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THE IMPROVEMENT OF SKILL ON PROCESSING SCIENCE AND STUDENTS' ACHIEVEMENT ON VOLUMETRIC ANALYTICAL CHEMISTRY AT SMK – SMAK BOGOR THROUGH SCIENTIFIC APPROACH AND ASSISTED BY ICT-BASED MEDIA

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CHEMISTRY AT SMK – SMAK BOGOR THROUGH SCIENTIFIC APPROACH AND ASSISTED BY ICT-BASED MEDIA

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ABSTRACT

This Classroom Action Research is aimed to increase science process skill of SMK-SMAK students in Bogor on Volumetric Analytical Chemistry subject. Besides, to uplift the learning outcome of the students on Volumetric Analytical Chemistry subject by using various learning media based on ICT. This research in a long term is hoped to be the alternative study media on Open Distance Learning (ODL).

This research method uses Classroom Action Research model from Kemmis and Mc Taggart. This method is chose based on a mission to really repair a process of Volumetric Analytical Chemistry learning. The method consists of cycles where each cycle has four main steps which are planning, acting, observing, and reflecting. This research uses curriculum 2013 scientific approach to see the skill of students on processing science and using learning media such as power point, e-learning, and video

project. The Instrument that are used i.a pre-test, post-test, observation paper, check list and questionnaire.

The research is composed by three cycles where each cycle is applied on different material with different learning media. The outcome of this research is the increasing of students' scientific process skill through the activity on learning process that reach 88.39%. The increasing of students' learning outcome then can be seen from gain score which reaches 0.88 with high category.

Key Word: Science process skill, learning outcome, learning media based on ICT.

INTRODUCTION

Vocational and pre-professional senior secondary school is one of the school that generates experts in Indonesia. This school teaches specifically one field of expertise. So is vocational senior secondary school – Vocational School Chemical Analysis Bogor also runs one field of specific expertise i.e. chemical analysis. Hence, the student's skill on mastering chemical analysis has to be beyond the limits. Besides, the student's skill on processing science also have to be practiced consistently as it can generate chemical analyst that masters three domains of learning, which are cognitive, psychomotor, and affective.

Curriculum 2013 instructs every school to improve the skill on processing science in learning. By applying scientific approach, a school will measure three aspects of competence in learning, for example knowledge, skill, and behavior aspect. Unexceptionally Chemical Volumetric subject in SMK-SMAK Bogor also applies Curriculum 2013. Basically Ministry Education and Culture gives its own conception stating that the scientific approach on the study includes several components: observing, asking, reasoning, trying/discovering, and serving/communicating. With such approaches it is hoped to increase the student's skill on processing science. Scientific process itself focuses on involving students actively and creatively on the process of gaining the learning outcome (Semiawan, 2002), thus the study has to be student centered.

Nowadays, students are called as a digital native. Digital native is the people that cannot be separated from digital activity (Prensky, 2001). They spend most of their time to be or using digital devices, such as computer, video games, digital music player, hand phone, camera digital, and others. That

phenomenon impacts on teacher's creativity to facilitate and suffice the student's need. Hence, the learning that is presented by teacher should use instructional media that is related to digital world. It will include the active participation of student. This is aimed to trigger the student to be independent and happy on joining the learning.

Based on that analysis, researcher argues that it is needed to make an scientific approach and innovation on instructional media that is used on teaching Volumetric Analytical Chemistry. That instructional media also have to utilize ICT that enables students to understand the class. Therefore, we hope that the learning outcome of the student will improve.

The goal of this research is to upgrade the student's learning outcome through scientific approach with the support from technology based on information. The outcome of the learning will appear as an alteration of student's behavior that can be observed and measured in the form of skill and knowledge character change. The change can be interpreted as the increasing and the developing of student's knowledge, from unknown to known, from impolite to polite, et cetera. (Oemar Hamalik, 2001;154).

Whilst according to Ministry Education and culture (2013), the application of scientific approach on learning involves the skill of science process such as to observe, to classify, to measure, to predict, to explain and to conclude. On doing these processes, teacher's support is needed. But the teacher's support has to be lessening as the students reach the higher level of education. On this research, the skill of scientific process that is taken or observed consists of 8 aspects, i.e. the

ability to observe, ask, count, communicate/answer the question, associate, respond, design the experiment, and to conclude.

Naturally, the outcome of someone's learning is obtained, start from the direct event, the reality in its environment then through the imitation sign, to the verbal (abstract) expression. One of the most frequent depictions that is used as reference on theoretical basis based on learning process media is Dale's Cone of Experience on Azhar Arsyad (1997:10)

This research is done with Classroom Action Research that follows Kemmis & Mc Taggart opinion. Kemmis & McTaggart model is naturally in the form of devices or chains with one device consist of four components, which are: planning, acting, observing and reflecting. The four components that form the chains are seen as one cycle. (Kemmis & McTaggart,1990:14).

RESEARCH METHOD

The subject of this research is the student on class XI in SMK-SMAK Bogor. While the object of this research is the increase of student's science process skill and the learning outcome on Volumetric Analytical Chemistry subject. This research is carried in SMK –SMAK Bogor at even semester on January until May 2015. The research will adjust chemical analysis learning time grade XI SMK-SMAK Bogor. The type of this research is Classroom Action Research which contrives to review and reflect student's learning outcome on Volumetric Analytical Chemistry subject. This research is divided into cycles that are suited with time allocation and the chosen topic. Each cycle consist of four steps (Kemmis and Mc Taggart, 1998) which are:

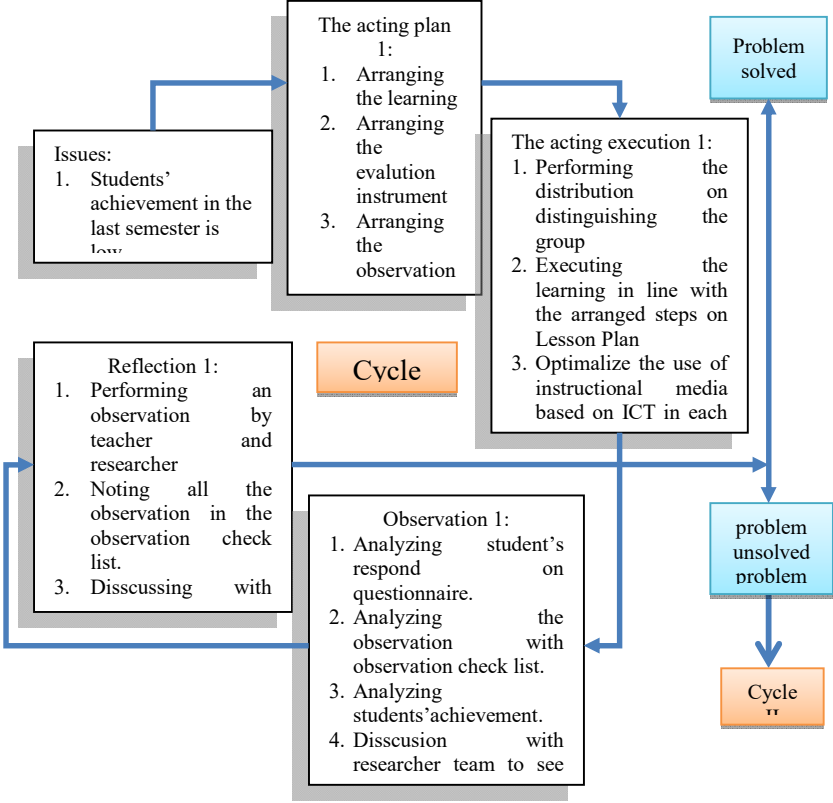
Planning: formulating the problem, determining the aim and method of research and also make action plan,

Acting: this is done as a changing effort of what is done

Observing: it is done systematically to monitor the outcome or the impact of action towards learning-teaching process, and

Reflecting: reviewing and considering the outcome or the impact of the taken action.

The research of this class chooses Kemmis & Mc Taggart method as it is easier to be applied on the research. The research plan is seen through figure 1:



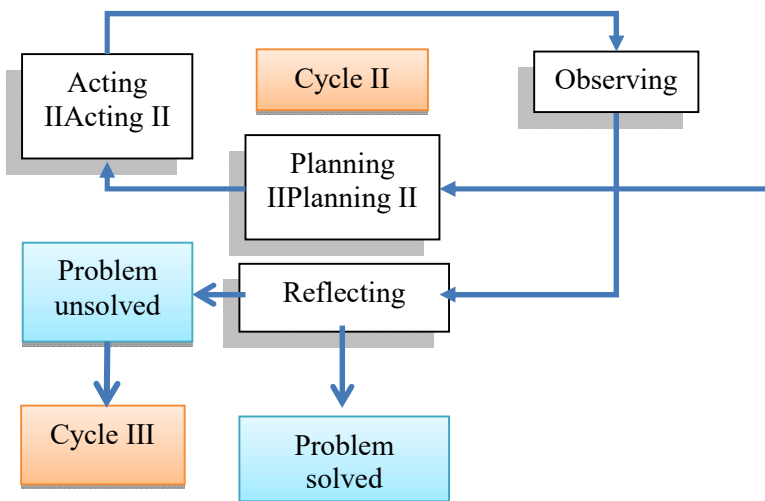


Figure 1. Procedures of research based on Kemmis and Mc Taggart's Model

The instruments that are used in this research are pre-test score, observation paper and questionnaire for the students. In this research, pre-test and post-test are used to know the student's learning outcome using learning media based on IT. Students will be considered as success if he gains score above MMC (Minimum Mastery Criteria). MMC score on Chemical Volumetric Analysis subject is 75. Besides, to know the increase of science process skill, we will use observation paper. Science process skill will be considered as increasing if the student's activity and participation are improving. Whilst, questionnaire paper is used to know student's opinion about the application of various learning media based on ICT.

In this research, the analyzed data is the student's learning outcome data that is earned from pre-test and post-test, observation, and questionnaire data.

Student's learning outcome

Learning outcome data is analyzed by calculating the average and the completeness score of the students. The calculation formula of average completeness score of student's outcome is as follow:

$$\begin{aligned} \text{Average Score: } & \frac{\sum \text{total of student's score}}{\sum \text{student's total}} \\ \% \text{Completness of the study} & \\ & = \frac{\sum \text{student's above MMC}}{\sum \text{student's total}} \times 100\% \end{aligned}$$

While the increase of study outcome, we use gain score analysis. The process on increasing student's achievement is needed to compare the achievement (student's achievement) on learning. Tabulating the learning improvement is needed to compare the success (student's improvement) on learning. Processing learning achievement is also used to know the effective type of direct learning, so the taken steps are as follows:

Calculating normalized gain in the end of the cycle. Normalized gain is the comparison between actual gain score with maximum gain score, using the formulation as follows: [Hake(Rochiati,2005:92)]

$$\langle G \rangle = \frac{T_f - T_i}{SI - T_i}$$

Description :

$\langle G \rangle$ = normalized gain

T_f = posttest score

T_i = pretest score

SI = ideal score (100)

Determine the average score from normalized gain score

Determine the effective criteria of learning from the existing standard on second table 1.

Table 1. Normalized Gain Criteria

| Normalized Gain Score <G> | Normalized Gain Criteria |
|---------------------------|--------------------------|
| 0.7 < N-Gain | High |
| 0.3 ≤ N-Gain ≤ 0.7 | Medium |
| N-Gain < 0.3 | Low |

The success indicator of this research is the increasing of the mastery of study result that reaches 85% which are in line with mastery learning and gain score analysis is categorized in high category

Science process skill observation

Science process skill is observed through observation check list paper. There are eight aspects that are observed including to observe, to ask, to calculate, to communicate/answer the question, to associate, to respond, to design the experiment, and to conclude. These eight aspects can be observed through learning process and report or media that is generated by the student. To know the science process skill enhancement, students can observe the activity data of student, thus the formula that can be used is as follow:

$$\% \text{Activity of student through science process skill} = \frac{\sum \text{students do activity}}{\sum \text{student's total } \times \text{science process skill aspect}}$$

The success indicator of this research is if 70% students actively do eight aspects of science process skill in the learning process.

Media selection by students

To know media selection or interest of the student towards used media, researcher gives questionnaire to the student. The questionnaire contains yes or no question towards media that is used at that time. To know media selection of students, the used formulation as follow:

$$\text{Media selection} = \frac{\sum \text{student select a media}}{\sum \text{student's total}}$$

RESULT AND DISCUSSION

This research is done in three cycles, three different subjects, and three different media of learning. The first cycle is applied on the Yodometri and Yodimetri subject, the second cycle is applied on Argentometri, and the third cycle is on the Water Analysis Application.. The time allocation on the first cycle is 3 X 2 lesson hours, the second cycle is 2 X2 lesson hours, while the third cycle is 2X2 lesson hours. To know the success on each cycle there would be pre-test on the beginning and post-test at the ending of the cycle. Besides, the student is given questionnaire to know the opinion about the used media on a cycle.

The goal of this research is to enhance the student’s learning outcome. Based on I,II and III cycles that have been done by the researcher, the enhancement of student’s learning outcome is presented in Table 2.

Table 2. The Data learning result on Pre-test and Post-test Cycle I,II, and III

| Result | Cycle 1 | Cycle 2 | Cycle 3 |
|---------------------------|---------|---------|---------|
| Pre-test average | 68 | 74 | 89 |
| Post-test average | 89 | 91 | 97 |
| Mastery pre-test learning | 35.71% | 53.57% | 100% |

| | | | |
|-----------------------------|--------|------|------|
| Mastery post-test learning | 96.43% | 100% | 100% |
| Gain | 0.88 | | |
| Category of learning result | High | | |

As seen from the table, there is an enhancement on student's learning outcome. Not only in pre-test but also post-test. The increasing also happens in the mastery of student's learning both on pre-test and post-test. The aim of the research is to enhance student's result until it reaches 85% of mastery learning in the third cycle. Neither pre-test nor post-test on the third cycle, using the video project learning media results to the 100% mastery of study. The increasing of student's achievement would be categorized as high, based on gain score result analysis which is 0.88.

The achievement of research's purpose cannot be separated from the existence of learning media support based on IT. The existence that is given by the researcher in each cycle to see the interest and suitability of learning media, researcher can conclude that the suitable learning media for Chemical Analysis subject is a learning media that includes real experience (concrete) of the students. It is like what has been stated by Dale on Dale's Cone of Experience in Ahar Arsyad (1997:10) that the best learning media is the direct experience. Learning media in a form of presentation using power point gets 50.00 % responds, whilst learning media through learning management system (e-learning) collaborates with power point gets 75.00% responds. In line with Septi and Jaslin's research (2013:320) that learning media which includes student's participation such as mobile game gets positive responds from

the student as it could increase their learning motivation. It proves that hypothesis about learning media based on IT can increase student's outcome can be accepted.

Based on Arif and Jaslin's research (2015) that learning media based on ICT can improve student's outcome significantly. The learning media that are used consist of android application, media flash animation, power point presentation and prezi online presentation that are presented by the student itself. Zulkifli dkk (2013) also recites that learning media based ICT is effective to be applied for increasing student's outcome on learning in SMK Kendari, Indonesia.

Another aim in this research is to increase student's science skill process. The enhancement of science skill process can be seen from the activity of the student when complies with the learning process which is observed from observation paper. Result of the science skill process enhancement on the first, second and third cycle can be seen in table 6 as follows.

Table 6. Enhancement of Science Skill Process Cycle I, II, and III.

| No. | Cycle | 1st Meeting | 2nd Meeting | 3rd meeting |
|-----|-----------|-------------|-------------|-------------|
| 1. | Cycle I | 58.93% | 49.60% | 33.90% |
| 2. | Cycle II | 45.30% | 65.18% | - |
| 3. | Cycle III | 54.91% | 88.39% | - |

The result proves that there are decrease and increase of student's activity. It can be seen on Cycle I, the activity is decreasing as there is lack of student's motivation on doing the activity on learning process. On Cycle II and III they are given reward so the activity is increasing. Science Process skill that

increases above 70% is only occurred in Cycle III which is 88.39%. It proves that the application of scientific approach using student center can increase student's science process skill. This research is in line with Mohammad H. Soodeh et al (2012) that a learning that involves student as the center of learning can increase their self-esteem to deliver opinion and be brave on taking a stand to solve the problem in the class.

CONCLUSION AND SUGGESTION

Based on analysis of the result, we can conclude that:

Student's science skill process increases as it is seen from the student's activity in the classroom which has percentage on 88.39%.

Student's outcome increase is seen from gain score which is 0.88 with high category.

While the given suggestion from the researcher based on the research are:

It is necessary that there are further improvement and completion about learning media that is used is up to date so that can support Open Distance Learning (ODL)

This Class Action Research should be applied continuity so that the lack and advantage on every meeting on learning-teaching process can be known.

This Class Action Research should be spread to another teacher, not only in SMK-SMAK Boor but also teacher in another school so that the learning process can be repaired thus it would increase student's outcome.

REFERENCES

Agus Suprijono. 2009. *Cooperative Learning, Teori dan Aplikasi PAIKEM*. Surabaya: Pustaka Pelajar

Arif Yoga Pratama and Jaslin Ikhsan. 2015. *Integration of ICT-Based Multimedia into Hybrid Multimodal Learning at Senior High School to Improve Students' achievement*. Proceedings International Conference on Educational Research and Innovation (ICERI 2015).

Azhar Arsyad. (1997). *Media Pengajaran*. Jakarta: PT Raja Grafindo Persada

Cony Semiawan. 1986. *Pendekatan Keterampilan Proses*. Jakarta: PT Gramedia

Kemmis, S. dan McTaggart, R. 1983. *The Action Research Planner, Third Edition*. Victoria: Deakin University

Lampiran IV ,Peraturan Menteri Pendidikan Dan Kebudayaan Republik Indonesia Nomor 81a. 2013.*Tentang Implementasi Kurikulum Pedoman Umum Pembelajaran*. Jakarta: Kemdikbud

Mohammad H. Asoodeh, Mohammad B. Asoodeh, Maryam Zarepour. 2012. *The Impact of Student - Centered Learning on Academic Achievement and Social Skills*. Iran:Procedia - Social and Behavioral Sciences 46 (2012) 560 – 564

Oemar Hamalik. 2001. *Perencanaan Pengajaran Berdasarkan Pendekatan Sistem*. Jakarta: Bumi Aksara

Prensky, Marc. (2001). *Digital Natives Digital Immigrants*. On the Horizon (MCB University Press). 9 (5): 1-6.

Rochiati. 2005. *Pengembangan Kemampuan Berpikir Siswa Melalui Pendekatan Keterampilan Proses dengan Bantuan Tutor Sebaya*. Skripsi Jurusan Pendidikan Matematika FPMIPA UPI, Bandung.

Rochiati Wiriaatmadja. 2007. *Metode Penelitian Tindakan Kelas: Untuk Meningkatkan Kinerja Guru dan Dosen*. Bandung: Program Pascasarjana UPI dan PT. Remaja Rosdakarya.

Rusman, dkk. (2011). *Pembelajaran Berbasis Teknologi Informasi dan Komunikasi*. Bandung: Rajawali Press

Septi Riyanningsih dan Jaslin Ikhsan. 2013. *The Development of Character-Based Mobile Game "Robochem" on the Reaction Rate Topic and the Response of Grade 11th Students to the Game*. Proceedings International Conference On Educational Research And Innovation 2013 (ICERI2013) page 320.

Sukardi. 2005. *Metodologi Penelitian Pendidikan: Kompetensi dan Praktiknya*. Jakarta: Bumi Aksara

Sulistiowati, Leila Nuryati, dan Yudi Yudianingrum. 2012. *Analisis Volumetri Kelas XI*. Jakarta: Pusdiklat Industri Kementerian Perindustrian

Zulkifli M., Suparlan Suhartono, Umar Tirtaraharja, and Tawany Rahamma. 2013. On ICT-Based Learning Model of Islamic

Education at Senior High School 4 Kendari South-East Sulawesi Province. Journal of Arts, Science & Commerce. Vol. – IV, Issue – 4(1): 32Development Learning Media Using Implementation Jigsaw Method