

Using Learning Science, Environment, Technology and Society (SETS) Local Wisdom and based Colloids Teaching Material

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Abstract. The aim of this study was to investigate the effectiveness of learning using SETS and local wisdom based colloids teaching material on 10th-gradesenior high school students. Pretest-posttest control group design was used as the study method. Two classes have participated. XA class was chosen as experiment group which was taught using SETS and local wisdom based colloids teaching material, while on the other hand XB class was chosen as the control group which was taught using conventional colloids teaching material. The study showed that there were significant differences between two treatments given. Entrepreneurial passion and concept understanding of experiment group were better than the control group. Overall, students' entrepreneurial passion was good. Therefore, learning using SETS and local wisdom based colloids teaching material was effective to improve entrepreneurial passion and concept understanding of students

Keywords: teaching material, SETS, local wisdom, colloids, entrepreneurial passion, concept understanding

I. INTRODUCTION

The emergence of a wide range of education in Indonesia at this time, to make people look forward to continuing with the highest education. However, not everyone can meet all their desire continued education up to higher education level. Economic factors become one of the causes of the majority of people are not able to continue their education through college. Some people are only able to cover their education up to the level of junior high school or high school.

The high unemployment rate is derived from a high school graduate, in fact, can be tackled from the beginning through learning in school. Efforts to do is to improve students' thinking was originally looking for work into creating jobs. Based on a preliminary study in 2015 by giving questionnaires to three (3) schools in the city of Pontianak comprising 1 SMA Private and 2 SMA obtained from the data as much as 72% of the 150 students aspired to be a public servant, saying: guaranteed in the old days because their retirement, do not worry about layoffs (Termination), and the work is not too heavy. The results of the questionnaire to parents of students, as many as 80% of data obtained from 120 parents want their children to become civil servants. These data indicate that the majority of the student desires and expectations of parents is to become a civil servant, but the number of jobs is not downloading inadequate. The mindset like this that should be corrected by the teacher now, because of the limited employment opportunities available.

The teacher's role is very important in the cultivation of a mindset or mental attitude of students. High School as formal educational institutions through chemical subjects have a responsibility to address the issue of unemployment. In addition, technological advances that impact on the

environment and society will make the greater challenges faced by teachers in preparing students to be independent and have the ability to work. Learning innovation needs to be done by teachers to equip students in growing interest in entrepreneurship. Interest in entrepreneurship can be influenced by the potential of one's personality [1], and entrepreneurship can be taught [2]. Entrepreneurship education is positive and significant effect on the intention to entrepreneurship [3]. Interest or desire to be an entrepreneur can be nurtured and developed through entrepreneurship education, entrepreneurship education as a source of overall attitudes and intentions to become entrepreneurs [4]. Curriculum 2013 provides an opportunity for teachers to creativity in developing the potential of students and schools so that students' interest in entrepreneurship can be nurtured and developed through learning.

Results of surveys and interviews have been conducted on high school chemistry teacher in the city of Pontianak, obtained information that the dominant teachers in delivering the learning materials. Learning is not associated with real life is happening in the community, so that students feel the benefits of learning about chemistry for life. Learning this has not been up to be one cause of understanding chemical concepts students are also not maximized, so that mastery of concepts to be low. There are still many students who have difficulty in solving chemical problems. We need a change in learning to overcome these problems. One approach that can be used are SETS (Science, Environment, Technology, and Society). SETS focused on the real world, students are encouraged to investigate, analyze, and apply the concept in real situations [5].

Learning to use SETS can encourage students to be more active and creative in dealing with problems in society [6]. SETS is a concept of learning that combines science,

events in the environment, technology, and society as a reciprocal and integrated[7]. The fact observations in chemistry in high school learning Pontianak found that learning chemistry is less associated with social issues and technology as well as technology products that have a negative impact on society. In addition, interviews also indicate that students are less interested in studying chemistry because chemistry study considers less beneficial for him. Based on this, the study uses a very urgent SETS implemented, because SETS has the objective to stimulate students to be interested in science and to help them find out how much the relationship of science to their daily lives [8].

The colloidal material is among the colloidal material which is not too difficult for the students, but in reality, there are still many students who have difficulty in studying this material. This occurs because the learning colloid has been a tendency of memorizing. Students were asked to memorize a few examples, the concepts, principles, and formulas. The learning method used more teachers without the provision of information in depth understanding of the colloid itself. The knowledge obtained by the students, not from direct experience of students in learning. This is resulting in the level of completeness of students in learning colloidal unsatisfactory.

Learning SETS on colloidal material, students are encouraged to understand the concept of colloid through direct experience at the same time solve the problem associated with the colloid in relation to technology and society. Learning activities students can do vary, such activity observed, mem-read supplement, text books, discussion group, practicum, and presentations. The real situation actually presented the teacher in the classroom in accordance with the concepts taught, for example, an event/events that developed in the community, or issues regarding the potential of local knowledge of an area. Understanding the concept of colloid students become better. This is supported by the results of research by Baeti, Binadja, and Susilaningsih [9] concluded that the lab-based learning SETS vision affects learning completeness students because the students learn by linking learning elements SETS. Meaning, understanding students in learning colloid can be improved.

One of the local potential contained in Pontianak is an aloe vera plant and durian. Agro-industry development of aloe vera in Indonesia concentrated in Pontianak in West Kalimantan province. The aloe vera plant that comes from Pontianak (*Aloeverachinensis*) is a tar-superior variety in Indonesia even acknowledged superiority in the world.drinks *Aloeverada* lempokdurianare two of nine SME products are defined as products OVOP (One Village One Product)in 2015 based on the decision letter of the Minister of Industry Number: 521 / M-IND / Kep / 12/2015 on the establishment of OVOP. Aloe vera and durian fruit used in the manufacture of ice cream mixture in the lab colloid.

The aloe vera plant and durian fruit have local wisdom values that need to be preserved. In this globalization era, the students' understanding of the values of local wisdom has begun to disappear. Local knowledge

should be preserved because of the values of local wisdom has begun to be forgotten, not much discussed and introduced again to the students, as well as in everyday life had not emerged today [10]. In addition, there are symptoms in students who believe that the concepts knowledge-scientific knowledge is more important, more necessary and as if not associated with popular culture [11].

Local knowledge is a life perspective of a society shaped by the activities of local communities in addressing issues in order to meet their needs [12]. So local knowledge can be used in addressing environmental problems. The increasing volume of waste in the season fruit durian skin it can cause problems Lingkungan late, because it is very disturbing panorama's view and smell the community. Environmental problems associated durian peel waste time earlier times is already missed because waste durian skin has been used since the first repellent for mosquitoes and flies. How to draw up waste durian skin above the cooking area, when dry burned for mosquito repellent at night, or as fuel for cooking. Likewise, the use of aloe vera naturally. Since the first of the parents if they want their children to have thick hair and black, then the child since toddlers are given aloe vera. There is even a mix of aloe vera sap from banana trees become a drug to grow hair. However, at the present time, the use of leather waste durian for nyaluk repellent and aloe vera naturally, slowly has begun to fade, unmatched by products factory which is considered more practical by the community.

To carry out a good learning necessary teaching materials. The availability of teaching materials chemistry, especially chemistry-based supplements with local wisdom SETS still rare in schools. SMAN observations from Pontianak found that supplements SETS based chemistry is not yet available with local wisdom and learning to tend to be centered on the students. Hunde and Tegegne [13]said that approach is a student-centered learning approach that engage students actively in activities that fit, teachers facilitate student activities. Instructional materials for this commonly used chemistry of students in the form of LKS (Student Worksheet), which contains a summary of the material and exercises. Teachers teaching materials obtained from the publisher. The instructional materials less attention to issues or social issues related to science and technology and local wisdom. Less instructional materials provide increased knowledge and skills of students in making responsible decisions based on scientific information.

Development of teaching materials in the form of chemical supplement (complimentary chemistry textbooks) become a very urgent need for the consequences of the implementation of the curriculum in 2013 who wanted students to learn through, then supplements can help learners to achieve competence specified. Teachers can pack such materials with fixed air-orientation on aspects of attitudes, knowledge and skills. Through the teaching materials in the form of supplements based chemistry SETS with local knowledge are expected to equip students not only the aspect of knowledge but rather a caring attitude towards the problems surrounding and values local knowledge of an

area, so skilled in managing the resources that exist independently for survival,

In colloidal supplements based SETS with local knowledge, students will be introduced to how to make products such as ice cream and ice cream aloe durian and durian peel waste package, so it has a high economic value, as well as addressing environmental problems in society. In addition, students will be introduced to local wisdom values of durian and aloe vera. This learning process can foster a caring attitude of students to the values of local wisdom and increase interest in entrepreneurship, and be able to overcome the problems that occur in the community. Sony [14] states that the entrepreneurship learning at school is very important, as the process of change and formation of knowledge, skills, attitude and the ability of an entrepreneur, either through the educator's, training, mentoring, or experience.

Thus SETS based chemistry teaching materials with local potential is very urgent to be made in order to preserve the values of local knowledge while fostering students' entrepreneurial interest. This is confirmed by Aikenhead cited by Yoruk [15] that the linking of learning technology in social life through the interaction between science, technology, and society, the students are able to recognize the impact of technology on life, thus enabling students to understand science better, and eventually learning can be exciting and fun. Rosario [16] states that the approach of linking science, technology, and society or the environment is an effective learning approach.

Based on the facts and theories that support the research-based learning using colloidal materials SETS with potential local knowledge of high school students in New York City is very urgent implemented. Learning through use of colloidal materials is expected to interest in entrepreneurship and increase student mastery of concepts, potential local knowledge possessed Pontianak city can be preserved, as well as to reduce the number of unemployed high school students in the city of Pontianak.

II. RESEARCH METHOD

This study uses experimental type of quasi experiment. The design or the design of the study using pretest-posttest control group [17], which formed two groups were selected at random, then the group was given questionnaires and tests to determine the interest in entrepreneurship and mastery of concepts students before the learning, students were given a questionnaire and tests after learning. In full as follows:

Table I
 Quasi Experimental Design

	Pretest	Treatment	Posttest
Class Experiment	O ₁	X	O ₂
Class Controls	O ₁	-	O ₂

Description:

O₁. Delivery of questionnaires and tests before being treated
 O₂. Delivery of questionnaires and tests after being treated

X: Treatment in the form of learning using colloidal teaching materials based SETS on local wisdom with potential

Using as much as two-class sample research that experimental class taught using teaching materials based colloid Science, Environment, Technology, and Society with local potential and control classes taught using the usual textbooks used by teachers (conventional learning). The determination of this class by using simplerandom sampling with lottery, obtained experimental class is the class XA, and class B. Class X controls are technique simple random sampling used for these two classes of students is based on the t-test test results concluded that both the data does not have a difference.

Data collection techniques used in the study is the measurement, observation, and interviews, while the data collection tool is a teaching material in the form of supplements based colloid Science, Environment, Technology, and Society and local knowledge, test mastery of concepts, entrepreneurial interest questionnaire, observation sheets of indoor and outdoor learning and guidelines for the interview.

Data analysis used independent-sample t-test, previous test requirements for the experimental class and control class, which is a test of normality distribution of data by using test of Shapiro-Wilk., Followed by a homogeneity test to see the diversity of data using Levene's Test of Equality of Error Variance, To address the problem of testing the hypothesis used independent-sample t test.

III. RESULT AND DISCUSSION

Accordance with the object, which is to determine the effectiveness of learning using teaching materials based colloidal SETS and local knowledge, the data collected in the form of quantitative data. This data was obtained from a questionnaire interest in entrepreneurship and tests mastery of the concept of class X_A many as 38 students were taught using colloid-based teaching materials SETS with local wisdom and X_B of 39 students who were taught using text books used by chemistry teachers. Interest in entrepreneurship and mastery of concepts developed from the indicator variables of the study, further developed, so that a grain of questionnaires and tests. Item 40 item questionnaire and tests mastery of concepts in the form of multiple choice, totaling 26 items. Validation of questionnaires and tests mastery of concepts by experts conducted before it is used for research. Further trials conducted entrepreneurial interest questionnaire and tests mastery of the concept to 29 students. Questionnaire data were analyzed using formula correlation biserial point, the results are summed up 35 points valid questionnaires. Data were analyzed using the concept mastery test KR-20 formula, the result is the reliability of the test mastery of the concept of $r = 0.92$.

Teaching materials in the form of colloidal supplements based on local wisdom SETS and validated by an expert before use in learning. This colloidal supplements composed with respect to the theory of SETS, guidelines for

the development of teaching materials, and the facts of local potential in Pontianak, so that aspect of the adequacy and appropriateness of teaching materials based SETS with local potential fulfilled.

The results of data processing interest in entrepreneurship class X SMA Pontianak show that for all aspects of interest in entrepreneurship, respondents experimental group was higher than the control group. Average for the answer "yes" every aspect of interest in entrepreneurship experimental group was chosen by 71.71% of the students while the control group was selected by 26.28% of the students. The complete frequency distribution of student interest in entrepreneurship on clearly as follows:

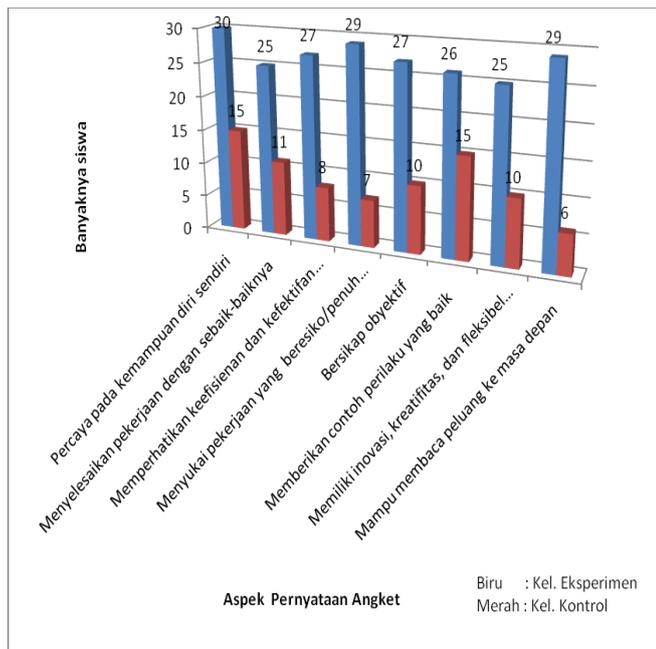


Fig. 1 The Frequency distribution of Student Interest in Entrepreneurship

Questionnaires interest in entrepreneurship in Figure 1 above shows that interest in entrepreneurship experimental group was better than the control group.

The test results for normality using the Shapiro-Wilk questionnaire data concluded that the experimental group and the control group before learning-normal distribution teachings. Furthermore, the use of Levene's Test of Equality of error variance, concluded that the questionnaire data the experimental group and the control group before learning doctrines are homogeneous. Thus the hypothesis testing conducted by independent-sample t test, the results obtained p value greater than 0.05 ($p > 0.05$), so it is concluded that there are differences in students' interest in entrepreneurship before the learning, both in the experimental group and control, Hypothesis testing is done after the implementation of learning in the experimental group and the control group.

If p value less than 0.05 ($p < 0.05$), so that there are differences in the interest of entrepreneurs concluded between control and experimental group significantly. When

viewed from the average N-gain, a control group of 0.55, while the experimental group by 0.73, then the average N-gain experimental group than the control group. This means learning to use teaching materials based colloidal SETS and local wisdom is effective to increase student interest in entrepreneurship.

Interest in entrepreneurship better in the experimental group due to student-centered learning. Students actively practice the concepts learned to make the product economically valuable and useful. The nature of learning students are trained to think as a whole and analytical in dealing with problems in life, that relate to people and technology through the knowledge already gained. Furthermore, students trying to make a technology product and market it in a small scope. Students come to understand and feel the benefits of chemistry learning.

Students' understanding of the benefits of entrepreneurship will cause them to be a tendency towards to become an entrepreneur. According to Solesvik [18] that the entrepreneurship attitude positive and significant effect on the interest in entrepreneurship. Thus the interest in entrepreneurship in the experimental group to be better than the control group.

Figure 1 shows the difference in student scores experimental group and the control group for the aspect of trust in yourself, like jobs at risk, and able to read the opportunities for the future is better than the other aspects. These three aspects are very important in increasing interest in entrepreneurship high school students. According to Hamzah [19], a strong belief in the ability of yourself will make the students being independent in their work, do not worry about failure or be ready to face the risk, always looking for new knowledge and experience to be able to read the opportunities, and are able to change any.

The questionnaire results obtained in response to learning as much as 94.74% of students (36 of 38 students) experimental group responded positively to learning, while as many as 25.64% of students (10 of 39 students) a control group gave a positive response in learning. It was concluded that the positive response of the experimental group was higher than the positive response of the control group. In line with the research results Binadja et al. [7] found a positive impression on learning can be nurtured in students through a SETS. It can be seen in Figure 2 below.

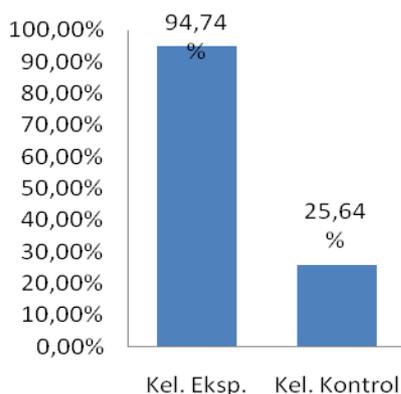


Fig. 2 Response Students to Study

Analysis of the interviews with teachers and students, there was information that the chemical-based learning SETS with local knowledge makes students aware of cultural values their own areas. Students learn about something that has become a habit of their parents or of their own community. Learning becomes fun for students.

Learning colloid use you-kan SETS based teaching materials and local knowledge, students are directly involved in conducting an investigation, information gathering, analysis, and applying the concept to solve the problems that occurred in the community based on the values of local wisdom. Active students involvement in learning can be improved their learning activities [20] and have ability to collect data or information that is better [21], Understanding the students would be better if the ability to collect data or information is good. Thus the student's mastery of concepts in the experimental group to be better than the control group.

Based on the concept of students' mastery test data, indicate that the control and experimental group increased mastery of concepts. The results of pretest in both groups using independent-sample t test were concluded there was no difference in the mastery of the concept of the two groups prior to learning. The test is conducted after fulfilling the requirements of the test, the test of normality and homogeneity. Furthermore, hypothesis test using independent sample t test to the data post-test or the data after learning in both study groups. The result p value less than 0.05 (p value < 0.05), so that there are differences in concept mastery concluded between control and experimental group significantly. Obtaining the average N-gain, indicating the N-gain experimental group was higher than N-gain control group. This means learning to use colloidal materials SETS vision and local knowledge is effective to improve students' mastery of concepts.

Some studies show that SETS learning can affect the entrepreneurship interest and student achievement. Mursalin [22] in his study concluded that the use of learning and teaching materials based SETS visionary entrepreneurship can foster students' interest in entrepreneurship, and improve student achievement. Furthermore, Dian et al. [23] concluded that the learning vision and SETS effect on student achievement. Afriawan et al. [24] concluded that the

learning approach envisions SAVI SETS at SMAN 1 Onions have a positive influence. Esmiyati et al. [25] concluded that *saling temas* based modules can improve the mastery of learning outcomes and get a positive response from the students and teachers.

The knowledge and skills acquired the students can be demonstrated through this study is not the result given set of facts, but is the result of the find and generalize itself. Thus, the increased interest in entrepreneurship and mastery of concepts better students in the experimental group than the control group is the influence of learning using teaching materials based colloidal SETS and local wisdom.

Practicum colloids make ice cream with aloe vera and durian mixture makes students eager to study chemistry, as the knowledge and skills they have learned in this lab activity can be an opportunity for him to entrepreneurship. Kusuma and Siadi [26] states that the skills-based lab activities life make students more enthusiastic about learning. It causes learning fun for students. In addition, in the learning of students are also invited to apply the science of chemistry in the entrepreneurial world while preserving the values of the local wisdom of the local potential of the city of Pontianak. In lessons also, the students invited to use the waste as the durian skin ever undertaken by their parents earlier to a creative product. Local knowledge durian skin is used by ancient people to answer the durian skin problems that are not used that cause environmental problem.

IV. CONCLUSIONS

Based on research results that have been obtained, it was concluded that the use of learning-based teaching materials SETS and local wisdom is effective to increase interest in entrepreneurship and mastery of the concept of high school students in the city of Pontianak. It is shown from the results of the data analysis concluded that there are differences in entrepreneurial interest and mastery of concepts between the control and experimental groups. Perolehan average N-higher gain experimental group than the control group, and questionnaire responses indicate a positive response from the experimental group was higher than the control group. Thus, learning using SETS based teaching materials and local knowledge can be used by teachers as one of the alternatives in growing interest in entrepreneurship and mastery of concepts, while preserving the values of local knowledge of an area, particularly the city of Pontianak.

Chemistry learning using teaching materials based on local wisdom on SETS and colloidal material can be made on other chemical materials. Teachers can encourage students to actively explore the values of local wisdom that exists around the environment and link it with chemical concepts before learning begins, because it can train students communication skills, collect information and conduct investigations in the community. It can practice the skills of scientific work and critical thinking.

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