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

Ezif Rizqi Imthana 1,*, Djukri 2

Magister of Biology education, Universitas Negeri Yogyakarta, Indonesia
1 ezifrizqi.2018@student.uny.ac.id, 2 djukri@uny.ac.id
* Corresponding author

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 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.

| 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.
| No. | Year | Author | Skills are influenced by the integration of local potential | Local potential used | Biology theme/topic |
|-----|------|--------|----------------------------------------------------------|---------------------|---------------------|
| 1.  | 2018 | Ellin Carlina, Djuhri | Environmental literacy | Natural resources (Baruppu') | Ecosystem |
| 2.  | 2017 | Insin Wilujeng, Zuhdan Kun P., IGP. Suryadarma | Nature of Science (NoS): Science process skills, generic skills, critical thinking | Nature of Science (NoS): Natural resources and simple technology | Environment and ecosystem |
| 3.  | 2017 | Riris Riezquia Budy Rahardini, I. Gusti Putu Suryadarma, Insin Wilujeng Arifah Putri Kurniawati, Zuhdan Kun Prasetyo | Science process skills | Simple technology (PLTMH) | Environment |
| 4.  | 2017 | Science process skills | Natural resources (essential oil clove leaves) | Environment |
| 5.  | 2017 | Generic skills | Natural resources (mount Ijen) | 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 Tamamiya, I. Gusti Putu Suryadarma Diana Hernawati, Mohamad Amin, Minnie | Conceptual understanding, creative thinking | Natural resources (mount Ijen) | Environment |
| 8.  | 2019 | Henie Irawati Al Muhdhar, Sri Endah Indriwati B. Setiawan, D.K. Innatesari, W.B. Sabtiawan, Sudarwin L.P.M. Dewi, I.G.P. | Science literacy | Natural resources (diversity of animals and plants in Tasikmalaya) | Biodiversity |
| 9.  | 2017 | I. G.P. Suryadarma, I. Wilujeng, S. Wahyuningsih A. Dwianto, I. Wilujeng, Z. K. Prasetyo, I.G.P. Suryadarma | Science process skills, scientific attitude | Natural resources (mount Kelud) | Environment |
| 10. | 2017 | Suryadarma, I. Wilujeng, S. Wahyuningsih A. Dwianto, I. Wilujeng, Z. K. Prasetyo, I.G.P. Suryadarma | Critical Thinking | Simple technology (wood carving and pottery) | Environment |
| 11. | 2017 | Science process skills, scientific attitude | Natural resources (red onion farming) | Biodiversity |
| 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, Insin 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 Siti Sriyati, Wahyu Rimbu, Amprasto | Self-regulation, environment attitude | Natural resources (umbul Tlatar) | Plant structure |
| 17. | 2019 | Environmental attitude | Natural resources (mangrove) | Ecosystem |
| 18. | 2016 | Dani Setiawan, Insin Wilujeng Isna Amanatul Hayati, Dadan Rosana, Sukardiyono | Environmental attitude | Natural resources (onion agriculture) | Environment |
| 19. | 2019 | Science process skills | Surrounding environment | Environment |
| 20. | 2017 | Insin 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; Nusantara, Utina, Kattli, & Tamu, 2020; B. Setiawan et al., 2017; Dani Setiawan & Wilujeng, 2016; Sriyati, Rimbun, & Amprasto, 2019; Susanti, 2017; Syab’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; Nusantara et al., 2020; D. Setiawan & Wilujeng, 2016; Sriyati et al., 2019; Syab’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; Syaban & Wilujeng, 2016) and environmental literacy (Carlina & Djuwiri, 2018).

3.2 Science process skills

The ability to utilize science process skills in overcoming everyday problems is very important is 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 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; Syaban & 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 tent 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., I.G.P. Suryadarma (2017) | Science process skills | 0.376 | 0.185 | Small |
|     | Generic skills | 1.790 | 0.667 | Big |
|     | Critical thinking | 0.376 | 0.185 | Small |
| 3.  | Riris Riezqia Budy Rahardiani, 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 Tamimiyia, I. Gusti Putu Suryadarma (2019) | Conceptual understanding | 0.469 | 0.228 | Small |
| 8.  | Diana Hernawati, Mohamad Amin, Mimien Henie Irawati Al Muhdhar, Sri Endah Indriwati (2019) | Creative thinking | 0.469 | 0.228 | Small |
| 9.  | B. Setiawan, D.K., Innatesari, W.B., Sabtiawan, Sudarwin (2017) | Science literacy | 0.401 | 0.196 | Small |
| 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 | 0.417 | 0.204 | Small |
| 12. | D. Setiawan, I. Wilujeng (2016) | Science process skills | 0.369 | 0.181 | Small |
| 13. | Agnesi Sekarsari Putri, Nurffina Aznam (2019) | Critical thinking | 0.420 | 0.205 | Small |
| 14. | Muhammad Fuad Sya’ban, Insih Wilujeng (2016) | Problem solving | 0.420 | 0.205 | Small |
| 15. | Aries Anisa (2017) | Science literacy | 0.479 | 0.232 | Small |
| 16. | Dwi Hartanti, Sajidan, Baskoro Adi Prayitno (2019) | Environmental attitude | 0.724 | 0.340 | Average |
| 17. | Siti Sriyati, Wahyu Rimbun, Amprasto (2019) | Self regulation | 0.598 | 0.286 | Average |
| 18. | Dani Setiawan, Insih Wilujeng (2016) | Environmental attitude | 0.872 | 0.400 | Big |
| 19. | Isnla Amanatul Hayati, Dadan Rosana, Sukardiyo (2019) | Science process skills | 0.830 | 0.383 | Big |
| 20. | Insih Wilujeng, I.G.P. Suryadarma (2017) | Science process skills | 2.622 | 0.749 | Big |
| 21. | Akhiruddin, Herawati Susilo, Ilrohim (2016) | Conceptual understanding | 1.691 | 0.645 | 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

210 | JURNAL BIOEDUKATIKA
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.

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, 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.

**References**

Akhiruddin, A., Susilo, H., & Ibrohim, I. (2016). Pengaruh penggunaan modul inkuiri dipadu PjBL berbahan ajar potensi lokal terhadap keterampilan proses sains siswa SMA. JURNAL PENDIDIKAN: TEORI, PENELITIAN, DAN PENGEMBANGAN 11(10), 1964–1968. Retrieved from http://journal.um.ac.id/index.php/jptpp/article/view/7212

Anisa, A. (2017). Meningkatkan keterampilan berpikir kritis peserta didik melalui pembelajaran IPA berbasis potensi lokal Jepara. Jurnal Inovasi Pendidikan IPA, 3(1),
Ardan, A. S. (2016). The development of biology teaching material based on the local wisdom of timorese to improve students knowledge and attitude of environment in caring the persevation of environment. *International Journal of Higher Education*, 5(3), 190–200. https://doi.org/10.5430/ijhe.v5n3p190

Aydogdu, B., Erkol, M., & Erten, N. (2014). The investigation of science process skills of elementary school teachers in terms of some variables: Perspectives from Turkey. *Asia-Pacific Forum on Science Learning and Teaching*, 15(1). Retrieved from https://www.eduhk.hk/afslt/v15_issue1/baydogdu/index.htm#con

Baxter, D. (2007). Teaching strategies for adult learners. *RIVIER ACADEMIC JOURNAL*, 32(1–3). Retrieved from https://www2.rivier.edu/journal/ROAJ-Fall-2007/1120a-Celebrating-PedagogyX-Baxter.pdf

Cahyaningtyas, R. N., Wilujeng, I., & Suryadarma, I. G. P. (2017). The effect of science learning based on an integrated scientific approach to local potential on the science process skill of the student. *Unnes Science Education Journal*, 6(2), 1601–1605. Retrieved from https://journal.unnes.ac.id/sju/index.php/usej/article/view/15857

Carlina, E., & Djukri. (2018). Science project-based learning integrated with local potential to promote student’s environmental literacy skills. *Advanced Journal of Social Science*, 4(1), 1–7. https://doi.org/10.21467/ajss.4.1.1-7

Dewi, E. C., Suryadarma, I. G. P., & Wilujeng, I. (2018). Using video integrated with local potentiality to improve students’ concept mastery in natural science learning. *Journal of Physics: Conference Series*, 1097, 012001. https://doi.org/10.1088/1742-6596/1097/1/012001

Dewi, I. P. M., Suryadarma, I. G. P., Wilujeng, I., & Wahyuningsih, S. (2017). The effect of science learning integrated with local potential of wood carving and pottery towards the junior high school students' critical thinking skills. *Jurnal Pendidikan IPA Indonesia*, 6(1). https://doi.org/10.15294/jpii.v6i1.9598

Durst, S., & Edvardsson, I. R. (2012). Knowledge management in SMEs: a literature review. *Journal of Knowledge Management*, 16(6), 879–903. https://doi.org/10.1108/13673271211276173

Dwianto, A., Wilujeng, I., Prasetyo, Z. K., & Suryadarma, I. G. P. (2017a). The development of science domain based learning media which is integrated with local potention to improve science process skill and scientific attitude. *Jurnal Pendidikan IPA Indonesia*, 6(1), 23–31. https://doi.org/10.15294/jpii.v6i1.7205

Dwianto, A., Wilujeng, I., Prasetyo, Z. K., & Suryadarma, I. G. P. (2017b). The development of science domain based learning tool which is integrated with local wisdom to improve science process skill and scientific attitude. *Jurnal Pendidikan IPA Indonesia*. https://doi.org/10.15294/jpii.v6i1.7205

Hartanti, D., Sajidan, S., & Prayitno, B. A. (2019). Pengembangan modul discovery learning struktur tumbuhan dengan memanfaatkan potensi lokal umbul tlatar untuk meningkatkan regulasi diri dan sikap kepedulian lingkungan siswa SMA. *JURNAL BIOEDUKATIKA*, 7(1), 27–38. https://doi.org/10.26555/bioedukatika.v7i1.12532

Hayati, I. A., Rosana, D., & Sukardiyoono, S. (2019). Pengembangan modul potensi lokal berbasis SETS. *Jurnal Inovasi Pendidikan IPA*, 5(2), 248–257. https://doi.org/10.21831/jipi.v5i2.27519

Hernawati, D., Amin, M., Al Muhdhar, M. H. I., & Indriwati, S. E. (2019). Science literacy skills through the experience of project activities with assisted local potential based learning materials. *Jurnal Pendidikan Biologi Indonesia*, 5(1), 159–168. https://doi.org/10.22219/jpbi.v5i1.7372

Jumriani, J., & Prasetyo, Z. K. (2017). Important roles of local potency
based science learning to support the 21st century learning. *European Journal of Engineering and Formal Sciences*, 7(1), 6-16. https://doi.org/10.20417/ejef.v111.p6-16

Juniati, E., & Sari, W. P. (2016). Integrasi potensi lokal pada pembelajaran SL terhadap pembentukan learner softskill untuk memecahkan permasalahan lingkungan. *Prosidings Symbion (Symposium on Biology Education)*, 543-550. Retrieved from http://symbion.bio.uad.ac.id/prosidings/prosidings/ID_348-Etika dan Windu-revisi_Hal 543-550.pdf

Kurniawati, A. P., Prasetyo, Z. K., Wilujeng, I., & Suryadarma, I. G. P. (2017). The effectiveness of science domain-based science learning integrated with local potency. *AIP Conference Proceedings*, 080001. https://doi.org/10.1063/1.4995185

Nusantari, E., Utina, R., Katili, A. S., & Tamu, Y. (2020). Science learning to understand the value of conservation character in students in the coastal region. *JURNAL BIOEDUKATIKA*, 8(1), 48-57. https://doi.org/10.26555/bioedukatika.v8i1.15070

Putri, A. S., & Aznam, N. (2019). The effect of the science web module integrated on Batik’s local potential towards students’ critical thinking and problem solving (thinking skill). *Journal of Science Learning*, 3(3), 92-96. https://doi.org/10.17509/jslv23.16843

Rahardini, R. R. B., Suryadarma, I. G. P., & Wilujeng, I. (2017). The effect of science learning integrated with local potential to improve science process skills. *AIP Conference Proceedings*, 080008. https://doi.org/10.1063/1.4995192

Sarah, S., & Maryono, M. (2014). Pengembangan perangkat pembelajaran berbasis potensi lokal untuk meningkatkan living values peserta didik SMA di Kabupaten Wonosobo. *JURNAL TEKNOLOGI TECHNOECONOMIA*, 6(2), 185-194. Retrieved from https://ejournal.akprind.ac.id/index.php/technoscientia/article/view/570/433

Setiawan, B., Innatesari, D. K., Sabtiawan, W. B., & Sudarmin, S. (2017). The development of local wisdom-based natural science module to improve science literacy of students. *Jurnal Pendidikan IPA Indonesia*, 6(1), 49-54. https://doi.org/10.15294/jpii.v6i1.9595

Setiawan, D., & Wilujeng, I. (2016). The development of scientific-approach-based learning instruments integrated with red onion farming potency in Brebes Indonesia. *Jurnal Pendidikan IPA Indonesia*, 5(1), 22-30. Retrieved from https://journal.unnes.ac.id/jnu/index.php/jpii/article/view/5785

Setiawan, Dani, & Wilujeng, I. (2016). Effectiveness of scientific approach integrating onion agriculture potential viewed from secondary school students’ environmental care attitude. *PROCEEDING OF 3RD INTERNATIONAL CONFERENCE ON RESEARCH, IMPLEMENTATION AND EDUCATION OF MATHEMATICS AND SCIENCE*, 43-48. Retrieved from http://seminar.uny.ac.id/icroems/sites/seminar.uny.ac.id/icroems/files/prosiding/SE-07.pdf

Situmorang, R. P. (2016). Analisis potensi lokal untuk mengembangkan bahan ajar biologi di SMA Negeri 2 Wonosari. *Jurnal Pendidikan Sains*, 4(1), 51-57. Retrieved from http://103.97.100.145/index.php/JPKMIA/article/view/1938

Sriyati, S., Rimbun, W., & Amprasto, A. (2019). Penerapan bahan ajar berbasis potensi lokal ekosistem Mangrove pondok bali untuk meningkatkan kemampuan berpikir kreatif. *EDUSAINS*, 11(1), 105–111. https://doi.org/10.15408/es.v111i.11664

Sudarisman, S. (2015). Memahami hakikat dan karakteristik pembelajaran biologi dalam upaya menjawab tantangan abad 21 serta optimalisasi implementasi kurikulum 2013. *Florea: Jurnal Biologi Dan Pemeliharaannya*, 2(1), 29–35. https://doi.org/10.25273/florea.v211.403
Susanti, Z. (2017). Comparative Effectiveness of Science Integrated Learning Local Potential of Essential Oil Clove Leaves in Improving Science Generic Skills. *International Journal of Environmental and Science Education.*

Suwono, H., Pratiwi, H. E., Susanto, H., & Susilo, H. (2017). Enhancement of students' biological literacy and critical thinking of biology through socio-biological case-based learning. *Jurnal Pendidikan IPA Indonesia, 6*(2), 213–220. https://doi.org/10.15294/jpii.v6i2.9622

Syaban, M. F., & Wilujeng, I. (2016). Pengembangan SSP zat dan energi berbasis keunggulan lokal untuk meningkatkan literasi sains dan kepedulian lingkungan. *Jurnal Inovasi Pendidikan IPA, 2*(1), 66–75. https://doi.org/10.21831/jipi.v2i1.8369

Tamimiya, K. T., & Suryadarma, I. G. P. (2019). Potensi lokal Gunung Ijen untuk pemahaman konsep dan berpikir kreatif pengurangan resiko bencana. *Jurnal Inovasi Pendidikan IPA, 5*(1), 117–128. https://doi.org/10.21831/jipi.v5i1.25702

Wilujeng, I., Prasetyo, Z. K., & Suryadarma, I. (2017). Science learning based on local potential: Overview of the nature of science (NoS) achieved. *The 4th International Conference on Research, Implementation, and Education of Mathematics and Science (4th ICRIEMS): Research and Education for Developing Scientific Attitude in Sciences And Mathematics, 080005.* https://doi.org/10.1063/1.4995189

Wilujeng, I., & Suryadarma, I. G. P. (2018). The effectiveness of integrating local potential on science process skills and conceptual understanding. *Proceedings of the International Conference on Learning Innovation (ICLI 2017), 17–21.* https://doi.org/10.2991/icli-17.2018.4