstract: Improvement of skill for students in vocational school is very important to face the new era of Industry 4.0. Students need the flexible ability and long-life problem-solving skill. In this work problem solving of assignment combined with think pair share and lesson study approach is proposed to be used in class of electrical installation. Student collaboratively try to solve, discuss and find solution of the assignment given by the teacher. Learning process was also observed by teacher partner as a reflection what happen in class. The reflection is used for planning the next action to improve the quality of learning. It found that the real-life problem which is designed as assignment in practical class improve the motivation of student to engage with problem solving. Think pair share made the class more active and help the conceptual understanding. Lesson study help the teacher to improve the quality of learning process. The combination of the method has improved significantly the learning result.

1 INTRODUCTION

Industry 4.0 makes change from mass technology production to flexible production. The change influences the job description and the way of works for people with vocational education training (VET) (Hämäläinen & Cincinnato, 2014). However, the vocational school usually trained the students with specific skill that may depreciate more rapidly (Gaddis & Pieters, 2014). VET worker needs to adapt with condition that often requires problem solving of new challenges (Wever, Malin, & Cincinnato, 2015). The complex problem solving and collaborative problem solving is critically needed in the new era of industry dan workspace (Neubert, Mainert, Kretzschmar, & Greiff, 2015). Problem solving skills are needed in most of all works and even in our life. Problem solving is very important skill in our life including ability to interpret, analyse, predict, evaluate, give the reason, design and create (Karatas, 2013). The problem-solving skill even is suggested to be trained in early childhood that may affect positively. (Snell et al., 2014).

The ability of problem solving can be trained with assignment or project that is designed as real-life problem. Further some improvement how to educate or trained student to have flexible and long-life ability of problem solving might be obtain by applying new technology in laboratory as student

workspace. (Hämäläinen & Cincinnato, 2014). Even game can be used for trained the ability of problem solving. (Wever et al., 2015). Not only the content of lesson but also the method of delivering lesson influence the quality of problem-solving learning. Think pair share strategy improved the view toward problem solving and conceptual understanding when applied in the class (Gok, 2018). Think pair share also develop higher quality of cognitive skills than enhance the problem-solving skill (Bamiro, 2015). With think pair share, student collaboratively try to understand the task, share the idea to solve the task and formulating the solution of the task. This activity has positive affect and enhance the cognitive thinking (Kwok & Lau, 2015).

To improve the quality of learning, besides the lesson material and the process of learning, the reflection of what teacher has been done in class is very important to be analysed. Lesson study can be used for this purpose. Lesson study help teacher to reflect and pus the teacher to be more introspective that can improve the planning and instructional decisions (Takahashi & Mcdougal, 2016). Lesson study is also very useful to develop pedagogical content knowledge (PCK) and improve the ability of preservice teacher to teach (Akerson, Pongsanon, Rogers, Carter, & Galindo, 2015). There are strong evidence that quality of teachers can be positively influenced by being involved in the dialog of lesson study. (Vrikki, Warwick, Vermunt, Mercer, & Halem, 2017). In the proposed method combination

of problem solving, think pair share and lesson study is implemented in laboratory class.

2 METHODS

The research is done in vocational school SMKN 1 Semarang in the class of electrical installation subject. The prior observation is conducted to get the initial understanding and skill of the student in electrical installation. Diagnostic test is done to as initial evaluation (pre-cycle). Prior analysis is done to decide whether the existing learning process is suitable.

The flowchart of the research is shown in the following figure 1.

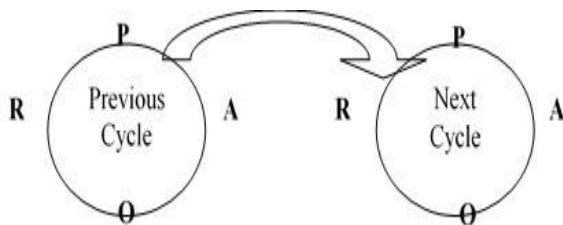


Figure 1. Research flowchart

The letter P, A, O and R means Planning, Action, Observation and Reflection respectively. Based on the prior observation, problem solving and think pair share are selected to improve conceptual understanding and practical skill of the students.

In the planning, we prepare instructional plan, evaluation instrument, job sheet, assignment, observation method and scheduling. In the action, we do the following for the first cycle:

- Teacher explain the planning and implementation of electrical installation for housing.
- Assignment to draw single line and wire diagram of simple installation is given to the students so that student know how to draw and use the wire diagram in the implementation.
- In order to sharpen the concept, teacher gives a problem to be solved as an electrical installation plan.
- Student works together in pair, the discuss about the problem and make the installation planning.
- Students share the works in front of class and discuss together to get the correct works with teacher as facilitator.
- Students draw the conclusion together.
- Other teacher make observation during the lesson (lesson study)

- Teachers do reflection what they have done in cycle 1 to get evaluate the result of the learning process. The evaluation is used for deciding the plan in cycle 2.

In the action, we do the following for the first cycle:

- Continue the lesson with drawing more complex installation as the next step of cycle 1.
- All of students present and discuss together their works.
- Teacher as facilitator and moderator give guidance to the students so that they know their mistake and do the correct planning
- Teachers do evaluation to observe the effectiveness of the process and to analysis the problem happen during the process. Teacher do the second reflection.

3 RESULTS AND DISCUSSIONS

3.1 Results

We use descriptive statistic before the implementation of the methods, first cycle and second cycle which are shown in table 1, 2 and 3 respectively

Table 1. Descriptive statistic of pre-cycle

	N	Min.	Max.	Mean	SD	Variance
Pra Siklus	35	58,00	88,00	76,7429	6,08442	37,020
Valid N (listwise)	35					

Table 2. Descriptive statistic of first cycle

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Siklus_1	35	63,00	92,00	82,8286	7,08970	50,264
Valid N (listwise)	35					

Table 3. Descriptive statistic of second cycle

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Siklus_2	35	69,00	92,00	86,1714	5,06130	25,617
Valid N (listwise)	35					

3.2 Discussions

3.2.1 Improvement of Motivation And Conceptual Understanding

The implementation problem solving and think pair share improve motivation and conceptual understanding of the students. The result is consistent with other result from previous work (Kwok & Lau, 2015). These can be observed from the following facts:

- Activities and participation of students in learning process increases compared to the previous condition. Before implementation of the methods, teachers are the centre of learning who always explain the theory and demonstrate how to build goon installation system. The participation of students in the discussion increased significantly after improvement with the think pair share method. After implementation of the proposed method, the students actively take a role in the discussions. The improvement of class participation with think pair share can also be found in other literature (Bataineh, 2015). In the learning process, student observe the installation procedure and diagram, and then students from different group convey the observation and compare each other to obtain the conclusions of their observation. This discussion makes the students are centre of learning instead of teachers.
- In the first cycle, the teacher give assignment to the student to draw wire diagram both single line and working diagram. The students work in group of two students to solve the problem. The students learn to collaborate in problem solving of the task and help their who do not understand the lesson material. In these activities, student get the experience of how to solve the real problem. The assignment is designed for real life problem of electrical installation. In this first cycle, we also implement lesson study approach. One teacher took a role as main teacher whereas three other teachers worked as observer. With three observers, the teacher obtained various feedback that was used for planning the next lesson. It positively influence the awareness of teacher to improve their quality of teaching trough the reflection as can also be found in other studies (Brown, Taylor, & Ponambalum, 2016)(Larkin, 2017)(Norwich, Fujita, Adlam, Milton, & Edwards-, 2018).
- In the second cycle, we again used think pair share method in the learning process with focused on motivating student to involve in the discussion. Some students share their works and explain to all of them. During sharing session, other students ask some question so that they will

understand better. The student also learned from the mistake which is done by some group.

3.2.2 Improvement Of Gra-Des Of Learning Result In Theoretical And Practical Skill

The method also improves the learning result which is proven with the increasing grades shown in the Table 4.

Table 4. Average grade in every cycle

	Pre-Cycle	Cycle 1	Cycle 2
Average Grades	76,74	82,83	86,17

The obtained gains every cycle is shown in Table 5.

Table 5. Obtained gain in learning result

	Pre-Cycle to Cycle 1	Cycle 1 To Cycle 2	Pra-Cycle to Cycle 2
Gain	0,26	0,19	0,41

With the gain category as shown in Table 6.

Table 6. Gain category

Gain	Category
$g > 0,7$	High
$0,3 < g \leq 0,7$	Moderate
$g \leq 0,3$	Low

The gain from pre-cycle to cycle to shows that the improvement of the learning result grades is moderate. Gain from pre-cycle to Cycle shows the combination effect of problem solving and think-pair share approach. The gain is low because the initial condition of the student that is not used to discuss and share together with the class. The gain from cycle 1 to cycle 2 show the improvement from think pair share and lesson study approach. This result give other proof of the previous different study that problem solving (Snell et al., 2014)(Hämäläinen & Cincinnato, 2014), think pair share (Gok, 2018)(Bamiro, 2015) and lesson study (Wood & Cajkler, 2017)(Chizhik, Chizhik, Close, & Gallego, 2017)(Cajkler, Wood, Norton, & Pedder, 2014)(Bjuland & Mosvold, 2015) give positive influence in the quality of learning.

3.2.3 Improvement of The Effectiveness of Learning in Every Cycle

In order to measure the effectiveness of the method from previous cycle to next cycle, paired t-test has been conducted as shown in Table 7.

Table 7. paired t-test from pre-cycle, cycle 1 and cycle 2

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pra_Siklus - Siklus_1	-6,08571	4,66761	,78897	-7,68909	-4,48234	-7,713	34	,000
Pair 2	Siklus_1 - Siklus_2	-3,34286	3,31612	,56053	-4,48198	-2,20373	-5,964	34	,000
Pair 3	Pra_Siklus - Siklus_2	-9,42857	4,55222	,76947	-10,99231	-7,86483	-12,253	34	,000

The result show that effectiveness improvement from pre-cycle 1, cycle 1 to cycle 2 and pre-cycle to cycle 2 are significant. That means the learning process become more effective with the combined method. With the combination method, positive effect of each method will strengthen the improvement of the quality of teaching and learning.

4. CONCLUSIONS

Lesson study, problem solving and think pair share has improved student understanding in theoretical and practical understanding of vocational student in subject of electrical installation. The improvement can be seen in the ability of student to explain and solve the given problem. Students are also able to make practical report. The team work skill also has been improved. With lesson study, the teacher obtain suggestion from the other teacher as observer to improve the quality of learning process. Think pair share and problem solving make the student understand easier and faster. The gain 0.4 show that the method improved the understanding of the subject sufficiently.

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