Analysis of scientific learning implementation by science teachers in Samarinda

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Abstract. This study aimed to obtain information on how the implementation of learning science/physics at the elementary, middle, and high schools in Samarinda that covering two main activities, namely program development and program implementation. The population are all science/physics teachers in Samarinda with 60 teachers as samples that was choosen by proportional random sampling technique. Data was collected through a checklist questionnaire. Data analyzed by using descriptive analysis techniques in the form of a percentage that indicates the percentage of each item and the percentage of each indicator. The results showed the implementation of science physics in elementary, middle, and high school in the city of Samarinda which includes two main activities namely development program and implementation program each including high category.

1. Introduction

Society is heavily influenced by the advancement of science and technology. Therefore, society is expected to have science literacy on science and technology. Almost all lines of life use science and technology products. In line with that the government seeks to improve the quality of science education at the level of educational units. In order for students to have the ability to learn science like science, then Science (Physics, Chemistry, and Biology) is taught by inquiry method like a scientist working in the laboratory. The publication of National Science Education [1] states that to raise awareness among educators will be instilled that science literacy is more than just knowledge of certain facts and concepts. Accordingly, the American Association for the Advancement of Science [2] argues that conceptual understanding will increase based on experience made when learning uses scientific inquiry learning at the educational unit level. Victor and Kellough [3] stated that science learning and science literacy in primary and junior secondary schools is the key to successful individual success for the future. It also affects the attitude of science to students very well if given earlier [3, 4, 5, 6, 7].

Regulation of Minister of Education and Culture number 65 Year 2013 [8] about the Process Standard of Basic and Intermediate Education requires the learning given to the students is strengthening the scientific (scientific) approach. Especially in science or science teaching is recommended for teachers to use scientific methods in learning done in the classroom, namely; (a) inquiry-based learning, Joyce and Weil [9] suggest that inquiry learning involves learners in investigative real-life investigations, how to identify problems and how to overcome them. Ong and Borich [10] argued that inquiry learning is how to observe, ask questions, seek and use information through experiments, using tools to collect, analyze and interpret data, ask questions, explain, and predict, and communicate results.

The NRC [11] suggests inquiry learning refers to the way in which scientists work when studying nature, seeking explanation through evidence gathered from its surroundings. Furthermore, Wenning [12] suggests inquiry learning is the ability of learners in doing observation, manipulation, generalization, verification, and application. (b) problem-based learning, in learning PBL learners have skills in solving problems. it is intended that in the future learners can play an active role globally and able to develop capabilities and characters such as critical thinking, creative thinking, problem solving, love to work together, skilled at managing time, responsible, leadership spirited, ethical, courageous, and other positive characters [9].

Problem-based learning is defined by education experts with a variety of them: [13], [14], [15], [16], and [17]. However, in general PBL refers to how learners can find problems and solve the problem. In this learning the learning paradigm is students centered.

Arends [18] explains that the characteristics of PBL are learners: (a) asking questions/problems, (b) focusing on the linkage between discipline, (c) authentic investigation, (d) producing and exhibiting products, e) cooperation. The syntax of PBL learning is: (a) giving orientation to the problem, (b) grouping learners, (c) guiding learners independently or in groups, (d) developing and presenting the work, and (e) analyzing and evaluating the process of solving problem. (c) project-based learning, Project-based learning abbreviated as PjBL emphasizes students' liveliness and group work (collaborative), and authentic assessment techniques undertaken from the outcomes of the projects undertaken. Projects undertaken by learners can be either self-contained or group projects and implemented over a period of time and produce products that can be displayed or presented.

The characteristics of project-based learning [9] are: (a) learners make decisions about a framework, (b) there are problems or oppositions to be worked on; (c) learners process to determine solutions to problems or challenges posed;) learners are collaboratively responsible for accessing and managing information to solve problems (e) the assessment process is carried out continuously; (f) learners reflect on the activities undertaken; (g) the resulting product is evaluated qualitatively; and (h) the lessons learned are quite tolerant of mistakes and changes.

Project-based learning can be done with the teacher's position as facilitator and evaluator with the details of the task as follows: (a) preparing the problem to be solved, (b) assisting the provision of resources, (c) organizing the group and creating a comfortable atmosphere, (d) each group member, (e) providing timely information based on group development, (f) ensuring the discipline followed by self-assessment, (g) maintaining group-centeredness to achieve goals, (h) monitoring and facilitating the discussion, (i) maintaining participant motivation students, (j) provide open questions that encourage learners to seek solutions, (k) evaluate learning activities and group participation, and (l) assess the course of project-based learning.

There are several stages or syntax designs for project-based learning as follows: (a) asking questions, (b) designing project plans, (c) preparing schedules, (d) monitoring project progress, (e) assessment of outcomes, and (f) evaluate experience. (d) the learning cycle. Learning cycle is a series of stages of activities organized in such a way that learners can master the competencies that must be achieved in learning by playing an active role. Lawson [19] classified the learning cycle model in three types namely descriptive, objective empiric and hypothetical deductive. The important difference between the three is the level of the students' ability to describe the nature or explicitly produce and test alternative hypotheses.

Each of the four models has its own level according to the learning character that will be given in the classroom. Along with these goals, it is necessary to know the readiness of teachers in the school about the method of learning that will be used.

In the academic year 2016/2017 the even semester of all schools in Samarinda in particular, will apply the Curriculum 2013. Therefore, an instrument is needed to determine whether the desired scientific learning curriculum can be implemented properly. Based on the results of interviews in several schools, both in primary school and high school, teachers will generally teach using scientific learning model. However, some teachers are still confused about the model. This is because the teacher's

understanding is limited to the definition that the model has been done if the learning in the classroom is centered on the students.

Based on the above, it will be investigated to determine the learning undertaken by a teacher are in accordance with scientific or not. The main objective in this study was to analyze the enforceability of scientific learning that teachers do in the classroom. Some of the activities required in this instrument as an instrument that can measure the scientific learning, among others: the background of the teacher as a science teacher, which is owned educational status, length of teaching, participation in professional teacher organizations, how to build collaboration with other teachers, and how they scientific teaching in the classroom. Based on the literature, research instruments have been devised designed to measure Dunbar's scientific inquiry learning [20]. However, the instrument that was created was only developed based on elementary school teachers. The research is going to take data from elementary school to high school in the city of Samarinda.

2. Research Methods

The research method used in this research is descriptive method and is a preliminary research. To find out the implementation of science / physics lessons in elementary, middle and high schools is done through a limited response questionnaire. To know the implementation of science / physics learning used two indicators namely development and implementation. The study involved 60 teachers consisting of 20 science teachers of elementary schools, 20 science teachers of middle schoola, and 20 high school physics teachers in Samarinda City.

3. Results and Discussion

3.1 Results of data analysis of each item for elementary teachers

Discussion on the results of data analysis Implementation of science learning as follows:

1) The percentage analysis of data about the time teachers teach science shows 50% of respondents choose less 3 years teaching science, 15% of respondents choose 3 to 5 years, 10% of respondents choose 6 to 10 years, and 25% of respondents choose more 10 years. Based on the above fact it appears that the majority of science teachers in primary schools have been teaching science less than 3 years.
2) Percentage analysis of data about teacher education shows 100% of respondents choose S1. Based on the above fact it appears that all elementary school teachers have degrees.
3) Analysis of percentage of understanding data about scientific study shows 25% of respondents choose never, 50% of respondents choose 1 to 3 times, 25% of respondents choose more than 3 times. Based on the fact it appears that the majority of teachers have received material about scientific learning.
4) The percentage analysis of data on participation in the training / workshop / workshop on scientific learning / inquiry showed 60% of respondents voted never, 30% of respondents choose 1 to 3 times, 20% of respondents choose more than 3 times. Based on the fact it appears that the majority of teachers have never attended the workshop / workshop / workshop on scientific learning / inquiry.
5) The percentage analysis of the data about the scientific work of science teachers shows 65% of respondents choose none, 35% of respondents choose there 1 to 3. Based on the fact it appears that the majority of teachers do not have scientific papers since 2014.
6) Percentage analysis of data on classroom action research activities showed 45% of respondents never conducted classroom action research, 45% of respondents choose to do research class action 1 to 3 times, 10% of respondents have done more than 3 times. Based on this fact it appears that almost 50% of teachers have conducted classroom action research.
7) Analysis of the percentage of data on KKG participation showed 15% of respondents voted never, 70% of respondents choose sometimes, 5% of respondents choose frequently, 10% of respondents choose always. Based on the fact it appears that the majority of teachers have followed the KKG.

8) The percentage analysis of data about the number of model book / teaching methods owned by teachers showed 55% of respondents choose 1 to 3, 45% of respondents choose more than 3. Based on the fact it appears that the majority of teachers have 1 to 3 book model / learning methods.
9) The percentage analysis of data on the number of science books owned by teachers with different authors showed 15% of respondents choose none, 85% of respondents choose 1 to 5. Based on the fact it appears that the majority of teachers have 1 to 5 science books with different authors.
10) Percentage analysis of data on the use of laboratory as a practice / teaching shows 55% of respondents choose never, 45% seldom choose. Based on the fact it appears that the majority of teachers never use laboratory for practice / teaching.
11) Percentage analysis of data on the use of tools or materials while teaching in the class showed 5% of respondents voted never, 25% of respondents choose seldom, 60% of respondents choose sometimes, 10% of respondents seldom choose. Based on the fact it appears that the majority of teachers sometimes use the tools / materials while teaching in the classroom.
12) Percentage analysis of data on collaboration with other teachers in making RPP shows 10% of respondents voted never, 30% of respondents seldom choose, 25% of respondents choose sometimes, 30% of respondents choose frequently, 5% of respondents choose always. Based on these facts it appears that the majority of teachers have already collaborated with other teachers in making RPP.
13) Percentage analysis of data on teacher guidance based on teaching lesson when teaching shows 10% of respondents choose sometimes, 35% of respondents choose often, 55% of respondents choose always. Based on the fact it appears that the majority of teachers are always guided by RPP while teaching in the classroom.
14) Percentage analysis of data on curriculum studies to determine learning objectives showed 5% of respondents choose seldom, 25% of respondents choose sometimes, 35% of respondents choose frequently, 35% of respondents choose always. Based on these facts it appears that the majority of teachers do curriculum studies in determining learning objectives.
15) Percentage analysis of data on the use of open questions while teaching to encourage students to observe, investigate, and think scientific shows 25% of respondents choose sometimes, 30% of respondents choose often, 45% of respondents choose always. Based on the fact it appears that the majority of teachers always use open questions when teaching.
16) Percentage analysis of data on giving opportunities to students using various sources to conduct investigations showed 45% of respondents choose sometimes, 45% of respondents choose frequently, 10% of respondents choose always. Based on the fact it appears that the teacher has given the opportunity to students using various sources to conduct an investigation.
17) The percentage analysis of data on bringing science books while teaching in class shows 5% of respondents voted never, 10% of respondents seldom choose, 10% of respondents choose sometimes, 5% of respondents choose frequently, 70% of respondents choose always. Based on the fact it appears that the majority of teachers bring science books into the classroom while teaching.
18) Analysis of the percentage of data about the focus of learning done in the classroom is solving the UN problems show 5% of respondents voted never, 5% of respondents seldom choose, 25% of respondents choose sometimes, 55% of respondents choose frequently, 10% always. Based on the fact it appears that the majority of teachers do learning in the classroom focused to solve the problems of the UN.
19) Percentage analysis of data on teaching methods that have not been done by teachers when teaching showed 45% of respondents choose inquiry laboratory, 40% of respondents choose project-based learning. Based on the fact it appears that the majority of teachers have not used scientific learning.

3.2 Results of data analysis of each item for middle school teachers

Discussion on the results of data analysis Implementation of science learning as follows:

1) Percentage analysis of data about time teachers teach science shows 35% of respondents choose 6 to 10 years, and 65% of respondents choose more 10 years. Based on the above fact it appears that

the majority of science teachers in middle schools have been teaching science for more than 10 years.

2) Percentage analysis of data on teacher education shows 90% of respondents choose S1 and 10% of respondents choose S2. Based on the above fact it appears that all middle school teachers have class of scholars.
3) Analysis of percentage of understanding data about scientific study shows 20% of respondents choose never, 70% of respondents choose 1 to 3 times, 10% of respondents choose more than 3 times. Based on the fact it appears that the majority of teachers have received material about scientific learning.
4) The percentage analysis of data on participation in the training / workshop / workshop on scientific learning / inquiry shows 20% of respondents voted never, 75% of respondents choose 1 to 3 times, 5% of respondents choose more than 3 times. Based on the fact it appears that the majority of teachers have attended the workshop / workshop / workshop on scientific learning / inquiry.
5) The percentage analysis of the data on the scientific work of science teachers shows 80% of the respondents choose none, 20% of respondents choose there 1 to 3. Based on the fact it appears that the majority of teachers do not have scientific papers since 2014.
6) Percentage analysis of data on classroom action research activities showed that 65% of respondents had never done classroom action research, 35% of respondents had choosen to do action research class 1 to 3 times. Based on these facts it appears that the majority of teachers never collaborate with other teachers in classroom action research.
7) Percentage analysis of data on MGMP participation showed 55% of respondents choose occasionally, 35% of respondents choose frequently, 10% of respondents choose always. Based on the fact it appears that the majority of teachers have followed the MGMP.
8) The percentage analysis of data on the number of model book / teaching methods owned by teachers shows 85% of respondents choose 1 to 3, 15% of respondents choose more than 3. Based on the fact it appears that the majority of teachers have 1 to 3 model book / learning methods.
9) The percentage analysis of data about the number of science books owned by teachers with different authors shows 5% of respondents choose none, 75% of respondents choose 1 to 5, and 25% of respondents choose more than 5. Based on the fact it appears that the majority of teachers have 1 up to 5 science books with different authors.
10) Percentage analysis of data on the use of laboratory as a place of practice / teaching shows 20% of respondents seldom choose, 55% of respondents choose sometimes, and 25% of respondents choose often. Based on the fact it appears that the majority of teachers use laboratory for practice / teaching.
11) Percentage analysis of data on the use of tools or materials while teaching in class shows 5% of respondents choose seldom, 50% of respondents choose sometimes, 40% of respondents choose frequently, 5% of respondents choose always. Based on the fact it appears that the majority of teachers sometimes use the tools / materials while teaching in the classroom.
12) Percentage analysis of data on collaboration with other teachers in making RPP shows 10% of respondents voted never, 20% of respondents seldom choose, 40% of respondents choose sometimes, 25% of respondents choose frequently, 5% of respondents choose always. Based on the fact it appears that the majority of teachers sometimes collaborate with other teachers in making RPP.
13) Percentage analysis of data on teacher guidance based on lesson plans when teaching shows 5% of respondents choose seldom, 10% of respondents choose sometimes, 50% of respondents choose frequently, 35% of respondents choose always. Based on the fact it appears that the majority of teachers are often guided by RPP while teaching in the classroom.
14) Analysis of the percentage of data on curriculum studies to determine learning objectives showed 5% of respondents voted never, 20% of respondents seldom choose, 25% of respondents choose sometimes, 35% of respondents choose frequently, 15% of respondents choose always. Based on

these facts it appears that the majority of teachers do curriculum studies in determining learning objectives.

15) Percentage analysis of data on the use of open questions while teaching to encourage students to observe, investigate, and think scientific shows 10% of respondents seldom choose, 20% of respondents choose sometimes, 55% of respondents choose often, 15% of respondents choose always. Based on these facts it appears that the majority of teachers often use open-ended questions while teaching.
16) Percentage analysis of data on giving opportunities to students using various sources to conduct investigations showed 45% of respondents choose sometimes, 45% of respondents choose frequently, 10% of respondents choose always. Based on the fact it appears that the teacher has given the opportunity to students using various sources to conduct an investigation.
17) Percentage analysis of data on bringing science books while teaching in class shows 5% of respondents seldom choose, 5% of respondents choose sometimes, 35% of respondents choose often, 55% of respondents choose always. Based on the fact it appears that the majority of teachers always bring science books into the classroom while teaching.
18) Analysis of the percentage of data about the focus of learning conducted in the classroom is to solve the UN problems show 20% of respondents seldom choose, 20% of respondents choose sometimes, 45% of respondents choose often, 15% of respondents choose always. Based on the fact it appears that the majority of teachers do learning in the classroom focused to solve the problems of the UN.
19) Percentage analysis of data about teaching methods that have not been done by teachers when teaching showed 55% of respondents choose expository, 40% of respondents choose discovery learning. Based on the fact it appears that the majority of teachers have not used scientific learning.

3.3 Results of data analysis of each item for high schools teachers

Discussion on the results of data analysis about implementation of science learning as follows:

1) The percentage analysis of data about the time teachers teach science shows 10% of respondents choose less 3 years teaching science, 5% of respondents choose 3 to 5 years, 15% of respondents choose 6 to 10 years, and 70% of respondents choose more 10 years. Based on the above fact it appears that the majority of science teachers in high schools have been teaching Physics for more than 10 years.
2) Percentage analysis of data on teacher education shows 70% of respondents choose S1, and 30% of respondents choose S2. Based on the above fact it appears that all high school science teachers have bachelor degree.
3) Analysis of percentage of understanding data about scientific study shows 5% of respondents choose never, 60% of respondents choose 1 to 3 times, 35% of respondents choose more than 3 times. Based on the fact it appears that the majority of teachers have received material about scientific learning.
4) The percentage analysis of data on participation in the training / workshop / workshop on scientific learning / inquiry shows 25% of respondents voted never, 55% of respondents choose 1 to 3 times, 20% of respondents choose more than 3 times. Based on the fact it appears that the majority of teachers have attended the workshop / workshop / workshop on scientific learning / inquiry.
5) The percentage analysis of the data about the scientific work of science teachers shows that 70% of respondents choose none, 20% of respondents choose 1 to 3, and 10% of respondents choose more than 3. Based on the fact it appears that the majority of teachers have no scientific writing since 2014.
6) The percentage analysis of data on classroom action research activities showed that 65% of respondents had never conducted classroom action research, 10% of respondents choose to have classroom action research 1 to 3 times, and 25% of respondents choose more than 3. Based on the fact it appears that the majority teachers never do classroom action research.

7) Percentage analysis of data on MGMP participation showed 25% of respondents choose occasionally, 65% of respondents choose frequently, 10% of respondents choose always. Based on this fact it appears that the majority of teachers often follow the MGMP.
8) The percentage analysis of data about the number of model book / teaching methods owned by teachers showed 55% of respondents choose 1 to 3, 45% of respondents choose more than 3. Based on the fact it appears that the majority of teachers have 1 to 3 book model/learning methods.
9) The percentage analysis of data about the number of science books owned by teachers with different authors showed 65% of respondents choose 1 to 5, and 35% of respondents choose more than 5. Based on the fact it appears that the majority of teachers have 1 to 5 science books with the author different.
10) Percentage analysis of data on the use of laboratory as a place of practice / teaching shows 35% of respondents choose seldom, 35% choose sometimes, and 30% choose often. Based on the fact it appears that the majority of teachers use laboratory for practice / teaching.
11) Percentage analysis of data on the use of tools or materials while teaching in class shows 10% of respondents seldom choose, 45% of respondents choose sometimes, 40% of respondents choose frequently, and 5% of respondents choose always. Based on the fact it appears that the majority of teachers use the tools / materials while teaching in the classroom.
12) Percentage analysis of data on collaboration with other teachers in making RPP shows 5% of respondents voted never, 10% of respondents choose seldom, 50% of respondents choose sometimes, 30% of respondents choose frequently, 5% of respondents choose always. Based on the fact it appears that the majority of teachers sometimes collaborate with other teachers in making RPP.
13) Percentage analysis of data on teacher guidance based on lesson plans when teaching shows 10% of respondents choose seldom, 35% of respondents choose sometimes, 30% of respondents choose frequently, 25% of respondents choose always. Based on the fact it appears that the majority of teachers are sometimes guided by RPP while teaching in the classroom.
14) Percentage analysis of data on curriculum studies to determine learning objectives showed 10% of respondents choose seldom, 40% of respondents choose occasionally, 40% of respondents choose frequently, 10% of respondents choose always. Based on these facts it appears that the majority of teachers do curriculum studies in determining learning objectives.
15) Percentage analysis of data on the use of open questions when teaching to encourage students to observe, investigate, and think scientific show 5% of respondents choose seldom, 30% of respondents choose sometimes, 60% of respondents choose often, 5% of respondents choose always. Based on these facts it appears that the majority of teachers often use open-ended questions while teaching.
16) Percentage analysis of data on giving opportunities to students using various sources to conduct investigations showed 35% of respondents choose sometimes, 50% of respondents choose frequently, 15% of respondents voted always. Based on these facts it appears that teachers often give opportunities to students using various sources to conduct investigations.
17) Percentage analysis of data on bringing science books while teaching in class shows 10% of respondents choose sometimes, 40% of respondents choose frequently, 50% of respondents choose always. Based on the fact it appears that the majority of teachers always bring science books into the classroom while teaching.
18) Analysis of the percentage of data about the focus of learning conducted in the classroom is to solve the problems of UN and / or SBMPTN shows 15% of respondents seldom choose, 10% of respondents choose sometimes, 50% of respondents choose often, 30% of respondents choose always. Based on the fact it appears that the majority of teachers often do learning in the classroom focused on solving the problems of UN and / or SBMPTN.
19) Percentage analysis of data about learning methods that have not been done by teachers when teaching shows 40% of respondents choose the inquiry laboratory, 60% of respondents choose

simulation based learning. Based on the fact it appears that the majority of teachers have not used scientific learning.

3.4 Science learning in elementary school

a. Program Development
Percentage analysis of data on program development shows that 31% of respondents choose never, 51% of respondents choose 1-3 times, 13% of respondents choose more 3 times.
Based on the above facts it appears that teachers develop the program is quite high category.

b. Program Implementation
Percentage analysis of data on program implementation shows that 10% of respondents voted never, 12% of respondents choose seldom, 25% of respondents choose sometimes, 25% of respondents choose frequently, and 28% respondents choose always.
Based on the above fact it appears that teachers always implement this indicator. Implementation of the program including high category.

3.5 Science lessons in middle schools

a. Program Development
The percentage analysis of data on program development shows that 25% of respondents voted never, 64% of respondents choose 1-3 times, 11% of respondents choose more 3 times.
Based on the above fact it appears that teachers develop programs including high category.

b. Program Implementation
Percentage analysis of data on program implementation showed that 9% of respondents choose rarely, 29% of respondents choose occasionally, 42% of respondents choose frequently, and 20% of respondents voted always.
Based on the above facts it appears that teachers often implement this indicator. Implementation of the program including high category.

3.6 Physics Learning at high schools

a. Program Development
Percentage analysis of data on program development shows that 20% of respondents voted never, 51% of respondents choose 1-3 times, 29% of respondents choose more 3 times.
Based on the above fact it appears that teachers develop programs including high category.

b. Program Implementation
Percentage analysis of data on program implementation showed that 11% of respondents choose rarely, 29% of respondents choose occasionally, 43% of respondents choose frequently, and 17% of respondents voted always.
Based on the above facts it appears that teachers often implement this indicator. The implementation of the program is quite high.

From the results of the discussion above it appears that each dimension for each level (elementary, middle and high school) in the development of the program included in the high category and the implementation of the program are also included in the high category.

4. Conclusion

Based on the results of data analysis and discussion of research results it can be concluded that:

1. Development of programs in the implementation of scientific learning in elementary, middle, and high school in Samarinda including high category.
2. Implementation of the program in the implementation of scientific learning in elementary, middle and high schools in the city of Samarinda including high category.

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