Scientiae Educatia: Jurnal Pendidikan Sains (2018), Vol 7(2): 146-158
DOI: http://dx.doi.org/10.24235/sc.educatia.v7i2.2858
Published by Tadris IPA Biologi, IAIN Syekh Nurjati Cirebon, Indonesia. p-ISSN: 2303-1530, e-ISSN: 2527-7596

SCIENTIAE EDUCATIA: JURNAL PENDIDIKAN SAINS

journal homepage: www.syekhnurjati.ac.id/jurnal/index.php/sceducatia

www.syekhnurjati.ac.id/jurnal/index.php/sceducatia/article/view/2858

The Potential of Local Wisdom on Traditional Fishing *(Tangkul)* Gear in Lake Sipin Jambi City as a Science Learning Source

Jufrida[a], Fibrika Rahmat Basuki[a*], dan Dwi Risky Pratiwi[a]

[a] Department of Physics Education, Faculty of Teacher Training and Education, Universitas Jambi, 36361, Indonesia

[*]Corresponding author: Jambi-Ma Street. Bulian, Mendalo Indah, Muaro Jambi, Jambi, 36361, Indonesia. E-mail addresses: fibrikabika@yahoo.com

a r t i c l e i n f o

Article history:
Received: 13 July 2018
Received in revised form: 16 July 2018
Accepted: 20 December 2018
Available online: December 2018

Keywords:
Local wisdom
Tangkul
Science learning resource

a b s t r a c t

This study aims to explore and identify the concept of science contained in "Tangkul" and mapping basic competence of science in Junior High School. The study was descriptive qualitative research. The research subjects were the Sipin Lake community and science education experts. The data collection instruments used were observation sheets, interview guides, and documentation. Data were analyzed descriptively using the Miles and Huberman analysis model (data collection, reduction, display, and verification). The validity test of the data used is the triangulation technique. Tangkul is a traditional fishing gear in Lake Sipin form of trap nets were hung using bamboo. The working mechanism of Tangkul uses the principle of a simple aircraft, namely a net as a load, a pole as support, bamboo as a power arm and a load arm. At the time of lifting the nets, the fishermen draw power with muscle force smaller than the load. The mapped basic competency is in class VIII, i.e., basic competency 3.3 Explain the concept of effort, simple plane, and its application in everyday life including muscle work on the structure of the human skeleton.

1. Introduction

According to Fajrini (2014), local wisdom is a view of life and science as well as various life strategies that are tangible activities carried out by local communities in answering various problems in meeting the needs. Furthermore, Khusniati (2014) argued that local wisdom could be understood as a human effort by using his mind to act and behave towards an event that occurs in a certain space. Anggraini and Kusniarti (2015) mention that local wisdom functions to shape people to be wiser in living their lives. Meanwhile, Ardan (2016) defines local wisdom as something contained among other traditional knowledge as a Savior of the environment has been widely researched and examined by experts. From their research, it can be seen that there should be a bridge to connect between the traditional knowledge with modern scientific and look for ways to integrate it within the system of formal learning at students who understand and will never forget the values of the local culture its own. Based on some definitions of local wisdom above, it can be concluded that local wisdom is the way

people live their lives wisely. The community uses the natural environment as a source of life independently as a result of local customary knowledge or policies. Various forms of wisdom become a unity in the lifestyle of the community.

One of the potential areas of Jambi City which has local wisdom is Lake Sipin. Lake Sipin is located in the Danau Sipin sub-district which is a division of the Telanaipura sub-district. Lake Sipin is a natural resource that can provide benefits to the community and the Jambi City government. The wisdom of Danau Sipin community can be seen from the use of traditional transportation like traditional boats, traditional fishing gear (*Tangkul*), utilization of lakes as cage cultivation, surrounding communities living in traditional stilt houses, *batik* activities and other potential natural resources such as typical fishes namely Lamb and Bad Fish. Communities around Lake Sipin live wisely with the surrounding environment with various patterns of life.

The biodiversity found in Lake Sipin is a supply of river fish which is quite a lot to be consumed by the surrounding community. Hence, the community uses this potential as a family economic resource, namely by fishing and freshwater fish farming activities carried out around Lake Sipin. Capture fisheries activities are fishing activities using traditional tools while fish farming activities are carried out in floating net cages. One of the fishing tools used is *Tangkul* (a fishing trap type that is hung using bamboo).

Based on the background above, the focus of this study is that traditional fishing gear (*Tangkul ikan*) from observations in schools, especially in Jambi City, is known that there are not many learning activities that integrate local wisdom. Learning science and the potential of local wisdom has not been well documented so that it can be used as a source of learning science. Science learning will be more meaningful if it is connected with daily life or local wisdom of the local community.

This is by relevant research conducted by Warpala et al. (2010), the results show that teaching materials that orient science based on local wisdom can improve students' understanding of concepts and scientific performance. Saputra et al. (2016) learning local wisdom can be earning local wisdom can increase environmental awareness. Satriawan and Rosmiati (2016) state that teaching materials are contextually based with local wisdom can improve mastery of physical concepts. Marhayani (2016) states that local wisdom can develop character. Further explanation is given by Parmin et al. (2015) who concluded that the use of local wisdom in learning also ensures that the science of learning not only understands

concepts but also strengthens Indonesia's identity with various cultures. Multicultural education in Indonesia is more appropriately seen as an approach, namely an educational approach that seeks that regional cultural values (ethnicity) and religion in Indonesia can be understood, appreciated, and utilized for educational purposes (Amirin, 2012).

Society in carrying out activities cannot be separated from the elements of culture and the value of science in it. Disclosure of local community ideas that are local can strengthen the essence of meaningful learning, and encourage every student in the school to be wise, and full of wisdom so that they can solve their problems in daily life (Azizahwati & Yasin, 2017). The scientific values contained in the local wisdom objects of the community have the potential as a source of science learning based on the Science Environment Technology Society (SETS) approach. The SETS approach provides an understanding of the links between science, environment, technology, and society and is a vehicle for training students' sensitivity to environmental impact as a result of the development of science and technology (Yuniastuti, 2015). According to Khasanah (2015), science education is a vehicle for studying oneself and the environment and its application in everyday life. In accordance with the Content Standards (Kemdikbud, 2014), it is expected that at the SMP / MTs level, there will be an emphasis on mutual learning (science, environment, technology, and society) integrated directed at learning experiences to design and create works through the application of science concepts and work competencies scientifically wisely. Through learning based on the SETS approach, students can integrate local wisdom with learning activities.

The integration of local wisdom in learning will be by the environment that exists and experienced by students. Thus, students will be motivated in learning. According to Ameyaw (2011), students have difficulty in making connections between science concepts integrated with local wisdom in teaching materials that have been prepared. It is noted that less than 20% of integrated teaching materials are prepared for students. Integrating local wisdom does not reduce the understanding of science concepts.

On the contrary, it can add meaning to the concept. Students can study science by using more objects found in the environment and selecting objects tailored to their needs and understanding of concepts and learning styles. This study aims to explore and identify in depth the potential of local wisdom in traditional fishing gear *(Tangkul)* as well as to reach the basic competence of science mapping in the middle school level. The results of the mapping can then be used as a source of learning science.

2. Methods

This research is explorative qualitative research. This is aimed at exploring and identifying the potential of local wisdom of *Tangkul* fishing gear. The research subjects were the Danau Sipin community and science education experts. The sampling technique is purposive sampling, namely sampling techniques based on consideration. The criteria for the research subject were the lake sipin community who know the history, customs and local culture, and community profession as fishermen using *Tangkul* fishing gear. Meanwhile, the criteria for science education experts are that someone who has a background in science education and works professionally in the field of science education.

The research instruments are in the form of observation sheets, interview guides, and documentation. Observation sheet indicators include material, shape, and driving force of *Tangkul*. The interview guide lists questions from the Lake Sipin community and education experts. Indicators that were asked of the community were the origin of Lake Sipin, the existence of *Tangkul* fishing gear in Sipin Lake and the use of *Tangkul* fishing gear. The indicator asked by science experts is the science concept found in the working mechanism of *Tangkul* fishing. While the documentation in the form of pictures and videos related to the lake area and the use of *Tangkul* fishing, the documentation can be developed as a learning resource.

Data were analyzed descriptively qualitatively by Mills and Humberman model which consisted of several stages, namely data collection, data reduction, data display and conclusion drawing / verification. Reduction activities in this research are carried out after the researcher enters the field (location of penetration), where the records of the initial observations that have been obtained are grouped and then coded according to the research requirements. Display data in this study is to find the relationship between various data from observations with science concepts. The initial conclusions put forward are still temporary and will increase if no strong evidence is found that supports the next stage of data collection. But if the conclusions raised at the initial stage are supported by valid and consistent evidence when the researcher returns to the field to collect data, then the conclusions put forward are credible conclusions. The validity test of the data used is the credibility test. The data credibility test is done by triangulation of techniques, namely data collection by observation, interviews, and documentation on the same data source.

3. Results And Discussion

Lake Sipin is one of the lakes in Jambi City. The existence of Lake Sipin in the center of Jambi City has an important role for the surrounding community. Therefore, the community exploits this potential as a family economic resource, namely fish farming, and capture fisheries carried out around Lake Sipin. Capture fisheries are fishing activities using traditional tools. Traditional fishing gear is a form of local wisdom that comes from the knowledge of the community in facilitating fishing activities that have been going on for generations.

Local wisdom according to Asriati (2012), is a local idea that is wise, full of wisdom, good value, embedded and followed by community members. Local wisdom according to Leo (2015), is the order of life values inherited from one generation to another in the form of religion, culture or customs that are commonly spoken in the social system of society. The presence of local wisdom in the community is a result of the process of adaptation to a normally inhabited environment where interactions often occur from one generation to another over a very long period. According to Suastra (2013), local wisdom can be understood as a human effort by using his mind (cognition) to act and behave towards something, object, or event that occurs in a particular space. Ibrahim (2014) states that integrating local wisdom in educational and learning activities is very potential to bring innovation. Integration of local wisdom into education can be done in various forms and objectives, including (a) local affairs as a model, which can be an example to be imitated and practiced in daily life; (b) local wisdom as content / content of lessons that can act as examples taught; (c) local wisdom as an inspiration, which raises new ideas in learning.

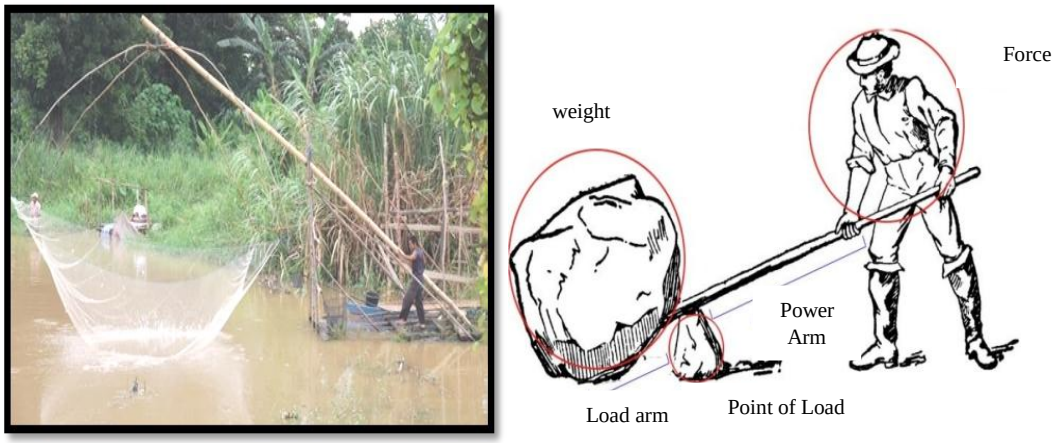
One of the wise behaviors of the people living in the Danau Sipin area is community activities in fishing by using local understanding wisely in maintaining the lake environment. Fishing activities in the community are using net traps which are hung using bamboo or better known as *Tangkul* fishing gear. This fishing activity (with *Tangkul*) has been carried out for generations by the community. *Tangkul* fish has a scientific concept that can be seen from its mechanism of action.

3.1 Science Concept on the Local Wisdom of *Tangkul* Fishing

According to Dahliani et al. (2015), local wisdom has two main elements, namely humans with a mindset and nature with its climate. Local wisdom is the uniqueness of local knowledge and understanding of certain cultures or communities (Indrawasih, 2017). According to Hasbiah (2015), local wisdom is reflected in daily life; it will be reflected in the knowledge and practice of people who use and maintain the environment. Local wisdom according to Mungmachon (2012), is a basic knowledge obtained from the balance of life with nature. Based on the interview results of one of the speakers who is a fisherman in the Danau Sipin area, said that the existence of *Tangkul* itself was long around two centuries ago. Catching fish using *Tangkul* is an activity that has been carried out for generations. *Tangkul* fishing gear made of waring with a mesh size of 1 mm, size 2.5 x 2.5 m. Bamboo stalks or handles 3 cm in diameter 2-3 m in length-bamboo branches (frames) of 1.5 cm in diameter (4 pieces).

The length of the stretch is from one to another is 50-75 cm, connecting the skeleton of the branch with two pieces of stalks made of bamboo with a diameter of 1.55 cm in length 15 cm tied with a rope at the end of the bamboo stalk. So that the bamboo handle can rotate in any direction when it is lifted. *Tangkul* fishing equipment is operated in an open place to facilitate installation and can also be on the banks of the river, carried out by two people. One person raises *Tangkul*, and the other one is tasked with dragging or collecting seeds that enter into *Tangkul* (Abidin, 2009).

Tangkul fishing can be found in several locations in Lake Sipin. In fishing activities using community, *Tangkul* fishing equipment use the principle of simple machine. Simple machines are tools that can help humans make an effort. The following figure shows the concept of a simple machine in *Tangkul*.



Source: Personal Documentation

(a)

Source: *http://www.sainsseru.com/2017/12/materi-terlengkap-pesawat-sederhana.html#more*

(b)

Figure 1. (a) *Tangkul* Fishing, and (b) The Concept of Simple Machine in *Tangkul* Fishing

Tangkul uses mechanical principles. The nets are developed which then connected with ropes and bamboo. The fulcrum is in the middle, the net is a load, and the fisherman holds the power point. In figure 1, there is a simple mechanic concept found in *Tangkul* fishing. A simple type of mechanic that belongs to the working mechanism of *Tangkul* is a simple type I of mechanic (the type of lever). According to Puspita and Rohima (2009), a simple machine is tools that can help humans make an effort. The lever is a rod that can be rotated around the fulcrum, the lever functions as a force magnifying device so that the advantage of using a lever is the force produced is greater than the force released. Then it can be formulated as follows:

$$KM = \frac{w}{F} = \frac{l_k}{l_b}$$

Notes:

KM = Mechanical Benefit, *w* = Wight, *F* = Force, L_k = =power arm, dan L_b = load arm.

The principle of *Tangkul* work is a lever, where the *Tangkul* is lowered then raised. It is related to the human skeleton, so there is a thing called straight and attractive movement of the flexor and extensor for movement in his hand. The mechanism of action of the muscles is the work of the principal muscles of contraction and relaxation, when interesting he has contractions when straightened he relaxes. Muscles are a network consisting of muscle cells. Muscle cells combine to form muscle fibers. Muscle fibers are wrapped by a muscle

membrane (sarcolemma). These muscle fibers combine to form a collection of muscle fibers called muscle bundles. The combination of muscle bundles is called muscle or flesh. The muscle is wrapped by a muscular sheath (fascia). Muscles can contract by expanding and deflating. As a result, the muscles can move the skeleton. Therefore muscle is called active motion.

According to (Gusti, 2014), the muscles which are active instruments have three characteristics, namely as follows.

1) Contractibility, namely the ability of muscles to make changes to be shorter than the original size.
2) Extensibility, namely the ability of the muscle to relax or extend from its original size. This characteristic is the opposite of contractibility. Motion that arises is the opposite of motion caused by the contraction of the muscles in question.
3) Elasticity, namely the ability of the muscle to be able to return to its original size after contracting or extensively. When the muscle returns to its original size, the muscle is called a state of relaxation.

Muscle work cannot be done with just one type. This causes the work of the muscles to be differentiated into synergistic and antagonistic.

1) *Synergic* is the work of the muscles whose contractions cause unidirectional movements. For example muscles in the forearm, and cubits.
2) *Antagonists* are muscles that contract the opposite effect. Example:
   a. Extensor (straightening) and flexor (bending)
   b. Abductor (away from the body) and adductor (approaching the body)
   c. Depressor (down) and the elevator (upwards)
   d. Supinator and pronator (face down)

In the activity of catching fish, it is necessary to carry out additional training if there are many fish catches. This heating is done so that the muscles are not surprised to minimize the occurrence of cramps in the muscles when it pulls the fish tank.

3.1 The Mapping of Basic Competency which is Integrated with Local Wisdom of *Tangkul* Fishing

The concept of a simple machine in *Tangkul* fishing can be seen from the working mechanism of the *Tangkul* itself. In addition to the concept of a simple machine in *Tangkul* fishing, there is a concept of a human motion system. This can be seen from the activities of the community in operating *Tangkul* fishing. This tool is operated by pulling the end of the bamboo so that the load (fish caught) contained in the trap net can be lifted. In this activity flexor and extensor, movements occur, namely straight and interesting movements for movement in his hand. Based on the results of the analysis of the science concept, it can be mapped basic competencies for science subjects in junior high schools that can be integrated with the local wisdom of *Tangkul* fishing. The mapping results are shown in Figure 2.

Ridwan (2007) argues that local wisdom can be understood as a human effort using his mind (cognition) to act and behave towards something, object or event that occurs in a particular space. *Tangkul* is one form of local wisdom that is in Lake Sipin from the results of people's thinking and passed down from generation to generation. The results of people's thinking in creating traditional fishing gear (*Tangkul* fishing) is a wise action in preserving the environment. Based on the results of this study, it can be seen that there are scientific concepts in *Tangkul* fishing, namely the concept of simple machine and motion systems in humans. This *Tangkul* fishing can be used as a source of learning science by making *Tangkul* fishing as a context to explore scientific content. Students can learn about simple machine concepts through the first-hand experience of simple machine applications on fish tanks. Jufrida et al. (2018) state that local wisdom that has a scientific concept is used as a source of learning science. The same thing expressed by Al Musafir et al. (2016), local wisdom can be a source of learning geography. Local wisdom is a part of the environment around students so that it can be used as a learning resource.

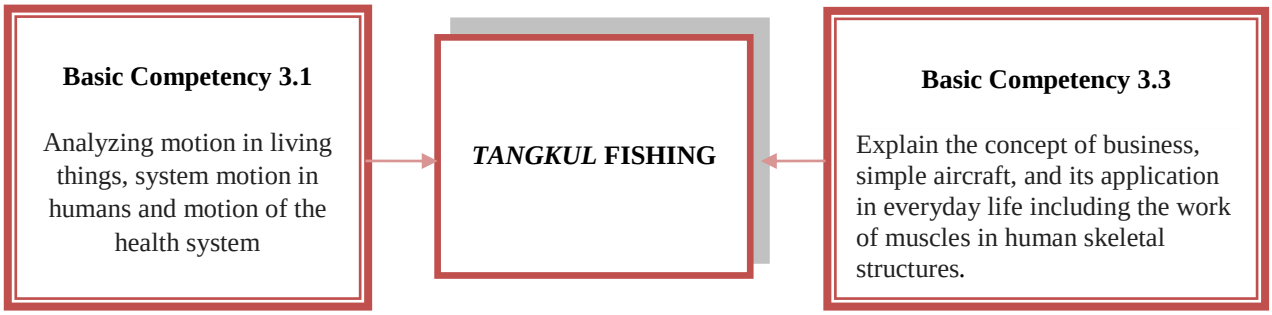


Figure 2. The Mapping of Basic Competency of Science

According to Al Bahij et al. (2018), the surrounding of the natural environment can be utilized as a teaching media in science learning so that it can foster creativity; students are more active in learning outside the classroom because it is more fun. Students can see directly using real media in the school environment. The environment can be used as a natural laboratory in science learning so students will get information based on direct experience and can learn from things that are concrete so that students will more easily understand the material being studied (Utaminingsih, 2015).

Lamasai et al. (2015) explain that the use of the surrounding natural environment as a learning resource can be achieved by conducting activities by bringing students to the environment, such as observation and practice in the field. The use of the environment as a learning resource provides opportunities for students to actively explore information about everything that is around them and then is connected with learning in schools (Ikhsan et al., 2017). Haryati (2016) concluded that utilizing the school environment as a learning resource makes students active and directly involved in the learning process. Ifrianti and Emilia (2016) argued that the use of the surrounding environment as a learning media could improve student learning activities and outcomes. Future science learning needs to be sought so that there is a balance between the knowledge of science itself and the planting of scientific attitudes, as well as the values of local wisdom that exist and develop in the community. Therefore, the socio-cultural environment of students needs to get serious attention in developing science education in schools because it contains original science that can be useful for their lives. Thus, science education will truly benefit the students themselves and the wider community (Suastra, 2010). This is by the opinion of Subali et al. (2015) that the implementation of local wisdom-based science learning not only has a positive impact on students but also can improve learning achievement.

4. Conclusion

Based on the results obtained, it can be concluded that the scientific concepts identified in *Tangkul* fishing are physics and biology. In the field of physics, there is a simple machine concept that can be viewed from the mechanism of *Tangkul*. Whereas in the field of biology, there is the concept of muscle style in operating the *Tangkul* fishing gear. The results of the basic competency mapping identified on the object of local wisdom in *Tangkul* fishing are the basic competency of 3.3 Explaining the concept of business, simple machine, and its

application in daily life including the work of muscles in human skeletal structures. This *Tangkul* fishing can be used as a source of learning science by making *Tangkul* fishing as a context to explore scientific content. Students can learn about simple machine concepts through the first-hand experience of simple machine applications on fish tanks. The next researcher is expected to research the development of teaching materials and learning media based on local wisdom of *Tangkul* fishing.

Acknowledgments

The research conducted in this article was funded by the University of Jambi Institute of Research and Community Service in the research scheme of beginner lecturers at the Jambi University LPPM 2018 budget year.

References

Abidin, M. (2009). Pengoperasian alat tangkap tangkul untuk menangkap benih Ikan Jelawat (*Leptobarbus Hoeveni Blkr*) di perairan Batanghari Jambi. *Buletin Teknik Litkayasa Sumber Daya dan Penangkapan, 7* (1), 7-9. DOI: 10.15578/btl.7.1.2009.7-9

Al Bahij, A., Santi, A. U. P., & Prastiwi, D. A. (2018). Pemanfaatan lingkungan alam sekitar sebagai media ajar di Sekolah Dasar Negeri 2 Sirah Pulo Padang. *Prosiding Seminar Nasional Pendidikan Era Revolusi, 1*(1), 89-106. Available online: https://jurnal.umj.ac.id/index.php/SNP/article/view/2762/2223

Al Musafiri, M. R., Utaya, S., & Astina, I. K. (2016). Potensi kearifan lokal suku using sebagai sumber belajar geografi SMA di Kabupaten Banyuwangi. *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan, 1*(10), 2040-2046. Available online: http://journal.um.ac.id/index.php/jptpp/article/view/7955/3619

Ameyaw, Y. (2011). Environmental pedagogies that promote students understanding of integrated science (biology aspect). *Journal of Education*, *1*(1), 10-15 Available online: http://www.bioinfo.in/contents.php?id=58

Amirin, T. M. (2012). Implementasi pendekatan pendidikan multikultural kontekstual berbasis kearifan lokal di Indonesia. *Jurnal Pembangunan Pendidikan: Fondasi dan Aplikasi, 1*(1), 1-16. DOI: 10.21831/jppfa.v1i1.1047

Anggraini, P., & Kusniarti, T. (2015). The insertion of local wisdom into instructional materials of Bahasa Indonesia for 10th grade students in senior high school. *Journal of Education and Practice, 6*(33), 89-92. Available online: https://eric.ed.gov/?id=EJ1083666

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. DOI: 10.5430/ijhe.v5n3p190

Asriati, N. (2012). Mengembangkan karakter siswa berbasis kearifan lokal melalui pembelajaran di sekolah. *Jurnal Pendidikan Sosiologi dan Humaniora, 3*(2), 106-118. Available online: http://jurnal.untan.ac.id/index.php/JPSH/article/view/3663

Azizahwati, A., & Yasin, R. M. (2017). Pengembangan lembar kerja siswa berbasis kearifan lokal. *Jurnal Geliga Sains. 5*(1), 65-69. Available online: https://ejournal.unri.ac.id/index.php/JGS/article/view/4400

Dahliani, D., Soemarno, I., & Setijanti, P. (2015). Local wisdom in built environment in globalization era. *International Journal of Education and Research, 3*(6), 157-166. Available online: http://www.ijern.com/journal/2015/June-2015/13.pdf

Fajrini, U. (2014). Peranan kearifan lokal dalam pendidikan karakter. *Jurnal Sosio Didaktida, 1*(2), 123-130. DOI: 10.15408/sd.v1i2.1225

Gusti, A. 2014. *Konsep dasar IPA: Aspek biologi*. Yogyakarta : Penerbit Ombak.

Haryati, D. (2016). Efektivitas pemanfaatan lingkungan sekolah sebagai sumber belajar terhadap hasil belajar IPA peserta didik kelas IV SD Inpres BTN IKIP I Makassar. *AULADUNA: Jurnal Pendidikan Dasar Islam, 3*(2), 80-96. DOI: 10.24252/auladuna.v3i2a4.2016

Hasbiah, A. (2015). Analysis of local wisdom as an environmental conservation of strategy in Indonesia . *Journal Sampurasun, 1*(1), 2-7. DOI: 10.23969/sampurasun.v1i1.19

Ibrahim, M. (2014). Inovasi pembelajaran sains berbasis kearifan lokal. Seminar nasional sains dan inovasi pembelajaran berbasis kearifan lokal. 22 November 2014 IKIP Mataram.

Ifrianti, S., & Emilia, Y. (2016). Pemanfaatan lingkungan sekitar Sebagai media pembelajaran ips untuk meningkatkan Aktivitas dan hasil belajar peserta didik Kelas III MIN 10 Bandar Lampung. *TERAMPIL: Jurnal Pendidikan dan Pembelajaran Dasar, 3*(2), 1-21. Available online: http://www.ejournal.radenintan.ac.id/index.php/terampil/article/view/1186/2164

Ikhsan, A., Sulaiman, S., & Ruslan, R. (2017). Pemanfaatan lingkungan sekolah sebagai sumber belajar di SD Negeri 2 Teunom Aceh Jaya. *Jurnal Ilmiah Mahasiswa Pendidikan Guru Sekolah Dasar, 2*(1), 1-11. Available online: http://jim.unsyiah.ac.id/pgsd/ article/view/4374/2047

Indrawasih, R. (2017). Revitalisasi lembaga adat pengelolaan sumberdaya laut untuk membangun kembali budaya bahari. *Jurnal Kebudayaan*, *12*(1), 58-70. Available online: http://jurnalpuslitjakdikbud.kemdikbud.go.id/index.php/jk/article/view/167

Jufrida, Basuki, F. R., & Rahma, S. (2018). Potensi kearifan lokal Geopark Merangin sebagai sumber belajar sains di SMP. *Edufisika*, *3*(1), 1-15 Available online: https://online-journal.unja.ac.id/index.php/EDP/article/view/5773

Khasanah, N. (2015). SETS (Science, Environmental, Technology and Society) sebagai pendekatan pembelajaran IPA modern pada Kurikulum 2013. *Prosiding KPSDA*, *1*(1), 270-277. Available Online: http://jurnal.fkip.uns.ac.id/index.php/kpsda/article/view/5386

Khusniati, M. (2014). Model pembelajaran sains berbasis kearifan lokal dalam menumbuhkan karakter konservasi. *Indonesian Journal of Conservation, 3*(1), 67-74. Available online: https://journal.unnes.ac.id/nju/index.php/ijc/article/view/3091

Lamasai, M. M., Mestawaty As. A., & Puadi, R. I. (2015). Pemanfaatan lingkungan alam sekitar sebagai sumber belajar dalam meningkatkan hasil belajar IPA siswa kelas III SDN 10 Gadung. *Jurnal Kreatif Tadulako Online*, *5*(3), 132-144. Available online: http://jurnal.untad.ac.id/jurnal/index.php/JKTO/article/view/3841/2804

Leo, A. (2015). The Development of local wisdom-based social science learning model with Bengawan Solo as the learning source. *American International Journal of Social Science*, *4*(4), 51-58. Available online: http://www.aijssnet.com/journals/Vol_4_No_4_August_2015/8.pdf

Marhayani, D. A. (2016). Development of character education based on local wisdom in indegenous people Tengahan Sedangagung. *JETL (Journal of Education, Teaching and Learning), 1*(2), 66-70. DOI: 10.26737/jetl.v1i2.40

Mungmachon, M. R. (2012). Knowledge and local wisdom: community treasure. *International Journal of Humanities and Social Science, 2*(13), 174-181. Available online: http://www.ijhssnet.com/journals/Vol_2_No_13_July_2012/18.pdf

Parmin, Sajidan, S., Ashadi, A., & Sutikno, S. (2015). Skill of teacher candidates in integrating the concept of science with local wisdom. *Jurnal Pendidikan IPA Indonesia, 4*(2), 120-126. DOI: 10.15294/jpii.v4i2.4179

Puspita, D., & Rohima, I. (2009). *Alam sekitar IPA terpadu untuk SMP/MTs kelas VIII*. Jakarta: PT. Leuser Cita Pustaka.

Ridwan, N. A. (2007). Landasan keilmuan kearifan lokal. *Jurnal Studi Islam dan Budaya, 5*(1), 27-38.

Saputra, A., Wahyuni, S., & Handayani, R. D. (2016). Pengembangan modul IPA berbasis kearifan lokal daerah pesisir puger pada pokok bahasan sistem transportasi di SMP. *Jurnal Pembelajaran Fisika, 5*(2), 182-189. Available online: https://jurnal.unej.ac.id/index.php/JPF/article/view/3967

Satriawan, M., & Rosmiati. (2017). Pengembangan bahan ajar fisika berbasis kontekstual dengan mengintegrasikan kearifan lokal untuk meningkatkan pemahaman konsep fisika pada mahasiswa. *JPPS (Jurnal Penelitian Pendidikan Sains), 6*(1), 1212-1217. Available online: https://journal.unesa.ac.id/index.php/jpps/article/view/540

Suastra, I. W. (2010). Model pembelajaran sains berbasis budaya lokal untuk mengembangkan kompetensi dasar sains dan nilai kearifan lokal di SMP. *Jurnal Pendidikan dan Pengajaran, 43*(1), 8-16. DOI: 10.23887/jppundiksha.v43i1.1697

Suastra, W. (2013). Model pembelajaran fisika untuk mengembangkan kreativitas berpikir dan karakter bangsa berbasis kearifan lokal Bali. *JPI (Jurnal Pendidikan Indonesia), 2*(2), 221-235. DOI: 10.23887/jpi-undiksha.v2i2.2166

Subali, B., Sopyan, A., & Ellianawati, E. (2015). Developing local wisdom based science learning design to establish positive character in elementary school. *Jurnal Pendidikan Fisika Indonesia*, *11*(1), 1-7. DOI: 10.15294/jpfi.v11i1.3998

Utaminingsih, R. (2015). Pemanfaatan lingkungan sebagai laboratorium alam pada pembelajaran IPA SD. *Trihayu: Jurnal Pendidikan Ke-SD-an, 2*(1), 215-220. DOI: 10.30738/trihayu.v2i1.792

Warpala, I. W., Subagia, S., & Suastra, I. W. (2010). Pengembangan bahan ajar berbasis kearifan lokal untuk mata pelajaran sains smp. *Jurnal Penelitian dan Pengembangan Pendidikan*, *4*(3), 300-314.

Yuniastuti, E. (2015). Pengaruh model pembelajaran SETS (*Science, Environment, Technology, and Society*) terhadap hasil belajar biologi siswa kelas VII SMP Kartika V-1 Balikpapan tahun 2015/2016. *Jurnal Sains Terapan, 1*(2), 72-78. DOI: 10.32487/jst.v1i2.94