



## Learners' skills affected by the integration of local potential in biology: A review study



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### ABSTRACT

Integration of local potential in biology is important as a form of learning that is more contextual and brings students closer to the object, the reality of life. The purpose of this research review is to examine the kinds of local Indonesian potential that are integrated in biology learning according to the biology topic raised so it will be known how the effect to student's skills. This research is a review analysis following 4 steps. 21 articles were selected from 33 article published in the last 5 years (2015-2019). Eligibility of the 21 selected journals was checked through expert judgement based on criteria. The research article was searched using the Educational Resources Information Center (ERIC), Sinta Indonesia, and Google Scholar online database. The results of the analysis show that the kinds of local potentials integrated in biology are natural resources, simple technology, and the surrounding environment. Biology topics that apply the integration of local potential in biology are the environment, ecosystem, biodiversity, and plant structure. The integration of local potential in biology affects 5 student's skills, that are literacy skills, science process skills, generic skills, thinking skills, and science attitude skills. The effect size results show that the effect of integration of local potential is greatest on generic skills with the big category, while other skills experience significant fluctuations. The results of this review can be followed up by optimizing efforts to strengthen the integration of local potential in biology through appropriate learning strategies.



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### Introduction

Biology is a part of science has specific materials characteristics that are different from other sciences it because the object of the study in biology are living things, the environment and the relationship between the two. The essence of biology learning is

the interaction between subjects, that is students and the object being studied. In biology learning, teachers are expected to be able to relate the material being taught in real situation so that students can connect knowledge with its application in everyday life (Ardan, 2016). Therefore, as implementers of learning activities,

teachers are given the opportunity to raise local potential problems in biology learning, especially on concrete subjects. The use local potential as a learning resource is one of the characteristics in the curriculum so that it can be applied and makes learning more meaningful (Sarah & Maryono, 2014). Local potential is a local resource that is owned by a particular region (Cahyaningtyas, Wilujeng, & Suryadarma, 2017). Local potential in an area can be in the form of the physical environment such as the diversity of flora, fauna and the use of simple technology in society (Sudarisman, 2015), local wisdom which contains traditional knowledge, natural resources and local culture (Ardan, 2016), all of which can be used as learning resources.

The diversity of local potentials in Indonesia is one aspect that needs to be integrated in biology learning. The general goal of integrating local potential in biology is to prepare students to have a deeper and broader understanding of their environment and the right attitude towards local potential (E. C. Dewi, Suryadarma, & Wilujeng, 2018). The integration of local potential into learning process is needed so that students can develop the local potential around them to learn (Kurniawati, Prasetyo, Wilujeng, & Suryadarma, 2017). The integration of local potential in learning is needed and even more so in the current situation where the younger generation has decreased knowledge of the local potential and culture of the region they have (Wilujeng, Prasetyo, & Suryadarma, 2017). To overcome the problem of degradation of youth's respect for regional potential, it can be started by integrating the local potential that is around students into learning process (Kurniawati et al., 2017). The integration of local potential in learning will make students as teenagers know the values related to local wisdom so that they will experience internalization of values that can make them personally characterized (Wilujeng et al., 2017).

Several studies have been carried out by integrating local potential in biology learning and having a positive influence on the various skills of students. The importance of integrating local potential in biology learning as a learning resource encourages researchers to study what skills can be influenced through the integration of local potential in biology.

This article will identify and analyze research on biology learning that has integrated local potential in published journals. The purpose of writing this article is to determine the type of local potential used, the topic of focused in biology, what skills are affected, and how strong is in influence of local potential integration in biology on each of the skills of the affected students.

Based on this background, this study was conducted to analyze various relevant journals on the integration of local potential in biology learning in relation to the skills of affected students. In addition, it will also be analyzed how much influence the integration of local potential has on each variable of students' skills so that it will be known which skills have the greatest influence through the integration of local potential in biology learning. To support the research objectives, the following research questions were asked: (1) what kinds of local potential are integrated into biology learning? (2) what biological themes or topics are covered through the integration of local potential? (3) what skills can be influenced by the integration of local potential in biology learning? (4) what skills have the greatest effect size that is influenced by the integration of local potentials in biology learning?

## Method

This research is a meta-analysis research by adopting the literature review method conducted by Durst and Edvardsson (2012) with the following steps:

- (1) Determine the area to be discussed and literature search

The areas to be studied in this study are in accordance with the following questions: 1) the kinds of local potentials used, 2) the biology themes or topics covered, 3) the skills that are affected, 4) the skills that have the greatest effect size. Data was collected by searching for literature in the form of research journals indexed by Scopus, SINTA, and Google Scholar on various website that are Educational Resources Information Center (ERIC), SINTA Indonesia, and Google Scholar. The journals analyzed in this study amounted to 21 with the research subjects were high school students and university students. The 21 selected

journals analyzed in this study were 6 Scopus indexed journals, 14 SINTA indexed journals (minimum SINTA 2) and 1 google scholar indexed journal.

(2) Determine inclusion and exclusion criteria

Inclusion and exclusion criteria were used as the basis for searching research journals. For inclusion criteria: 1) the keywords used in the journal literature search are "biology, local potential, local excellence, local wisdom, and local content", 2) research journals that examine the integration of local potential or the utilization of local potential in biology learning in Indonesia and has an influence on the skills of students. The exclusion criteria limiting this study: 1) research journals published in the last 5 years (2015-2019). The first search was carried out using the Educational Resources Information Center (ERIC) online database with the keywords "biology, local potential, local excellence, local wisdom". Seven relevant selected journals were found and 2 journals were selected. The second search used the keyword "local potential, local wisdom, local excellence, local content" in SINTA Indonesia online database and 11 journals were selected from 14 relevant journals. The third search was conducted using Google Scholar online database and 8 journals were selected from 12 relevant journals with the keyword "biology, local potential, local wisdom, local content". Eligibility of the 21 selected journals was checked by expert judgment base on inclusion and exclusion criteria.

(3) Analysis

Data analysis is focused on knowing the type of local potential used, the scope of biology themes or topics through the integration of local potential, the kinds of skills of students who are affected and the skills have the greatest effect size through the integration of local potential in biology. The effect size estimation is done to determine how strong the influence between variables in each study that is the effect of integration of local potential in biology on the skills that are affected. Quantitative data were obtained from the results of research in 21 journals by taking the mean and standard deviations or the t-test and df (independent groups) values based on their statistical calculations. Furthermore, these values were analyzed

to obtain Cohen's d and effect size r using the online application Effect Size Calculator by Dr. Lee A. Becker accessed by <https://www.uccs.edu/lbecker/>. To find out how strong the variable skills of students are affected by the integration of local potential in learning, it is necessary to see the value of Cohen's d obtained and adjusted to the criteria (Table 1) so that the interpretation is known.

Table 1. Interpretation size effect based on Cohen's d value

Size	Interpretation
$0.8 < d < 2.0$	Big
$0.5 < d < 0.8$	Average
$0.2 < d < 0.5$	Small

(4) Writing

Writing is done by presenting the data and analyzing the results.

## Results and Discussion

Data identification on 21 selected journals shows that through the integration of local potential in biology learning, it has an influence on some of the skills of students. There are even some research results show that through the integration of local potential in biology it can affect and improve not only one student skills. The data presented in the table are journal identities and research information on the integration of local potential in biology. The identification results are presented in Table 2.

### 1. Local potential integrated in biology

The results of the analysis of 21 journals in Table 2 show that almost 60% of the local potential integrated in biology learning is natural resources, 31% is simple technology and 2% is the surrounding environment. The characteristics of Indonesia which have diversity and potential resources in each area are very abundant and diverse (Wilujeng & Suryadarma, 2018), so that the ecological aspects developed from local potential in the form of natural resources can educate and protect the environment (Sya`ban & Wilujeng, 2016). Local potential is a specific resource that is owned by an area including natural resource potential, human resources, geography, culture and history (Wilujeng & Suryadarma, 2018) and is one of the themes of environment-based learning.

Table 2. List of articles on the integration of local potential in biology learning in Indonesia by researchers

No	Year	Author	Skills are influenced by the integration of local potential	Local potential used	Biology theme/topic
1.	2018	Ellin Carlina, Djukri	Environmental literacy	Natural resources (Baruppu')	Ecosystem
2.	2017	Insih Wilujeng, Zuhdan Kun P., IGP. Suryadarma	Nature of Science (NoS): Science process skills, generic skills, critical thinking	Natural resources and simple technology	Environment and ecosystem
3.	2017	Riris Riezqia Budy Rahardini, I. Gusti Putu Suryadarma, Insih Wilujeng	Science process skills	Simple technology (PLTMH)	Environment
4.	2017	Arifah Putri Kurniawati, Zuhdan Kun Prasetyo, Insih Wilujeng, I. Gusti Putu Suryadarma	Science process skills	Simple technology (Javanese brown sugar)	Environment
5.	2017	Susanti, Zuhdan Kun Prasetyo, Insih Wilujeng	Generic skills	Natural resources (essential oil clove leaves)	Environment
6.	2019	Elya Nusantari, Ramli Utina, Abubakar Sidik Katili, Yowan Tamu	Conservation character	Natural resources (coastal area of Gorontalo Province)	Ecosystem
7.	2019	Khatriya Tiffani Tamimiya, I. Gusti Putu Suryadarma	Conceptual understanding, creative thinking	Natural resources (mount Ijen)	Environment
8.	2019	Diana Hernawati, Mohamad Amin, Mimien Henie Irawati Al Muhdhar, Sri Endah Indriwati	Science literacy	Natural resources (diversity of animals and plants in Tasikmalaya)	Biodiversity
9.	2017	B. Setiawan, D.K. Innatesari, W.B. Sabtiawan, Sudarwin	Science Literacy	Natural resources (mount Kelud)	Environment
10.	2017	I.P.M. Dewi, I.G.P. Suryadarma, I. Wilujeng, S. Wahyuningsih	Critical Thinking	Simple technology (wood carving and pottery)	Environment
11.	2017	A. Dwianto, I. Wilujeng, Z. K. Prasetyo, I.G.P. Suryadarma	Science process skills, scientific attitude	Natural resources	Environment
12.	2016	D. Setiawan, I. Wilujeng	Science process skills	Natural resources (red onion farming)	Biodiversity
13.	2019	Agnesi Sekarsari Putri, Nurfina Aznam	Critical thinking, problem solving	Simple technology (batik)	Environment
14.	2016	Muhammad Fuad Sya'ban, Insih Wilujeng	Science literacy, environmental attitude	Natural resources (peatlands of Kalimantan Selatan)	Ecosystem
15.	2017	Aries Anisa	Critical thinking	Simple technology (making pottery and furniture)	Environment
16.	2019	Dwi Hartanti, Sajidan, Baskoro Adi Prayitno	Self-regulation, environment attitude	Natural resources (umbul Tlatar)	Plant structure
17.	2019	Siti Sriyati, Wahyu Rimbun, Amprasto	Creative thinking	Natural resources (mangrove)	Ecosystem
18.	2016	Dani Setiawan, Insih Wilujeng	Environmental attitude	Natural resources (onion agriculture)	Environment
19.	2019	Isna Amanatul Hayati, Dadan Rosana, Sukardiyono	Science process skills	Surrounding environment	Environment
20.	2017	Insih Wilujeng, I.G.P. Suryadarma	Science process skills, conceptual understanding	Simple technology (PLTMH)	Environment
21.	2016	Akhiruddin, Herawati Susilo, Ibrohim	Science process skills	Surrounding environment	Environment

Developing local potential-based biology teaching materials such as modules (Akhiruddin, Susilo, & Ibrohim, 2016; Hartanti, Sajidan, & Prayitno, 2019; Hayati, Rosana, & Sukardiyono, 2019; Putri & Aznam, 2019; B. Setiawan, Innatesari, Sabtiawan, & Sudarmin, 2017) is an effective way to introduce students to the potential of the area it has. Through developing and integrating local potential in biology, it can emphasize scientific concept and strengthen national identities with various cultural diversity. Based on the results of reviews on 21 selected journals, identification of Indonesia's local potential which is integrated in biology are: natural resources (Carlina & Djukri, 2018; Dwianto, Wilujeng, Prasetyo, & Suryadarma, 2017a, 2017b; Hartanti et al., 2019; Hernawati, Amin, Al Muhdhar, & Indriwati, 2019; Nusantari, Utina, Katili, & Tamu, 2020; B. Setiawan et al., 2017; Dani Setiawan & Wilujeng, 2016; Sriyati, Rimbun, & Amprasto, 2019; Susanti, 2017; Sya`ban & Wilujeng, 2016; Tamimiya & Suryadarma, 2019; Wilujeng et al., 2017), simple technology (Anisa, 2017; I. P. M. Dewi, Suryadarma, Wilujeng, & Wahyuningsih, 2017; Kurniawati et al., 2017; Putri & Aznam, 2019; Rahardini, Suryadarma, & Wilujeng, 2017; Wilujeng et al., 2017; Wilujeng & Suryadarma, 2018), and surrounding environment (Akhiruddin et al., 2016; Hayati et al., 2019).

## 2. Biological topics

In general, research topics that produce good data can be used as learning materials and can be used as a consideration for further research in relevant fields. Table 2 shows that the biology topics used through the integration of local potentials are environment (63%), ecosystem (23%), biodiversity (9%) and plant structure (4%). The results of the analysis show that almost all real biology topics can be done with local potential-based learning. Biological material is closely related to the real world context, therefore this local wealth or potential can be used as a theme in developing teaching materials and integrated in learning (Tamimiya & Suryadarma, 2019), so that biology learning becomes more contextual. Local potential that is internalized in biology is one of the tools to present biological material that is suitable for everyday life (Situmorang, 2016). Exploration of learning topics that promote everyday life can be optimized by applying

the concept of scientific learning with a project-based learning model (Carlina & Djukri, 2018; Hernawati et al., 2019; Tamimiya & Suryadarma, 2019) and discovery learning model (Hartanti et al., 2019).

Based on the results of the review, the material in the study integrates local potential for high school students and university students are: environment (Akhiruddin et al., 2016; Anisa, 2017; I. P. M. Dewi et al., 2017; Dwianto et al., 2017a; Hayati et al., 2019; Kurniawati et al., 2017; Putri & Aznam, 2019; Rahardini et al., 2017; B. Setiawan et al., 2017; Dani Setiawan & Wilujeng, 2016; Susanti, 2017; Tamimiya & Suryadarma, 2019; Wilujeng et al., 2017; Wilujeng & Suryadarma, 2018), ecosystem (Carlina & Djukri, 2018; Nusantari et al., 2020; D. Setiawan & Wilujeng, 2016; Sriyati et al., 2019; Sya`ban & Wilujeng, 2016; Wilujeng et al., 2017), biodiversity (Hernawati et al., 2019; D. Setiawan & Wilujeng, 2016), and plant structure (Hartanti et al., 2019).

## 3. Learners' skills are affected by the integration of local potential

The results of the study in Table 2 show that integrating local potential into learning affects the various skills of students in relation to skills in the field of biology. This is because through learning by integrating local potential will train students to observe objects directly, make observations, find various problems in life and in the end students can provide solutions related to these problems, so that it will provide positive aspects of changes in student attitudes (Jumriani & Prasetyo, 2017). It is known that the skills of students that can be influenced through the integration of local potential based on the identification results in the review article consist of: literacy skills, science process skills, generic skills, thinking skills, and scientific attitude skills.

### 3.1 Literacy skills

Literacy skills in biology are the ability to use the process of scientific inquiry about biological problems, communicate them and integrate them into decision making (Suwono, Pratiwi, Susanto, & Susilo, 2017). The utilization of local potential has a direct contribution as a source of learning in order to develop the potential of students (Baxter, 2007). Biology learning that integrates local potential can develop literacy skills of students related to the environment itself.

Based on the identification results in the article, literacy skills that are influenced through the integration of local potential are: science literacy (Hernawati et al., 2019; B. Setiawan et al., 2017; Sya`ban & Wilujeng, 2016) and environmental literacy (Carlina & Djukri, 2018).

### 3.2 Science process skills

The ability to utilize science process skills in overcoming everyday problems is very important in social life (Aydogdu, Erkol, & Erten, 2014) because students can better understand the potential in their area and get used to finding information and using this information to solve problems around their environment (Kurniawati et al., 2017). Through the integration of local potential in learning, students can develop science process skills because the object being studied can be found in the surrounding environment (Jumriani & Prasetyo, 2017).

The results of the identification of review articles have shown that through the integration of local potential in biology it is effective in influencing and improving students' science process skills (Akhiruddin et al., 2016; Dwianto et al., 2017a; Hayati et al., 2019; Kurniawati et al., 2017; Rahardini et al., 2017; D. Setiawan & Wilujeng, 2016; Wilujeng et al., 2017; Wilujeng & Suryadarma, 2018).

### 3.3 Generic skills

Integrated learning with local potential can provide meaningful experiences to students because it provides opportunities for students to be able to improve generic skills through observation, directly or indirectly in the learning process so that students can use previous knowledge to solve problems faced, be able to refer to logic, understand the law of cause and effect in learning activities and can do modeling related to the learning carried out (Susanti, 2017). The results of the identification of review articles have shown that the integration of local potential in biology effectively affects and improves the generic skills of students (Susanti, 2017; Wilujeng et al., 2017).

### 3.4 Thinking skills

The integration of local potential in learning process can improve thinking skills such as critical thinking (Susanti, 2017) and understand the concept correctly and contextually (Wilujeng & Suryadarma, 2018). The results of the identification of review articles, there are

several thinking skills that are influenced by the integration of local potential in biology that are: critical thinking (Anisa, 2017; I. P. M. Dewi et al., 2017; Putri & Aznam, 2019; Wilujeng et al., 2017), creative thinking (Sriyati et al., 2019; Tamimiya & Suryadarma, 2019), problem solving (Putri & Aznam, 2019), and conceptual understanding (Tamimiya & Suryadarma, 2019; Wilujeng & Suryadarma, 2018).

### 3.5 Science attitude skills

Local potential integrated learning trains students to observe directly, make observations, find various problems and finally through communication can provide solutions related to existing problems. This step will provide a positive aspect of changing the attitudes of students because students are invited to be logical, critical and reasonable about the various problems that exist around them. Identification of the 21 review articles suggest several science attitude skills which is influenced by the integration of local potential in biology are conservation character (Nusantari et al., 2020), environmental attitude (Hartanti et al., 2019; D. Setiawan & Wilujeng, 2016; Sya`ban & Wilujeng, 2016), and self regulation (Hartanti et al., 2019).

### 4. Result of the effect size of each skill

To find out how much influence between skill variables in various research journals in Table 2, an estimate of the effect size is sought, so that it will be known which skill variables have the strongest influence through the integration of local potential in biology. The results of the calculation of the effect size on skills that are influenced by local potential integration in biology learning are presented in Table 3.

To find out the criteria for variables that are influenced by the integration of local potential in learning, negative and positive values of Cohen's d are ignored, so it considered absolute values and adjusted to the effect size interpretation criteria in Table 1. The results of the effect size calculation in Table 3 show mixed results among skill variables that are influenced by the integration of local potential. Overall, the integration of local potential in biology that has been applied in biology learning has effect size with the small category on the students' skills. The variable that has the biggest effect size is the generic skill variable with 100% the big category, while the other skill variables tend to fluctuate significantly (Figure 1).

Table 3. Estimation of the effect size of research journals data

No.	Research journal literature	Skills are influenced by the integration of local potential	Cohen's d	Effect-size r	Category
1.	Ellin Carlina, Djukri (2018)	Environmental literacy	0.932	0.422	Big
2.	Insih Wilujeng, Zuhdan Kun P., IGP. Suryadarma (2017)	Science process skills Generic skills Critical thinking	0.376 1.790 0.376	0.185 0.667 0.185	Small Big Small
3.	Riris Riezqia Budy Rahardini, I. Gusti Putu Suryadarma, Insih Wilujeng (2017)	Science process skills	2.597	0.792	Big
4.	Arifah Putri Kurniawati, Zuhdan Kun Prasetyo, Insih Wilujeng, I. Gusti Putu Suryadarma (2017)	Science process skills	2,048	0.715	Big
5.	Susanti, Zuhdan Kun Prasetyo, Insih Wilujeng (2017)	Generic skills	1.433	0.582	Big
6.	Elya Nusantari, Ramli Utina, Abubakar Sidik Katili, Yowan Tamu (2019)	Conservation character	0.498	0.241	Small
7.	Khatriya Tiffani Tamimiya, I. Gusti Putu Suryadarma (2019)	Conceptual understanding Creative thinking	0.469 0.469	0.228 0.228	Small Small
8.	Diana Hernawati, Mohamad Amin, Mimien Henie Irawati Al Muhdhar, Sri Endah Indriwati (2019)	Science literacy	0.401	0.196	Small
9.	B. Setiawan, D.K. Innatesari, W.B. Sabtiawan, Sudarwin (2017)	Science literacy	0.941	0.425	Big
10.	I.P.M. Dewi, I.G.P. Suryadarma, I. Wilujeng, S. Wahyuningsih (2017)	Critical thinking	0.695	0.328	Average
11.	A. Dwianto, I. Wilujeng, Z. K. Prasetyo, I.G.P. Suryadarma (2017)	Science process skills Science attitude	0.417 0.417	0.204 0.204	Small Small
12.	D. Setiawan, I. Wilujeng (2016)	Science process skills	0.369	0.181	Small
13.	Agnesi Sekarsari Putri, Nurfini Aznam (2019)	Critical thinking Problem solving	0.420 0.420	0.205 0.205	Small Small
14.	Muhammad Fuad Sya'ban, Insih Wilujeng (2016)	Science literacy Environmental attitude	0.479 0.479	0.232 0.232	Small Small
15.	Aries Anisa (2017)	Critical thinking	0.724	0.340	Average
16.	Dwi Hartanti, Sajidan, Baskoro Adi Prayitno (2019)	Self regulation Environmental attitude	0.598 0.598	0.286 0.286	Average Average
17.	Siti Sriyati, Wahyu Rimbun, Amprasto (2019)	Creative thinking	0.872	0.400	Big
18.	Dani Setiawan, Insih Wilujeng (2016)	Environmental attitude	0.830	0.383	Big
19.	Isna Amanatul Hayati, Dadan Rosana, Sukardiyono (2019)	Science process skills	0.451	0.220	Small
20.	Insih Wilujeng, I.G.P. Suryadarma (2017)	Science process skills Conceptual understanding	2.262 1.691	0.749 0.645	Big Big
21.	Akhiruddin, Herawati Susilo, Ibrohim (2016)	Science process skills	0.842	0.388	Big

Sudarisman (2015) states that science including biology essentially contains 4 elements that are process (*scientific processes*), product (*scientific knowledge*), attitude (*scientific attitudes*), and technology. The overall skills of students that are affected by the integration of local

potential in learning (Figure 1) can include 3 of the 4 elements, that are: processes (scientific processes) include science process skills and generic skills, products (scientific knowledge) include science literacy skills and thinking skills, and attitudes (scientific attitudes) include

scientific attitude skills. Thus, it can be said that the skills that are influenced by

the integration of local potential are part of the learning outcomes in learning biology.

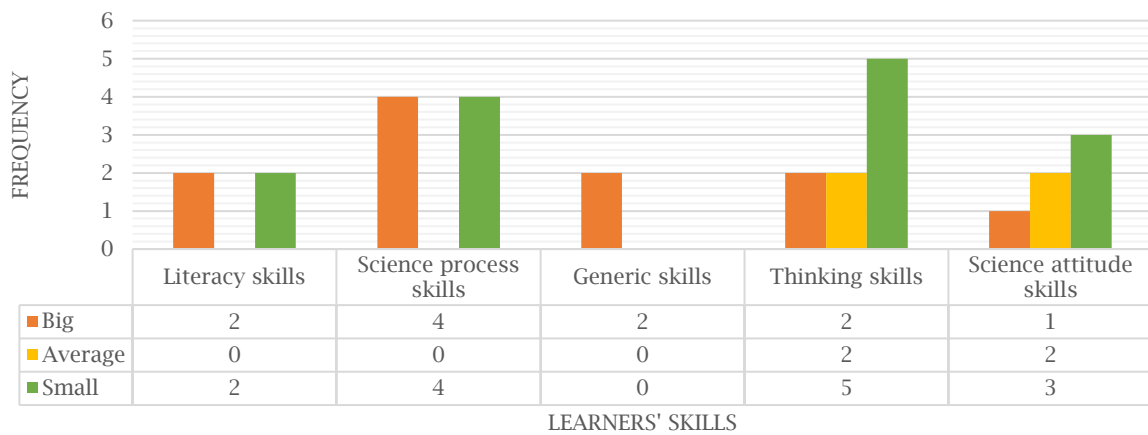


Figure 1. Interpretation of the effect size results based on Cohen's d

Utilization of local potential in biology able to make students know the local potential of the area, understand this potential to provide community needs while preserving local potential in Indonesia (Juniati & Sari, 2016). Local potential that is integrated into learning will increase students' respect for local potential and local wisdom values in the environment where they are located, so that indirectly this will affect learning outcomes (attitudes, habits and thinking skills) (Wilujeng & Suryadarma, 2018). This is because integrated learning with local potential will make students more active and take place naturally where students experience through direct observation, not only transferring knowledge from teachers to students. In addition, integrated learning with local potential causes students' mastery of scientific concepts to be better than just memorizing (Wilujeng & Suryadarma, 2018).

**Conclusion**

Based on the results of review analysis on 21 journals on the integration of local potential in biology learning, there are 5 skills that are influenced that are: 1) literacy skills including scientific literacy and environmental literacy, 2) science process skills, 3) generic skills, 4) thinking skills include critical thinking, creative thinking, problem solving and conceptual understanding, 5) science attitude skills include science attitude, environmental

attitude, character conservation and self regulation. The importance of integration local potential in biology shows that it is necessary to do further studies to get new ideas in developing local potential-based biology learning so that local potential values can influence student learning outcomes through appropriate learning strategies. The results of the review analysis in this study have succeeded in finding the influence between variables that is the skills of students which are influenced by the integration of local potential in biology through the effect size, so that it can be a consideration for developing research based on local potential in relation to the skills of the affected students.

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