

The Implementation of Physics Learning Based on Teacher Competency

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Abstract— This study aimed to describe the role of Physics teachers in planning, to implement, and to assess learning at Senior High Schools in Makassar based on their competencies. A survey has been conducted in several senior high schools in Makassar. The subjects of this study were Physics teachers who had been certified from 2009-2019. The results of the study were analyzed using a quantitative descriptive approach combined with a qualitative approach. The results of the study indicated that the planning of Physics learning by teachers, whether those who had a certification period of fewer than seven years or more, had corresponded 2013 curriculum. Besides, the Physics teachers had carried out learning in the classroom based on the lesson plans they had constructed before. In addition, the results showed that the assessment of Physics learning regardless of the teacher certification period, both the process and the results of Physics learning, had not been fully implemented in accordance with the lesson plan. Overall, whether the planning, implementation, and evaluation of Physics learning by high school teachers in Makassar in implementing the 2013 curriculum did not show significant differences in terms of the teacher certification period.

Keywords: *teacher competency, physics learning*

I. INTRODUCTION

Education is basically a process to help people develop themselves, so they are able to face all changes and problems with an open attitude. The aim of education, in general, is to improve the intelligence of the nation through increasing students' understanding of the material taught. In order to achieve national education goals, it can only be approved, which is supported by various factors such as the quality of teaching teachers. In addition, the right teaching method is needed, teacher teaching discipline, student learning discipline, textbooks, and preparation of subject matter according to the applicable curriculum.

According to Mulyasa, curriculum and teaching programs include planning, implementation, and assessment activities [1]. In 2013, the Indonesian government implemented a new curriculum as one of the implementations of the Indonesian law Number 20 the Year 2003 concerning the National

Education System, known as the 2013 curriculum [2]. According to Kurniasih & Sani, 2013 Curriculum is a refinement of the competency-based curriculum that was applied since 2004 and then continued with School Level-Based Curriculum (KTSP) in 2006 [3]. While Kosasih stated that the 2013 curriculum is a curriculum that is in accordance with understanding, skills, and character education, where students are required to understand the material, be active in the process of discussion and presentation, as well as providing courtesy and high discipline motivation [4]. The learning process in the 2013 curriculum is directed to develop three competencies, including attitude competencies, knowledge, and skills in an integrated manner, which means that it cannot be separated from other competencies to support the achievement of educational goals [4].

Completion of this curriculum requires teachers to design lesson plans which are suitable for the applied curriculum, in this case, the 2013 curriculum, then to carry out and evaluate learning activities in accordance with the lesson plans made before. The most prominent thing in the 2013 curriculum is the learning approach. The learning process in the 2013 curriculum is carried out using a scientific approach. The learning process must touch three domains, namely, attitudes, knowledge, and skills. The achievement of these three domains is very dependent on the learning process carried out by teachers in the class.

The success of curriculum implementation depends on the ability of the teacher because the teacher is the implementer and the curriculum developer. Although the teacher does not trigger the concept of curriculum, she/he is the curriculum translator as well as can process and concoct the curriculum. As revealed by Hamalik, that teaching and learning process and student learning outcomes are not only determined by the school, its patterns, structure, and curriculum, but most are determined by the competence of teachers who teach and guide the students [6].

Professional teachers must have competence in carrying out learning programs. This is in line with the opinion of Mulyasa that teachers as implementers of classroom learning activities are required to have competence in implementing learning in

accordance with 2013 curriculum concepts and characteristics, whether in terms of classroom management, selection of learning models, use of media and appropriate learning resources [7].

Teacher competency is one of the factors that influence the achievement of learning and education goals at schools [8]. Broke and Store suggests that teacher competence is a qualitative description of the nature of meaningful teacher behavior [7]. Whereas according to Carreker & Boulware, teacher competence is the accumulation of the ability to facilitate learning [9].

In line with the above opinion, Law Number 14 the Year 2005 Article 10 Paragraph 1 concerning teachers and lecturers stating that the competencies that must be possessed by a teacher include four aspects, namely pedagogic competence, professional competence, social competence, and personality competence [10]. The four aspects are very influential in the implementation of the 2013 Curriculum.

Professional teachers must also have the ability and special expertise in the field of teacher training so that they can carry out their duties and functions to teach knowledge and character to students effectively. This is consistent with the research conducted by Rahman, that professional competence has a positive effect on teacher performance [11]. In addition, Andriani also revealed that a professional teacher greatly influences the success of learning and increases the interest of students in Physics learning [12].

Teachers with high competency values can now be proven by an educator certificate and professional teacher allowance. The Republic of Indonesia Government Regulation Number 19 of 2005 concerning National Education Standards states that teachers have a position as a professional staff, as evidenced by the provision of an educator certificate [13]. Until now, there have been thousands of teachers who have passed the certification test as professional teachers either through portfolios or through training. The existence of these certifications is expected to improve the quality of students and the performance of teachers in managing and assessing learning based on the improvement of lesson plans made by the teachers.

Teachers must be able to carry out the learning process in accordance with process standards. The learning process in schools is related to the teaching and learning process of a subject matter, including physics. Physics, as part of science, is a collection of knowledge about objects and natural phenomena obtained from the results of the thoughts and investigations of scientists through scientific methods [14]. So that Science knowledge, especially the field of Physics, is built on the stages of observation, data clarification, verification of concepts and laws, both quantitative and qualitative. Physics is needed in everyday life to fulfill human integrity, especially in the fields of science, environment, technology, and society relatedly and direct the learning process of students to design works through the application of Physics concepts.

Physics learning is delivered using various approaches to explore a natural phenomenon. The result of research conducted by Isa shows that one of the strategies that can be

used in learning Physics is by using a guided inquiry learning method [15]. In addition, the results of the study from Nurlina, Nurhayati, and Arafah shows that the average learning outcomes of Physics students are in the high category through problem-based learning [16]. In its implementation, the teacher plays a role not only as of the subject of knowledge to students, but students must develop a knowledge independently in their thinking. The nature of Physics learning is in line with the foundation of thinking in the implementation of the 2013 curriculum that the learning process emphasizes the use of a scientific approach.

In addition, the role of the teacher in achieving learning goals and educational goals is very important. Especially the ability to implement and assess learning based lesson plans that have been prepared.

Based on the information obtained researcher, the implementation of the 2013 curriculum in Public High Schools in the city of Makassar has not been fully consistent with the educator certificates they have. In addition, teacher performance in the implementation and assessment of classroom learning has not been observed and evaluated after passing the teacher certification.

The Indonesian Minister of Finance, Sri Mulyani, also stated that "often teachers are only present in class, checking attendance, but then leave the students in the class." She also questioned many honorary teachers, and it indicates that the teachers did not do their duties. Even Teacher Certification system no longer reflects the improvement of teacher quality, only being procedural to get benefits, and does not mean the teacher is professional and responsible in her/his work [17].

II. RESEARCH METHOD

This study is a descriptive-quantitative, followed by in-depth interviews on the subject. The subjects of this study were high school Physics teachers who had been certified from 2009 - 2019. The research location was in Makassar. The data collection techniques used in this study were questionnaires, documentation, and observation. The questionnaire was used to see the tendency of the subjects' answers to the teaching activities they had done. Furthermore, observations and interviews were carried out to see the suitability between the answers of the subjects and the real conditions done by the teachers in the school. The data analysis technique used descriptive-quantitative analysis followed by a qualitative approach.

III. RESULTS AND DISCUSSION

The results of this study describe the planning, implementation, and assessment of learning conducted by Physics teachers of state high schools in Makassar based on teacher competencies. The measurement of lesson planning was done by using non-test instruments in the form of questionnaires that contain 24 items of statements with alternative answers YES or NO. The questionnaire used had been adjusted to Regulation of Education and Culture Ministry Number 22 and 23 the Year 2016 as well as the concept of the 2013 curriculum. The answers given by each subject were then

analyzed on each item by looking at the suitability of the lesson plan documents that had been made. The results are as follows:

TABLE I. THE SUITABILITY OF THE QUESTIONNAIRE WITH THE REAL LEARNING CONDITION

Certification Period	Percentage of Planning Aspect	
	<i>Suitable</i>	<i>Not Suitable</i>
< 7 years	71 %	29%
≥ 7 years	73%	27%

The data show that in the lesson planning stage, the teachers made a lesson plan that was suitable for the 2013 curriculum concept and Regulation of Education and Culture Ministry Number 22 the Year 2016 concerning the standard process of primary and secondary education, regardless of their certification period. Making lesson plans (RPP) of the 2013 curriculum is the core of the lesson planning process that will be carried out by a teacher. A teacher who has competence will really pay attention to the details of the learning design. Here the teachers will apply scientific approaches and learning models as required in the core activities, which distinguishes them from the previous curriculum. The Physics teachers of state high schools in Makassar had made plans in the form of lesson plans, student worksheets, assessment sheets, as well as remedial and enrichment programs. Public high school Physics teachers in Makassar in preparing lesson plans have compiled components in the form of core competencies, basic competencies, learning indicators, learning objectives, learning materials, media, and learning resources. Also, the teacher has compiled learning methods and models, steps of learning, assessment, remedial programs, and enrichment that meet the 2013 curriculum criteria. However, the teachers still need to make improvements in their construction of lesson plans.

All of the subjects in this research generally had not formulated learning objectives, which include attitudes, knowledge, and skills competencies. The learning objectives formulated also did not include A, B, C, and D (Audience, Behavior, Condition, Degree). In addition, all of the subjects in this study had not chosen media which are suitable with the learning objectives, whereas, the theory actually reveal that learning media are all objects that can be used to convey material so as to provoke attention, desires, thoughts, and sensitivity of students in learning activities so that the learning goals can be achieved [18].

Indicators are one important component in learning activities. The existence of indicators is the reference to the success or failure of the implementation of learning activities. With that, teachers are expected to be able to understand the indicators. Analysis conducted by teachers on SKL, KI, and KD can assist teachers in developing Competency Achievement Indicators (GPA), which are used as a basis in determining learning by increasing character values through literacy activities and the 21st Century skills development. Educators can formulate achievement indicators of knowledge and dimensions of cognitive processes as well as indicators of skills relating not only to the skills of action but also thinking skills,

which are also said to be abstract and concrete skills [19]. Indicators of Competency Achievement (GPA) are categorized into three levels, namely, key indicators, supporting indicators, and enrichment indicators. In the real condition of the field, it was found that the formulation of indicators by every Physics teacher at State High Schools in Makassar had been formulated in accordance with the KKO on Basic Competency. However, the indicators formulated only cover key indicators and do not include supporting indicators and enrichment indicators.

This is not in accordance with the opinion of Ariyana et al. which states that the formulation of Competency Achievement Indicators (GPA) can be done by following a number of steps, namely paying attention to the dimensions of cognitive processes and dimensions of knowledge as the targets that must be achieved by students, determine the BC will be reduced to GPA, using Operational Verbs (KKO) that are appropriate for the formulation of GPA so that the material concept can be conveyed effectively, gradations of GPA are identified from Lower Order Thinking Skills (LOTS) towards Higher Order Thinking Skills (HOTS) and formulating supporting GPA and GPA key, whereas enrichment GPA is formulated if the minimum competency of KD has been fulfilled by students [19].

However, all the subjects have developed lesson plans from the syllabus, and in formulating indicators and learning objectives, all the research subjects had adjusted to basic competencies. This is in accordance with Regulation of Education and Culture Ministry Number 22 the Year 2016, which states that the lesson plan is developed from the syllabus to direct learners' learning activities in an effort to achieve Basic Competence [20]. So it can be concluded that the lesson plan prepared by the Physics teacher at the state high schools in Makassar is in accordance with the concept of 2013 curriculum and the Regulation of Education and Culture Ministry Number 22 the Year 2016 concerning basic and secondary education process standards even though each component has not been implemented optimally.

The success of the 2013 curriculum implementation is seen in the planning aspect. Besides that, it was also seen the suitability of the aspects of the implementation and assessment of learning with planning that had been made by the teacher beforehand. Data on the learning implementation and assessment obtained through observations were then analyzed to see the suitability with the lesson plan, and the teacher answer on the questionnaire sheet. The results can be seen in Table 2.

TABLE II. THE SUITABILITY BETWEEN THE IMPLEMENTATION AND ASSESSMENT OF LEARNING WITH THE LESSON PLAN

Dimension	The suitability with Lesson Plan	
	<i>Suitable</i>	<i>Not Suitable</i>
Learning Implementation	52%	48%
Learning Assessment	46%	54%

Table 2 above shows that the implementation of Physics learning was in accordance with the lesson plan with the percentage of 52%, while the dimensions of learning

assessment were not suitable with the lesson plan with the percentage of 46%. Thus, if the percentage is presented in a chart, the presentation is as shown in Figure 1.

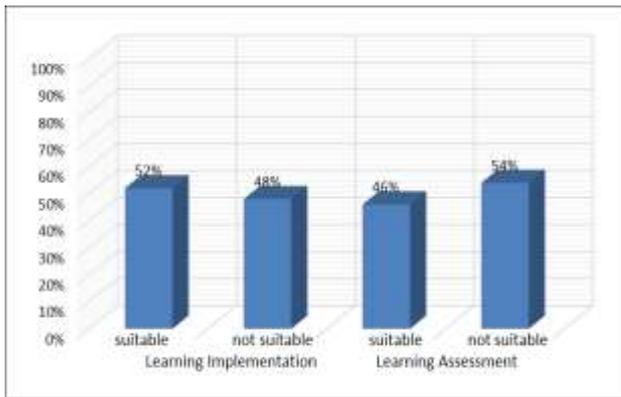


Fig. 1. Chart of the Percentage of Suitability between the Implementation and Assessment of Learning with the Lesson Plan

The learning implementation done by the Physics teachers of state high schools in Makassar had been running in accordance with 2013 curriculum learning principles. The pre-activities were carried out following the steps that must be done, namely preparing students to learn, giving apperception, and delivering learning materials. However, the core activities were not suitable with the stages of the scientific approach and focused more on the use of lecturing method. The stages of the scientific approach carried out in learning are observing, questioning, and reasoning. Thus, the students tended to be passive, and they only relied on the information provided by the teacher.

In lesson planning, the subjects in this research planned learning using a learning model that is required in 2013 curriculum, namely discovery learning and Problem Based Learning (PBL), whereas, in the learning process, the teachers delivered the materials and asked students to answer questions even though sometimes using the student worksheet in the learning process. The materials taught in the class were suitable for the materials listed in the lesson plan. However, the method of delivering materials was not suitable yet with learning objectives and the basic competence to be achieved. Based on this, it can be concluded that the implementation of learning by the Physics teachers of state high schools in Makassar had not matched the Regulation of Education and Culture Ministry Number 22 the Year 2016 which requires the use of a scientific approach and learning model that is prescribed in 2013 curriculum for each meeting.

The use of media and learning resources by the Physics teachers of state high schools in Makassar for the learning implementation was not fully suitable yet with the lesson plan made, while in the implementation of remedial and enrichment programs, all of the subjects in this research, in this case, Physics teachers of state high schools in Makassar, had implemented remedial programs for students who did not pass the basic competencies. However, the teachers did not implement an enrichment program for students who passed the daily examination.

The dimensions of assessment are divided into three observed aspects, namely, the assessment of attitudes, knowledge, and skills. Based on the results of observations, all of the subjects had prepared instruments and carried out an attitude assessment through observation. This is in accordance with the lesson plan that had been prepared and the answers from the questionnaire sheet. In addition, it was also in accordance with the assessment procedures and assessment mechanisms stated in Regulation of Education and Culture Ministry Number 23 the Year 2016 [21].

The implementation of attitude aspect assessment was conducted by the state high school Physics teacher in Makassar through observation. This is in line with the assessment procedure and appraisal mechanism in Regulation of Education and Culture Ministry Number 23 the Year 2016, namely observing the behavior of students during the learning process and carrying out attitude assessment through observation. In the aspect of attitude assessment, the observation results show that the teachers had not been able to process the results of the attitude assessment obtained from the observation results optimally so that further evaluation was carried out so as to produce a new policy even though the attitude assessment mechanism was in accordance with Regulation of Education and Culture Ministry Number 23 the Year 2016. This is consistent with the opinion of Markle and O'Banion that there are still very few teachers who do affective assessments well in the field [22].

Furthermore, all of the research subjects had prepared instruments and carried out knowledge assessments to measure student learning outcomes related to the taught basic competence. Knowledge assessment was carried out in the form of assignments, daily tests and semester tests and sometimes in the form of oral tests. So, it can be concluded that Physics teachers of state high schools in Makassar had carried out assessments that were in accordance with the assessment mechanism on the assessed competencies [21].

The implementation of skills competency assessment by the research subjects, in this case, is the Physics teachers of state high schools in Makassar, was conducted by assessing the students' result of discussion and the way they do a presentation by using powerpoints. However, the implementation of assessments in the form of performance assessment of carrying out Physics experiments had not been carried out by all of the research subjects during the learning process. This was concluded by researchers because, during the observations, the students did not carry out Physics experiments for two basic competencies, whereas the basic competencies taught required Physics experiment. Therefore, the researcher asked all of the research subjects directly. The research subjects, in general, revealed that the reason for not implementing the skills assessment was due to the limited number of practical tools available in the Physics laboratory.

In addition, the results of observations and interviews showed that more than 90% of the research subjects did not carry out the project evaluation even though it was standardized in the taught basic competence. Thus, it can be concluded that the Physics teachers of state high schools in Makassar had not fully implemented assessment in accordance

with the educational assessment standards regulated by Minister of Education and Culture Number 23 the Year 2016.

If the data about the implementation and assessment of learning carried out by the teachers are correlated to the period of certification, data are obtained, as shown in Table 3.

TABLE III. THE SUITABILITY BETWEEN THE IMPLEMENTATION AND ASSESSMENT OF LEARNING WITH THE LESSON PLANNING BASED ON CERTIFICATION PERIOD

Dimension	Certification Period			
	< 7 years		≥ 7 years	
	Suitable	Not Suitable	Suitable	Not Suitable
Learning Implementation	50%	50%	53%	47%
Learning Assessment	41%	59%	45%	55%

Based on table 3 above, it can be seen that the implementation and assessment of learning by Physics teachers in state high schools in Makassar toward the lesson plan in implementing 2013 curriculum did not seem to show a significant difference between teachers with less than 7 years of certification and teachers with more than or equal to 7 years of certification. Teachers who have good and professional abilities in curriculum implementation are teachers who can design a lesson plan, implement learning, and assess learning outcomes well [23]. This statement provides an explanation that teachers with high competency values that have been proven by teacher certificates and professional teacher allowances and are considered as a professional tend to have good performance in learning. Thus, teachers who have a long certification period are expected to have good performance in learning. The percentage of the implementation of Physics lesson planning in terms of teacher competence can be seen in Figure 2.

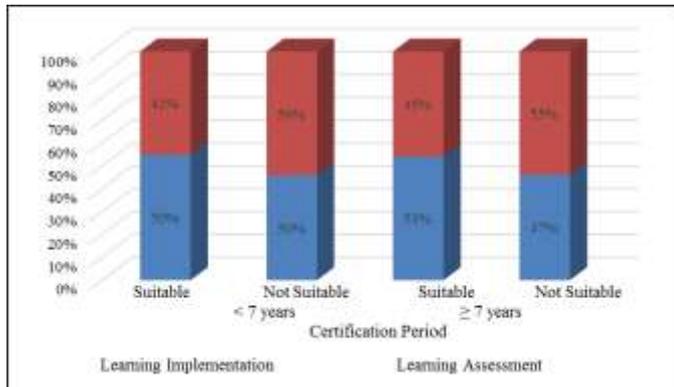


Fig. 2. Percentage of the Suitability between the Implementation and Assessment of Learning with the Lesson Plan Based on Certification Period

Although there is no significant difference in the implementation and assessment of learning by teachers based on the certification period, the observations show that teachers with more than or equal to 7 years of certification had better mastery skills and used more electronic media than teachers with less than 7 years of certification in implementing learning. Zafer and Aslihan also stated that "experienced teachers are more likely to prefer to be in control in their classrooms than the new teachers while interacting with students when making decisions" [24]. The statement provides an explanation that experienced teachers tend to be able to control the class compared to teachers who lack experience when interacting with students. In addition, in this study, it was also obtained that all Physics teachers of state high schools in Makassar had

conducted an attitude assessment with observation. However, none of the teachers were able to manage the results of these observations for evaluation.

IV. CONCLUSION

The results of the study indicate that the planning of Physics learning by teachers, whether those who have a certification period of fewer than seven years or more, were in accordance with the 2013 curriculum. Besides, the Physics teachers carried out learning in the classroom, which was in accordance with the lesson plans they had made before. However, based on the results of the observation, Physics teachers who have a certification period of seven years or more generally had better class mastery skills. Assessment of physics learning without seeing the teacher certification period, both the process and the results of learning physics, have not been fully implemented in accordance with the plans they have made before. Overall, whether the planning, implementation, and evaluation of Physics learning by high school teachers in Makassar in implementing the 2013 curriculum did not seem to show significant differences in terms of the teacher certification period.

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