EM 9 (1) (2020) 17 - 24

Educational Management

http://journal.unnes.ac.id/sju/index.php/eduman

Developing Scientific Approached Learning Instrument under theme Saving Energy for Primary School Students

Septi Risnawati✉, Sri Wardani, Muhammad Khafid

Universitas Negeri Semarang, Indonesia

Article Info

Article History:
Recived 15th September 2018
Accepted 10nd January 2019
Published 15th June 2019

Keywords:
Lesson Plan, Scientific Approach, Learning Material

Abstract

Based on Rules of National Education Minister Number 22 Year 2016 about Process Standard in implementing 2013 curriculum, scientific approach in learning could be used to improve cognitive, affective, and psychomotor aspects. To ensure this scientific approach running smoothly, teacher should be able to design learning in which uses scientific aspect. In Banyumas municipal, there were several primary schools implemented 2013 curriculum appropriately. This research aime to analyze effectiveness of scientific approach learning instrument under theme saving energy. This Research and Development study was conducted for fourth graders of SDN 03 Cilangkap and SDN 01 Samudra, Banyumas municipal. The techniques to collect data were interview, observation, questionnaire, documentation, and learning outcome test. The findings showed that the learning instrument validation by validators was said valid. The implementation of the learning instrument on theme – saving energy for the fourth graders were practical and effective. The effectiveness of the instrument could be seen from the learning outcomes of the students in prestest and posttest. The score of students before intervened by the product was 64.26. Meanwhile, after intervened by the product, it improved into 78.89. Thus, it resulted to N – Gain test with 0.40, categorized moderate. Furthermore, affective and psychomotor learning outcomes also had improvement with very well criterion on affective domain and well criterion on psychomotor domain.

✉ Address correspondence:
Kampus Unnes Jl. Kelud Utara III Semarang 50237, Indonesia
E-mail: septi.risna94@gmail.com

p-ISSN 2252-7001
e-ISSN 2502-454X

INTODUCTION

Current education is demanded to always renew its learning concept to be relevant to 21st century society's needs. Therefore, education in this century focuses on building qualified human resources and readiness to face dynamic challenges of the era (Hosnan, 2016).

The main focus of education is to create effective learning situation and process (Taufiq et al, 2010). Effective learning process will not be separated from the role of teachers whom will always need to innovate and create in designing learning process. Before conducting learning process, teacher must compose lesson plan properly (Indriawan et al, 2017). Because the accomplishment of learning objective is influenced by the existence of learning process plan designed by teacher. Therefore, better lesson plan deisgn will facilitate in achieving learning objectives.

2013 curriculum learning process by using scientific approach provides understanding for students to recognize and understand various learning materials by using scientific approach (Bermawi&Fauziah, 2016). Scientific approach has 5 syntax: observing, inquiring, trying, reasoning, and communicating (Permendikbud No 22 Tahun 2016).

Primary school students are aged between 7 to 11 year old. According to Piaget, the characteristics of primary school students are on concrete operation. On this stage, students are able to think rationally, such as thinking to solve concrete problem (Desmita, 2013). Their thinking skills are limited on concrete situation. Thus, in solving problem, teacher's role is needed (Heni, Binadja&Sulistyorini, 2015). Teacher is expected to be able in facilitating his students to carry out encouraging learning to construct or develop their knowledge toward certain faced phenomenon. Such learning could be done by using scientific learning approach.

Scientific approach emphasizes on student centeredness. Thus, teacher could not dictate students with his or her own knowledge. However, teacher should provide chance for them to actively find the answers by themselves to learn (Prastyawati, 2016). Teachers could stimulate students to share questions which would be solved by various activities, such as observation until observing activity. The activity could facilitate students in finding new information or solving problem. Through scientific approach, affective, psychomotor, and cognitive enhancement integrated aspects are expected to create productive, affective, innovative, and creative students. Therefore, what is prioritized is how cognition, affection, and psychomotor are obtained by students (Viantari, 2015).

Based on observation results at several primary schools in Banyumas, the learning processes were found to be teacher – centered as the main source of knowledge. The students were not actively involved in learning process. They only observed and noted the lesson. It was in line with Fitriyaningsih (2014) investigating a primary school in Banyumas. It was found that learning at primary school was still dominated by one – teaching direction. The teacher only transferred knowledge without developing thinking skill of the students so that their learning outcomes were categorized poor. It was in line with Rachmawati (2015) telling that learning process at school was still teacher – centered. So, the material was difficult to be understood by students.

Such one teaching direction was also found in the lesson plan. The learning did not run based on scientific syntax because it only had observing activity stated on the lesson plan. In fact, learning process on 2013 curriculum should implement scientific learning approach based on the rule of national education ministry. The lasting learning was rarely found to have asking – answering session. There was not also found opportunity given to students in finding the materials from other sources. Piaget argued that an individual could develop his knowledge by various ways, such as reading, exploring, experimenting the environment, and many more (Poedjiaji, 2010).

Learning process in 2013 curriculum may be conducted directly or indirectly. Direct learning is learning which develops knowledge,

thinking skill, and skill to use knowledge of students through direct interaction with learning souce. Meanwhile, indirect leanring is a learning occurring during learning process. Indirect learning also deals with value and attitude developments. Beside poor learning outcome of the students, based on observation at several schools, it showed that learning only emphasized on cognitive domain. There was a few activity involving psychomotor aspect of the stduents. Plus, the affective aspect development was not emphasized.

Learning process is led on three domains: cognitive, affective, and psychomotor aspects holistically. It means there is none of the elements is separated by other domain or aspect (Permendikbud No 22 year 2016 about Process Standard). It shows that success of learning is not only indicated by students' abilities to master the knowledge but also ability on each aspect and skill (Alamsyah, 2016). Therefore, holistic learning process will result to qualified personality as reflected into masteries of cognition, affection, and psychomotor.

This research focuses on development of lesson plan with scientific approach for fourth graders of primary school. The scientific approach was limited on observing, inquiry, and trying syntax. The chosen theme was saving energy. It was chosen as realization in delivering learning material about the importance of saving energy in daily life.

METHOD

This R & D used Borg & Gall which were adjusted to research needs. This research model aims to develop and valiate a certain product (Sugiyono, 2015).The developed learning instruments were syllabus, lesson plan, student textbook, worksheet, and test of achievement.

This research was conducted at Primary Schools in Banyumas with 2 primary schools as the subjects: SDN 03 Cilangkap and SDN 01 Samudra. The sample consisted of 9 students on product trial run and 27 students on field test. The data source was from validators, educators, and students. The techniques of collecting data were interview, observation, documentation, questionnaire, and test.

FINDINGS AND DISCUSSION

This research was done by designing hypothetic model of scientific learning approach. Then, its effectiveness was tested by using scientific approach. According to Nieveen and Van den Akker (1999), a product is valid to use if it has met several validity, practicability, and effectiveness levels.

The developed learning instrument was validated by validators. Based on the validation result, the instrument was good and could be investigated.

The success measurement of the instrument was based on implementation aspect of lesson plan, student response, and learning outcome.

A learning could run properly when its management follows stages and learning scenario as designed in lesson plan and is done systematically and orderly. Since the developed lesson plan should be in line with National Education Ministry Rule Number 22 Year 2016, then it should meet several components and principles of lesson plan: (1) school identity, (2) lesson identity, (3) class/semester, (4) main material, (5) time allotment, (6) learning objective, (7) basic competence and achievement indicators, (8) learning material, (9) learning method, (10) learning medium, (11) learning source, (12) learning stages through introduction, whilst teaching, and closing, and (13) learning outcome assessment.

Then, by considering principles of lesson plan consist of (1) individual differences, (2) active participation of students, (3) student – centeredness, (4) literacy activity, (5) feedback provision and lesson plan follow ups, (6) emphasis on concerning and integrated elements of basic competence, learning material, learning activity, achievement indicators, assessment, learning source into one complete leanring experience, (7) accommodation of thematic – integrated learning, integration across lessons, learning aspects, and cultural diversity, and (8)

implementation of information and communication technologies.

The materials to develop in this learning were fourth graders' material theme 2 – subtheme 1, learning 1 – 6, consisting of Indonesian languge, Civics, Science, Social Study, and Art. Those six lessons created in lesson plan had covered 5 scientific syntax: observing, inquiring, trying, reasoning, and communicating. Observing is an activity to listen, read, and see (with or without devices). Inquiring is learning activity done by posting question about unclear material from what is observed. Trying is learning activity by experimenting, reading various information and objects until interviewing interviewess. Reasoning is activity to process the already collected information for both limited on observation activity result and information collecting activity, processing the already collected information which are enrichment and comprehension in nature until information process which are seeking solution from various different arguments until the opposite arguments. Communicating is an activity to deliver observation result and conclusion of an analysis both written, spoken, or using other media (Erny et al, 2017).

Those five syntaxes are explained into several activity arranged from the introduction until closing activities. The learning purpose was emphasized on cognitive, affective, and psychomotor aspects. The learning material was made based on local potency of the students' environment. The designed learning was done by considering the students' characteristics, interest, and motivation to learn. The device, media, and learning source were various plust its ICT based in nature. It also had assessment orientation used on cognitive, affective, and psychomotor aspects.

After creating the model of the product, then the product was validated by experts. The validation of the model resulted to thematic learning instrument hypothetic model with scientific approach. Based on the validation, it was revealed that the lesson plan hypothehic model development on learning 1 – 6 did not experience any significant changes than thematic learning product with scientific approach. So, the hypothetic model with scientific approach was ready to test.

The test of the instrument with scientific learning was done at two stage: initial field test and field etst. The initial field test under learning theme – saving enegy – involved 9 students. The students were intervened by the developed learning by the researcher. On field test to obtain practicability data, it was done by teacher – student response questionnaire.

The practicability of the lesson plan was seen based on teachers' responses toward the scientific learning process. The responses showed it was positively reliable. It could be seen on the percentage, reaching 91.67%, categorized very positive. Meanwhile the students shared their response until reaching 84.26% and was categorized very positive.

Based on 2013 curriculum learning process with scientific approach, it was very good to implement. Learning with scientific process as stated in lesson plan had covered on learning principles in process standard. Besides teacher, the fourth graders also shared their positive judgment on the learning process. It could be seen from their enthusiasm in following the learning actitvity and the improvement of the students' learning outcomes.

After being limitedly tested, then field test was done to find out effectiveness of a product. The effectiveness of the product with scientific approach could be seen from the learning outcomes within: affective, cognitive, and psychomotor aspects. They were improved after using the product. The cognitive score could be seen from the improvement of pretest and posttest scores. The prestes average of the fourth graders at SDN 01 Samudra was 64.26 while their posttes scores were 78.80. The average improvement based on N-gain test was 0.40%, categorized moderate. Besides that, effectiveness test was done to find out differences of the learning outcomes between pre- and post – intervention. The effectiveness test was done by *paired sample test* as seen on Table 1.

.

Table 1. Paired Samples Test

	Paired Differences			T	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
Pre – Pos	-1.44	4.46	.858	-16.83	26	.000

The analysis of pre- and post- averages obtained that scientific approach learning, tested by *paired sample test,* to have significant score 0.00 < 0.05. It meant there was significanct difference of average between pre – and post – intervention.

It showed that cognitive learning of the students between pre – and post – intervention by the product was not similar. Thus, it could be concluded that there was improvmenet on cognitive learning outcome after using lesson plan with scientific approach. The cognitive improvement of the students after using the product was also seen on Hapsari et al (2019). The finding showed that there was improvement of cognitive learning outcome after using scientific approach.

The cognitive learning outcome improvement was due to the developed scientific approach on theme – saving energy – was a real life material for the studetns and there was provision of real life problem entailing the students to foster, arrange, and find new knowledge.

Based on the learning, the students' attitudes were observed to be religious, discipline, responsible, and care. The affective learning outcome were entailing influences of cognitive and psychomotor aspect learning. So, the observation could be done during learning. Religious attitude could be seen when all students prayed before and after the learning process. Discipline could be seen when they listened to teacher explanation, work on the task in time, and keep the class conducive.

On caring attitude, it could be seen from their behaviors to keep the class clean, maintain good relationship among class members, have empathy for all peers, and not aggressively disagree with their peers' arguments. Then, the responsibility could be seen from their attitudes to keep their cleanliness, tidy up their classroom before and after learning, and tidy up all learning media after following the learning. The average of affective learning could be seen on Table 2.

Table 2. Affective Learning Outcome

Learning Score(%)						Avg (%)
1	2	3	4	5	6	
85.41	92.82	90.64	94.90	96.53	95.60	92.65

The affective average score obtained by the fourth graders is 92.65, categorized well. The observed affective attitudes on learning 1 – 6 were: religious, discipline, care, and responsible. On learning 1, the average score was 95.41. On learning 2, the average score was 92.82. On learning 3, the average score was 90.64. On learning 4, the average score was 94.90. On learning 5, the average score was 96.53. On learning 6, the average score was 95.50.

On scientific learning process, the students were active and enthusiastic to follow the learning. The activeness was seen from their changing behaviors, from passive, fearing afraid of asking questions and sharing opinion, less cooperation with team members to the active one. It was in line with Lestar et al (2015) showing that the students were active in learning activity. It was due to 2013 curriculum learning involves activeness of students because they are the center of learning started from the objectives until the formation of targeted competences (Arum &Wahyudi, 2016). So that the designed learning should emphasize on students' involvement in learning process.

The students' activeness in learning process was in line with the strength point of scientific approach implementation. The approach has strength points, such as several

solution for the teachers to make the learning interesting, qualified for both the process and product, and meaningful for the studnets, (2) it emphasizes students' invovlements so that students are active in learning(Agustinaet al, 2015). Scientific approach has purpose to provide understanding for students to recognize, understand various materials with scientific approach, and to know that information ould be obtain anywhere, anytime, and not only depended from the teacher (Wijayanti, 2014). Scientific approach needs to be implemented in learning to prepare students braver in innovating and to make them frequently commence their skills and inquiring, observing, and experimenting behaviors (Kawiyah, 2015).

Based on the already done learning activity, the psychomotor activities could be observed on observing, inquiring, trying, reasoning, and communicating. The students' activeness could be seen improved from first until sixth meetings. The activeness was assessed by using

Observational sheet during learning process. It is in line with Nurwati (2014) showing that psychomotor learning outcome test should be done by using behavioral test instrumentation. The activity was started by singing National Anthem to foster learning spirit. There was also literacy activity to improve their reading interest. Besides that, on the learning, the students were grouped heterogeneously. Each group discussed and experimented. The average of affective learning outcome could be seen on Table 3.

Table 3. Psychomotor Average Score

Learning Score(%)						Avg
1	2	3	4	5	6	(%)
78.89	80.37	75.74	79.26	78.33	80.18	78.80

The psychomotor average scores obtained by fourth graders was 78.80, categorized well. The psychomotor activities could be observed on learning 1 – 6: observing, inquiring, trying, reasoning, and communicating. On learning 1, the average score was 78.89. On learning 2, the average score was 80.37. On learning 3, the average score was 75.74. On learning 4, the average score was 79.26. On learning 5, the average score was 78.33. On learning 6, the average score was 80.13.

The learning outcome on cognitive, affective, and psychomotor aspects showed that scientific learning designed on lesson plan was effective to implement in the learning process. It is in line with Firman et al (2018) and Astuti et al (2016) stating that scientific learning was effective in improving learning outcomes.

Success in scientific learning implementation and improvement of the students' learning outcomes could not be separated from teacher roles which had maximized the functions of students as "early scientists". Students were asked to act how a scientist found knowledge through serial stages called scientific method. It is started by observing a certain object carefully. The carefulness in observing object influences observational result. After observing, the students have freedom to ask something they do not know and to provide clear explanation of observed phenomenon. Then, it was continued by experimenting or designing an experiment to collect the data. The data is then analyzed then communicated to other students. (Ain& Huda, 2018). Learning through scientific approach is important to teach for students to make them habitualize in finding out new concepts systhematically. Therefore, scientific learning approach implementation accurately will improve students' learning outcomes (Machin, 2014).

CONCLUSION

The developed scientific learning approach was based on National Educatoin Minister Rule Number 22 Year 2016 about Process Standard. The theme used on the lesson plan was theme 2 – energy saving, subtheme 1 – energy resource on learning 1 – 6. The validation and effectiveness of the instrument from this developed lesson plan with scientific approach

could be seen on posttest result of the fourth graders. It was 78.80. Meanwhile, the pretest result obtained aveage score 64.26. The N-gain test obtained score 0.40, categorized moderate. The t-test showed that the learning outcome between pre – and post – intervention of the product with scientific approach was different. The t-test was analyzed by *Paired Sample Test.* It was obtained significant score 0.00. The criteria of the decision were based on comparison of significant score (Sig). If Sig > 0.05, then Ho was accepted. If Sig < 0.05, then Ho was denied. The results showed that significance 0.00 < 0.05. It meant Ho was denied. Besides cognitive assessment, the researcher also assessed the affective and psychomotor aspects. Based on the observation on affective domain, covering religiosity, discipline, care, and responsibility during learning 1 to 6, the affective score of the fourth graders was 92.65, categorized good. On psychomotor aspects, covering observing, inquiring, trying, reasoning, and communicating during the learning 1 to 6, the score of the fourth graders was 78.80, categorized good. Thus, the lesson plan with scientific approach was effective to apply.

REFERENCE

Ain, N., Huda, C. 2018. PendekatanSaintifik di Sekolah Dasar. *Physics Education Journal, 2(1),* 1-7.
http://ejournal.unikama.ac.id/index.php/momentum/article/view/2368

Agustina., Putra, K.D., Lasmawan, I, W., Dantes, G. R. 2015. Pengaruh Pendekatan Saintifik terhadap Prestasi Belajar PKn ditinjau dari Sikap Demokrasi Siswa Kelas V Gugur 1 Kecamatan Abang. *E-Journal Pascasarjana Universitas Pendidikan Ganesha Program Studi Pendidikan Dasar, 5*.
http://oldpasca.undiksha.ac.id/e-journal/index.php/jurnal_pendas/article/view/1487

Alamsyah. 2016. Penerapan Pendekatan Saintifik untuk Meningatkan Kreativitas dan Hasil Belajar Siswa dalam Mata Pelajaran IPA. *Jurnal Pendidikan, 1(1)*, 81-88.
https://journal.unesa.ac.id/index.php/jp/article/view/368/201

Arum, T.S., Wahyudi. 2016. Pengembangan Modul Pembelajaran Tematik Integratif Subtema Hubungan Makhluk Hidup dalam Ekosistem Pendekatan Saintifik untuk Kelas 5 SD. *Scholaria, 6(3)*, 239-250.
https://ejournal.uksw.edu/scholaria/article/view/549

Astuti, D.P.P., Lasmawan, I.W., Natajaya, I N. 2016. Pengembangan Rencana Pelaksanaan Pembelajaran Berbasis Pendekatan Saintifik dan Berorientasi Multikultural Tema Menuju Masyarakat Sehat Siswa Kelas VI SD Rintisan Kurikulum 2013 Kecamatan Buleleng. *Jurnal Pendidikan Dasar Indonesia, 6(1).*
http://119.252.161.254/e-journal/index.php/jurnal_pendas/article/view/2070

Bermawi, Y., Fauziah, T. 2016. Penerapan Pendekatan Saintifik dalam Pembelajaran di Sekolah Dasar Aceh Besar. *Jurnal PesonaDasar, 2(4)*, 63-71.
http://www.jurnal.unsyiah.ac.id/PEAR/article/viewFile/7533/6200

Desmita. 2013. *Psikologi Perkembangan. Bandung*: PT Remaja Rosdakarya.

Firman, Baedhowi, Murtini. (2018). *The Effectveness of The Scientifik Approach to Improve Student Learning Outcmes. Internatinal Journal of Active Learning, 3*(2), 86-91.
https://journal.unnes.ac.id/nju/index.php/ijal/article/view/13003

Fitriyaningsih. 2014. Keefektifan Model Take and Give terhadap Aktivitas dan Hasil Belajar IPA. *Journal of Elementary Education (JEE), 3(2), 42-49.*
https://journal.unnes.ac.id/sju/index.php/jee/article/view/3702

Hapsari, E.E., Sumantri, M.S., & Astra, M.I. (2019) Strategi Guru Meningkatkan Hasil Belajar Menggunakan Pendekatan Saintifik di Sekolah Dasar, *3*(3),850-860. https://jbasic.org/index.php/basicedu/article/view/171

Heni, D. N., Binadja, A., & Sulistyorini, S. 2015. Pengembangan Perangkat Pembelajaran Tematik Bervisi Sets Berkarakter Peduli Lingkungan. *Journal of Primary Education (JPE),* 4(11), 30-35. https://journal.unnes.ac.id/sju/index.php/jpe

Hosnan, M.2016. *Pendekatan Saintifik Dan Konstektual Dalam Pembelajaran Abad 21.* Bogor :Ghalia Indonesia.

Kawiyah, Siti. 2015. Pengembangan Perangkat Pembelajaran Matematika Berbasis Saintifik untuk Meningatkan Kemampuan Pemecahan Masalah dan Prestasi Belajar Siswa. Jurnal Pendidikan Matematika, *10*(2),201-210. https://journal.uny.ac.id/index.php/pythagoras/article/view/9163/0

Lestari, Dwi Ana. 2015. Pendekatan Saintifik dalam Pembelajaran Tematik untuk Meningkatkan Ketrampilan Bertanya Siswa. *Jurnal Widyagogik, 3*(1), 66-72. https://journal.trunojoyo.ac.id/widyagogik/article/view/1683

Machin, A. 2014. Implementasi Pendekatan Saintifik, penanaman karakter, dan konservasi pada pembelajaran materi pertumbuhan. *Jurnal Pendidikan IPA Indonesia, 3(1)*, 28-35. https://journal.unnes.ac.id/nju/index.php/jpii/article/view/2898

Nieveen, N. 1999. Prototyping to Reach Product Quality. Dalam Plomp, T; Nieveen, N; Gustafson, K; Branch, R.M; dan van den Akker, J (eds). Design Approaches and Tools in Education and Training. London: Kluwer Academic Publisher.

Nurwati, Andi. 2014. Penilaian Ranah Psikomotorik Siswa dalam Pelajaran Bahasa. Jurnal Penelitian Pendidikan Islam, *9*(2), 385-400. http://journal.stainkudus.ac.id/index.php/Edukasia/article/view/781

Permendikbud Nomor 22 Tahun 2016 Tentang Standar Proses Pendidikan Dasar dan Menengah. Jakarta: Dirjen Peraturan Perundang-Undangan Kemenhumdan HAM.

Poedjiadi, A. 2010. Sains Teknologi Masyarakat Model Pembelajaran Kontekstual Bermuatan Nilai. Bandung: RemajaRosdakarya.

Prasetyawati, Priyatna. 2016. Analisis Proses Pembelajaran Berbasis Student Centered Learning dalam Pendekatan Saintifik pada Mata Pelajaran Sejarah di SMA Negeri Se Kota Palu. *eJurnal Katalogis, 4*(10),130-137. http://jurnal.untad.ac.id/jurnal/index.php/Katalogis/article/view/7010

Rachmawati, Tutik dan Daryanto. *Teori Belajar dan Proses Pembelajaran yang Mendidik.* Yogyakarta: Gava Media.

Sugiyono. 2014. *Metode Penelitian Kuantitatif Kualitatif dan R&D.* Bandung: Alfabeta.

Taufiq, dkk. 2010. *Pendidikan Anak di SD*. Jakarta: Universitas Terbuka.

Viantari, Resmitha Nidya.2015. Pemahaman Guru Mengenai Pembelajaran Tematik Inegratif Berpendekatan Saintifik di Sekolah Dasar. *Indonesian Journal of Curriculum and Educational Technology Studies*, *3*(1), 71-78. https://journal.unnes.ac.id/sju/index.php/jktp/article/view/8691

Widodo, Slamet. 2017. Pengembangan Lembar Kerja Peserta Didik (LKPD) berbasis Pendekatan Saintifik untuk Meningkatkan Keterampilan Penyelesaian Masalah Lingkungan Sekitar Peserta Didik di Sekolah Dasar. *Jurnal Pendidikan Ilmu Sosial, 26(2),* 189-204. https://ejournal.upi.edu/index.php/jpis/article/viewFile/9399/5776

Wijayanti. 2014. Pengembangan Autentic Assesment Berbasis Proyek dengan Pendekatan Saintifik untuk Meningkatkan Keterampilan Berpikir Ilmiah Mahasiswa. *Jurnal Pendidikan IPA Indonesia, 3(2),* 102-108.