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Penyunting menerima artikel yang belum pernah diterbitkan dalam media lain. **Petunjuk penulisan dapat dibaca pada bagian belakang jurnal**. Naskah yang masuk dievaluasi oleh penyunting. Penyunting dapat melakukan perubahan tulisan yang dimuat untuk keseragaman format, tanpa mengubah maksud dan isinya

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ENERGIZE LEARNERS TO USE SCIENTIFIC APPROACH AND INTERACTIVE MEDIA IN TEACHING SCIENCE

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Abstract: Science competence is learning outcome of students achieved as the result of their exploration through science learning process that cover of tree aspects: 1) knowledge of science products, 2) science process skills, and 3) scientific attitude. The objective of this research is to increase science competence of elementary students grade IV through science learning process make use of scientific approach with interactive multimedia. Scientific approach that used including 5 (five) learning phases, that areengage, explore, explain, elaborate, and evaluate. Learning multimedia that used including: 1) information computer technology (*ICT*) based multimedia, 2) manual multimedia, and 3) simple science visual aid and science games card. The research method used in this research is classroom action research. This research is conducted at two elementary schools that used curriculum 2013, that are: SekolahDasar Pertiwi I and SD Polisi I Kota Bogor. This research is conducted during one semester that is first semester of year 2013/2014. Multimedia of learning science designed refers to learning themes on curriculum 2013, teacher's book, and student's book. The research findings are: 1) Implementation of scientific approach with interactive multimedia is able to increase science competence of elementary students grade IV; 2) Nurturant effect of implementation of scientific approach with interactive multimedia is there is increasing of curiousity, interest, motivation, expectation, needs, and self-confidence of elementary school students' grade IV in learning science. Implications of this research are to increase the science competence of students' need creativity and innovation of the science teachers' in designing science learning models and science multimedia so that science learning process have more certain quality. And then, school as institution must complete ICT facilities and also supported by teachers' science competencies to use it, so that learning science process is more interesting, fun, resourceful, and effectively achieve the learning objectives.

Keywords: science competence, interactive multimedia, and scientific approach.

The effectiveness to achieve of learning objectives are determined by many factors. Two main factors consist of the accuracy in selecting approach and the use of instructional media in the learning process. If the learning approach used in accordance with nature of science and characteristics the students and supported by instructional media capable of mending and maintaining curiosity, interest, motivation, and self-confidence of students, the learning objectives will be achieved effectively.

The fact is the case today, there are still many elementary school teachers to teach science using the traditional approach. Traditional science teaching relied heavily on lectures, reading, and teacher led demonstrations. Traditional science teaching more then emphases on effort make student mastery of science concept, so it tends to be the transfer of knowledge. Consequently, science subjects become less desirable, it is difficult, borring, laden of formula, and unattractive, so the science competencies that achieved by students to be low.

Essentially, science includes three aspects: 1) knowledge of science products, 2) science process skills, and 3) scientific attitude. Therefore, science learning should be able to guide students in order to achieve the third of science competency aspects. Science learning approach that predicted can be guide students to achieve the three of science competency aspects is scientific approach. Besides of

learning approach, also learning media is important devices to effort teacher success to organize of learning process. Science learning media, both of manual as well as based on information computer technology (ICT) which is varied, interesting, and relevant with student's life context can encourage student's interest and motivation in science learning. Therefore, use a scientific approach and supported by multimedia learning science, predicted can improve the competence of science students.

This paper describes the result of the implementation of scientific approach with interactive multimedia to increase science competence of elementary students' grade IV at Sekolah Dasar Pertiwi I and Sekolah Dasar Polisi I Kota Bogor. The research reported forms part of a larger study whichinvolved the development of an innovative format for planning and conducting scientific approach in learning science for inquiry, the development of science interactive multimedia, having it evaluated byteachers, and then implementing it to see how much the curriculum style used promotes inquiry and making up student's learning energy. This paperwill only report that part of the research referring to the implementation of curriculum 2013. It will not focus on thecurriculum style of format, but on the impact that the implementation of this curriculum had on theteacher and the students involved in learning science based on inquiry or scientific approach.

1. Statement of the problem

There are two problems in this study:

a. What was implementation of scientific approach with interactive multimedia is able to increase science competence of elementary students grade IV?
b. What was nurturant effect of implementation of scientific approach with interactive multimedia is able to increasing of interest, motivation, expectation, needs, and self-confidence of elementary school students' grade IV in learning science?

2. Literature Review

Science is a methodical approach to studying the natural world. Science try to asks basic questions, such as how does the world work? How did the world come to be? What was the world like in the past, what is it like now, and what will it be like in the ….? These questions are answered using observation, testing, and interpretation through logic. To do these activities needed amount of skills that called science process skills, scientific attitude, and knowledge of science related to the problem.

James B. Conant, defined science as ‖... is series of concepts and conceptual schemes that have developed as a results of experiments and observations that encourage further experiment and observation (James B. Conant, 1951). Science is an accumalated learning and systematic about natural fenomena. The progress of science is characterized not just by the accumulation of facts, but also by the development of the scientific method and scientific attitude. Thus, in essence science involves three aspects, namely science as a product, science as a process, and science as a scientific attitude

Science learning in schools should be able to develop science competencies associated with all of three aspects of the nature of science. Science learning approaches that can be used to achieve that objective is a scientific approach that is inquiry-based science learning. Artigue argued that inquiry-based science learning is an approach to teaching and learning science that has evolvedfrom researchers' understanding of how children learn the nature of science inquiry, while also covering basicscience content to be taught (Artigue et al., 2010). The main goal of science teaching is help students understand the nature of science and how to use scientific inquiry ways. Understanding of the nature of science—the goals, values and assumptions inherent in the development and interpretation of scientific knowledge (Lederman, 1992). Therefore, Inquiry-based learning in science means that students develop understanding through using mental and physical skills to gather evidence about the natural and made world. This way of learning is consistent with the modern view of the nature of scientific activity and of how learning takes place. Learning through inquiry not only means that

students learn with understanding, so that their knowledge is applicable, but also that they learn about learning.

There have been several advantages notedto utilizing inquiry-based science instruction inundergraduate education (Oates, 2002). There have also been advents in utilizing web-based mechanisms in order to develop an inquiry-based science environment (Linn *et al.*, 2003). Inquiry basedscience has also provided great benefits indiverse classrooms, wherein students are able tobetter respond to open-ended and multiple choice assignments (Songer*et al.*, 2003).

Inquiry is not just about motivating children by engaging them in hands-on activities (Finley &Pocovi, 2000; Minstrell& van Zee, 2000; Wheeler, 2000). Inquiry is a state of mind referred to as ―inquisitiveness‖ the eagerness to know ―how‖ and ―why‖; and in part a skill that must be acquired through experience (Alberts, 2000). The main reason for teaching inquiry is to equip children with the necessary skills for problem-solving, to communicate their findings and be proficient in facing the modern world (Alberts, 2000). The key element is to allow time for children to engage in dialogue with the material world by observing, questioning, predicting, debating and reflecting on data evidence and make logical sense of their observations in a structured manner (Alberts, 2000; Wheeler, 2000; Crawford, 2009; Artigue et al., 2010).

The main aim of inquiry-based education is to develop students in becoming independent learners. Teachers must facilitate each individual learner to develop, articulate and refine their own ideas (Harlen& Allende, 2009). Through scientific inquiry children develop cognitive skills such as problem-solving skills, skills to calculate and interpret data and investigative skills (Hanauer, Hatfull& Jacobs-Sera, 2009). Children inquire by engaging with scientific phenomena, posing questions to be investigated, hypothesising, planning and designing investigations, predicting experimental results, evaluating their findings, and then presenting results either visually, as in graphs or diagrams, or verbally or both. Children may then pose new questions to investigate other inquiries. Inquiry-based science learning is an approach to teaching and learning science that has involved 5Es of learning cycle—engage, explore, explain, elaborate, and evaluate—and is based on a constructivist philosophy of learning. (Teacher Created Materials, 2009).

Funk *et al*. divide the science process into 16 scientific processcalled science process skills. Science process skills are grouped into two groups: basic science process skills and integrated science process skills. Basic science process skills include the skils to observe, classify, communicate, measure, predict, and inference. Integrated science process skills include identifying variables, constructing tables, constructing graphs, explain the relationshipbetween variables, collect and process the data, analyze the investigation, formulate hypotheses, operationally defining variables, designing investigations, and conduct experiments. (Funk, H. J., et al., 1979). In this study, science process skills which measures the succes of the learning program is the basic science process skills.

In addition to the appropriateness of learning methods and approaches, learning media is an important tool to support the success of teachers in implementing the learning process. Brown (1973) argue that the instructional media used in the learning activities can affect the effectiveness of learning. According Kleinsmith (1987), the potential of computer media that can be used to enhance the effectiveness of teaching include: 1) allows the direct interaction between students with learning materials, 2) the learning process can take place on the individual basis according to the ability of students, 3) capable of displaying elements of audio-visual equipment to increase learning interest, 4) can provide immediate feedback to the student's response, and 5) be able to create a continuous learning process.

Livie and Lentz (1982) in Sanaky (2011) suggests that there are four functions of instructional media, especially visual which is a function of attention, affective function, cognitive function, and compensatory function. Function of attention means that visual media is at the core, interesting, and direct the attention of the students to

concentrate on the learning content related to the meaning of the displayed visual or text accompanying the subject matter. Affective function means is that the visual media can arouse emotions, attitudes, and feelings of students in participating in the learning process. Cognitive function means that the visual media can help students in understanding the information or message contained in visual symbols. Compensatory function means that the visual media provides a context for understanding the text to help students who are weak in reading to organize the information in the text and recall.

3. The research metdology

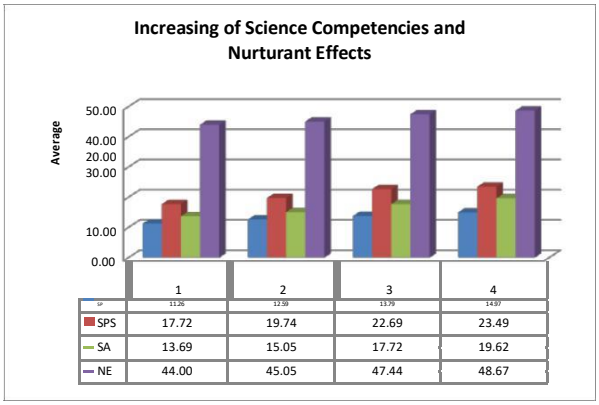
The research method used in this study is classroom action research. This study conducted at two elementary schools that are SekolahDasar Pertiwi I and SekolahDasarPolisi I Kota Bogor. Students grade IV enrolled in the course first semester year 2013/2014, were learning science using scientific approach and multimedia interactive for a period of one semester. The study sample consisted of 39 students at SD Pertiwi I and 34 students at SD Polisii I. Teachers involved as a collaborator of 4 people.

There are four learning theme in first semester, so that in this study learning actions divided to be four cycles. Both the test and observation of students' activity was used to measure the students' science competencies in which include mastery of the science process skills (SPS), development of scientific attitudes (SA), and mastery of science products (SP), and nuturant effect (NE), immediately as long as and after the every cycles.

Collection of data for PS and SPS using test techniques, while SA and NE using observation techniques. The data analysuis technique used is the technique of descriptive statistics, that is comparing the average score of SP, SPS, SA, and NE for each cycle or learning theme. Selanjutnya untuk menguji signifikansi perbedaan rata-rata skor SP, SPS, SA, and NE tiap siklus atau theme pembelajaran digunakan teknik analisis variansi satu arah.

4. Research findings and discussion

Data in this study include science competencies achieved by students as instructional effects which include science products (SP), science process skills (SPS), and scientific attitudes (SA), as well as interests, motivations, expectations, and needs of science as nurturant effects (NE). The results of data analysis presented below.



Graph 1. Increasing Average of Science Competencies and Nurturant Effects in SD Pertiwi I

Graph 1 show that there is an average increase of SP, SPS, SA, and the NE achieved by students in SD Pertiwi I from theme one to the next. The result of SP data analysis using the technique of one way analysis of variance for SD Pertiwi students is presented in table 1. The data analysis shows that there are significant differences (on the significance level $p < 0.5$) between the average achievement of competence of science aspects of SP on the theme one, two, three, and four. This showsthat the competence of science students on aspects of the SP increased significantly from one theme to next theme.

Teble 1. Anova of Science Competencies Aspects of SP in SD Pertiwi I

Source of Variance	df	Sum of Squares	Mean Square	F	sig. (p<0.5)
Total	155	1880.31			
Between Groups	3	298.10	99.37	9.55	2.67
Wethin Groups	151	1582.21	10.41		

The result of SPS data analysis using the technique of one way analysis of variance SD Pertiwi I students is presented in table 2. The data analysis shows that there are significant differences (on the significance level $p < 0.5$) between the average achievement of competence of science aspects of SPS on the

theme one, two, three, and four. This showsthat the competence of science students on aspects of the SPS increased significantly from one theme to next theme.

Teble 2. Anova of Science Competencies Aspects SPS in SD Pertiwi I

Source of Variance	df	Sum of Squares	Mean Square	F	sig. (p<0.5)
Total	155	2634.74			
Between Groups	3	833.36	277.79	23.44	2.67
Wethin Groups	151	1801.38	11.85		

The result of SA data analysis using the technique of one way analysis of variance SD Pertiwi I students is presented in table 3. The data analysis shows that there are significant differences (on the significance level $p < 0.5$) between the average achievement of competence of science aspects of SA on the theme one, two, three, and four. This showsthat the competence of science students on aspects of the SA increased significantly from one theme to next theme.

Teble 3. Anova of Science Competencies Aspects SA in SD Pertiwi I

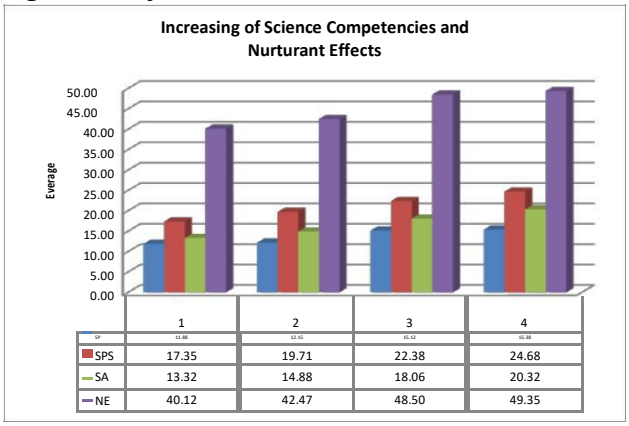
Source of Variance	df	Sum of Squares	Mean Square	F	sig. (p<0.5)
Total	155	3102.94			
Between Groups	3	825.61	275.20	18.37	2.67
Wethin Groups	151	2277.33	14.98		

The result of NE data analysis using the technique of one way analysis of variance SD Pertiwi I students is presented in table 4. The data analysis shows that there aren't significant differences (on the significance level $p < 0.5$) between the average of NE on the theme one, two, three, and four. This suggests that the increase in NE shown students from one theme to the next theme does not occur significantly. This occurs probably caused by the difficulty observers while observing the behavior of student learning. Observers find it difficult to observe the interests, motivations, expectations, and needs of students towards science of studying the behavior of the students as they follow the learning process of science.

Teble 4. Anova of NE in SD Pertiwi I

Source of Variance	df	Sum of Squares	Mean Square	F	sig. (p<0.5)
Total	155	11854.02			
Between Groups	3	535.87	178.62	2.40	2.67
Wethin Groups	151	11318.15	74.46		

Graph 2 show that there is an average increase of SP, SPS, SA, and the NE achieved by students in SD Polisi I from theme one to the next. The result of SP data analysis using the technique of one way analysis of variance for SD Polisi I students is presented in table 5. The data analysis shows that there are significant differences (on the significance level $p < 0.5$) between the average achievement of competence of science aspects of SP on the theme one, two, three, and four. This showsthat the competence of science students on aspects of the SP increased significantly from one theme to next theme.



Graph 2. Increasing Average of Science Competencies and Nurturant Effects in SD Polisi I

The result of SPS data analysis using the technique of one way analysis of variance for SD Polisi I students is presented in table 6. The data analysis shows that there are significant differences (on the significance level $p < 0.5$) between the average achievement of competence of science aspects of SPS on the theme one, two, three, and four. This showsthat the competence of science students on aspects of the SPS increased significantly from one theme to next theme.

Teble 5. Anova of Science Competencies Aspects SP in SD Polisi I

Source of Variance	df	Sum of Squares	Mean Square	F	sig. (p<0.5)
Total	135	1353.62			
Between Groups	3	358.26	119.42	15.84	3.07
Wethin Groups	132	995.35	7.54		

The result of SA data analysis using the technique of one way analysis of variance for SD Polisi I students is presented in table 7. The data analysis shows that there are significant differences (on the significance level $p < 0.5$) between the average achievement of competence of science aspects

of SA on the theme one, two, three, and four. This showsthat the competence of science students on aspects of the SA increased significantly from one theme to next theme.

Teble 6. Anova of Science Competencies Aspects SPS in SD Polisi I

Source of Variance	df	Sum of Squares	Mean Square	F	sig. (p<0.5)
Total	135	2769.88			
Between Groups	3	1033.59	344.53	26.19	3.07
Wethin Groups	132	1736.29	13.15		

The result of NE data analysis using the technique of one way analysis of variance for SD Polisi I students is presented in table 8. The data analysis shows that there are significant differences (on the significance level $p < 0.5$) between the average achievement of competence of science aspects of NE on the theme one, two, three, and four. This showsthat the competence of science students on aspects of the SA increased significantly from one theme to next theme.

Teble 7. Anova of Science Competencies Aspects SA in SD Polisi I

Source of Variance	df	Sum of Squares	Mean Square	F	sig. (p<0.5)
Total	135	3035.06			
Between Groups	3	1008.76	336.25	21.90	3.07
Wethin Groups	132	2026.29	15.35		

NE data analysis produces different findings between SD Pertiwi I with SD Polisi I. NE data analysis in SD Pertiwi I showed no significant difference in improvement NE between the themes of the other theme, while in SD Polisi I Showed the opposite result.

Teble 8. Anova of NE in SD Polisi I

Source of Variance	df	Sum of Squares	Mean Square	F	sig. (p<0.5)
Total	135	10151.35			
Between Groups	3	2087.08	695.69	11.39	3.07
Wethin Groups	132	8064.26	61.09		

This study found that the use of inquiry-based scientific approach that is supported by the uses of interactive multimedia in science teaching can improve students' overall competence of science, which includes mastery of the product of science or knowledge of science, the mastery of science process skills, and scientific attitude transformation. Benefits for students through the learning science using the scientific approach include: 1) increasing the intellectual potential of students, 2) more arouse intrinsic motivation rather than extrinsic, 3) develop of students' self-esteem, 4) teaching materials are studied more meaningful, 5) increasing social and emotional intelligence, 6) to give a greater opportunity to the students to assimilate and accommodate the information in learning, and 7) learning process becoming a student-centered learning.

5. Conclusions and implications

This study concludes:

a. Implementation of scientific approach with interactive multimedia is able to increase science competence of elementary students 4th grade;
b. Nurturant effect of implementation of scientific approach with interactive multimedia is there is increasing of curiosity, interest, motivation, expectation, needs, and self-confidence of elementary school students' grade IV in learning science.

Implications of this research are to increase the science competence of students' need creativity and innovation of the science teachers' in designing science learning models and science multimedia so that science learning process have more certain quality. And then, school as institution must complete ICT facilities and also supported by teachers' science competencies to use it, so that learning science process is more interesting, fun, resourceful, and effectively achieve the learning objectives.

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