



Development of Invertebrata Identification Student Worksheet for High School Students

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Abstract

Invertebrate learning process at SMA N 1 Rembang is dominated by one way learning where the learning process focus on the students in the class, so that it hasn't made use of the environment around them and it hasn't made the experiment because of the limitation of the media learning. Because of it, the development of students worksheet which can guide students to do outdoor investigation is needed. The purpose of this study is to determine the feasibility and effectiveness of Invertebrate Identification Students Worksheet for X grade students of Senior High School. The method of this research was Research and Development (R & D) with product of Invertebrate Identification Students Worksheet for High School. Data collection of Students Worksheet for Coastal Invertebrate Identification through 4 stages, including preliminary study, planning, development, and LKS testing. It was found that Student Worksheet (LKS) in Invertebrate Identification is considered effective in supporting outdoor experiment with various assessment among others, guiding students to identify and classify coastal invertebrate.

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INTRODUCTION

The initial observation shows, Rembang area there are some beaches or coastal areas that can be used as. A real learning resource for high school students in Rembang, especially to learn Invertebrate Identification using Student Worksheet (LKS) by applying the Nature Exploration (JAS) approach. According to Sumarmi (2008), learning resources obtained from anywhere that contains learning elements. The school environment is the closest environment that students can use to gain knowledge and learning experiences. A good learning resource can create meaningful learning and make environmental education more real.

Majid (2009), explained that LKS is the sheets containing the tasks that must be completed by the students. Trianto (2007), argues that LKS contains a set of fundamental activities that must be done by student to maximize the understanding in the effort of forming basic skills according to the indicators of learning outcomes achievement. According to Karsli & Sahih (2009), LKS can assist teachers in facilitating students to improve the activity of reading, thinking, developing process skills and collaborating skills. One of the goals of LKS is to achieve the learning objectives that have been formulated by the teacher so that the learning of a concept can be going effectively (Marno & Idris, 2010).

Outdoor learning on the coast of Kartini Jepara with Group Investigation (GI) model is favored by students. They can interact directly with the object to be learned, so that learning becomes fun and interesting. This matter shows the enthusiasm or motivation to learn, therefore to optimize student learning outcomes (Zubaidah, 2011). According to Sari (2012), the surrounding nature exploration (JAS) approach by utilizing the education garden of Unnes as a students learning resource can optimize the activities and student learning outcomes. JAS approach in the study has made students active. Achievement of student activity level is categorized as active and very active. This result can be attributed to students feeling that the learning is fun. Linawati (2012), the learning process by utilizing the education garden of UNNES is effective on student learning outcomes ≥ 75 and make students more active.

Based on the research result of the influence of inquiry-based outdoor learning on the learning result of ecosystem material, 90.33% of students play an active role in outdoor learning and student activity is considered high. From the observational data of the cognitive domain learning outcomes, the average of experimental class learning outcomes is higher than the average learning outcomes of control class. The psychomotor and affective sequence of learning outcomes from this study also shows more motor skills than control classes. So, it can be concluded that inquiry-based outdoor learning has a positive effect on student learning outcomes (Santiningtyas, 2012). Based on research from Hayat and Sri (2011), the results showed that the students' scientific attitude using the practice-based learning differs significantly from the students who study conventionally.

The validity of the LKS based on environment-oriented process skills on Arthropoda submaterial for class X is helpful in facilitating students. LKS validity is reviewed from the results of expert validation, namely material experts, educational experts, and two high school biology teachers. Validation of LKS in this study was reviewed based on 3 aspects, namely feasibility of presentation, content feasibility, and language feasibility (Nursa'diyah, 2014). Based on research from Widarmayanti and Endang (2015), the validity profile of LKS based on process skill at invertebrate's material for class X SMA students is a development research which refers to 4-D model (Define, Design, Develop, and Disseminate). However, this study only reached the development stage (Develop). This LKS is validated by biology education experts, materials experts, and biology teachers based on content, presentation, and linguistics.

The purpose of this study is the feasibility and effectiveness of the use of student worksheets (LKS) Invertebrate Identification for class X on invertebrate materials.

RESEARCH METHOD

The method used in this research is Research and Development (R & D) with invertebrate Identification Student Worksheet's product for High School. The research was conducted in Jatisari beach and SMA Negeri 1 Rembang. This study was conducted on February – May 2017 and the even semester of the academic year 2017/2018. Research methods includes namely preliminary study, planning, development, and LKS testing. Methods of data analysis in this study include LKS validity, analysis of learning motivation, analysis of learning outcomes, N gain test, data normality test, significance test (T test), psychomotor aspect value analysis, affective value analysis, and teacher response questionnaire analysis as well students.

RESULTS AND DISCUSSION

This research is divided into four stages, namely preliminary study, planning, development, and LKS testing. The observation result of invertebrate materials are low learning outcomes and low learning motivation. Analysis of invertebrate materials based on KI, KD, and syllabus. The material includes the general characteristics of invertebrate, including body shape, body cavity, body symmetry, and reproduction, grouping of invertebrates into *phylum*.

The result of mini research, found as many as 19 species. The species is classified into 6 *phylum*, that are Porifera, Coelenterata, Platyhelminthes, Mollusca, Echinodermata, and Arthropoda. The result of mini research, Jatisari Beach can be used as the learning sources and also can be used as the reference for making the student worksheet (LKS) which support the learning process. In this research a Student Worksheet (LKS) of Coastal Invertebrates Identification contains practice manual, data table, determination key, and summary has been developed. This study aims to determine the feasibility and effectiveness of Invertebrate Identification LKS in learning.

The LKS was validated by biology lecturer and a biology teacher. Analysis result stated that Coastal Invertebrate Identification LKS is feasible to be implemented for field study. Feasibility test and LKS legibility test can be said good with average percentage level is 92.5%. According Sudjana (2009), the percentage is said to be very feasible. This can be seen in table 1.

Table 1 Recapitulation of LKS Validation Result

No.	Validator	Score	Percentage(%)	Categori
1.	I	38	95	Highly feasible
2.	II	36	90	Highly feasible
Total		74	92,5	Highly feasible

The objectives of the preparation of LKS are four points, among others: (1) present teaching materials that enable students to interact with the given material; (2) present tasks that can improve students' concept understanding, (3) train student's independence, and (4) makes it easier for educators to give assignments. Preparation of LKS also consider the suitability of content based on curriculum analysis and LKS needs analysis (Prastowo, 2015).

The criteria of Coastal Invertebrate Identification LKS are considered feasible, among others: (1) the suitability of the topic with the subject, (2) conformity with the learning objectives, (3) correspond to the scope of the subject matter, (4) the suitability of the content of the activity with the technique and the learning method used, (5) the clarity and sharpness of the image, (6) the language used is the Indonesian language which is easily understood by the students, (7) the used language is

communicative, simple, and easy to understand, (8) LKS cover design in accordance with the contents of the LKS, (9) the suitability of the letters used the LKS, and (10) the media or learning resources used to guide the students to participate actively. This is in accordance with Hidayati, Puspitawati, and Kuntjoro (2012), the development of the school-environment-oriented LKS with 2 major aspects that being assessed are the analysis of LKS and LKS legibility. The analysis of LKS includes (1) the suitability of the topic, (2) the suitability of the learning objectives, (3) the material conformity, (4) the presentation of the worksheet, and (5) the selection of the drawings. While the legality of LKS includes (1) the language used, (2) the attractiveness of LKS, and (3) the suitability of the media used.

This study is considered to be effective, if the fulfilled the following criteria (1) students' learning motivation increase, (2) students' psychomotor increase, (3) students' affective increase, and (4) classical mastery > 50%. According to Karinasari (2017), the effectiveness of LKS can be seen from the improvement of students' positive responses developed through giving students questionnaire. The results of Susiana et al (2017), revealed that the effectiveness of the developed LKS can be seen from the achievement of predetermined learning indicators.

The application of Coastal Invertebrate Identification LKS is done outside of lesson time. This is because the time required for field practicum quite a lot and not possible done during school hours. This practice was conducted at Jatisari beach located in Rembang Regency. The place is chosen because it meets several predetermined criteria: (1) invertebrate animals are diverse, (2) safe, (3) beautiful, (4) affordable in terms of location and transportation, and (5) suitable for student learning resources.

The cognitive learning outcomes are derived from the pretest and posttest values. The result of the posttest score indicates that the value is still low. There is enhancement of classical mastery between last year's and learning by using the Coastal Invertebrate Identification LKS. The last year's classical mastery is 25% with the established KKM is 70. Learning using the Coastal Invertebrate Identification LKS obtained 72% of classical mastery. Meanwhile, for some students who lacks of mastery is not because they cannot follow the learning, but they do not match with the field study. The different of classical mastery is by 47% with KKM 70. The increase of classical mastery is 3 times than last years. It can be avowed that Identification of Coastal Invertebrates LKS, increase the percentage of classical mastery in invertebrates material. The results can be seen in table 2.

Table 2 Pretest and Posttest Results with Learning Using Invertebrate Identification LKS

Information	N	Pretest value	Posttest Value
The highest value		52,5	92,5
The lowest value	32	25	55
Average value		37	75
Percentage of completeness		0%	72%
Percentage of incompleteness		100%	28%

The N-gain test in this study shows that some students are classified into high, medium and low criteria. The most dominant N-gain result in this class is the medium criterion, while low criterion as minoritas. In this study there are still some students whose value of N-gain in low criterion, this is because there are some external factors that influence, among others: the daily test in conjunction with posttest time implementation, so that the learning concentration for posttest less mature, and their scores of daily test for previous material and the value of mid-term test still do not meet the KKM. The class average N-gain obtained in this study is 0.6 with the criteria classified as medium. This can be seen in table 3.

Table 3 Result of N-Gain Test Analysis

Class	N	N-gain Criteria Percentage (%)		
		High	Medium	Low
X Mia 8	32	37,5	53,1	0,9

The data normality test of pretest and posttest showed the distribution of data is normal distribution. Besides proved by the sign value of the normality test, it can be seen from the bar chart with the highest distribution in the middle. Based on the significance test, the accepted hypothesis is that the average pretest value is not equal to the average posttest value. This shows that the learning process by using Coastal Invertebrate Identification LKS has an effect on student's learning result. It can be seen from the number of N-gain value reaching the high and medium category, and proved by significance test using paired T test. This can be seen in table 4.

Table 4 Result of Data Normality Test Analysis

Value	kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistics	Df	Sig.	Statistics	df	Sig.
Pretest	0,114	32	0,200*	0,972	32	0,565
Posttest	0,100	32	0,200*	0,979	32	0,758

The result of T-test analysis shows that, sig. (2-tailed) < 0.05. It means the research is successful. The success of Coastal Invertebrate Identification Student Worksheet can be seen from the N-gain and data significance test. The results of this study are in line with Zubaidah (2011) study, arthropous material learning with Group Investigation (GI) model can improve students' learning outcomes and activities shown by the high average of learning mastery and students' activity that is said to be very active.

Table 5 Result of T-Test Analysis

Value	Mean	SE	T	Df	Sig.(2-tailed)
Pretest-Posttest	-36,59	2,05	-17,84	31	0,00

In this study, students' affective and psychomotor assessment were assessed by the observer. Assessment of attitude is classified into good and good criteria with the percentage of 65.6% and 34.4%. Student's worksheet (LKS) for Coastal Invertebrates Identification demands and teaches students to work together, tolerance, decipline, responsdibility, and respect between friends and teachers. The learning by application of Student's worksheet (LKS) for Coastal Invertebrates Identification, the religious attitudes and social attitudes will be embedded in students. Students' psychomotorics can is seen from the skills of students, starting from preparing the equipment to be used as a practicum, skills while practicing, skills in communicating results and the ability to respond to a question. This can be showed by the application of the Coastal Invertebrate Identification LKS directly, so that students can interact with invertebrate animals and communicate their practicum results in the form of group presentations and discussions. In this study, students' psychomotor are assessed from the beginning to the end of learning. The students' psychomotor assessment result, included the criteria of very good and good with the percentage of 87.5% and 12.5%. This shows that the students' psychomotor in doing the practicum and presentation is excellent because this LKS requires students to use more motor aspects. The results, Student's worksheet (LKS) for Coastal Invertebrates Identification proven to improve students psychomotor. In this LKS, students are required to be more active in participating in learning because the students'

initial understanding is explored themselves through the process of practicum and interaction directly with coastal invertebrate animals.

In addition to the cognitive, affective, and psychomotor assessment, there are assessments of individual tasks that include the filling of the cladogram worksheet and the practice report. Cladogram can make it easier for students to understand the evolutionary levels of invertebrate animals starting from the simplest body structure to more complex body structures. The level of evolution in invertebrate material need to be known by students because all learning in biology must begin with evolution, especially in this material applying the principle of animal classification which leads to the diversity of invertebrate animals. Based on the data analysis, the average value of cladogram task is 88 which is classified very good criteria. The assessment result of the task for individual report of the results of practicum work is in good category with the average value of reporting tasks is 80. It can be concluded that students have been able to communicate the results of field practice through writing.

Students' learning motivation in following the learning of invertebrate material is good with percentage for number of active student indicates good criterion and quality percentage in asking question shows very good criteria. Students are willing to ask, respond to questions, refute answers, and summarize the results of the presentation very well. In addition, students become more enthusiastic and critical in combining natural phenomena with invertebrate materials discussed in the lesson. Students are also willing to answer and ask questions to the teacher. Students are also very enthusiastic in following the learning that is held either inside or outside the classroom.

Student's responses in Identification of Coastal Invertebrates LKS learning on invertebrate materials can be seen through a questionnaire of student responses. A total of 91% of students are interested to following the invertebrate material biology learning using the coastal learning resources of Rembang. The percentage results are very good, so it can stated increase of student's learning motivation. The use of coastal Rembang learning resources as the application of JAS approach allows students to interact directly with invertebrate animals and get 90% student response which is considered very good. A total of 88% of students are motivated to participate in invertebrate material learning conducted at Jatisari beach. The percentage earned is excellent. It can be a reference that students are interested in studying biology, with a fun learning atmosphere. 90% of students understand better the lessons learned by direct practice, so that the studied object is real and contextual. The percentage is very good.

This is accordance by Fagerstam (2014), the potential for outdoor teaching and learning education. The results of the study stated that (1) outdoor learning made the students feel happier to following the lesson, (2) positive impact on the social relations aspects of students and teachers, (3) students become more actively participate in the learning process, (4) students feel it is easier to find new things by working together, (5) students are interested to following the lesson with an increase in motivation and interest in learning, and (6) the mobility of teachers and students increases.

The use of LKS to facilitate a finding their own concept get 79%. A total of 83% of students stated that LKS helped in the process of parcticum. 83% said the use of LKS makes it easier for students to classify invertebrates according to morphology. LKS is appropriate for use in invetebrates material. This is evidenced by students response of 82%. Average questionnaire results of 86% which is considered very good. It shows that learning using Coastal Invetebrate Identification Student Worksheet appeals to students.

Based on the results of questionnaire teacher responses, invertebrate learning materials using Identification of Coastal Invertebrates LKS is very interesting to do. It is seen from the students' enthusiasm and focus in conducting field practicum and group discussions. This learning model makes the learning activities of students to be more optimal both outside the classroom and in the classroom, so students become more independent to explore the material. In this lesson, the teacher

can cover all assessments because by using this model of learning all the affective, cognitive, and psychomotical assessments will be covered. However, this kind of learning also has difficulty in implementation, ie in terms of time management and material management. The time required to implement this learning is considerable, so it is advisable to take hours outside the lesson to do field work.

Coastal Invertebrates Identification Student Worksheet used as an alternative learning media that is helpful in conducting field practicum, especially coastal areas. By this Student Worksheet, students can conduct directed field practicum. In addition to the field practice manual, this LKS is equipped with a table of observation data, determination key, and invertebrate material summary.

CONCLUSION

Based on the Results of the study, concluded that the development of invertebrate identification student worksheet declared are feasible and effective in supporting field practicum learning with various assessments that can be obtained.

REFERENCES

- Fagerstam, E. 2014. High School Teachers' Experience of The Educational Potential of Outdoor Teaching and Learning. *Journal of Adventure Education and Outdoor Learning*, Vol. 14, No. 1, 56-81
- Hayat, M. S., S. Anggraeni., dan S. Redjeki. 2011. Pembelajaran Berbasis Praktikum pada Konsep Invertebrata untuk Pengembangan Sikap Ilmiah Siswa. *Journal Bioma*, Vol., No.2, Oktober 2011
- Hidayati, D., Puspitawati, R. P., dan Kuntjoro, S. 2012. Pengembangan LKS Berorientasi Lingkungan Sekitar Sekolah Pada Materi Ekosistem di MAN Pamekasan. *E-journal BioEdu Vol. 1/No.2/Oktober 2012*
- Karinasari, F. 2017. Kelayakan Teoritis Lembar Kerja Siswa (LKS) Berbasis *Experiential Learning* Submateri Komponen Penyusun Ekosistem Kelas X SMA. *E-Journal Unesa Vol. 6 No. 3 ISSN:2302-9528*
- Karsli, F. & Sahin, C. 2009. Developing Worksheet Based on Science Process Skills: Factors Affecting Solubility. *Journal Asia-Pacific Forum on Science Learning and Teaching*, 10(1): 1-12.
- Linawati, A., A. Retnoningsih., dan A. Irsadi. 2012. Hasil Belajar Klasifikasi Tumbuhan dengan Memanfaatkan Kebun Wisata Pendidikan Unnes. *Unnes Journal of Biology Education 1 (2) (2012) 109-115*
- Majid, A. 2009. *Perencanaan Pembelajaran*. Bandung: PT Rosdakarya.
- Marno & Idris. 2010. *Strategi dan Metode Pengajaran Menciptakan Psikomotorik Mengajar yang Efektif*. Yogyakarta: Ar-Ruzz Media.
- Nursa'diyah, N., S. Susantini., dan R. Ambarwati. 2014. Validitas LKS Berbasis Keterampilan Proses Berorientasi Lingkungan Sekitar pada Submateri Arthropoda untuk Kelas X. *E-Journal Vol.3 No.2 Mei 2014 ISSN: 2302-9528*. Surabaya : Jurusan Biologi FMIPA UNESA.
- Prastowo, A. 2015. *Panduan Kreatif Membuat Bahan Ajar Inovatif*. Yogyakarta: DIVA Press.
- Santiningtyas, K., A. P. D. Prasetyo., dan B. Priyono. 2012. Pengaruh *Outdoor Learning* Berbasis Inkuiri terhadap Hasil Belajar Materi Ekosistem. 2012. *Unnes Journal of Biology 1 (2) (2012) 1995-202*
- Sari, I. P., M. Rahayuningsih., dan N. E. Kartijono. 2012. Pemanfaatan Kebun sebagai Sumber Belajar dengan Menerapkan Pendekatan Jelajah Alam Sekitar (JAS). *Unnes Journal of Biology Education 1 (2) (2012) 95-101*
- Sudjana. 2009. *Dasar-Dasar Proses Belajar Mengajar*. Bandung: Sinar Baru.
- Sumarmi. 2008. Sekolah Hijau Sebagai Alternatif Pendidikan Lingkungan Hidup Dengan Menggunakan Pendekatan Kontekstual. *Jurnal Ilmu Pendidikan 5 (1):19-25*.
- Susiana, S. Indana, dan N. K. Indah. 2017. Validitas dan Efektivitas LKS Berbasis Literasi Sains Pada Tumbuhan untuk Siswa Kelas X. *E-Jurnal Unesa Vol.6 No. 1 ISSN:2302-9528*
- Trianto. 2007. *Model-model Pembelajaran Inovatif Berorientasi Konstruktivistik*. Jakarta: Prestasi Pustaka.
- Widarmayanti, R dan E. Susantini., dan R. Ambarwati. 2015. Profil Validitas LKS Berbasis Keterampilan Proses pada Subpokok Bahasan Invertebrata untuk Kelas X SMA. *Journal Vol.4 No.1 ISSN: 2302-9528 Januari 2015*

Zubaidah, N. 2011. Pembelajaran Materi Arthropoda dengan Menggunakan Model Investigasi Kelompok di Pantai Kartini Jepara pada Kelas X SMA N 1 Jepara. *Skripsi*. Semarang : UNNES.