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# THE DEVELOPMENT OF THEMATIC-INTEGRATED E-PORTFOLIO MEDIA WEB BLOG BASED TO INCREASE THE SCIENTIFIC LITERACY OF ELEMENTARY TEACHER EDUCATION PROGRAM'S STUDENT

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**ABSTRACT**

The aim of this study is to improve the scientific literacy of Elementary Teacher Education Program's students using a valid thematic-integrated e-portfolio media web blog based. Applied research and development methods for elementary school's course planning by applying thematic-integrated e-portfolio media web blog based. The result of media and evaluation experts recommend that e-portfolio which has been developed gets 98.75% of eligibility percentage which means that it is very decent to be used in the lecturing. Thematic-Integrated e-portfolio media web blog based effectively improves the scientific literacy of students to reach multidimensional level, in which students are able to take advantage of various concepts and demonstrate the ability to connect these concepts to daily life. Students understand how science, society and technology are interrelated and influence each other. Students also demonstrate an understanding of the nature of science through his answer.



**Keywords:** E-Portfolio, thematic-integrated, scientific literacy, student of elementary teacher education program

## INTRODUCTION

The society life that has developed along with the development of science and information technology forces people to be more critical and creative in order to successfully adapt to every aspect of life. Education is one of the aspects of life that determine the up and down of a society in the world where everything becomes very competitive. Therefore, education progress is supposed to evolve people to be people who totally comprehend science and technology (scientific and technology literacy) to shape people with characteristic. Education is also expected to be a bridge which connect individual to his environment in the fast developing globalization era, therefore individual is able to participate as qualified human resources.

According to comparative study that had been done by PISA (Program for International Student Assessment) in 2006, it was acquired that scientific literacy ability of Indonesian students was on the rank 50 from 57 total countries. This study was acquired by: (a) comparing literacy of reading, math, and science of students from every country; and (b) understanding the strength and weakness of every country's education system.

Research of Sujana et al. (2014) showed that scientific literacy of Elementary Teacher Education Program's students and Elementary teachers are far from expectation. This situation may negatively influence the learning process of science at elementary school if it is left unchecked. The effort to increase the scientific literacy of Elementary Teacher Education Program's students needs a more serious attention because they will apply science concepts especially to elementary

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school's students

Learning science needs comprehensive media and assessment to evaluate the overall skill of the students. The assessment that can be developed is authentic portfolio assessment. Setyandari et al. (2012) stated that assessment portfolio media is effective to be used to increase activity, learning mastery, skill and students' interest in learning science. According to Nugiyantoro (2008), authentic assessment system concerned on evaluating process and learning outcomes, therefore all the performance of the students in the learning process can be evaluated objectively and not only evaluate the final result. Wahyudi (2008) stated that alternative portfolio assessment is a continuing process. This assessment system can be used to observe the process of students' skill.

The implementation of portfolio assessment in teaching in college had been done by several researchers (Birgin, 2011). After it was compared to forms of performance assessment, portfolio assessment has more strength since it gives a series of process and document as evidence of students' learning outcomes (Davis&Ponnamperuma, 2005)

Nevertheless, conventional portfolio assessment has several weaknesses such as requires a lot of storages to save the documents and requires more time to give feedback; hence it cannot be finished in short of time (Wulan, 2009). These problems can be solved by doing portfolio assessment through web, which is called electronic portfolio assessment. This assessment can record and monitor the student's progress (Wyllie, 2010). Electronic Portfolio Assessment (e-portfolio) is evaluation based on assessment procedure for learning, which the students' work are collected digitally (Ramlawati et al, 2014).

According to the explanation above, thematic – integrated e-portfolio media web blog based is needed to be developed to increase the scientific literacy of Elementary Teacher Education Program's students. The aim of this study is focusing on revealing scientific literacy through development of on-line thematic – integrated learning method web blog based to increase the scientific literacy of Elementary Teacher Education Program's students.

**E-Portofolio Media**

Electronic portfolio (e-portfolio) becomes something that really important in education especially in the senior high school and university. E-portfolio is not a new term in education research field, but its implementation in Indonesia as learning and assessment tool has not been widely used. E-Portfolio reflects the important of technology, access technology in life and anticipatory accommodation of electronic market labor improvement (Cheng, 2008; Wang, 2009). Portfolio assessment which does not use information technology as the basis is called traditional portfolio or Pencil and Paper portfolio based. Traditional portfolio hereinafter is called as portfolio, whereas ICT (Information, Communication, and Technology) portfolio based is known as electronic portfolio.

The term of electronic portfolio is described as process and portfolio assignment result which is saved in electronic format. Electronic Portfolio is assignment document or students' project during the lecture in an electronic format which is collected in one online portal media in the form of website or blog.

The development of electronic portfolio includes two different processes; they are multimedia project development and portfolio development. E-portfolio development must be considered parallel because both of them are effective essential electronic portfolio development. Moritz and Christie (2005) explain that e-portfolio development undergoes several steps, they are: *Collection*: portfolio's significance, audience and its implementation of the artifact for the future's interest must firstly be considered what kind of artifact that would be collected; *Selection*: choosing material criteria which fits to the learning's purpose and appropriate with portfolio's purpose that is created. The purpose may refer to national goal or competency standard that has been settled; *Reflection*: including reflection of every part of portfolio and reflection in total; *Projection (Direction)*: reviews the reflection of learning, has futuristic view and arranges purpose for the future; *Connection*: it is a step to develop the hypertext links and publish the portfolio to get feedback from the others; this step can be taken place before or after the projection step.

**Scientific Literacy**

Literally, literacy is from the term literacy which has meaning as the ability to read or write. And the term science is rooted from the English word science which has meaning as knowledge. Science is interrelated to find out natural world systematically, hence, science is not only about the mastering of collection of knowledge which are consisted of facts, concepts or principles, but it is also a process of finding.

Scientific literacy according to PISA is the ability of using science knowledge, identi-

fying question, and taking a conclusion based on the given evidence in order to understand and make decision related to nature and the change happened to the nature that done by human. This definition considers scientific literacy has multidimensional characteristic, it is not simply about the understanding of science knowledge, it is something more than that. PISA regards the students' understanding of the characteristic of science as scientific investigation, the awareness of how science and technology shapes the environmental material, intellectual and culture and the willingness to engage with issues related to science. Think scientifically is a necessity for everyone, not just scientists. Scientific literacy is general competency of life reflects the tendency that is appeared in scientific questions which is in line with the development of technology.

Learning based on scientific approach is fit with the 2013 curriculum context, focusing on material content of elementary school science is allowing the teacher to use scientific approach in order to do learning by doing activity. Science learning process is needed to be guided by scientific approach principles. .The characteristics of scientific approach are eye-catching observation dimension, reasoning, finding, approval, and explaining a truth. Hence, the learning process should be guided by the values, principles or scientific criteria (Taufiq & Wijayanti, 2014).

According to the opinions above, the assessment of scientific literacy that was used by PISA was not simply about measuring the level of scientific knowledge, further it was about the understanding of every aspect of science and the ability to implement the knowledge and the scientific process in the real situation that is faced by the students either as individual or part of the society and citizen of the world. According to Thomas and Durant in Shwartz (2005), the knowledge that are connected to scientific literacy are: Understanding science – norm and scientific method and scientific knowledge; Understanding key of scientific concept; Understanding how science and technology work together; Understanding and appreciating the influence of science and technology in the society; The relationship of competencies in the scientific context – the ability to read, write and understand human knowledge system; Applying scientific knowledge and the ability to consider the knowledge in the daily life.

## METHOD

This study was development research that was directed to develop thematic - integrated e-portfolio media web blog based to increase scientific literacy of Elementary Teacher Education Program's students. This research was done in *LPTK* (Institution of Education's Personnel Development) of one of University in Semarang, Central Java which has Elementary Teacher Education Program, which educates student to be a candidate for Elementary school's teacher. This *LPTK* (Institution of Education's Personnel Development) was chosen as the place to take data, analyze data and interpret the result of the research. This research took around one odd semester in the 2015/2016 period to do the trial, revision, verification, implementation, further revision, further verification, data processing, analysis, discussion, seminar, and writing the article and research report.

This research was conducted to produce thematic-integrated e-portfolio media web blog based to increase scientific literacy of Elementary Teacher Education Program's students which empirically precise and tested. The result that had been acquired is thematic-integrated e-portfolio media web blog based which can increase scientific literacy of Elementary Teacher Education Program's students.

## RESULT AND DISCUSSION

The eligibility of e-portfolio media was done by the media expert and character building expert; the experts are lecturer from Faculty of Science and Math, Semarang State University. The results of the validation were in the form of suggestion and commentary which was used as the reference to fix the e-portfolio media that is developed. Furthermore, there was another validation and analysis in order to get average score from the division of acquired score with the maximum score.

The researchers accumulated the result of expert's responds that were acquired through questionnaire sheets, and then it was accumulated by dividing the score acquired with the maximum score and then it was multiplied to 100%. The percentage result was interpreted to the criteria that are settled on the Table 1.

**Table 1**. Criteria of E-Portfolio Thematic – Integrated Media Percentage Score Eligibility Assessment

| Interval of Score Percentage | Criteria |
|---|---|
| 81% - 100% | Very Good |
| 61% - 80% | Good |
| 41% - 60% | Enough |
| 21% - 40% | Not Good |
| <20% | Not Very Good |

E-portfolio Media Validation in the research included the validation on design and product. The results of the validation that had been done by the media and evaluation lecturer experts are: According to the result of eligibility questionnaire design by the expert, the values acquired are showed on the Table 2.

**Table 2**. Recapitulation of Data Validation by the Expert towards the Design of Thematic – Integrated E-Portfolio

| Validator | Average | Criteria |
|---|---|---|
| Media Expert | 3,78 | Appropriate |
| Evaluation Expert | 3,95 | Appropriate |

According to assessment result which used questionnaire by the expert, it was acquired that the percentage value of the eligibility of media design was 95, 84%, it was included in very good criteria, therefore this design can be continued to get several revision on the font style and font size aspects, and link of the students' web blog placement on the main e-portfolio web blog which was developed. The researchers did revision that the validator suggests, after several discussions and reflections the e-portfolio media developed was given good and valid recommendation.

The product eligibilty was acquired through the expert assessment using questionnaire which was developed by the researchers. The result of E-portfolio product validation by the expert is on the Table 3.

**Table 3**. Recapitulation of Data Validation Result by the Expert towards the Design of Thematic – Integrated E-Portfolio

| Validator | Average | Criteria |
|---|---|---|
| Media Expert | 3.93 | Appropriate |
| Character Building Expert | 3.96 | Appropriate |

The average score of all aspects that were given good mark by the media expert and character building expert towards the product of e-portfolio media are 3.95, it showed that the product can be implemented.

The implementation of thematic – integrated e-portfolio media web blog based is supposed to test the effectiveness of media utilizing which is developed using ability to increase scientific literacy and trigger either critical or creative character of Elementary Teacher Education Program's student. The implementation of the media was done in two steps, they are small-scaled trial and field test.

Early step of the research was composing the literacy ability test and guidance of students' answer categorization according to scientific literacy level. The test and guidance of scientific literary categorization were adapted from Soobard & Rannikmae (2011). To categorize the scientific literacy ability of the student Bybee (1997) suggested that the work plan consist of four levels, they are nominal, functional, procedural and multidimensional. The General description or the categories of scientific literacy composed are shown on the Table 4.

The students' scientific literacy pretest result showed that most of the students were in the first and second category, only a few of them were in the conceptual / procedural level. Most of the students did not answer the questions in the test except from the four answer categories above. The students' scientific literacy post test result showed there was significance increasing from the students' scientific literacy categories, especially from the nominal level to the functional level and from the functional level to the conceptual / procedural level. There was student who reaches multidimensional level in which in the previous test there was no student who reaches this level. The Category of Students' answer Percentage According to Scientific Literacy Category in detail is showed in the Figure 1.

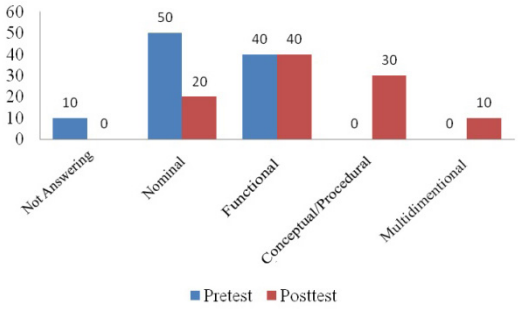


**Figure 1**. Level of Scientific Literacy Percentage Before and After the Implementation on Question No. 1.

**Table 4**. Categorization of Student's Answer According to Scientific Literacy Level

| Level | Description |
|---|---|
| Nominal | Students agree with other's suggestion without having their own idea. Students utilize and write scientific term, but they are not able to correct the term or there is misconception. |
| Functional | Students can remember information from the text book such as writing fundamental facts, but they cannot correct their own opinions according to the texts or graphics given. Students understand the concepts inter disciplines, but they cannot describe the relationship between the concepts. |
| Conceptual/Procedural | Students utilize the inter disciplines concept and show the understanding and relevance. Students understand the problem; correct the answer with the help of the information from the text, graphic and table given |
| Multi-dimensional | Students utilize several concepts and show the ability to relate the concepts to the daily life. Students understand how knowledge, society and technology interrelate and influence each other. Students also show the understanding of the characteristics of knowledge through their answer. |

Figure 1 shows the Level of Students' Scientific Literacy Percentage before and after the implementation of Thematic – Integrated E-Portfolio Media Web Blog Based, the highest of each value are nominal 50% and functional 40%. Before thematic – integrated E-Portfolio web blog based was implemented, the highest percentage was on the level functional 40%, and after the implementation of thematic – integrated E-Portfolio media web blog based, the highest percentage reached was 10% of multi-dimensional level. The measured scientific literacy indicators were: indentify scientific question, explain scientific phenomena, and use scientific evidence. Scientific literacy sub indicators for question number one are diagnosing question that can be investigated scientifically and making prediction.

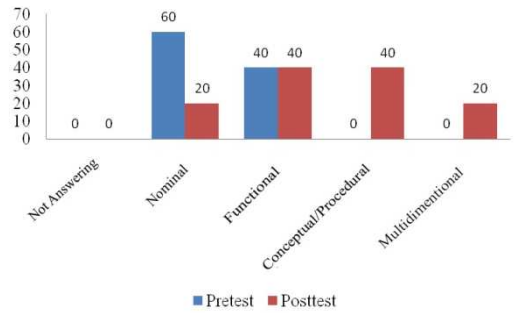


**Figure 2**. Level of Scientific Literacy Percentage Before and After the Implementation on Question No. 2.

Figure 2 shows the Level of Scientific Literacy Percentage Before and After the Implementation of Thematic – Integrated E-Portfolio Media Web Blog Based, the highest of each value were nominal 60% and functional 40%. Before thematic – integrated E-Portfolio media based on web blog is implemented, the highest percentage was on the level functional 40%, and after the implementation of thematic – integrated E-Portfolio media web blog based, the highest percentage reached was multidimensional level 20%. The measured scientific literacy indicators are: indentify scientific question and explain scientific phenomena. Meanwhile, the scientific literacy sub indicators used for the question number 2 are diagnosing scientific investigation features and using scientific knowledge in the situation given.

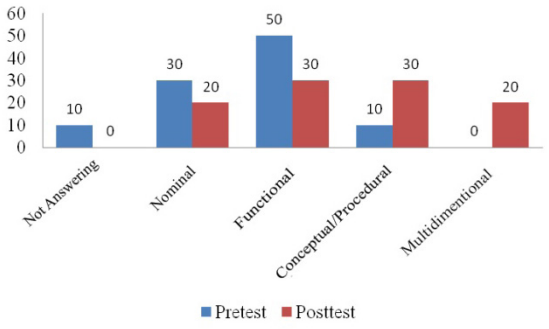


**Figure 3.** Level of Scientific Literacy Percentage Before and After the Implementation on Question No. 3.

Figure number 3 shows the Level of Scientific Literacy Percentage Before and After the Implementation of Thematic – Integrated E-Portfolio Media web blog based, the highest of each value were functional 50 % and procedural 30%. Before thematic – integrated E-Portfolio media based web blog based was implemented, the highest percentage was on the conceptual level 10%, and after the implementation of thematic – integrated E-Portfolio media web blog based, the highest percentage reached was multi-dimen-

sional level 20%. The measured scientific literacy indicator is explaining scientific phenomena. Meanwhile, the scientific literacy sub indicators used for the question number 3 are identifying and describing precisely, and giving explanation and prediction precisely.

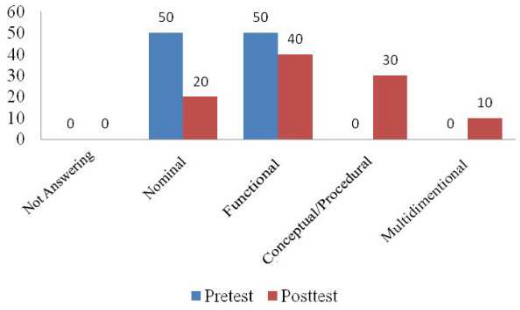


**Figure 4**. Level of Scientific literacy Percentage Before and After the Implementation on Question No. 4.

Figure 4 shows level of scientific literacy percentage of students before and after the implementation of thematic-integrated e-portfolio media web blog based, the highest of each value were 50% functional and 40% functional. Before the implementation thematic-integrated e-portfolio media web blog based, the highest level on functional was 40%, meanwhile after the implementation of thematic-integrated e-portfolio media web blog based, the highest level reached was 10% of multidimentional. The measured scientific literacy indicator is: explaining the scientific phenomenon. Meanwhile scientific literacy subindicators on the test no. 4 are: identifying and describing appropriately, and giving explanation along with the prediction appropriately.

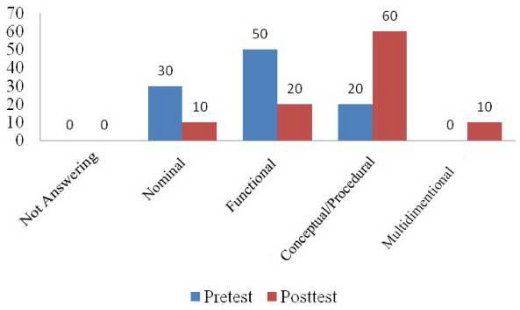


**Figure 5**. Level of Scientific literacy Percentage Before and After the Implementation on Question No. 5.

Figure 5 shows shows level of scientific literacy percentage of students before and after the implementation of thematic-integrated e-portfolio media web blog based, the highest of each value were 50% functional and 60% procedural. Before the implementation of e-portfolio thematic integrated media based on web blog, the highest level on conceptual was 20%, meanwhile after the implementation of thematic-integrated e-portfolio media web blog based, the highest level reached was 10% of multidimentional. The measured scientific literacy indicators are: identifying scientific question and using scientific evidence. Meanwhile the scientific literacy subindicators on the test no. 5 are: knowing the question that is possibly investigated scientifically, communicating, giving conclusion and reasoning evidence.

Generally, the Figures above show that the early scientific literacy skill of students is bigger than nominal level. Functional level gets small percentage in the test no. 2 which is not more than 40%, and the highest are on no. 3 and 5 with 50%. Meanwhile in conceptual level, the lowest percentage is 0% on no. 1 and 2, and the highest is 20% on no. 5. Multifunctional level has 0 persentage. The Figures above also show the percentage of students who are not be able to answer the questions of the test, in which the percentage is quiet big that is 10% on no. 1 and 3. This shows the students inability in giving the answer based on the skill of science process which is the main part of scientific literacy. From the five numbers of questions that has been given, the question no. 5 has the biggest percentage of the one which is not answered by the students. There are two maters which are focused on the scientific literacy subindicators, they are: scientific question and communicating trial result.

In the end of the learning process, generally, the significant increasing level of scientific literacy happened on the students, especially in conceptual/procedural level with the highest value 60% in the question no. 5. This showed that students start to be able to identify scientific questions and use scientific evidence. The achievement of scientific literacy as the indicator to identify scientific issue had been good. It is related to the learning process that has been done in class. In the step of observing and asking, the students had been trained at identifying scientific issue like making question related to scientific phenomenon that had been showed by the teacher. The ability of students to identify the scientific issue was also given in the step of collecting information/experiment. It is seen from the ability of student in researching the problem and hypothesis in the trial that had been done.

When the students were doing the review of related literature, they focused in using the

e-portfolio media training the skills of scientific process so that the students were used to the things related to the activity, such as: identifying scientific question, giving an explanation about a phenomenon scientifically and using scientific evidence. As the assessment tool, it is more authentic, because the students could rely on more than one evidence, this showed the development of the idea, and more accurate in representing the students' ability (Abrami & Barrett, 2005; Chang, 2001; Kimball, 2005; Ma & Rada, 2005).

## CONCLUSION

The result of media and evaluation experts recommend that e-portfolio which has been developed gets 96.55% of eligibility percentage which means that it is very decent to be used in learning process. The conclusion of this research is, there has been e-portfolio media which is decent-tested and can develop the scientific literacy of of elementary teacher education program's students.

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