

## Comparative Effectiveness of Science Integrated Learning Local Potential of Essential Oil Clove Leaves in Improving Science Generic Skills

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### ABSTRACT

This research aimed to test: (1) the effectiveness of integrated science learning local potential of essential oil clove leaves viewed from science generic skills; (2) comparison of the effectiveness integrated science learning local potential of essential oil clove leaves on grade VII Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik. This type of research is quasi experiment using nonequivalent (pretest and posttest) group design. The population of this study is the entire class VII Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik. Technique of sampling class using cluster random sampling. Technique of collecting data using test science generic skills. Data analysis technique used is independent test sample t-test, pair sample t-test with significance level 0,05. The results showed that: (1) integrated science learning local potential of essential oil clove leaves effectively in improving science generic skill of learners with significance value of 0.000; (2) integrated science learning local potential of essential oil clove leaves to be more effective applied in Junior High School of 3 Ngaglik than Junior High School of PIRI Ngaglik with significance value of 0.000

### KEYWORDS

Science learning, local potential, science generic skills

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### Introduction

The era of globalization challenges humans to have sufficient skills and skills to adapt to the times. Capabilities and skills that must be possessed in the global era include the ability to think critically, problem-solving skills, and the ability to create and innovate. One way to improve the skills and skills of human resources is through education, because education provides learning space, practice, and continue to forge themselves to be able to solve the challenges given within the educational environment, so unwittingly the skills and skills

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will be increasing and expected with the increased capabilities and skills of existing human resources can compete with the international world.

Education is a conscious and well-planned effort to create an atmosphere of learning and learning process so that learners actively develop their potential to have spiritual power, self-control, personality, intelligence, noble character, as well as the skills needed by him, society, nation and country as listed in Law Number 20 of 2003 on the National Education System.

Improving the quality of education is necessary because people's lives are influenced by the development of science and technology. One of the must-have skills to deal with this 21st century is generic skills. F. Brett, B. Mark & C. Craig (2011) state that students with generic proficiency have good job prospects, in science learning the skills in question are generic science skills. As stated by the National Research Council (1996) that in the 21st century the world will be filled with science and technology products so that everyone needs basic science knowledge, with the improvement of basic science skills or generic science skills are expected to help improve participants' educate.

Science generic skills can be interpreted as cognitive strategies that can relate to the cognitive, affective and psychomotor aspects that can be learned and left behind in learners (Tawil & Liliasari, 2014). Generic science skills are a very basic skill in helping students to learn to gain knowledge, build knowledge, and apply knowledge to solve new problems in learning science (Callan, 2003).

The curriculum change from KTSP to the current 2013 curriculum is expected to bring the change of education quality to be better, because in the curriculum of 2013 students are required to learn actively and able to explore the science being studied. The curriculum 2013, one of which is emphasized is the diversity of local potential, regional characteristics as well as the values of life (Sarah & Maryono, 2014). Local potential is the superiority of a region to become a valuable product or service and can supplement regional income and is unique and has a competitive advantage (Ahmadi, Amri & Elisah, 2012). Local excellence should be developed from the potential of each region. One of the most appropriate subjects to integrate with local potential is science subjects.

The curriculum 2013 requires the development of science lessons in junior high schools in the concept of integrated science, where one of its characteristics is thematic. This is in line with the opinion P. Widhiy, S. Nurrohman & W. Setyo (2013) which states that science learning in the curriculum 2013 is integrative science. Implementation of the curriculum should take into account the diversity of potential and characteristics of the region, environment, and values of life (living value). Local potential is one of the options that can be used as the basis for the selection of themes because it is contextual, interesting, and related to real life (Wilujeng, 2015). The integration of local potential in the learning process can improve the critical thinking skills of learners. This is based on research conducted by D.S. Mulyati, K. Kartimi & A. Mulyani (2015) states that there are differences in student learning activities and significant critical thinking skills between science-based learning of local excellence and who do not use science-based learning of local excellence.

The integration of local potential in science learning is needed so that learners do not forget their identity. In addition it is expected that learners are able to develop local potentials in the environment. If seen today, most learners have experienced degradation of respect for local potential and culture. One way

to cultivate a culture of loving local potentials is through science learning that is integrated with local potentials in the surrounding environment. The introduction of local potentials can increase learners' respect for local potential, recognize local wisdom values and internalize values that can lead participants educate to be a character person (Mumpuni, 2013).

Science is the unity of the body of science about nature. Science is a product of observation or observation, common sense, rational thinking and sometimes a remarkable outlook (Hewitt et al., 2007). Science is a subject that learns about the environment or nature, where learning is not only theories and only refers to the material book but directly to nature, because many things that must be explored about nature for more and more knowledge.

Nature provides various objects that can be associated with science learning both biotic objects (plants and animals) as well as abiotic objects (water, air, and stone) so that learners are more familiar with the learning environment. One of the biotic objects in the form of plants that can be used in science learning is clove plant.

Clove plants other than cloves taken for sale, dried clove leaves can be processed into essential oils that have a relatively high selling value. Where in the process of clove leaf processing involves the process of science. So that these clove plants can be incorporated into the learning materials of science. In the process of treating clove leaf oil involving the process of science is the process of separation of the mixture based on the boiling point. In addition, learners can also study the physical properties and chemical properties of clove leaves so that learners can learn directly at the processing of essential oil of clove leaf.

Science learning directly will provide a more meaningful experience to learners because students are faced with events that are actual and accountable for their truth. Natural phenomena that appear around the environment of learners will help learners in understanding the concepts and theories they have learned, so that learners can take an action when finding the same phenomenon. Similarly, E. Septianu, S. Sudarmin & A. Widiyatmoko (2014) argues that the learning process will be more meaningful and the information obtained will last longer if there is a link between the initial concept of the student and the new concept being studied.

Based on the results of observations pre-study at Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik obtained information that learners have not optimize the sensory devices that are owned in the process of learning science either to observe or conduct simple experiments, learners can not utilize the existing measuring tool in understanding learning materials Science which is being studied. In addition, learners are not optimal in answering questions related to the logical relationship between the two rules, because when given a question by the teacher related to the logical relationship between the two rules of learners tend to be confused and long in answering questions.

Learners are not yet optimal in answering questions related to causal relationships of natural phenomena encountered in everyday life, although the things that have been asked by teachers and learners have not been able to make the modeling of the material being studied, it can be seen from how learners make an analogy of a problem. This indicates that the generic skills of the learners are not optimal yet. In addition, learning activities undertaken in



schools have not exploited local potential, so that generic science skills possessed by learners has not been optimal. Integrated learning tools science local potential in the form of lesson plan and students worksheet with material changes in the objects around us have been developed and proven effective in improving the generic skills of science students class VII Junior High School of 3 Bumiayu academic year 2015/2016 (Haepi, 2016).

The problem that can be concluded is the learning of science integrated local potency of essential oil of clove leaf is effective in improving science generic skill of students of class 7th Junior High School. The objective of this research is to examine the effectiveness of science learning integrated local potency of clove leaf essential oil in improving generic science skill of class 7th Junior High School. The benefits that can be obtained from the research is in improving the students generic skills.

### Research method

The type of research used in this study is quasi experimental research (quasi experiment). Selection of this type of research because not all variables that appear and experimental conditions can be measured or controlled. This research was conducted at Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik, Sleman, Special Region of Yogyakarta academic year 2016/2017 in the odd semester of the academic year 2016/2017. The population in this study are all students of class 7th Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik. Selection of this school is done by purposive that is based on school status that is school with state and private status. Sampling is done by determining a class that will be given an integrated science learning local potential of clove leaf essential oil from each school. The research design can be shown in Table 1.

**Table 1.** Research Design

Group	Pretest	Treatment	Posttest
E <sub>1</sub>	O <sub>1</sub>	X <sub>1</sub>	O <sub>2</sub>
E <sub>2</sub>	O <sub>1</sub>	X <sub>1</sub>	O <sub>2</sub>

Source: (Cohen, 2007)

Information:

E<sub>1</sub>: eksperiment group 1

E<sub>2</sub>: eksperiment group 2

X<sub>1</sub>: integrated science learning local potential of essential oil clove leaf

O<sub>1</sub>: *Pretest*

O<sub>2</sub>: *Posttest*

This research data collected through research instrument that is test. The test is used to measure generic science skills. Data analysis technique used in this research is independent sample T-test to know the effectiveness of integrated science learning local potential of clove leaf essential oil with SPSS program version 16.

Data analysis technique used in this research is descriptive analysis and inferential analysis. Descriptive analysis to display data in the number of learners, the average value, the highest value, the lowest value and standard deviation. Inferential analysis using independent sample test T-test to know the effectiveness of science integrated learning local potential of clove leaf essential oil at Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik with help of program SPSS version 16. Test of independent sample T-test done after data obtained tested correlation and tested differently.

Increased generic skills of learners' science are analyzed based on the normalized gain obtained from the pretest and posttest scores. The gain data was obtained using the normalized gain technique  $\langle g \rangle$  (Meltzer, 2002). The equation for normalized gain is as follows.

$$\langle g \rangle = (\text{posttest score} - \text{pretest score}) / (\text{maksimum score} - \text{pretest score}) \quad (1)$$

The criteria of standardized gain value categories according to R.R. Hake (2007) are shown in Table 2.

**Table 2.** Category Gain Normalized

No	Gain Score Normalized	Kategori
1	$g \geq 0,7$	High
2	$0,7 > g \geq 0,3$	Medium
3	$g < 0,3$	Low

Before conducting an inferential analysis, first conduct a test of analytical preference test, namely normality test and homogeneity test in each experimental class. Normality test using Shapiro-Wilk because the sample amount is more than 30, while homogeneity test using Lavene test.

## Findings

**Table 3.** Data Description Science Generic Skills at Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik

No.	Komponen	Junior High School of 3 Ngaglik		Junior High School of PIRI Ngaglik	
		Pretest	Posttest	Pretest	Posttest
1	The number of students	32	32	26	26
2	Average Value	42,97	87,50	42,59	80,48
3	The highest score	55,00	95,00	50,00	87,50
4	Lowest Value	35,00	72,50	37,50	67,50
5	Standard Deviation	4,28	5,49	3,70	4,18

As can be seen in Junior High School of 3 Ngaglik the average pretest and posttest score of science generic skills are 42.97 and 87.50. The range of values for pretest is from 35.00 to 55.00, the range of values for the posttest is from 72.50 to 95.00, with the standard deviation on the posttest being 5.49. The larger the standard deviation the greater the sample diversity. The data information at Junior High School of PIRI Ngaglik that the average pretest and posttest score of science generic skills are 42,59 and 80,48. The range of values for pretest is from 37.50 to 50.00, the range of values for the posttest is from 67.50 to 87.50, with the standard deviation on the posttest being 4.18. The mean



of posttest result in both schools shows that the integrated science learning local potential essential oil of clove leaf at Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik effective improving science generic skills.

**Table 4.** Gain Score Normalized of Science Generic Skills

Aspect	Eksperiment Group 1 (Junior High School 3 Ngaglik)				Eksperiment Group 2 (Junior High School PIRI Ngaglik)			
	Pre tes	Post test	Gain	Categor ized	Pre test	Post test	Gain	Categoriz ed
Direct observation	59,38	88,13	0,63	Medium	60,00	86,86	0,67	High
Indirect observation	53,91	85,94	0,69	Medium	55,77	74,04	0,41	Medium
Logic inference	40,10	85,16	0,75	High	40,38	82,69	0,71	High
Law of cause and effect	52,23	82,14	0,63	Medium	59,89	73,08	0,32	Medium
Modeling	43,75	90,36	0,83	High	41,35	79,23	0,64	High
<b>Average</b>	<b>49,87</b>	<b>86,35</b>	<b>0,71</b>	<b>High</b>	<b>51,48</b>	<b>79,18</b>	<b>0,55</b>	<b>Medium</b>

As can be seen gain score of generic science skills in both schools presented in Table 3 shows that the score gain score at Junior High School of 3 Ngaglik is greater than Junior High School of PIRI Ngaglik is 0.71 and 0.55. The effectiveness of the application of science learning integrated local potential of clove leaf essential oil was analyzed using independent test of T-test sample. After that, to know the difference in effectiveness between the two schools is done further analysis by comparing the value of gain score science generic skills. The result of prerequisite analysis test includes normality test and homogeneity test. The results of homogeneity test of generic science skills data are presented in Table 5.

**Table 5.** Test Generality Data Skills Generic Science

No	Nilai	Junior High School of 3 Ngaglik			Junior High School of PIRI Ngaglik		
		Statistics	Df	Sig	Statistics	Df	Sig
1.	<i>Pretest</i>	0,951	32	0,156	0,936	26	0,128
2.	<i>Posttest</i>	0,945	32	0,103	0,915	26	0,134

As can be seen the significance value of pretest and postes data of Junior High School of 3 Ngaglik and PIRI Ngaglik is greater than 0.05, it indicates that the generic science skill data is normally distributed. The magnitude of significance value of pretest and posttest data of generic science skill in SMP N 3 Ngaglik is 0,156 and 0,103, whereas value of significance of pretest and posttest data of science generic skill at SMAN PIRI Ngaglik is 0,128 and 0,134. Generic science skill data in both schools is normally distributed so that further analysis can be done.

**Table 6.** Homogeneity Test Data Science Generic Skills

No	Variabel	Junior High School of 3 Ngaglik		Junior High School of PIRI Ngaglik	
		F	Sig	F	Sig
1.	Science Generic Skills	1,864	0,177	0,490	0,807

As can be seen the significant value of the generic science skill variable in Junior High School of 3 Ngaglik is greater than 0.05, so it can be seen that the generic skills data of science students in Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik comes from a homogeneous population. The value of significance in Junior High School of 3 Ngaglik is 0.177, whereas the significance value of science generic skill variable in Junior High School of PIRI Ngaglik is 0,807.

The result of homogeneity analysis shows that the data from both schools are in the homogeny population so that further analysis can be done. Based on the result of prerequisite analysis both normality test and homogeneity test show that for assumption test have been fulfilled, so that can be tested hypothesis.

The generic science skills variable is tested by paired sample t-test. Paired sample t-test is a different test of two paired samples. Paired samples are the same subjects but undergo different treatments. This test is used to determine the effectiveness of the learning of science integrated local potency of essential oil of clove leaf in improving generic science skill of learners at Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik and Junior High School of PIRI Ngaglik presented in Table 7.

**Table 7.** Hasil Uji Paired Samples Correlations

No	Group	Data	N	Correlations	Sig
1.	Junior High School of 3 Ngaglik	<i>Pretest &amp; Posttest</i>	32	0,543	0,001
2.	Junior High School of PIRI Ngaglik	<i>Pretest &amp; Posttest</i>	26	0,523	0,000

As can be seen the significance of the result of paired samples correlations test at Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik shows that between pretest and posttest values have high correlation (significant) because significance value less than 0.05. The value of significance in Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik is 0.001 and 0.000.

The results of different test paired samples test are presented in Table 8.

**Table 8.** Result of Between Samples Test

No	Group	Data	T	df	Sig (2-tailed)
1.	Junior High School of 3 Ngaglik	<i>Pretest &amp; Posttest</i>	-35,420	31	0,000
2.	Junior High School of PIRI Ngaglik	<i>Pretest &amp; Posttest</i>	-35,753	25	0,000

As can be seen in Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik significance value less than 0.05, so it can be concluded that the



learning of science integrated local potential of essential oil of clove leaf effective in improving science generic skill of class VII students of Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik. The significance value at both schools is 0.000, so it is necessary to test independent sample t-test. The test results of independent sample T-test are presented in Table 9.

**Table 9.** Independent Sample T-test

	<i>Independent Samples Test</i>		
	T	Df	Sig. (2-tailed)
<i>Equal variances assumed</i>	5,365	56	0,000
<i>Equal variances not assumed</i>	5,517	55,792	0,000

As can be seen sig value. (2 tailed) of  $0.000 < 0,05$  so that  $H_0$  is rejected and  $H_a$  accepted. Based on the analysis it can be concluded that there is a significant difference between science generic science average of Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik, this condition indicates that the learning of science integrated local potential of clove leaf essential oil is more effective in increasing science generic skill at Junior High School of 3 Ngaglik with Junior High School of PIRI Ngaglik. The comparison of gain score for generic science skill of learners at Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik presented in Table 10.

**Table 10.** Gain Score Science Generic Sains

No	Group	Gain Science Generic Skills
1.	Junior High School of 3 Ngaglik	0,710
2.	Junior High School of PIRI Ngaglik	0,550

As can be seen generic science gain gain value in Junior High School of 3 Ngaglik greater than in Junior High School of PIRI Ngaglik, where the value of the gain in Junior High School of 3 Ngaglik is 0.710 while the gain value in Junior High School of PIRI Ngaglik is 0,550.

## Discussion and conclusion

This study aims to determine the effectiveness of learning science integrated local potential of clove leaf essential oil in improving generic skills science students. The material used for this research is about changing the objects around us. The local potential that is integrated with this research is about clove leaf essential oil industry in Ngaglik, Sleman, Yogyakarta. The research was conducted in Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik. The effectiveness of learning is related to the level of successful implementation designed by educators to achieve learning objectives (Sanjaya, 2008). Based on this definition of learning process is said to be effective if in implementya produce quality output in accordance with predetermined learning objectives. The data obtained from the questionnaire is quantitative, it is necessary to define the criteria for a given range of scores.

Science is a science of nature where we will get information when we find out. Science is not only about the collection of knowledge but a process of discovery. In the process of discovery, of course, learners should have initial knowledge so that what is done is in accordance with the procedure. A person who wants to learn science must have basic skills that is generic science skills.



Based on the hypothesis test on the data obtained in Junior High School of 3 Ngaglik, obtained information that the value of significance 0.000. This science integrated local potential of clove leaf essential oil is effective in improving generic science skill in Junior High School of 3 Ngaglik.

Based on the information obtained from hypothesis test results in Junior High School of PIRI Ngaglik, the magnitude of significance value is 0.000. This indicates that the significance value is less than 0.05, then  $H_0$  is rejected and  $H_a$  is accepted, so it can be concluded that the learning of science integrated local potential of clove leaf essential oil is effective in improving generic science skill at Junior High School of PIRI Ngaglik.

Hypothesis test results at Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik both show the effectiveness of learning science integrated local potential of clove leaf essential oil in improving generic science skills. A. Coney (2005) states that learning is a process whereby a person's environment is deliberately managed to enable learners to participate in certain behaviors under special conditions to generate responses to a particular situation.

Based on Independent samples t-test analysis, it can be seen that the value of sig 0.000 means less than 0.05, so it can be concluded that there is significant difference between generic science skill in the two schools. Thus, integrated IPA learning local potency of clove leaf essential oil is more effective in improving generic science skill at Junior High School of 3 Ngaglik compared with Junior High School of PIRI Ngaglik. The comparison of generic science skill gain scores in both experimental groups is presented in Figure 1.

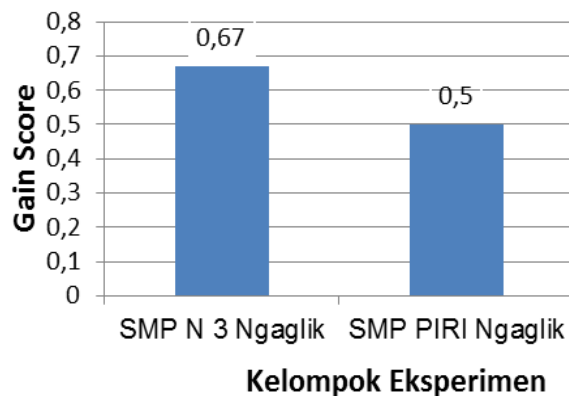


Figure 1. Comparison of Gain Score on Both Experiment Groups

The results of this study are in accordance with the results of research conducted by Septiani & Woro (2014) on the effectiveness of module-assisted inquiry models in improving the understanding of generic science concepts and skills with  $p = 0,000 < \alpha = 0.05$  with the conclusion that inquiry learning model inquiry module effective to improve understanding of generic science concepts and skills. In addition, research conducted by S. Sarah & Maryono (2015) on the effectiveness of potential local-based learning in high school physics learning in improving student living value, with  $p = 0,008 < \alpha = 0.05$ , with the conclusion that high school physics learning based on local potential is effective in



improving student's living value. S. Yilmaz, R. Olgan & E.A. Yilmaztekin (2016) stated that outdoor learning makes the students become more active and explorative in following learning activities.

Learning science that is integrated with local potential can provide meaningful experiences to learners because learners are given the opportunity to be able to improve generic science skills through direct or indirect observation in the learning process. Through these observations, the learner will be able to use the previous knowledge to solve the problems encountered, able to refer to the logic, to understand the law of cause and effect on the learning activities that are being done, and can do the modeling related to the learning being done.

Pretest and posttest data at Junior High School of 3 Ngaglik and Junior High School of PIRI Ngaglik both show the effectiveness of learning science integrated local potency of clove leaf essential oil in improving generic science skill, where study of science integrated local potential of clove leaf essential oil more effective at Junior High School of 3 Ngaglik school with country status). This is in accordance with the results of research conducted by U. Varicha (2017) on the development of science learning with scientific-based local potential approach to improve the ability of thinking and scientific attitudes of grade VII students of Junior High School IT Insan Permata Bojonegoro. Integrated learning science local potential can make science learning more meaningful and can improve student learning outcomes (McCormack, 1992).

Based on the explanation, it can be concluded that: (1) integrated learning of local potency of essential oil of clove leaf is effective in increasing generic science skill; (2) science learning integrated local potency of essential oil of clove leaf more effectively improve generic science skill at Junior High School of 3 Ngaglik than Junior High School of PIRI Ngaglik.

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The Authors reported that no competing financial interest.

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