INDEPENDENT LEARNING STRATEGY OF NATURAL SCIENCE WITH "ONE DAY ONE DIARY FOR SCIENCE" PROGRAM

STRATEGI PEMBELAJARAN IPA SECARA MANDIRI DENGAN PROGRAM "ONE DAY ONE DIARY FOR SCIENCE"

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ABSTRAK

Perilaku belajar dan kemampuan metakognitif siswa mempengaruhi nilai kognitif dan tingkat pemahaman setiap siswa. Penerapan program " One Day One Diary for Science" diperlukan dalam pembelajaran sains untuk melatih kemampuan metakognitif dan kemandirian siswa dalam belajar IPA. Penelitian ini bertujuan untuk mengetahui perilaku belajar, perkembangan kemampuan metakognitif, dan hubungan keduanya. Penelitian dilakukan dengan cara pengambilan data melalui pengamatan, wawancara, dan dokumentasi serta triangulasi data dengan cara memperpanjang lama pengamatan pada 33 siswa Sekolah Menengah Pertama. Hasil penelitian dianalisis dengan analisis domain, taksonomi, komponensial, dan temuan budaya, sehingga diperoleh data perilaku belajar sains dan kemampuan metakognitif siswa berdasarkan tingkatan kelas. Berdasarkan analisis data, perilaku belajar sains dan kemampuan metakogntif pada kelas atas lebih tinggi dibandingkan kelas lain. Terdapat hubungan yang kuat antara perilaku belajar dan kemampuan metakognitif

ABSTRACT

Learning behavior and metacognitive skill of students affect cognitive value and level of understanding of each student. The application of the "One Day One Diary for Science" program is needed in learning to train students' metacognitive skills and independence in learning science. This study was performed to find out the learning behavior, the development of metacognitive skills, and both relation. The study was conducted by observation, interview, and documentation on 33 junior high school students. The result of the study was analyzed the domain, taxonomy, components, and culture growth, so the data of learning behavior and metacognitive skill of students based on the score level can be obtained. Based on data analysis, learning behavior and metacognitive skill on a higher grade is higher than the other classes. There is a strong correlation between learning behavior and metacognitive skills.

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Keywords: learning behavior, metacognitive skill, diary, independent learning.

INTRODUCTION

The demands of current development in the era of globalization also gives effect to the policy improvement of education management in the school. One of which is the government policy related to curriculum change. Curriculum change aims to improve the quality of education, but often the changes are considered a burden for the school, especially for the teachers who act as agents of education. Implementation of the curriculum that very charge teacher is curriculum 2013, because the design, implementation, and evaluation of learning are quite complex. As an educator, it should not question the application of the curriculum because the dynamics of curriculum change will continue to

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occur. Because beyond on that, there are several things that need to be considered in detail, i.e. understanding and acceptance level of the students in science learning is different altough the students are taught using same curriculum and teaching methods in the classroom. The difference occurs because the behaviour of learning and metacognitive skills of students is different.

The presumption that science lesson is a difficult subject because there is a physics lesson, also gives effect to the students' understanding level on the science materials. According to Suparso (2013), physics is defined as a lesson filled with formulas and rote that make students bored and reluctant to learn. Physics is said as a scourge lesson. In contrast to physics, biology became subject that is considered easy for most students. In fact, to study biology required good ability in memorizing and understanding the biology materials.

In order that science learning is still running well, it would require an appropriate learning strategies to overcome the problems on the students. The ability of middle school students which is still developing desperately needs adult's role to realize and optimize their development. Therefore, teachers as educators should be able to familiarize the student to find, finish, and evaluate the problems independently. So, the shown learning behaviour leads to a positive direction and metacognitive skills of the students are able to develop well.

According to Baird as cited by Cubukcu (2008), metacognition refers to the knowledge, awareness, and one's own learning. So metacognitive development lead to the knowledge, awareness, and control of one's learning which is greater. More simply, metacognitive defined thinking about thinking methods, or better known as "thinking about thinking" (Lai, 2011). To train and know the development of students' metacognitive skills required learning journal. Learning journal becomes an appropriate container for developing strategies of metacognitive thinking because the students are able to diagnose the strengths and weaknesses in learning so as to optimize the learning outcomes (Septiyana, 2013). Junaedi's research results (2013) also stated that the learning journal and metacognitive thinking strategies have strong relationship to improve the learning achievement. Journal of learning can be packaged in the form of a diary to make it more interesting and fun in learning, because the students can write a diary every day using a relaxed and in-timate language.

Based on the above presentation, the authors conducted research on science learning behavior independently using metacognitive approach in the form of a diary. Program implementation of "One Day One Diary for Science" will be conducted in the research in order to train the habit of learning and metacognitive abilities of the students. Results from this study will determine how the behavior of learning, metacognitive abilities of the students, and the relationship between them in learning science.

The aims of the study are to determine science learning behaviour development of the students independently with the program "One Day One Diary for Science". So this study can contribute knowledge about the science learning behaviour development of the students independently, provide data for the teachers in order to prepare appropriate learning strategies, help the students to get used to learn independently and regularly and help the students monitoring learning behaviour and thinking process of the students.

METHODS

The method used in this study was qualitative research method. This method was used because the problems taken on the study are complex, dynamic, holistic, and relations between them are interactive, so the method is based on the philosophy of postpositivism. The problem taken in the research related to the learning behaviour of middle school students in science lessons independently. Those problems could be observed through learning behaviour and metacognitive skills of the students towards science lessons. The researcher observed learning behaviour of the student in the classroom and at home while studying science; conducted interviews with the students, parents of the students, science teachers, and friends of the students; and implemented "One Day One Diary for Science"program. The activities conducted by the researchers to gather data as much as possible about the learning behaviour and metacognitive skills of the students which would be analyzed according to the analysis stage of qualitative research.

This research was conducted in SMP 7 Semarang, SDN 02 Pendrikan, and a students house with informants drawn by the researchers were the students of class VII-E, teacher science subjects, friends of the students, and

parents (family) of the students. When science learning at school, the researchers studied the learning behaviour of the student in SMP 7 Semarang (Campus I) or at SDN 02 Pendrikan (Campus II). Reminding that SMP 7 Semarang is narrow, so that the learning should take place at two places (campus I and campus II) for class VII. Turn mechanism of the campus was set properly by the school, so the research went smoothly. In addition, the researcher also conducted observations and interviews with the students and parents in a student house. Determination of informants or sample data sources were selected purposively and snowball sampling.

In this study, the researcher was the main instrument (Sugiyono, 2009). The researcher acted as a human instrument that serve to fix focus of the research, chose the informant as a data source, collected data, assessed data quality, data analysis, interpreted the data, and made conclusions on the findings. But in the research, the researcher aided by key informants that is teacher science of class VII-E and also used diary of the students to study the learning behaviour and metacognitive skills of the students in learning science.

The researcher used data collection techniques such as participate observation, in-depth interviews, documentary studies, and triangulation of data. Triangulation of data used is triangulation techniques and sources, triangulation time less used by the researcher. Triangulation techniques and sources are shown in Figures 1 and 2.
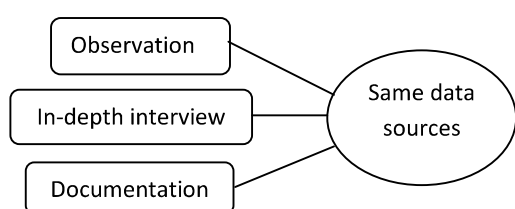

Figure 1. Triangulation "technique" of data collection.
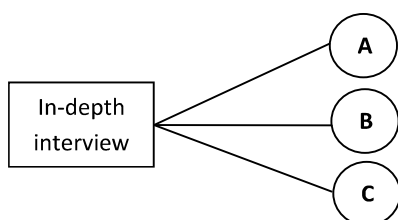
Figure 2. Triangulation "source" of data collection.

The research process and data analysis techniques were used in accordance with Spradley'data analysis techniques. According to Spradley as cited by Sugiyono (2009: 253-254), the process of qualitative research departs from the broad, then focus, and expanded again, as in Figure 3. While according Moleong (2005: 148), qualitative research model follows a circle and better known as cyclical research process. After analyzing the data, the result data analysis was examined its validity.

Data validity test of qualitative research included data credibility test (internal validity), depenability test (realibility) data, the transferability test (external validity/ generalization), and confirmability test (objectivity) (Sugiyono, 2009).
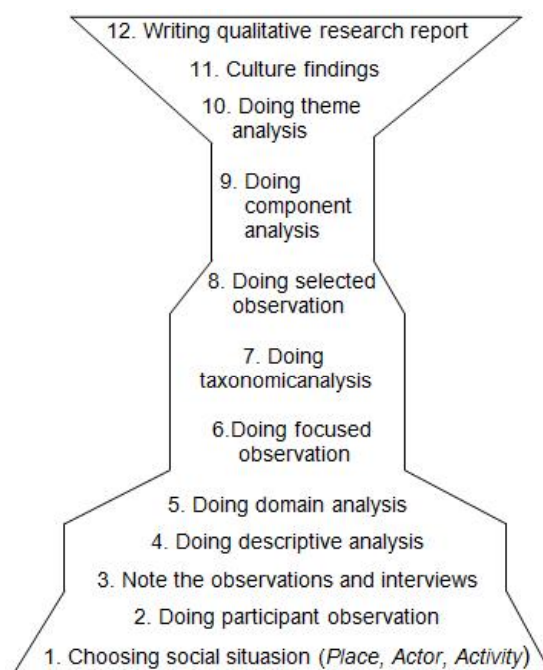
Figure 3. Qualitative Research Stage (Sugiyono, 2009)

Data credibility test is done by the extension of observation, increase endurance, triangulation, negative case analysis, using reference materials, held membercheck. Transferability test with the researchers tried to create a report with detailed, clear, and systematic descriptions. If the report result reader was able to understand overview of research results clearly, what and how these results apply, then the research report met the standards of transferability. Confirmability and dependability test can be performed simultaneously. Tersbeut testing done by doing audit of the entire research process. If the researcher was able

to show trace of field research and research results according to field research trace made by the researcher, the study met the standards depenability and confirmability.

RESULTS AND DISCUSSION

The researcher did dercriptive observation when initiating qualitative research. The researcher observed activities of the students and matters related to learning activities, both at home and at school, in order to obtain an overview. General description obtained by the researcher to conduct a descriptive observation and interviews to various parties concerned. From these observations obtained, the allocation of time normally used by the students in performing activities of the students. Activities of seventh grade students generally can be allocated as shown in Figure 4. While other general overview, can be described on the sheet of domain analysis grouped into 9 semantic relationships. The semantic relationship in question *i.e.* types, space, cause, rational/grounds, location to do things, how to achieve the purposes, function, sequence, and characteristics. Various things found in the study according to exist semantic relationship, and then analyzed on the sheet of domain analysis.

Based on the results of domain analysis, the researcher chose three elements derived from descriptive observations that are focused to learning behaviour of the students, meta-cognitive skills, and the relationship between learning behaviour of the students' and meta-cognitive skills. The researcher conducted an ability category of the students in the class into 3 groups to simplify the research, sketched in Figure 5.

Three groups were then explored in more depth information through focused observation. Focused observation done by observation, interview and documentation studies on the cognitive abilities development of class VII-E students. Cognitive value data obtained from observations of the students' cognitive value in semester 1 and 2. The values of cognitive there 8 namely, the first half taking midterm test, final test and report, in the semester 2 taking daily tests (the values of expansion, temperature, biodiversity and ecosystems, heat) and final test. From overall value, then searched the mean value. The mean value was used to analyze taxonomic groups of the students into students' learning ability.

Grouping of the students on the taxo-

nomic analysis eased the research on the selected observation stage. The researcher used observation, interview and documentation study at this stage. Observation used was participant observation in the classroom and regular observation at home when science learning. Interview with the students and parents conducted covertly at home, while interviews with science teachers through open interview. Documentation study done by applying the program of "One Day One Diary for Science" so that obtained the students'data in writing in diary book. Overall the data obtained from three techniques of data collection and data triangulation then done the componential analysis to determine specific differences in each component in individuals and students' groups.
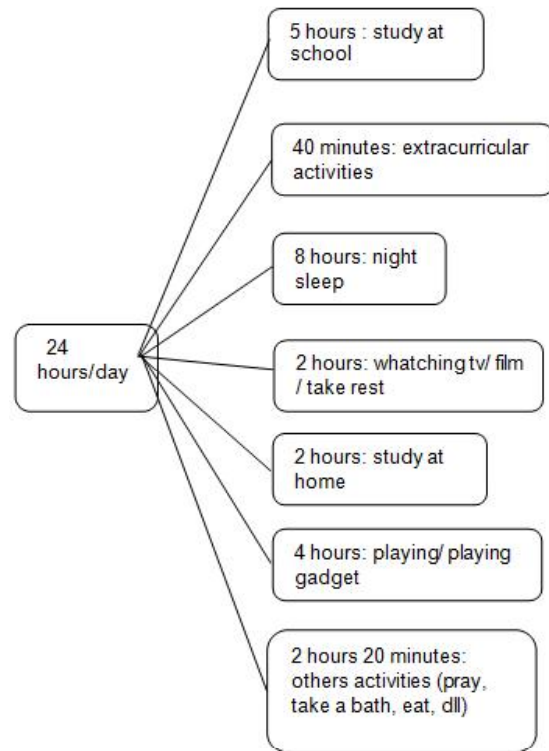

Figure 4. Chart of the average of students time allocation /day.
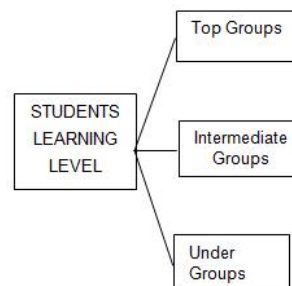

Figure 5. Domain Analysis Results of Student's Learning Ability

The components that searched for its differences was learning behaviour component and metacognitive skills of the students. The components of students' learning behaviour was a manifestation of learning behaviors, such as learning habits, associative thinking and memory, rational and critical thinking, as well as affective behavior (Shah, 2008). While the components of metacognitive skills were indicators of metacognitive learning strategies according Halter as cited by Murtadho (2013).

Based on the componential analysis results of each student, it obtained was learning behaviour and metacognitive skills of the students for each of groups that have analyzed the theme, as in Tables 1 and 2.

Learning behaviour and metacognitive skills of each student is different because every

Table 1. Differences of Students' Learning Behaviour

Group Aspect	Top Group	Intermediate Group	Under Group
Learning Habits	- Independent and responsible in learning. - Learning seriously and focus. - Learning atmosphere is quiet, calm, and comfortable - Having certain techniques in learning. - Learning when there are repetitions, tasks, and homeworks.	- Less independent and responsible in learning. - Learning less seriously and focus. - Learning atmosphere not to be quiet and calm. - Using memorization techniques in learning. - Learning when there are repetitions, tasks, and homeworks, and orders from parents.	- Not independent and less responsible in learning. - Learning not seriously and less focus. - Learning atmosphere is usual, There must be gadget usually while learning. - Using memorization techniques in learning. - Sometimes learning when there are repetitions, tasks, and homeworks,
Associative thinking and memory	- Associative thinking skills is high. - The ability to enter, store, and display back the materials is high and quick.	- Associative thinking skills is medium. - The ability to enter, store, and display back the materials is average and low.	- Associative thinking skills is low. - The ability to enter, store, and display back the materials is low and slow.
Rational and critical thinking	- The ability to determine cause and effect, analyze, and draw conclusions is high. - Understanding and mastering the materials of calculation and memorization - Knowing how to reason and ask. - Accurate in counting and understanding the problems.	- The ability to determine cause and effect, analyze, and draw conclusions is average. - Understanding memorization materials and lack of understanding calculation materials - Less able in knowing how to reason and ask. - Careless in counting and understanding the problems.	- The ability to determine cause and effect, analyze, and draw conclusions is low. - Lack of understanding and mastering calculation and memorization materials. - Not able in knowing how to reason and less able in knowing how to ask. - Very careless in counting and understanding the problems.
Affective behaviour	- Showing cheerful attitude and expression while learning. - Level of anxiety is low or average.	- Showing less happy and bored attitude and expression during learning, especially physics. - Level of anxiety is high.	- Showing unhappy attitude and expression during learning physics, but they still show a cheerful attitude and expression while learning. Although they do not actually notice. - Level of anxiety is extreme.

Table 2. Differences of Metacognitive Ability Students

Group Aspect	Top Group	Intermediate Group	Under Group
Awareness	- Aware of his/her ability and be able to identify what is known and unknown. - Able to select the appropriate learning aids. - Able to think the right way to learn. - Having high learning motivation and moderate anxiety level.	- Aware of his/her ability, but not able to identify what is known and unknown. - Less able to select the appropriate learning aids. - Has not been able to think the right way to learn. - Having unstable learning motivation and high anxiety level.	- Not aware of his/her strength, but aware of his/her weakness. Not able to identify what is known and capable enough in identifying what is unknown. - Less able to select the appropriate learning aids. - Has not been able to think the right way to learn. - Having low learning motivation and extreme anxiety level.
Scheming	- Clever in managing time to learn independently. - Disclipine in learning. - Able to choose the appropriate steps to complete the task/ paper.	- Able to manage time for learning, but has not been able to estimate the needed time. - Less disclipine in learning and must be controlled by parent. - Less able to choose the appropriate steps to complete the task/paper	- Able to manage time for simple learning. - Not able to estimate the needed time. - Not disclipine in learning. - Not able to choose the appropriate steps to complete the task/ paper.
Monitoring and reflection	- Independent and responsibility in monitoring and supervising himself/ herself in learning. - The ability to maintain concentration and motivation is high.	- Less independent and responsibility in monitoring and supervising himself/ herself in learning. - The ability to maintain concentration and motivation is average.	- Not independent and responsibility in monitoring and supervising himself/ herself in learning.. - The ability to maintain concentration and motivation is low.

student takes the stage of development at different speeds. This is supported by the opinion of Arends (2008), people differ in the way of learning, they approach learning tasks in different ways because the stage of development reached have different speeds. Learning behaviour and metacognitive skills of the students in the top group shows good thing compared to other groups. The students in top group have independent and responsible learning behaviour, and have high metacognitive skills and development of metacognitive much faster and optimized. Intermediate group students still need adult roles to complete the task and set the time to learn, level of independence and responsible behaviour were still lacking. Metacognitive ability of intermediate students was at moderate level, and it progressed more slowly than the top group of students. Most of which

under group students showed not independent and less responsible learning behaviour. They needed adults to help completing the task, setting the time to learn, and providing social and motivational encouragement or advice. Metacognitive ability of under group students was at lowest level compared to other groups. They were aware of some weakness in them but do not understand the potential / surplus on them, so that they were more indifferent. Their metacognitive development was not optimal and slow, so it needed a lot of practice to develop.

The relationship between learning behaviour and metacognitive skills showed strong relationship. Both of these elements influenced each other in learning and influenced on learning outcomes and students' achievement. Fauziyah, et al research results (2013) states that there is a significant relationship between

metacognitive skills and cognitive learning outcomes of the students. Isaacson and Fujita research results (2006), also states that students who have the ability to control themselves and metacognitive knowledge themselves, are able to achieve academic success.

Based on the overall data obtained in this study, the researcher discovered a new learning model that could be used to overcome the problems of students' learning ability, especially students of the bottom group. It was intended, so that under group students still able to attend science classes as well as the students in other groups. The learning model that was found was Mountaineering Based Learning (MBL). MBL is a learning model that mimics mountain climbing techniques, resulting in learning there is a person who acts as a rigging man, leader, and sweeper. MBL principle is prioritizing low-ability students, so they can adjust the lesson well, but still consider the students with medium and high ability. MBL characteristic is implementation of the program "One Day One Diary for Science". This model is a learning model that trains students' independence in learning use approaches of metacognitive strategies. MBL combines conventional learning with metacognitive learning.

CONCLUSION AND SUGGESTIONS

Based on data analysis and discussion, the conclusions obtained are learning behaviour top group students have best behaviour compared to other groups. Intermediate group has good behaviour, but still needed guidance from parents/adults. While under group has less good behaviour. Metacognitive skills of top group students are high and metacognitive development is rapid and optimal. Under group has average metacognitive skills and their metacognitive development is slow. While under group has low metacognitive skills and the development of metacognitive skills is very slow. It can be concluded that there is strong relationship between metacognitive abilities and learning behaviour of the students. Thus if students' metacognitive skills is high, then the learning behaviour will be exhibited by the students, and vice versa.

Based on the problems obtained in this study, the researcher has suggestions for various parties concerned. The educators/ teachers need to pay attention to the learning behaviour and metacognitive skills of the students, especially during physics lessons, in order to design and implement learning activities based on students' ability, so the learning objectives can be achieved optimally. For the parents, should always provide social support and motivation for the students so that the students are able to regulate their learning behaviour independently and improve their metacognitive skills.

For the advanced researchers who will examine behaviour and metacognitive skills of the students, should choose the right informant and the number is not too much, and in data retrieval always carries data collection tools, such as tape recorder, observation book, and cameras or camcorders. Observation data writing and directly interviews will ease the researchers to remember any newly acquired. It should also be examined in more detail about the factors that influence the learning behaviour and metacognitive abilities. For the readers/ students in general, it needs a further investigation of the effectiveness of learning model application "Mountaineering Based Learning" to know the advantages and disadvantages of the lesson model.

REFERENCES

Arends, R.I. (2007). *Learning to Teach* (7th). Translated by Helly P. S. & Sri M. S.Yogyakarta: Pustaka Pelajar.

Cubukcu, F. (2008).   Enhancing vocabulary development and readingcomprehension through   metacognitive   strategies. *Issues in Educational Research*, 18 (1). available in http://www.iier.org.au/iier18/cubukcu.html [27-1-2015].

Fauziyah, D.R., A.D. Corebima, & S. Zubaidah. (2013). Hubungan Keterampilan Metakognitif terhadap Hasil Belajar Biologi dan Retensi Siswa Kelas X dengan Penerapan Strategi Pembelajaran Think Pair Share di SMA Negeri 6 Malang. *Biology Education*. Tersedia di http://jurnal- online.um.ac.id/artikel-artikel. pdf [diakses 2-11-2014].

Isaacson R.M. & F. Fujita. 2 006. Metacognitive Knowledge   Monitoring and Self-Regulated Learning: Academic Success and   Reflections on Learning. *Journal of the Scholarship of Teaching and Learning*, 6(1): 39-55.

Junaedi, E. (2013). Penerapan Pembelajaran dengan Menggunakan Jurnal Belajar untuk meningkatkan Prestasi Belajar Bangun Ruang pada Siswa SMP Negeri 10 Malang Kelas VIII-H. *Mathematics education.* available in http://jurnalonline.um.ac.id/artikelartikel3D- F65EF8EE8D5ED8E9F.pdf [2-11-2014].

Lai. E. R. (2011). *Metacognition: A Literature Review*. Laporan Penelitian. Pearson's

Research. available in http://www.pearson-assessments.com [20-12-2014].

Moleong, L.J.(2005). *Metodologi Penelitian Kualitatif*.Bandung: PT Remaja Rosdakarya.

Murtadho, F. (2013). *Berpikir Kritis dan Strategi Metakognisi:Alternatif Sarana Pengoptimalan Latihan Menulis Argumentasi.* Makalah dipresentasikan pada 2nd Internasional Seminar on Quality and Affordable Education (ISQAE).

Septiyana, K., Andreas, P. B. P. & Wulan, C. (2013). *Jurnal Belajar sebagai Strategi Berpikir Metakognitif pada Pembelajaran Sistem Imunita*s. *Unnes Journal of Biology Education,* 2(1). available in http://journal.unnes.ac.id/sju/index.php/ujeb [18-9-2014].

Sugiyono. (2009). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Bandung: Alfabeta.

Suparso, E. (2013). *Pemanfaatan Bahan Ajar Berbentuk Cerpen Fisika untuk Meningkatkan Motivasi dan Hasil Belajar Siswa pada Pokok Bahasan Hukum Newton pada Siswa Kelas X MA Negeri Demak Tahun Pelajaran 2013/2014*. Makalah dipresentasikan pada Seminar Nasional PIF XXV, Unnes Semarang.

Syah, M. 2008. *Psikologi Pendidikan dengan Pendekatan Baru*. Bandung: PT Remaja Rosdakarya Offset.