Efforts to Overcome the Industrial Revolution 4.0 Through Lesson Study

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***Abstract**: In recent year technology in the industrial revolution era 4.0 is developing very rapidly. The industrial revolution 4.0 is very influential in changing behavior in the world of education, business, and the industrial world. Where the skills and competencies become the main things that need to be considered, besides that characteristics in the era of the industrial revolution 4.0 are also very influential on employment. From here, a change is needed to overcome the problem by carrying out learning activities using lesson study, which in turn can improve learning and the material provided can be delivered and the objectives of learning can be achieved. In this study aims to determine the development of learning innovations through lesson study on the mixed methods. The research method used is descriptive qualitative. The results of the study stated that students were ready with the efforts in facing the industrial revolution 4.0.*
***Keywords**: industrial revolution 4.0; lesson study; mix methods*

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INTRODUCTION

On May 2, 2010, the government launched the theme: Character Education towards national civilization as a long-term program that needs to be followed up by teachers and other educators. This is in accordance with Law No. 20 of 2003 on the National Education System in Article 3, which states that National Education serves to develop the ability and shape the character and civilization of the nation with dignity in order to educate the life of the nation. National Education aims to develop the potential of students to become human beings who believe and fear God Almighty, Noble, healthy, knowledgeable, capable, creative, independent, and become a democratic citizen and responsible. This raises new problems for educators, including education in developing capabilities in the current industrial revolution 4.0 civilization in learning. One way that educators can take to overcome this problem is to carry out lesson study activities.

According to the Minister of Research, Technology and Higher Education *(Menristekdikti)* Mohammad Nasir, the challenges of the Industrial Revolution 4.0 must be responded quickly and appropriately by all stakeholders in the Kemenristekdikti environment in order to improve the competitiveness of the Indonesian nation. For this reason, Higher Education must formulate strategic policies in various aspects ranging from institutional, field of study, curriculum, resources, and cyber university Development, and research and development to innovation.

Lesson study *(Jugkyokenkyu)* has been developed and implemented in several schools in Japan that are proven to be able to improve learning standards that have a direct impact on improving the quality of Education. Therefore, through learning with lesson study based on several courses that are expected to improve the standard of learning which in turn will be able to increase the achievement of learning achievement for students (Suyatmo, 2014). With the lesson study, it is expected that education in higher education can be in accordance with permenristekdikti standards. So that the realization of education in accordance with educational standards.

Lesson study is defined as a model of coaching the teaching profession through collaborative and continuous learning assessment based on the principles of parallel and mutual learning to build a learning community. Lesson study is an approach to improving the quality of learning that originally came from Japan. The Japanese word or term for this is "Jugyokenkyu" (Yoshida, 1999 in Lewis, 2002). This Lesson study began to be studied in America since the reporting of the results of the Third International Mathematics and Science Study (TIMSS) in 1996. In the TIMSS report that Japanese students, have a high ranking in mathematics and allegedly one of the supporting factors is the Jugyokenkyu (Wang-Iverson, 2002).

Lesson study that emerged as an alternative to overcome the problem of learning practices that have been seen as less effective. As understood, that has long been the practice of learning in Indonesia in general tend to be done conventionally like this is more likely to emphasize on how teachers teach (teacher-centered) rather than how students learn (student–centered) and overall, the results we can understand that it did not contribute much to improving the quality of the process and student learning outcomes. To change the habit of learning practices from conventional learning to student-centered learning is not easy, especially among teachers who are grouped in groups that reject change /innovation. In this case lesson study seems to be taught as one of the alternatives to encourage changes in learning practices in Indonesia towards a more effective.

In today's era, students are required to understand what the industrial revolution is and how it relates to the world of Education. The fourth-generation industrial revolution is a major challenge for today's college students. This big challenge can be a great potential to build a student movement. However, it can also be a threat to the student movement. It all depends on how we look, process and deal with it. Every revolution, of course, there is a big change, while now it has entered the 4th Industrial Revolution.

From the above problems the researchers assume the need for the use of the development of ways of learning conducted in the classroom. Through the application of lesson study can be used to improve learning so that it is in accordance with the education guidelines. Because lesson study itself is a learning assessment activity that is carried out gradually and planned consists of: plan, do, and see activity which is carried out continuously and continuously with each other in order to improve the quality of learning.

METHODOLOGY

Research design is a strategy to achieve research objectives that have been set and serve as guidelines or guides researchers in the entire research process (Nursalam, 2003), so that research design has an important role in research. The research design used by researchers is mix methods.

According to Sugiyono (2018) mix methods is a research method by combining two research methods at once, qualitative, and quantitative in a research activity, so that more comprehensive, valid, reliable, and objective data will be obtained. Creswell (2009) stated that combination research methods will be useful when quantitative methods or qualitative methods individually are not accurately used to understand the research problem, or by using qualitative and quantitative methods in combination will be able to obtain a good understanding when compared with one method.

RESULTS AND DISCUSSION

The study began on August 28, 2019 with the planning research phase (plan). This stage is the stage where the model lecturer makes the learning capability lesson study. After creating a learning community lecturers discuss classroom learning planning for the material to be delivered. The next stage is the implementation (do), this stage was held on september 4, 2019 in the classroom. The next stage is reflection (see) this stage is done after the learning is

complete, this is because to find out what findings are at the time of observation related to the Industrial Revolution 4.0

The planning phase (plan) was implemented on september 10, 2019. This stage the model lecturer plans what kind of learning process based on the findings of observations at previous meetings. On september 11, 2019 the implementation phase was carried out. Next is the reflection stage (see), the stage of delivering observation results in the classroom at the implementation stage related to the Industrial Revolution 4.0.

September 17, 2019 the planning stage (plan) was carried out by submitting a learning plan for the next meeting based on deficiencies and for improvements at the time of delivery of the material. September 18, 2019 in the classroom. The next stage is the reflection stage (see) based on the learning that has been carried out, this stage conveys the results of observations at the implementation stage based on findings related to the Industrial Revolution 4.0.

Research conducted for 3 times there are changes in the face of the Industrial Revolution 4.0 students of building engineering education. This is shown during the implementation process (do) takes place and based on the results of observations that begin with the planning stage(plan), implementation of learning (do) and back again for reflection (see).

In the Planning (plan) at the first meeting used internet-based learning (e-learning) that is by using e-learning SPADA UNS and implementation of literacy, ranging from data literacy, technology literacy and human literacy. Learning methods lectures, Q & A and group discussions with the approach of Contextual Teaching Learning (CTL) and at the first meeting is used a combination of problem-based learning (Problem Based Learning), guided Inquiry and Pair to Share, through learning activities with lesson study the learning objectives planned in advance at the planning stage was achieved.

Then in the second meeting learning observation used lecture learning method, question and answer and group discussion with Scientific approach and also used a combination of research-based learning model (research Based Learning) where this learning model meets the data literation which is one of the characteristics of the Industrial Revolution 4.0, Project Based Learning (PBL), Guided Inquiry and internet-based learning model (e-learning) thus the learning objectives planned in the previous planning stage can be achieved and meet the characteristics of the Industrial Revolution 4.0.

While the observation of learning at the third meeting used lecture learning methods, discussions and questions and answers as well as the Scientific approach and also used a combination of problem-based learning models (Problem-Based Learning), Research-Based Learning (Research Based Learning), Project-Based Learning (PBL), and Blended Learning (BL) and in the third meeting also used an internet-based learning model (e-learning) in addition to the assignment by making a concrete tutorial with different variations and learning objectives that have been planned in advance at the planning stage can be achieved and meet the criteria in the face of the Industrial Revolution 4.0.

Table 1. Data from observation

Aspects that are observed	Indicators	Meeting		
		I	II	III
Innovative learning	Use of IT (Information Technology)	4	4	5
	Operational technology (OT)	3	4	4
	Learning Model	3	4	5
Literacy	Data literacy (reading, analyzing, and using information in the digital world)	2	3	4

Aspects that are observed	Indicators	Meeting		
		I	II	III
	Technological literacy (can utilize support the learning process and its implementation)	3	4	5
	Human literacy (improved communication skills and mastery of design science. Provide opportunities for students to directly interact with the real world.)	3	3	4
Cyber University	Teaching with distance learning	3	3	5
	Ability to use SPADA	3	4	5
Infrastructure	Equipment advances in practicum	2	3	3
	Ability to use advanced infrastructure	3	3	4

Based on the observation results during the learning process at the first meeting until the third meeting showed an increase in efforts to deal with the Industrial Revolution 4.0. It is shown that at the first meeting with the innovation of learning models in the form of a combination of problem- based learning models (Problem Based Learning), guided Inquiry and Pair to Share, as well as internet-based learning models (e-learning), literacy, Cyber University there is an average value of students in facing the Industrial Revolution 4.0 through lesson study at this first meeting of 86.15%. In the second meeting with the innovation of learning models in the form of a combination of research-based learning models (Research Based Learning), Project Based Learning (PBL), guided Inquiry and internet-based learning models (e-learning), literacy, Cyber University, the use of building materials science laboratory equipment, there is an average value of students in facing the

Industrial Revolution 4.0 through lesson study at this second meeting of 83.86%. While at the third meeting with the innovation of learning models in the form of a combination of problem-based learning models (Problem Based Learning), Research-Based Learning (Research Based Learning), Project Based Learning (PBL), and Blanded Learning (BL) as well as internet- based learning models (e-learning) literacy, Cyber University, the use of building materials science laboratory equipment, there is an average value of students in facing the Industrial Revolution 4.0 through lesson study at this third meeting of 88%.

With the observation through lesson study in the building materials science course building engineering education study program of one of state university in Indonesia, it shows that students are able to face the Industrial Revolution 4.0 it is proven through observation at the first meeting until the third meeting.

CONCLUSION

Based on the results of data analysis, the conclusion of this study is:

1. There are efforts to deal with the Industrial Revolution 4.0 through lesson study in the Building Materials Science course in Building Engineering Education Program
2. There is an increase in students in the face of the Industrial Revolution 4.0 through lesson study in the Building Materials Science course in Building Engineering Education Program
3. Based on the data collected and the results of data analysis, other findings related to efforts to face the Industrial Revolution 4.0 were obtained. Other findings are as follows: The achievement of facing the Industrial Revolution 4.0 through lesson study activities in the Building Materials Science course of the Building Engineering Education Study program at one of the universities in Indonesia is with the result of innovative learning capacity of 86.15%

which means very good, literacy skills of 86.58% which means very good, cyber university skills of 83.86% which means very good. Evidenced from the analysis of questionnaire data that was filled by students

4. Lesson study applied at the time of learning has a good impact in facing the Industrial Revolution 4.0 for students of building engineering education.

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