



Learning Approaches in Biology Learning

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Abstract

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Biology is a subject that learns topics about Morphology, Anatomy, Physiology, Biodiversity, Ecosystem and the environment. Therefore, an appropriate learning approach is needed for students so that the topics will be received by students well. Learning is not only about a transfer of knowledge but also skills and attitudes. This article describes about learning approaches that can be applied to students in Biology. The research employed a literature study method from various literatures. There are three kinds of learning approaches that appropriate in Biology, they are Scientific Approach, Environmental Exploration Approach, as well as Local Wisdom and Cultural Approach. The characteristic of the Scientific Approach is scientific thinking. The characteristic of the Environmental Exploration Approach is an exploration in the environment, such as natural, social, and technology. The characteristic of the local wisdom and cultural approach is Ethnobiology and Ethnopedagogy studies in learning through science processes based on the level of knowledge, skills and attitudes of students. These three approaches are expected to be alternatives in learning Biology because they contain the principles of scientific processes and student-centered learning in them to accommodate 21st century education.

Keywords: Biology Learning Approaches, Scientific, Environmental Exploration, Local Wisdom and Cultural

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INTRODUCTION

The Ministry of Education and Culture established the 2013 Curriculum, since 2013 until now in 2020. The curriculum has occurred for about 6 (six) to 7 (seven) years, depending on the schools that start to use the curriculum. It is because the government implements the 2013 Curriculum in stages. In fact, the implementation of the 2013 Curriculum also has some revisions of the curriculum.

The 2013 curriculum is a competency-based curriculum. The competency that students must achieve, such as spiritual attitude competencies, social attitude competencies, knowledge competencies, and skills competencies. According to Permendikbud Number 37 of 2018 (2018), these competencies can be achieved by students through intracurricular, cocurricular, and/or extracurricular learning processes where spiritual and social attitude competencies can be achieved through indirect teaching.

The activities that can achieve the 2013 Curriculum competencies are through intracurricular learning or also called in-classroom learning according to the subjects are taken to students. Intracurricular activities are carried out in scheduled which are adjusted to the content competencies or subjects (Permendikbud Number 63 of 2014). In

intracurricular activities or learning processes, teachers were given the freedom to choose methods, strategies, approaches, and learning techniques according to the conditions of resources at schools (Lestari and Sukanti, 2016). In learning process or intracurricular activities, the teachers have to control the learning topics and be able to motivate students to participate in learning (Ma'rifataini, 2016). The teachers have to have the professionalism to apply a learning quality strategy to produce superior quality education to the demands of global needs (Solikah, 2014). Therefore, teachers have to learn management properly.

The Learning Approach is one of the learning managements. The excellent of Learning Approach can improve student's learning outcomes (Turdjai, 2016). The Learning Approach is an insight or perspective that is formulated based on the principles of learning and learning theory (Alimah and Marianti, 2016). Learning Approach is a perspective in choosing learning activities where each of these approaches has certain characteristics and objectives that are different from one another (Lutvaidah, 2015). In choosing an approach, the teacher has to adjust to the conditions and the objectives to be achieved. Scientific Approach is one of the learning approaches that is suggested in the 2013 Curriculum.

The Scientific Approach in Bahasa Indonesia known as Pendekatan Saintifik. A Scientific Approach is an approach that emphasizes students' science process skills. Science process skills contain observing skills (counting, measuring, classifying), formulating problems, making hypotheses, identifying variables and defining operational variables, planning research with appropriate procedures, analysis, interpretation, inference, and communicating results (Verawati and Prayogi, 2016). Furthermore, Agustina and Saputra (2016) say that science process skills consisting of observing, classifying, communicating, measuring, predicting, and concluding. These science process skills are simplified in a Scientific Approach. The Scientific Approach (scientific) is also known as the Pendekatan Saintifik (Maryani and Fatmawati, 2018), where this approach is always passed through scientific activities, such as observing, questioning, gathering information/trying experimenting, associating, and communicating (Nugroho, 2014).

Another learning approach that characterizes Biology is the Environmental Exploration Approach or in Bahasa Indonesia known as Jelajah Alam Sekitar (JAS). The Environmental Exploration Approach is a learning approach that utilizes the natural environment by prioritizing science process skills. The JAS approach as an approach with the use of the natural environment around the student's residence (students) includes the physical, social, technological, and cultural environment as objects of self-study using scientific work (Alimah and Marianti, 2016). The activities that used Environmental Exploration Approach can be explored in nature both outside of the classroom observation and through technology, such as the internet or other sources (Adinugraha, 2018), which is done with scientific work and its implementation is centered on students (Ismartoyo and Indriasih, 2013).

Another approach that can be applied in Biology learning is the Local Wisdom and Cultural Approach or in Bahasa Indonesia known as Pendekatan Kearifan Lokal dan Budaya (KALBU). The Local Wisdom and Cultural Approach is a learning approach that integrates local knowledge and cultural knowledge with Biology subjects including spiritual attitude competencies, social attitude competencies, knowledge competencies, and skills competencies. The noble values and knowledge in local wisdom and culture can be used as the alternative source of learning resources (Adinugraha, 2018) which the teacher has to facilitate students to construct modern science concepts while maintaining local wisdom and culture (Pieter, 2017).

The implementation of Biology learning should be student-centered learning oriented and prioritize to scientific thinking. Based on the description above, this article aims to describe learning approaches that can be applied in Biology, including the Scientific Approaches, the Environmental Exploration Approaches, and Local Wisdom and Cultural approaches.

METHODS

The research method in this article was qualitative method. The qualitative research process consisted of 3 stages, namely the description stage (entering a social context), the reduction stage (determining focus), and the selection stage (breaking down the focus). This research used literature study sources (Sugiyono, 2019). The kinds of literature in this article were scientific articles, books, government regulations, textbooks, and other articles. Searching the information at Google by keywords including Learning Approaches, Scientific Approaches, Environmental Exploration Approaches, Local Wisdom and Cultural approaches, Biology, and Curriculum 2013. Furthermore, theoretical theories in the literature are studied and conclusions are drawn so that a new argument or theory is produced.

RESULTS & DISCUSSION

The Learning Approach

Joni in Rianto (2006) affirms that the approach shows a general way for looking at an object of study or problem that would be impacted and be analogized to a person with certain color glasses in looking at the natural surroundings. The approach can be used to develop the students' potentials where the learning activities are shown, such as 1) students do various activities; 2) students participate actively; 3) provide learning experiences for students in developing their potential; 4) interactions that are developed during the learning process indicating the occurrence of multi-directional communication; and 5) during the learning process, the teacher plays the role as a facilitator, mentor, and leader (Rianto, 2006).

The Learning Approach is a starting point or point of view of the learning process from 2 (two) main approaches, namely the teacher-centered learning approach and the student-centered learning approach (Abdullah, 2017). The teacher-centered/teacher-oriented approach places students as objects in learning and classical while the student-centered/student-oriented approach places students as subjects in learning and modern (Rusman, 2017). The students as individuals with all the differences need to be understood by the teacher so that it is easy to determine the learning approach (Basir, 2017). The position of the learning approach in the learning process is presented in Figure 1.

Approaches that have characterized as student centered learning in Biology are the Scientific Approach (Pendekatan Saintifik), the Environmental Exploration Approach (Pendekatan Jelajah Alam Sekitar), and the Local Wisdom and Cultural Approach (Pendekatan Kearifan Lokal dan Budaya). The Learning Approach is how the teacher sees toward the learning process in general where certain theoretical scopes can accommodate, inspire, strengthen, and underlie learning methods (Nurmelly, 2008). Lefudin (2014) says that the Learning Approach is a guideline in teaching that is still theoretical and conceptual that requires teacher's wisdom to realize the learning process.

The Learning Approach must be adapted to the learning needs especially teaching topics and this approach must be written in the learning plan (Lutvaidah, 2015).

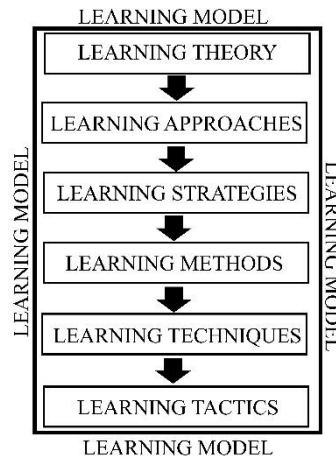


Figure 1. Correlation between Learning Models and Approaches, Strategies, Methods, Techniques and Learning Tactics.

Source. Alimah & Marianti (2016), translated in English

Based on the Figure 1, it can be synthesized that the Learning Approach is a teacher's perspective which is still theoretical but can be used in determining steps in Biology learning activities where the perspective will influence the teacher to choose the learning models, learning methods, and learning strategies.

The Scientific Approach (Pendekatan Saintifik)

The Scientific Approach is one of the characteristic approaches of the 2013 Curriculum. In principle, this approach refers to science process skills. Science process skills are how to obtain information (concepts, facts, principles, or laws) and how to think using scientific skills (Putri, 2019) where there are students' learning processes, activities, and creativity in receiving knowledge, skills, values, and attitudes in daily life (Acesta, 2014). Generally, science process skills, including observation and interpretation of observations, predictions, use of tools and measurements, asking questions, formulating hypotheses, planning investigations/experiments, interpreting, and communicating (Adinugraha, 2018).

Susilana and Ihsan (2014) argue that the Scientific Approach consists of several activities, including 1) observing (the observation process); 2) questioning (asking or making hypotheses); 3) associating (reasoning or making associations); 4) experimenting (testing questions/hypotheses); 5) processing (formulating knowledge/analysis); 6) concluding (inferring the knowledge gained); and 7) presenting (communicating). The scientific approach can measure, among others 1) attitude competencies obtained from activities, such as receiving, carrying out, appreciating, experiencing, and practicing; and 2) competency skills obtained from activities, such as observing, asking, trying, reasoning, serving, and creating (Prastowo, 2017). There are 4 (four) essences of a Scientific Approach, namely 1) the technique of investigating a new phenomenon or thing and integrating it with the students' prior knowledge; 2) promoting inductive reasoning (drawing conclusions in their entirety); 3) based on evidence of observed, empirical, and measured objects; and 4) includes activities such as scientific work (Rusman, 2017).

Based on the description above, it can be synthesized that the Scientific Approach is a learning approach based on the student-centered learning oriented with the principle that uses scientific thinking steps as seen in learning activities, including observing, asking questions, gathering information, associating, and communicating.

The Environmental Exploration Approach (Pendekatan Jelajah Alam Sekitar)

The Environmental Exploration Approach or in Bahasa Indonesia known as Pendekatan Jelajah Alam Sekitar (JAS Approach) has a main characteristic, that is, exploration activities that can be carried out in the environment around the student's residence (both natural and technological assistance). The Environmental Exploration Approach as a learning approach in which there is a comprehensive blend of exploration and evaluation approaches that are oriented towards pleasant learning (Santika, et. al., 2017). Winarni (2013) in Samitra, et. al. (2016) state that the Environmental Exploration Approach (JAS) in its learning activities uses objects, especially in the immediate surroundings which are carried out directly through observations, discussions and results reports.

The Environmental Exploration Approach or JAS approach can encourage students to develop information and it does not require students to memorize information but can do exploration and investigation activities (Samitra, et. al., 2016). In principle, the Approach to Exploring Nearby Nature (JAS) contains principles including 1) exploration, 2) construction, 3) science processes, 4) learning community, 5) bioedutainment, and 6) authentic assessment (Alimah and Marianti, 2016).

Based on the description above, it can be synthesized that the Environmental Exploration Approach (JAS) is an approach that explores the environment as a source of learning where the environment can be a natural, social, and cultural environment that can be helped with existing technology and has components in learning activities, including 1) exploration, 2) construction, 3) the science process, 4) learning community, 5) bioedutainment, and 6) authentic assessment.

Local Wisdom and Cultural Approach (Pendekatan Kearifan Lokal dan Budaya)

Local wisdom and culture are the wealth and heritage of the Indonesian people which must be continuously to be preserved amid in globalization and modernization in which a culture is considered ancient and out of date. Padur, et. al. (2017) state that local wisdom becomes the basis for policy making that occurs in several fields, including health, agriculture, education, natural resource management, and rural community activities. Ishak in Maridi (2015) states that culture refers to attitudes and mental and physical patterns according to a belief value system shared by a group of people who are seen as neutral and value-free. Local wisdom cannot be separated from culture. Kartawinata in Nasruddin, et. al., (2011), seen from the perspective of Anthropology that the emergence of culture (cultural identity) can be based on local knowledge (indigenous or local knowledge) or called local intelligence (local genius).

The Local Wisdom and Culture Approach or in Bahasa Indonesia known as Pendekatan Kearifan Lokal dan Budaya (KALBU Approach) has the main characteristic of integrating the values of local wisdom and culture around the school (where students live). In this approach, learning is student-centered learning oriented by prioritizing the process of scientific thinking (scientific learning). This is because students are invited to link the values of local wisdom and culture in terms of scientific and related to Biology topics.

The studies on the KALBU approach are Ethnobiology and Ethnopedagogy. Ethnobiology can be interpreted as a scientific study of population knowledge related to Biology, such as plants (Botany), animals (Zoology), and the natural environment (Ecology) (Iskandar, 2016). In this approach, the topic that is given to students has to be based on the Basic Competencies (Kompetensi Dasar) and Learning Indicators (Indikator Pembelajaran). Ethnopedagogy can be interpreted as education based on local wisdom by covering aspects of medicine, martial arts, the environment, agriculture, economics, government, calendar system, and others (Kurniawan and Survani, 2017). The pedagogy is interpreted as the competency of the teacher where the teacher will transmit to students. Therefore, the teacher must have pedagogical competencies related to religion and locality and culture so that learning can take place well.

The local wisdom and culture approach contain principles, including student-centered learning, joyful learning, meaningful learning, scientific learning, and local wisdom and cultural learning (Adinugraha, 2018). This approach to local wisdom and culture (KALBU) has advantages, such as 1) knowledge from local wisdom and culture around the residence can be understood by students and teachers; 2) the values of local wisdom and culture can be used as a guide in daily life; 3) Ethnobiology and Ethnopedagogy studies can integrate local wisdom and culture into learning Biology (Adinugraha, 2019).

Based on the description above, it can be synthesized that the Local Wisdom and Culture Approach is a learning approach by integrating local wisdom with the local culture with Biology topics that is adjusted to the level of students where in their analysis using Ethnobiology and Ethnopedagogy studies and has principles, among other student-centered learning, joyful learning, meaningful learning, scientific learning, and local wisdom and cultural learning.

The three approaches that are mentioned above are very suitable to be applied in learning Biology because they can invite students to develop science process skills using the steps of the scientific method. In addition, the object of Biology studies on biodiversity (animals, plants, fungi, protists, bacteria) including humans and the use of technology need approaches that allow students to see the immediate environment. The form of the three approach activities is presented in Figure 2. Based on the description of the three learning approaches above, each learning approach has its characteristics. However, when looking from its principles, there are similarities, that is, learning are student-centered learning and science process skills.

Student-centered learning is a learning approach where students can choose not only what will be learned but also how and why didactic teaching does not apply in class (TEAL center, 2010). The essential elements of student-centered learning are interesting tasks and complex, identification of resources to learn or make assignments, discussion activities with students and teachers, Reflection and refinement based on feedback, self-guided objectives, activities, and assessment, and the teachers as facilitators for students (Pearson Education Inc, 2017). In some cases of learning, student-centered learning is not the right choice (Krishnan, 2015) due to certain factors, such as insufficient resources, classrooms, lack of teacher skills (Qutoshi and Poudel, 2014), and differences in learning culture (Krishnan, 2015). However, if the teacher and students are consistent then student-centered learning will be realized even though it is difficult to get started in the beginning.



Figure 2. Students' activities in (A) Scientific Approach; (B) Environmental Exploration Approach; (C) Local Wisdom and Cultural Approach.

Source. Adinugraha (2019)

The process of science (science process skills) is a set of skills used in scientific activities (Safaah, et al., 2017) that occur scientifically in our minds including answering questions critically where science process skills include observing quality, measuring the quantity, sorting/classifying, concluding, predicting, experimenting, and communicating (Vitti and Torres, 2006). The aim of the science-based curriculum is to present science process skills (Yumuşak, 2016). This is in accordance with Biology subjects which are part of science. Biology as science learning must have elements of science process skills and student-centered learning in its learning activities.

Even though the curriculum changes one day, the approaches that are described above can be as alternatives in realizing biology learning that are guided by scientific thinking in accordance with the characteristics of learning Biology. Teachers and students do not need to hesitate and to worry if one day the curriculum changes. The approaches presented also accommodate the 21st century learning that has the 21st century characteristics, including information (available anywhere and anytime), computing (faster using machines), automation (reaching all work's routines), and communication (from anywhere, to anywhere) in the 21st century skills, including: critical thinking skills, communication skills, collaborative and creativity (Sajidan, et. al., 2018).

CONCLUSION

The characteristic of the Scientific approach is scientific thinking. The characteristic of the Environmental Exploration Approach is an exploration in the environment, such as natural, social, and technology. The characteristic of the local wisdom and cultural approach is Ethnobiology and Ethnopedagogy studies in learning through science processes based on the level of knowledge, skills and attitudes of students. These three approaches are expected to be alternatives in learning Biology because they contain the principles of scientific processes and student-centered learning in them to accommodate 21st century education.

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REFERENCES

- Abdullah, A. (2017). Learning approaches and models that enable students. *Edureligia*, 1 (1), 45-62.
- Acesta, A. (2014). Applying the science process skill approach to improve student learning outcomes in science learning. *Jurnal Ilmiah Pendidikan Dasar*, 1 (2), 96-106.
- Adinugraha, F. (2018). Environmental exploration approach or jejalah alam sekitar (JAS) in Animal Systematics Course. *Jurnal Pro-life*, 5 (3), 598-610.
- Adinugraha, F. (2018). Approach to science process skills in the form of scientific work projects to foster student interest in learning. *JDP*, 11 (1), 14-29.
- Adinugraha, F. (2018). Dolalak dance as a form of local wisdom and cultural approach (KALBU) in Biology Subjects. *Eduka Jurnal Pendidikan Hukum dan Bisnis*, 4 (1), 23-40.
- Adinugraha, F. (2019). Local wisdom and cultural approach or Pendekatan Kearifan Lokal dan Budaya (KALBU) in learning Biology in Purworejo. *Jurnal Pendidikan*, 20 (1), 1-17.
- Agustina, P. & A. Saputra. (2016). Analysis of basic science process skills (KPS) of prospective biology teacher students in plant anatomy courses (case study of P.Biologi study program FKIP UMS 2015/2016 school year). *Seminar Nasional Pendidikan Sains*. Surakarta UNS, 71-78.
- Alimah, S. & A. Marianti. (2016). *Environmental Exploration Approach (Jelajah Alam Sekitar): Approaches, Model Strategies, and Biological Learning Methods Characterized for Conservation*. Semarang: FMIPA UNNES.
- Anggito, A & J. Setiawan. (2018). *Qualitative Research Methods*. Sukabumi: CV Jejak.
- Basir, M. (2017). *Learning Approaches*. Sengkang: Lampena Intimedia.
- Iskandar, J. (2016). Ethnobiology and cultural diversity in Indonesia. *Umbara: Indonesian Journal of Anthropology*, 1 (1), 27-42.
- Ismartoyo, I & A. Indriasih. (2013). Application of environmental exploration approach or jelajah alam sekitar (JAS) on the development of plants in elementary schools. *Humanika*, 17 (1), 254-266.
- Krishnan, S. (2015). Student-centered learning in a first year undergraduate course. *International Journal of Learning, Teaching and Educational Research*, 11 (2), 88-95.
- Kurniawan, I.S. & R. Survani. (2017). Ethnopedagogy integration in developing Biology learning models. *Jurnal Konseling dan Pendidikan*, 6 (1), 15-24.
- Lefudin, L. (2014). *Study and Learning*. Sleman: Penerbit Deepublis (Grup Penerbitan CV Budi Utama).
- Lestari, P. & S. Sukanti. (2016). Building student character through intracurricular activities, extracurricular activities, and hidden curriculum (at SD Budi Mulia 2 Pandensari Yogyakarta). *Jurnal Penelitian*, 10 (1), 71-96.
- Lutvaidah, U. (2015). Effect of learning methods and approaches on mastery of Math concepts. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, 5 (3), 279-285.
- Ma'rifataini, L. (2016). The influence of intracurricular and extracurricular activities on the character formation of high school students (SMAN) 09

- Bandar Lampung. *Edukasi: Jurnal Penelitian Pendidikan Agama dan Keagamaan*, 14 (2), 171-186.
- Maridi, M. 2015. Promote local culture and wisdom in soil and water conservation systems. *Seminar Nasional XII Pendidikan Biologi FKIP UNS*. 20-39.
- Maryani, I & L. Fatmawati. (2018). *Scientific Approach to Learning at Elementary Schools*. Sleman: Penerbit Deepublish (Grup Penerbitan CV Budi Utama).
- Nasruddin, N., S.D. Kusumah., B.H.S. Purwana., & A.M. Kartawinata. (2011). *Book of Local Wisdom in the Midst of Modernization*. Jakarta: Kementerian Kebudayaan dan Pariwisata Republik Indonesia.
- Nugroho, T. (2014). Scientific approaches, models and learning strategies in the 2013 curriculum. *Lingua Humaniora*, 8, 797-808.
- Nurmelly, N. (2008). Approaches, models, and strategies in learning models. *Online at <https://sumsel.kemenag.go.id/>* [diakses 26 Maret 2020 pukul 18.54 WIB] 1-6.
- Padur, N.N., S.Y.V.I. Goni, & H.W. Pongoh. (2017). Cultural local islamicity farkawawin biak in village syabes district of yendidori regency of biak numfor. *E-Journal Acta Diurna*, VI (2), 1-13.
- Pearson Education Inc. (2017). Student Centered Learning. *Online at <https://www.pearson.com/>* [diakses 25 Juni 2020, pukul 09.27 WIB]
- Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 37 tahun 2018 tentang Perubahan atas Peraturan Menteri Pendidikan dan Kebudayaan Nomor 24 tahun 2016 tentang Kompetensi Inti dan Kompetensi Dasar Pelajaran pada Kurikulum 2013 pada Pendidikan Dasar dan Menengah [Permendikbud].
- Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 63 tahun 2014 tentang Pendidikan Kepramukaan sebagai Ekstrakurikuler Wajib [Permendikbud].
- Pieter, J. (2017). Science learning based on local wisdom as a solution to teaching science in the hinterlands of Papua Province. *Online at <https://www.researchgate.net>* [diakses 15 Mei 2018 pukul 13.45 WIB].
- Prastowo, A. (2017). *Develop a Thematic Integrated Learning Implementation Plan (RPP) for the Implementation of the 2013 Curriculum for SD/MI*. Jakarta: Kencana.
- Putri, S.U. 2019. *Science Learning for Young Children*. Sumedang: UPI Sumedang Press.
- Qutoshi, S.B. & T. Poudel. (2014). Student centered approach to teaching: What does it mean for the stakeholders of a community school in Karachi, Pakistan? *Journal of Education and Research*, 4 (1), 19-33.
- Rianto, M. (2006). *Learning Approaches, Strategies and Methods. Teaching Topics for Elementary School Citizenship Education Courses in Basic Education*. Departemen Pendidikan Nasional Direktorat Peningkatan Mutu Pendidik dan Tenaga Kependidikan: Pusat Pengembangan Penataran Guru IPS dan PMP Malang.
- Rusman, R. (2017). *Study & Learning: Oriented Standards of the Educational Process*. Jakarta: Kencana.

- Safaah, E.S., M. Muslim, & W. Liliawati. (2017). Teaching science process skills by using the 5-stage learning cycle in junior high school. *Journal of Physics: Conf. Series*, 895, 1-6. doi :10.1088/1742-6596/895/1/012106
- Sajidan, S., B. Baedhowi., T. Triyanto., S.A. Totalia., & M. Masykuri. (2018). *Improved Learning Process and 21st Century Learning Assessment in Improving the Quality of Vocational Learning*. Jakarta: Kementerian Pendidikan dan Kebudayaan.
- Samitra, D., M. Widiya., & N.D. Rahmasari. (2016). Effect of approach to roaming around the natural approach (JAS) on the process skills and learning outcomes of Biology students in grade X in public high school 5 Lubuklinggau. *Jurnal Bioedukatika*, 4 (2), 8-13.
- Santika, A.M., D.N. Budiningsih., & C.S.M. Yuwono. (2017). Environmental exploration approach or jelajah alam sekitar based on the conservation of Bali starlings to environmental awareness and the results of students' cognitive maps. *Jurnal Santiaji Pendidikan*, 7 (1), 55-66.
- Solikah, A. (2014). Strategies for improving the quality of learning in leading schools. *Didaktika Religia*, 2 (1), 175-212.
- Susilana, R., & H. Ihsan. (2014). The scientific approach in implementing the 2013 Curriculum is based on the study of the theory of learning psychology. *Edutech*, 1 (2), 183-195.
- Sugiyono S. (2019). *Method of Research: Quantitative, Qualitative, and R &D*. Bandung: Alfabeta.
- TEAL Center. (2010). Student-Centered Learning. Adapted from CALPRO Professional Development Module, Student-Centered Learning. Author: M. Corley (2008). AIR: Sacramento, CA. Online at <https://lincs.ed.gov/> [diakses 25 Juni 2020, pukul 09.27 WIB].
- Turdjai, T. (2016). The effect of the learning approach on student learning outcomes. *Triadik*, 15 (2), 17-29.
- Verawati, N.N.S.P & S. Prayogi. (2016). Review the literature on science process skills. *Prosiding Seminar Nasional Pusat Kajian Pendidikan Sains dan Matematika tahun 2016*. Mataram, 334-336.
- Vitti, D. & A. Torres. (2006). Practicing Science Process Skills at Home. *Article*. Online at <http://static.nsta.org/> [diakses 25 Juni 2020, pukul 13.23 WIB].
- Yumuşak, G.K. (2016). Science Process Skills in Science Curricula Applied in Turkey. *Journal of Education and Practice*, 7 (20), 94-98.