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ICoSMEE

THE 2ND INTERNATIONAL CONFERENCE ON SCIENCE, MATHEMATICS, ENVIRONMENT, AND EDUCATION

Innovative Research in Science, Mathematics, Environment and Education for Sustainable Development

26-28 July 2019

Science and Math Education Department
Faculty of Teacher Training and Education
Universitas Sebelas Maret
Jl. Ir. Sutami 36A Kentingan
Surakarta - Jawa Tengah 57126

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The 2nd International Conference on Science, Mathematics, Environment, and Education (ICoSMEE)

"Innovative Research in Science, Mathematics, Environment and Education for Sustainable Life"

Surakarta, July 26 - 28 2019

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The 2nd International Conference on Science, Mathematics, Environment, and Education (ICoSMEE)

"Innovative Research in Science, Mathematics, Environment and Education for Sustainable Life"

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CHAIRMAN WELCOME SPEAKS

AND REPORT

Assalamu'alaikum Warahmatullahi Wabarakatuh,
Alhamdulillahi rabbil'aalamin; Wash sholatu wassalamu 'ala ashrofil Anbiyai wal Mursalin; Wa'ala alihi waash habihi ajma'in;

The honourable, the Rector of Universitas Sebelas Maret (UNS) and all Vice-Rectors
The honourable, Dean of Faculty of Teacher Training and Education and all Vice-Deans
The honourable, the keynote and invited speakers
and all respected guests and participants who have attended here.

I'm very pleasure to welcome all of you in this 2nd International Conference on Science, Mathematics, Environment and Education (ICoSMEE). This biannual conference is a collaborative work organized by 5 departments in the Faculty of Teacher Training and Education of Universitas Sebelas Maret, Surakarta Indonesia, that are the department of Mathematics-, Chemistry-, Biology-, Physics-, and Science-Education.

This year we present the conference theme '**Innovative Research in Science, Mathematics, Environment and Education for Sustainable Life**'. This theme is closely related to the 21st century and the fourth industrial revolution issues. This conference aims to provide a forum to share and discuss ideas and new development in science, math, environment and education, as well as novel ideas in a holistic manner to address the challenge and issues on global sustainability.

Thus, we invited 6 keynote speakers from 6 countries in related disciplines namely:

1. Associate Prof. Oki Muraza (King Fahd University, Saudi Arabia)
2. Prof. Meng-Tzu Cheng (National Changhua University of Education, Taiwan)
3. Dr. Masitah Shahrill (University Brunei Darrusalam)
4. Prof. Dr. Shukor Md.Nor (Universiti Kebangsaan Malaysia)
5. Prof. Yoshisuke Kumano (Shizouka University, Japan)
6. Prof. Drs. Sutarno, M.Sc., Ph.D. (Universitas Sebelas Maret)

According to the theme, this conference encompasses a wide spectrum of topics including the state-of-art and recent trend in different innovative research in science, mathematics, environment and education which will be covered through plenary lectures, oral and poster presentations. To ensure the contribution of this conference to the scientific world, selected articles will be published in one of the publications as follows:

- Journal of Chemical Technology and Metallurgy (Scopus Q2)
- Journal of Turkish Science Education (Scopus, Q3)
- Journal of Technology and Science Edu (Scopus, Q3)
- AIP Conference Proceeding (Scopus)
- IJEME (International Journal of Emerging of Mathematics Education) (Sinta 2, DOAJ)
- International Journal of Paedagogy and Teacher Education (Sinta3, Copernicus, Eric)
- JKPK (Jurnal Kimia dan Pendidikan Kimia (Sinta 3)
- ICoSMEE Proceeding

I truly believe that the engagement of disciplines from different departments as well universities attending today will certainly make this conference fruitful and productive.

Finally, I would like to thank the Rector of Universitas Sebelas Maret and staffs, the Dean of Faculty of Teacher Training and Education and staffs who have given the opportunity to hold this conference.

I would also to thank all my colleagues that work together to organize this conference.

Many thanks to all the team for a good job.

Thank you

Wassalamu'alaikum warrahmatullah wabarakatuh.
May the blessings of God be upon you all.

Surakarta, 27 July 2019
Chairman of the ICoSMEE

Dr.rer.nat. Sri Mulyani, M.Si.

RECTOR SPEAKS

Assalamu'alaikum warahmatullahi wabarakatuh.
May peace and God's blessings be upon us

Welcome to Surakarta, Indonesia!

It is a great pleasure to welcome you all to the 2nd International Conference on Science, Mathematics, Environment and Education (ICoSMEE) held in Surakarta, Indonesia. On behalf of Universitas Sebelas Maret (UNS) and the committee, let me express my warmest greetings and appreciation to all speakers and participants (from abroad and within Indonesia) who come to Surakarta to attend this conference to share experiences and works related to Mathematics, Science, Environment and its education. My strong belief is that your safe journey is because of the blessings granted by the Almighty God. It is an honour for this university to have the opportunity to organize this important conference.

The 21st century and the fourth industrial revolution (Industry 4.0) are two issues closely related and have a great impact to education. An education system designed for the industrial economy is now being automated requires transformation, from a system based on facts and procedures to one that actively applies knowledge to collaborative problem solving. The main objective of the performed discussions is to examine the progress and seeking appropriate and more operational strategies addressing the challenge of a better global sustainability achievements. In the discussion, university has an important position in providing solution from both, in result-chain area and in causal-chain area. It cannot be denied that natural, environmental and education science play as a major backbone underpinning effort in seeking the solution of achieving the goal of sustainable development. Scholarly research, reviews and reports from these majors are of valuable scientific databases in achieving the goal of sustainable development.

This conference involving Science, Mathematics, Environment and Education in order to address the challenge of fulfilling holistic approaches Towards the improvement of the quality of human life without ignoring the sustainability of the environmental system.

This 2nd International Conference on Science, Mathematics, Environment and Education (ICoSMEE) aims at bringing together researchers, educators, scientists, and scholar students in the area of Science, Mathematics, Environment and Education to exchange and share their experiences, ideas, and findings and to discuss practical challenges encountered and the solutions to develop humanity and the quality of human life in a sustainable manner. It is expected that this conference will reach its declared objectives successfully. Let me wish you all a fruitful discussion during the conference and an enjoyable stay in Surakarta.

Thank you very much.

Wassalamu'alaikum warrahmatullah wabarakatuh.
May peace and God's blessings be upon you all

Surakarta, 27 July 2019
Rector

Dr. H. Jamal Wiwoho, SH,M.Hum.

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CONFERENCE SCHEDULE ICoSMEE

Time	Programme
07.00 – 08-00	**Registration**
08.00 – 08.30 *Room: Ballroom*	**Opening Ceremony** Indonesia Raya Traditional Dance Chairman Rector
08.30 – 09.15	**Keynote Speech** Prof. Yoshisuke Kumano
09.15-09.30	**Break I**
09.30-12.00 Moderator: Prof. Sulistyo Saputro Room : *Ballroom*	**Plenary Session I** Assosiate Prof. Oki Muraza Prof. Dr. Shukor.Md.Nor Prof Sutarno, M.Sc.,Ph.D
Moderator: Dr. Sri Widoretno Room : *Violant 1*	**Plenary Session II** Dr. Masitah Shahrill Prof. Mei-Tzu Cheng
12.00-13-00 *Restaurant 2nd Floor*	**Break II**
13.00- 13.30 *Violant 1-10 (1st Floor)*	**Poster Sesion**
13.30 – 15.30	**Parallel Session I**
15.30-16.00	**Break III**

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Improving Hots (Higher Order Thinking Skil) and Kognitive Performance through Sets Approach (Science, Environment, Technology and Society) By Learning Module

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Abstract: This research aims to improve: (1) HOTS (Higher Order Thinking Skill) Science Education students, (2) Student Cognitive Capabilities. This research is Classroom Action Research with the Kurt Lewin model and the Collaborative model carried out in two cycles. Each cycle begins with the preparation stage and then continues with the implementation phase of the cycle consisting of action planning, action, observation, evaluation, and reflection. The research subjects were STKIP PGRI Nganjuk Science and Mathematics Education students. Data is obtained through observation, interviews, quizzes, questionnaires and document studies. The data analysis technique used is quantitative and qualitative techniques. Based on the results of the study, it can be concluded that (1) Learning with the SETS approach (science, environment, technology, and society) with the help of modules can increase HOTS (higher order thinking skills). From the HOTS (higher order thinking skills) syntax that is determined, the following results are obtained: (a) Reasoning is obtained by the percentage of pre cycle results of 45.85%, first cycle 57.03%, second cycle 64.38%, (b) Analysis Ability obtained the percentage of pre-cycle results was 37.41%, the first cycle was 44.53%, the second cycle was 58.75%, (c) the problem solving ability was obtained by the results of the pre cycle 31.43%, the first cycle 40.48%, the second cycle 58.10 %, (d) critical and creative thinking skills obtained the percentage of pre-cycle results 38.57%, cycle I 51.05%, cycle II 69.38%, (2) Learning with the SETS approach (science, environment, technology, and society) With the help of the module it can improve students' cognitive abilities. Student learning completeness can reach 43.33% in the first cycle and 73.33% in the second cycle of the completeness standard of 65%.
Keyword: HOTS, Cognitive Performance, SETS, Module

INTRODUCTION

The SETS approach is taken from the educational concepts of STM (Science, Technology and Society), environmental education (Environmental Education / EE), and STL (Science, Technology, Literacy). In the Salingtemas or SETS approach the concept of STM or STL and EE education is seen as an inseparable unit within the concept of education and has an implementation so that students have higher order thinking skills [5]. One learning model that can help students in developing abilities communicating in writing is a learning model Science, Environment, Technology, and Society (SETS). The first SETS learning model developed by Robert Yager in 1985 in Pradeep (2005) is to focus problems from the real world which has components science and technology from the perspective of students, in it there are concepts and processes, furthermore students are invited to investigate, analyze, and apply the concept, and the process to the situationthe real one [16].

Higher order thinking skill-HOTS is a thinking process that is not just memorizing and returning information that is known. The ability to think higher is the ability to connect, manipulate, and transform the knowledge that it already has with problems that have never been taught in learning [15].

[3] Arief states that media are all physical tools that present messages stimulating students to learn, namely in the form of books. One of the teaching media that can be used by students for independent learning is in the form of modules. The learning module is the smallest unit of teaching and learning program that is studied by students themselves individually or taught by students to themselves (self instruction) [18]. In the Journal of education Macrothink Institute states that "the module can be used to study independently or individually because the module contains objective, instruction sheets, reading materials, answers keys, and evaluating tools" [16].

Modules can be used as learning material for students wherever and whenever independently because the module consists of content to evaluation.

Preliminary studies conducted at STKIP PGRI Nganjuk through observation activities obtained data 50% did not have print learning resources other than the main books used by lecturers. The results of interviews with students that students' interest in learning Basic Physics was low, this was evident when researchers followed teaching and learning activities. It was seen that almost 65% of students only listened to explanations from lecturers and 35% of students listened and were active in learning. Students in learning only record, listen and tend to be apathetic without questions or expressions of opinion so that the class atmosphere is less lively. Students learn only from books given by lecturers so that the ability to associate / reason and communicate is lacking. Student achievement data of the 2017/2018 Science Education academic year in the Basic Physics course of the lecturers stated that 34% of students had sufficient grades. Basic physics learning learns about natural phenomena as outlined in a concept / theory so that their usefulness in life can be applied, but students only read and listen to explanations from lecturers, this curbs the ability to reason, present and create students. From the observations of researchers in basic physics learning has limitations in learning print media so the need for learning media using learning modules. The SETS approach requires students 'thinking skills at a higher level so that it is expected that students' high-level thinking skills will increase. The hope of this research is through the application of the module-assisted SETS approach to improve higher order thinking skills and student cognitive skills. This research is also expected to help lecturers in implementing learning approaches using modules so that higher order thinking skills and student cognitive abilities increase. This research can also be used as additional information to develop further research from the application of the SETS approach to help the module improve higher order thinking skills (HOTS) and student cognitive abilities.

RESEARCH METHODS

The research method applied in this study is the Classroom Action Research (CAR) method. This PTK uses the Kurt Lewin model which consists of four components, namely: planning, acting (observing), observing and reflecting.

The relationship of the four components is seen as one cycle. The implementation of the four components in this study is explained in the research procedure [12].

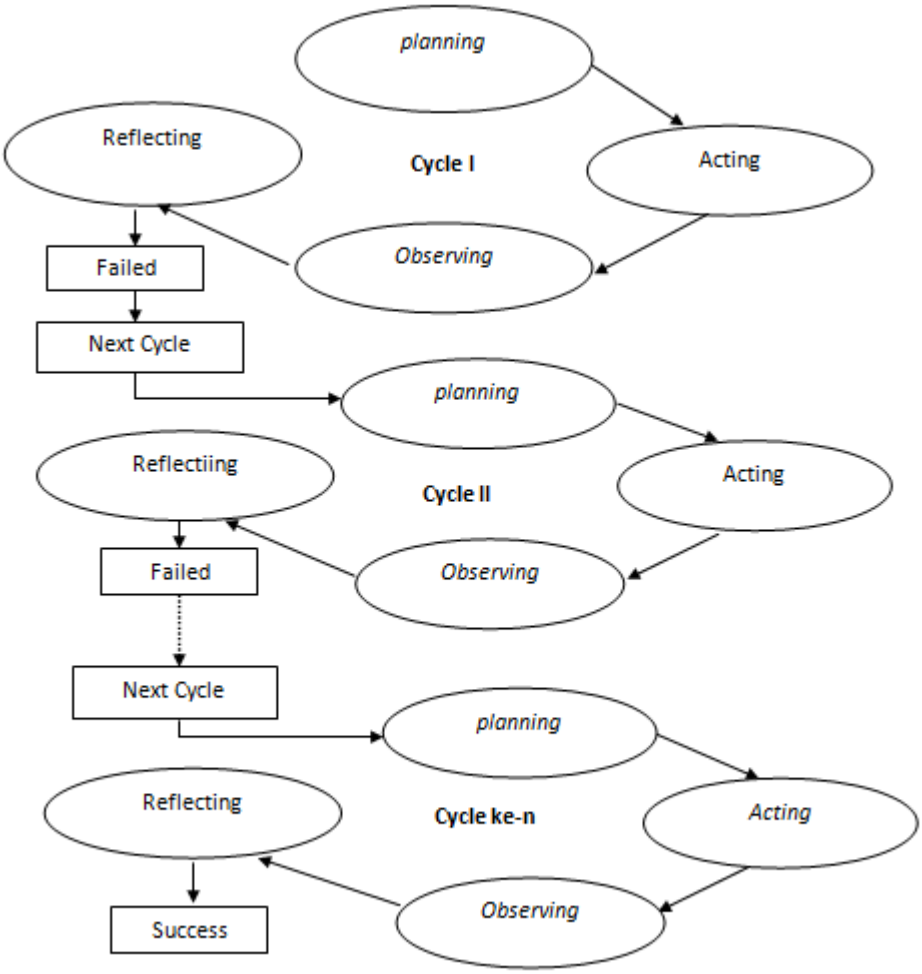


Figure 1. Module Design

The research method applied in this study is the Classroom Action Research (CAR) method. This PTK uses the Kurt Lewin model which consists of four components, namely: planning, acting (observing), observing and reflecting.

The relationship of the four components is seen as one cycle. The implementation of the four components in this study is explained in the research procedure. While in terms of relationships with other parties, PTK uses a collaborative model between lecturers and researchers.

Lecturers and researchers are also assisted by an observer or observer. Observers in this study were colleagues from researchers. The duty of the observer is to observe the process of learning in accordance with the guidelines that have been delivered by researchers and lecturers. In addition, observers can provide notes during the learning process to be used as material for discussion.

Data analysis in Classroom Action Research (CAR) starts from the beginning until the end of data collection. This is important because it will make it easier for researchers to analyze each event or situation that takes place in the class under study. This study uses data analysis qualitatively and quantitatively. Qualitative analysis is carried out in three components, namely data reduction, data presentation and drawing conclusions and verification.

The data analysis model used is interactive model can be seen in the scheme of Figure 3.1.

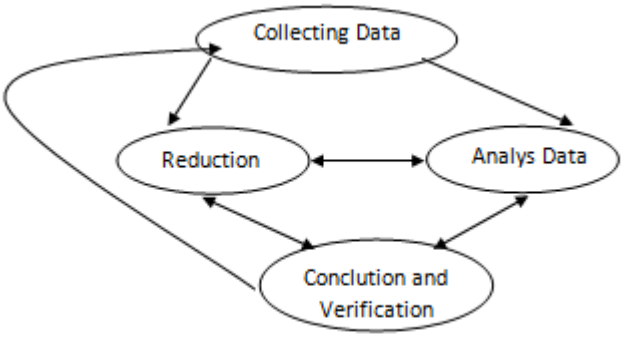


Figure 2. Analys Data

Quantitative analysis is done by descriptively analyzing the data obtained in each observation and test activity from each cycle by using the percentage technique to see the trends that occur in the learning process.

Higher order thinking skills of students obtained from the pretest and posttest are in the form of a description. To measure higher order thinking skills of students before and after learning using scientific-based physics modules can be calculated by:

$$g = \frac{S_{post} - S_{pre}}{S_{max} - S_{pre}} ..$$

Tabel 1. N-Gain

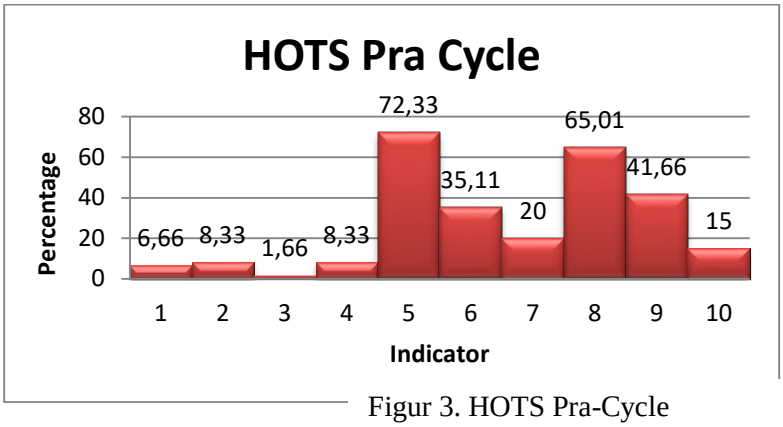
g	Keterangan
0,7<g<1	Tinggi
0,3≤g≤0,7	Sedang
0≤g<0,3	Rendah

then the hypothesis test uses parametric, and if one dta is not normal or not homogeneous, the hypothesis test uses nonparametric [17].

THE RESULT AND DISCUSSION

1.1. *The Result of Pra* cycle

This research begins with the search activities of data relating to2nd semester students of science education study program with the aim to know the initial description of the condition of semester 4 students. The HOTS are carried out include student interviews, classroom observations and studies documents. Based on the results of the pre-cycle observations conducted on March 5, 2019student HOTS is still low. This low SETS arises because of the process monotonous learning and the methods used still use methods lecture. If described in a bar diagram, namely:.

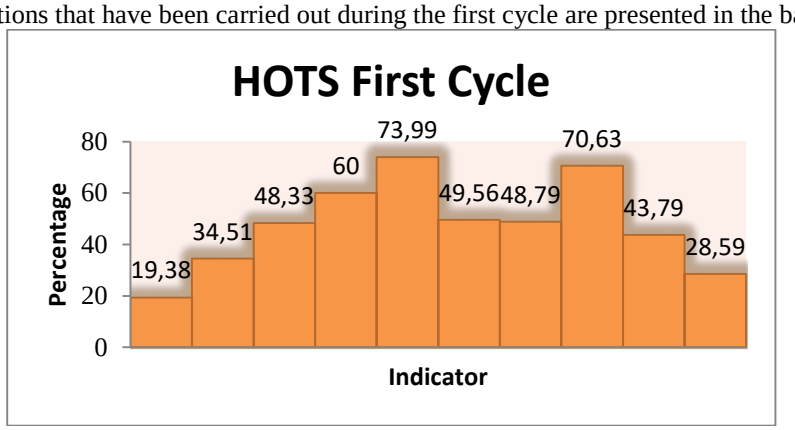


Figur 3. HOTS Pra-Cycle

1.2. The Result of First Cycle

The implementation of the action in the first cycle begins with an explanation of the learning method used by the lecturer by giving instructions on the methods and media that will be used during learning in the gauss legal material. Lecturers and students also made several agreements related to the course of learning and group division. Group division is done randomly with each group consisting of students who have high, medium and low physics learning achievements, male and female. The group formation is based on semester 1 grades. The number of students in the second semester of the IPA. STAIP PGRI Nganjuk 2016/2017 Academic Year is 10 students consisting of 7 daughters and 3 sons. Students are then divided into 5 groups with each group consisting of 2 students with group names which are the names of Children's Animation Figures. Each group is led by a chairperson. Each group member is responsible for his own achievements as well as his group's achievements.

Observations were made to find out student learning activities and events that occurred during the learning process in semester 2 classes. With direct observation of things that the lecturer might not have observed during the teaching process could be recorded by the observer. Data from direct observation is accurate data that can be used as input for the next learning process. In this study observations were carried out by researchers assisted by one research colleague. Observation of student learning activities is done through direct observation of the SEMESTER class learning process 2. Observations are carried out by researchers and fellow researchers. The focus of observation of student learning activities is the oral aspects of activities, visual activities, writing activities and emotional activities with each aspect developed into several indicators. The results of the observations that have been carried out during the first cycle are presented in the bar diagram:



Figur 4. HOTS First Cycle

CONCLUSION AND SUGGESTION

Higher Order Thinking Skill students in science education on fluida courses can be enhanced with the SETS (environmentally-science-based science) learning modules approach. Cognitive abilities of science education students in fluid courses can be enhanced through the application of SETS (environment science and society science) learning modules.

Based on learning SETS (environmentally-science-based science), the researcher recommends the implementation not only make the module but also integrating the learning device with another learning model which makes a student centre.

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