

Development of Biological Teaching Materials Based on Local Wisdom Integrated Character Education and Problem Based Learning Models for Senior High School in Aceh Barat-Indonesia

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ABSTRACT

Teaching material is a presentation of a set of material that aims to help the students in learning process. Good teaching materials are teaching materials that be developed according to the students needs, namely needs based on geographical, ethnographic, and regional wealth characteristics. This study aims to develop teaching materials based on local wisdom integrated character education in the problem based learning model for students in senior high school in Aceh Barat-Indonesia. This research is development research that following Borg and Gall model. The research instruments are questionnaire using likert scale 1 (bad or not feasible) to 4 (very good or very feasible). Validation was carried out by experts in the media, learning design, language, and material or content. Response data of teacher and student on teaching material were also collected. Data analysis was carried out by using simple statistic of percentage formula. The research results showed that feasibility of learning material that be developed based on local wisdom and problem based learning model was very feasible or very good with the average score 91.01%. The feasibility score of learning material according to media expert, learning design expert, language expert and content expert were 91.67%, 91.52%, 86.00% and 95.00%, respectively. Meanwhile, the response of teachers and students were also very good or very feasible with the average score 94.8% and 97.39%.

Keywords: Biology Teaching Materials, Local Wisdom, Character Education, Problem Based Learning, Aceh Barat

1. INTRODUCTION

Education is a national system that aims to produce human resources that have knowledge, skills and affective values. Expected to be the basis for the development of a nation. So do not be surprised if a developed country has a good education system. Therefore, in this case Indonesia as a developing country also sees

the need to improve the education system towards a better direction.

The Ministry of Education and Culture as one of the government agencies responsible for education in Indonesia at the elementary, middle and high school levels has made efforts to improve one of them on the curriculum. Hadi (2015) explained that the Indonesian curriculum changed from the

Education Unit Level Curriculum (KTSP) to the 2013 Curriculum in the year 2013. But in this case, the education system in Indonesia cannot be considered successful.

Looking at the PISA results of students' scientific literacy, Indonesia is only able to rank 38th out of 40 countries that participated in 2003, ranked 50th out of 57 countries participating in 2006, ranked 57th out of 65 countries participating in 2009, ranked 64th out of 65 countries who participated in 2012, ranked 62 of the 70 participating countries in 2015 (OECD 2004, 2007, 2010, 2012, PISA 2015, Manurung *et al.*, 2017).

In addition, the problems experienced by many countries today are cultural and character issues. According to Kesuma (2011), the current condition of the nation's future generation may be able to describe the reality of the nation, namely the moral condition of the nation's future generation that is damaged or destroyed (drug distribution, student brawl, circulation of pornographic photos and videos, and so on).

The issue of the value of knowledge, culture and character of the nation is now in the spotlight of the public. The spotlight was contained in various writings in print media, interviews and dialogues in electronic media. Various alternative solutions were proposed, one of which was widely proposed to overcome, at least reduce, the problems of knowledge, culture and national character discussed through education, namely the learning process in schools.

The teacher as the front guard in the learning process at school is responsible for the success of the learning process. The success of the learning process carried out by the teacher in the event of changes in students in the form of affective, cognitive, and psychomotor. This is certainly not easy for a teacher, if the teacher does not make innovations in learning and one of them is the teaching material. Folb *et al.*(2011) stated that learning innovations as outlined in textbooks can provide better learning

outcomes, increase the efficiency and effectiveness of learning towards renewal.

Horsley *et al.* (2010) stated that teaching materials are a set of materials that are arranged systematically so as to create an environment / atmosphere that allows students to learn. High quality teaching materials can contribute substantially to the quality of student learning experiences and student outcomes.

Good teaching materials are teaching materials developed according to user needs, namely needs based on geographical, ethnographic, and regional wealth characteristics. Local wisdom is a form of environmental wisdom that exists in community life in a place or region. The term local wisdom is also often used to designate the potential or excellence, content, and culture that is somewhere.

Local wisdom arises with the existence of human thoughts, attitudes, and behaviors in social life and then interpreted in the form of values. The values of wisdom are in the form of positive values, both in terms of religion, culture, customs, social, art, natural resources, and even work and other habits carried out by a community somewhere. Local wisdom-based education is an education that provides real and concrete learning with what students face. Science facts could be seen in everyday life that develops in society, so students can "literate" science (OECD, 2009).

In addition, teaching materials need to be prepared to emphasize character education. This is intended to improve the character of students who are increasingly damaged. Character education can be used as an alternative solution in improving the behavior and morals of students. Writing teaching materials that contain character education is one of the efforts to disseminate the ideas and implementation of character education to the wider community. Pala (2011) suggested that schools that seriously do character education on students tend to have high academic achievement.

Biology which is part of the natural sciences has the characteristics of a

scientific process or work that is based on the ability to think and solve problems because science is obtained through a process of reasoning, scientific inquiry, and experiments in explaining natural phenomena (Tasiwan *et al.*, 2014). Therefore, biology teaching materials is needed to be developed to provide students with scientific work experience. One learning model that is suitable for scientific work is Problem Based Learning (PBL).

Problem Based Learning is a learning model in which students solve problems. The problems are presented by the teacher in accordance with the material being studied. Akcay (2009) stated that problem based learning is more student-centered that makes student become more active. This learning approach improves critical thinking skills, analyzes, solves complex problems in real world problems, collaborates in groups, and can communicate in speech or writing. The advantages of problem-based learning compare with conventional approach is that PBL model is presented in real and more practical problems (Ajail *et al.*, 2013).

2. RESEARCH METHOD

2.1 Research design

This research is development research with the max method approach. Its model is adopted according to Borg and Gall which comprised the step of (1) Preliminary study; (2) Product design; (3) Validation of product design; (4) Revision of product design; (4) Product testing; (5) Product Revision; (6) Usage test; (7) Revision of product design; and (8) Final product report. In this study, the research step is limited just only until expert validation (media, learning design, language and content), biology teachers response and students perception.

2.2 Research Sample

The development of teaching materials was started from January 2018 until to May 2018. While the small group field test is carried out in June 2018. A small field test is conducted on four senior

high schools in West Aceh District which each school consists of three students with a total of 12 students.

2.3 Research Instruments

The instruments that be used in this study was expert validation sheets, teacher validation sheets, and teachers and students response questionnaires. The instrument uses Likert scale from 1 to 4. Expert validation is carried out by media experts, learning design experts, language experts and material experts. All expert belongs to doctoral qualifications. As for the teacher, assessment is carried out on the performance of teaching materials, presentation of teaching materials, linguistic teaching materials, and content of teaching materials. Questionnaire sheets for student response contains statements about books that include cover interests, clarity of instructions, language easy to understand, encouraging active students in the teaching and learning process, encouraging students to learn, material according to the student environment, encouraging to maintain biodiversity, and encouraging higher order thinking.

2.4 Data analysis

Expert data validation, teacher data validation, and student response questionnaires were analyzed by using a simple statistic, i.e percentage formula. The results of the analysis are then interpreted descriptively (Table 1).

Table 1. Feasibility grade of biology teaching material

Percentages (%)	Criteria
76-100	Very feasible/very good
56-75	Feasible/good
40-55	Less feasible/not good
0-39	Not feasible/bad

3. RESULTS AND DISCUSSION

3.1 The feasibility of biology teaching material

The feasibility of biology teaching material based on local wisdom integrated character education in the problem based learning model based on media expert, learning design expert, language and

material/content experts was very feasible or very good with the average score 91.01% (Table 2). Furthermore, the feasibility of teaching material from display quality,

presentation, language and content aspects were 91.67%, 91.52%, 86,00% and 95.00%, respectively.

Table 2. Feasibility of teaching material based on experts assesment

No	Aspects Assessed	F	N	P (%)	Criteria
1	Display Quality	110	120	91.67	Very feasible
2	Presentation Eligibility	400	440	91.52	Very feasible
3	Language Eligibility	258	300	86.00	Very feasible
4	Content Eligibility	304	320	95.00	Very feasible
Average in Overall				91.01	Very feasible

Note: F : Total score
N : Overall score of assessment
P : Percentage

3.1.1. Validation of media experts

Validation of media experts on biology teaching materials based on local wisdom integrated character education

through the problem based learning model was very feasible. The scores for its cover and size of letter, images were 90%, 90% and 95%, respectively (Figure 1).

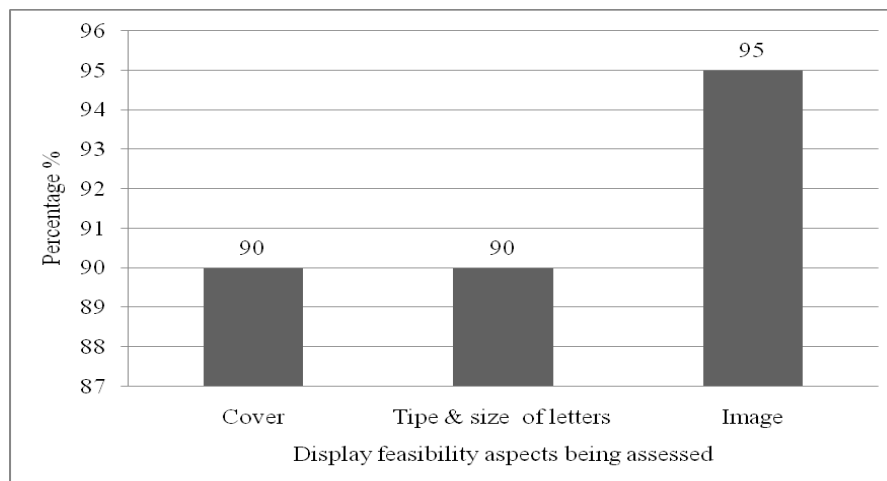


Figure 1. Feasibility of biology teaching materials display according to media expert

3.1.2. Validation of Learning Design Experts

The assessment of media expert on biology learning material was also very feasible (86, 88%-98.33%). The validation score for every indicator of learning design is displayed at Figure 2. Validation score for indicator presentation support was 98.33%, presentation techniques 86.88 %, and presentation learning 89.38%. All aspects of presentations were very feasible or very good.

indicator of language be displayed at Figure 3.

3.1.3. Validation of Language experts

Based on language expert, the feasibility of biology teaching material that has been developed was very feasible (77.5%-96.67%). Validation score for every

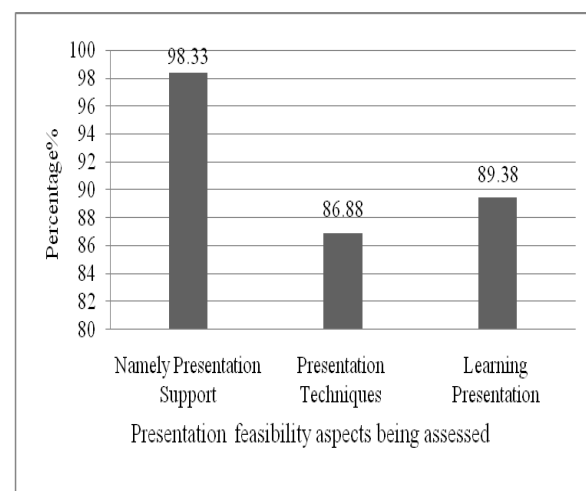


Figure 2. Feasibility of biology teaching material according to learning design expert

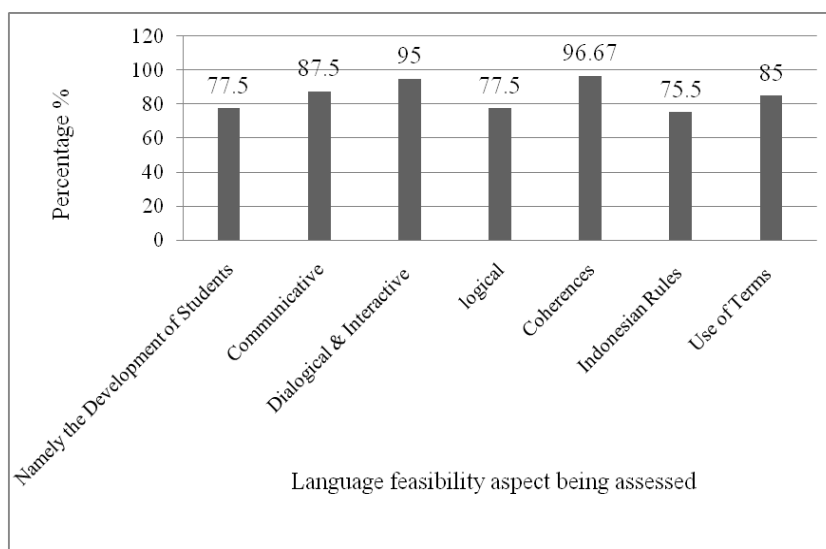


Figure 3. Feasibility of biology teaching material based on language expert

3.1.4. Validation of material experts

Validation from material/content experts on biology learning belongs to grade very feasible or very good (86.25%-100%). Meanwhile, the validation score for content aspects is presented at Figure 4.

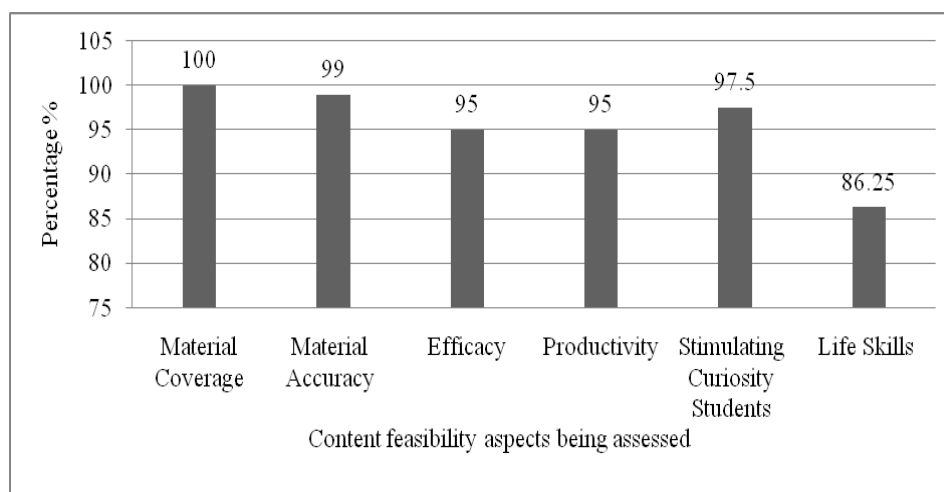


Figure 4. Feasibility of biology teaching material based on material/content expert

3.1.5. Teacher and Student Response

The results of the biology teacher's assessment on biology teaching materials based on local wisdom integrated character education through problem based learning models was very feasible with average score 94.8% (Table 3). The feasibility of material display, material presentation, material language and content were 91.7%, 96.9%, 92.9% and 97.7%, respectively.

Table 3. Feasibility of biology teaching material according to biology teacher

No	Aspek	Biology Teacher				F	N	P (%)	Criteria
		1	2	3	4				
1	Teaching material display	21	23	22	22	88	96	91.7	Very feasible
2	Teaching material presentation	86	84	87	84	341	352	96.9	Very feasible
3	Teaching material language	59	56	54	54	223	240	92.9	Very feasible
4	Teaching material content	88	85	84	87	344	352	97.7	Very feasible
Average in Overall 94.8									Very feasible

Note : F : Total score
 N : Overall score of assessment
 P : Percentage

The results of student response on biology teaching materials based on integrated local wisdom character education through the problem based learning model showed also categorized very feasible with score from 89.6% until 100% (Figure 5).

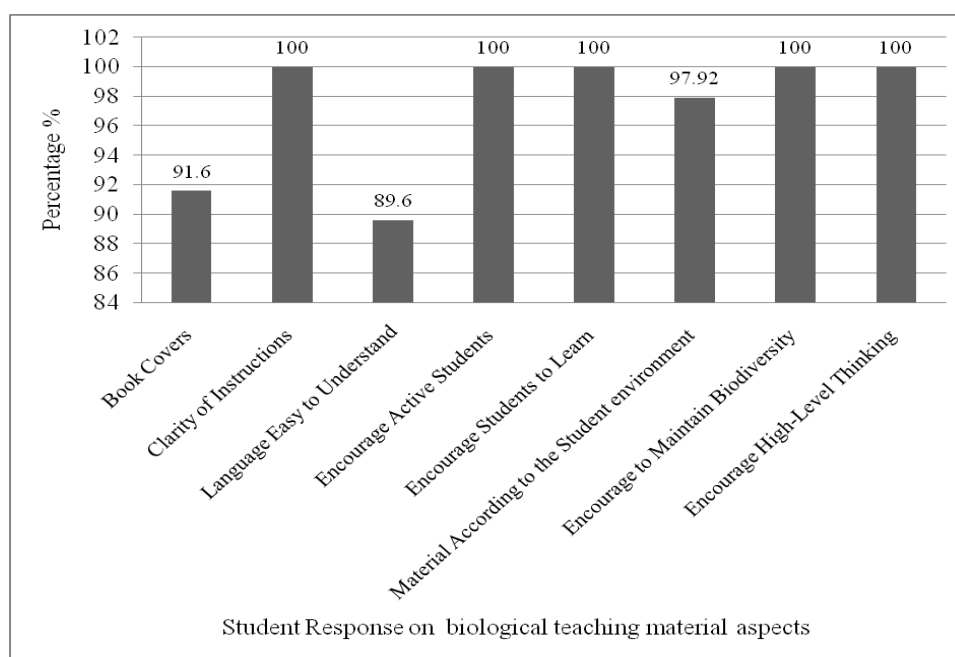


Figure 5. Student Response on biological teaching materials based on integrated local wisdom character education through Problem Based Learning models.

3.2. DISCUSSION

Biological teaching materials developed in this study contain biodiversity material with several titles which include: (1) Biodiversity level, (2) Indonesian biodiversity, (3) Damage and conservation, (4) biodiversity values, (5) classification system. The results of the development of these teaching materials are arranged in accordance with the applicable curriculum, namely the 2013 curriculum. In the 2013 curriculum, the most different changes from the previous curriculum (KTSP) are core competencies. Core competencies have been formulated by the government and basic competencies are developed according to the core competencies of each education unit as a reference for formulating indicators and learning objectives.

According to the National Research Council (1996) teaching materials are arranged in accordance with the learning objectives to be achieved, the development and ability of students and useful for the life of students in the community. Therefore, this teaching material was developed with

the aim of producing new teaching materials that can improve students' high-level thinking skills. The innovation in the development of this teaching material is integrating the local wisdom of the people of Aceh Barat (West Aceh), character values, and the use of Problem Based Learning (PBL) models as well as cognitive domains of Blom Taxonomy with high-level thinking, namely analysis, synthesis, and evaluation. According to Glynn & Winter (2004), learning using real-world contexts and the integration of various sciences will influence the mastery of students' concepts

3.2.1. Display Quality

Coverage of instructional materials developed is designed using a combination of blue, green and some images and red title letters. Blue is a color that gives tranquility while the red color stimulates and can help arouse enthusiasm and warm mood, then green can give a cool and soothing effect and images can clarify the information conveyed (Prastowo, 2012). Furthermore, Muslich (2010) stated books that have

covers and layouts, as well as attractive colors will attract students to learn them.

Font selection is done by analyzing several textbooks or biology textbooks for class X high school. Most high school books are presented using a Georgian font with a size of 11, 1.5 spaces and a book size of 17.6 cm X 25 cm. Therefore, the letters used in writing this teaching material are georgia fonts with size 11, spacing 1.5 and large book size 17.6 cm X 25 cm or size B5. Book size of B5 is a measure in accordance with the provisions of UNESCO teaching materials. Prastowo (2012) stated that teaching materials should be printed using letters that are not too small and easy to read. Whereas according to Sitepu (2012) the size of letters 10, 11, 12 points is a letter commonly used for learning textbooks. In line with BSNP (2015) which stated that the size of textbooks can be made in the form of A4, A5 or B5.

3.2.2. Presentation component

The instructional material of the teaching material that be developed consists of the front cover page, introduction, concept map, syllabus, table of contents, list of images, table list, lesson material, glossary, assessment (performance, multiple choice test questions and essay questions), bibliography and back cover page. The Directorate of High School Development (2010) explained that the making or developing of teaching materials takes into account the structure and components of each type of teaching material that will be developed which consists of the identity of subjects, basic competencies, titles, instructions/guidelines, exercises, assignments/work steps, and assessment. Concept maps contain the flow of material described in each chapter. The syllabus is an initial design that contains core competencies, basic competencies, teaching materials, indicators, learning objectives, and assessment. Each item that be mentioned in the syllabus is developed from KI and KD and interconnected between each others. Indicators and learning objectives are formulated with referring into

the Bloom Taxonomy Cognitive at the high order thinking, namely analyzing, implementing, designing, concluding and creating. These learning objective must be also contained the aspects of audience, behavior, condition, and degree.

The formulation of teaching materials is based on identification or study of teaching materials in the field and interviews doing with biology teachers in several state senior high schools in West Aceh. Teaching materials on biodiversity are prepared in facts, concept, principle and procedural materials. Teaching materials are also arranged factually, concrete and easy to remember. The material about nature also is presented in abstract concepts. The present of contextual material in teaching learning will increase material mastery by students in learning process and it is a good way to learn conservation and better understand on the surrounding environment.

Each chapter in the teaching material contains chapter titles, subtitles, subject matter, performance and practice questions. The teaching material that be developed is also composed by adopting the flow of deductive thinking, from general to specific. The concept material is presented from the easy to the difficult and from the concrete to the abstract. It is intended so that the material can be clearly received and can help students in improvement their thinking skills.

3.2.3. Linguistic Components

The teaching material as a whole is written in Indonesian language. Meanwhile, the caption is presented in Indonesian, scientific language, and Acehnese language. This is done with the aim so that students are easy to recognize and prevent mistake in mentioning the kind of animals and plants that be found in teaching material both in the term of national language, regional languages, and scientific languages. Besides that, foreign or scientific languages of the plants and animals are written in italic writing style.

Language that be used to explain the concepts, concept applications illustrations,

concrete examples, and abstract examples are in simple form. The illustrations that be used to explain the material in each chapter or sub-section are relevant to the message conveyed in the discourse. The language that be used can stimulate students to ask and to search the answers to discourse in teaching materials. The term that be used is in accordance with the Big Indonesian Dictionary and or the agreed upon technical term. The using of good and correct language is one effort to facilitate the student to understand about what they learn.

Submission of messages between one chapter and another chapter is close together, between chapters with sub-chapters in chapters, between sub-chapters with other sections, and between paragraphs in the adjacent sub-section reflects the content and relevance of the contents. The message or material presented in one chapter must reflect the unity of the theme, in one sub-section reflecting the unity of the sub-theme, and in one paragraph contains one subject matter. The presentation of messages between sentences in one paragraph reflects the content and relevance of the content. The sentence that be used to convey the message refers to the Indonesian grammar rules are good and true. The using of terms that describe a concept, principle, specific meaning must be fixed between parts of the book or teaching material.

3.2.4. Feasibility of content

The material developed in this teaching material is biodiversity material which consists of several chapters, namely biodiversity (genes, types, and ecosystems), Indonesian biodiversity, damage and conservation, biodiversity values, and classification systems. Each chapter of teaching material is prepared by integrating local wisdom, character education, and the syntax of Problem Based Learning models (PBL). The material, performance, examples, or exercises that be presented can illustrate the role of local wisdom in supporting the development of biological science. The using of local content in

teaching learning can enrich the teaching material (Glasson, *et al.*, 2010; Gopal, 2005). Increasing the awareness of the community is important for environmental conservation (Rao, *et al.*, 2003).

The overall character values that be integrated in textbooks can provide positive character values to students. Character values that are guarded can provide learners insight in maintaining biodiversity. PBL models that are integrated in the performance aspects can stimulate students to think scientifically. Presentation of material using PBL models can also to drill students to think in high-level.

The flow of material preparation in each chapter follows the flow of deductive writing, from general to specific. This is done in order to drill the students' in thinking skills, so that the learning process that takes place is student centered and can generate feedback through performance and practice questions in the chapter. The descriptions, examples, or exercises presented motivate students to explore and utilize information, solve problems and make decisions in scientific work. Colin (2006) stated that assessment is important in the teaching and learning process. In this case by adding assessment, students are easier to understand the material. The material presented in each chapter in this teaching material contains fact material, concept material, principle material, and procedural material. This is in accordance with the 2013 curriculum which explains that learning material contains four types of knowledge (facts, concepts, principles, and procedures).

Each paragraph in each chapter is interconnected and relevant to the title of the material presented and supported by the performance and practice questions. Through performance task, students can apply scientific methods through observation and/or problem solving presented in performance. The formulation of problems in teaching materials is the problems that arise after students read the material presented based on local wisdom.

Submission of problems to students can be done by presenting real problems in everyday life.

Learning by exploring the environment with students everyday experience can lay out real foundations for students to think and solve problems that occur in society so that one day the knowledge that be learned can be applied directly in society. After the problem formulation, students are directed to formulate hypotheses, collect data, to test hypotheses, and conclude the findings in accordance with the formulation of the problem.

4. CONCLUSION

It can be concluded that biology teaching materials based on local wisdom integrated character education in problem based learning models for students at senior high school in Aceh Barat is very good of feasibility. Where the feasibility of learning material based on expert has percentage score of 91.01% (very good), teacher response 94.8% (very good) and student response 96.06% (very good). Therefore, this study will be continued into the effectiveness test of the product.

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REFERENCES

- Akcay, B. 2009. Problem Based Learning in Science Education. *Journal of Turkish Science Education*. 35 (4): 48-51
- Ajai1, John T., Imoko, Benjamin I. & O'kwu, Emmanuel I. 2013. Comparison of the Learning Effectiveness of Problem-Based Learning (PBL) and Conventional Method of Teaching Algebra, *Educations and Practice Journal*, 2013, 4 (1), 1 – 6.
- BSNP. 2015. Deskripsi Butir Instrumen Penilaian Buku Teks Pelajaran SMA/MA
- Komponen Kelayakan Kegrafikan. Kementerian Pendidikan dan Kebudayaan.
- Colin, J. 2006. *A Critical Analysis of the Use of Formative Assessment in Schools*. Hongkong: APERA Conference.
- Direktorat Pembinaan SMA. 2010. *Juknis Pengembangan bahan Ajar SMA*.
- Folb, B.L., Wessel, C.B., dan Czechowski, L.J. 2011. Clinical and academic use of electronic and print books: the Health Sciences Library System e-book study at the University of Pittsburgh. *J Med Libr Assoc*. 99(3): 218-228
- Glynn, S.M., & Winter, L.K. 2004. "Contextual Teaching and Learning of Science in Elementary Schools". *Journal of Elementary Science Education*, XVI(2), 51-63.
- Gopal, R. 2005. "Indigenous Environmental Knowledge in Formal Education". *Jurnal Penyelidikan MPBL*, VI, 120-132
- Glasson, G.E., Mhango, N., Priri, A., & Lanier, M. 2010. "Sustainability Science Education in Africa: Negotiating Indigenous Ways of Living With Nature in The Third Space". *International Journal of Science Education*, XXXII(1), 125-141.
- Horsley, M., Knight, B., dan Huntly, H. 2010. The Role of Textbooks and Other Teaching and Learning Resources in Higher Education in Australia: Change and Continuity in Supporting Learning. *IARTEM 1-Journal* Vol. 3(2): 43-61.
- Hadi, K. 2015. Analisis RPP Berdasarkan KTSP dan RPP Berdasarkan Kurikulum 2013 di SMA Negeri Se-Kabupaten Aceh Selatan. *Jurnal Pendidikan Biologi Volume 5 No.1*, hal 35-48
- Kesuma, D. 2011. *Pendidikan Karakter : Kajian Teori dan Praktek si Sekolah*. Bandung : Rosda Karya.
- Manurung, B., Crysty, V., Syarifuddin and Pratama, A.T. 2017. Developing ecology and environment learning materials of scientific literacy skills and local potencial for Indonesia students. *International Journal of Humanities Social Sciences and Education* 4(7): 84-93.
- National Research Council, 1996. National Science Education Standard. Washington DC: National Academi Press.

- OECD. 2004. *Learning for tomorrow's world: First results from PISA 2003*. Paris, France: OECD.
- OECD. 2007. *PISA 2006 science competencies for tomorrow's world*. Volume 1. Paris, France: OECD.
- OECD. 2009. *PISA 2009 Assessment Framework: Key Competencies in Reading, Mathematics, and Science*. USA: OECD-PISA
- OECD. 2010. *PISA 2009 Results: Executive Summary*. www.pisa.oecd.org
- OECD. 2012. *PISA 2012 Results in Focus What 15 Year Olds Know and What They Can Do with What They Know*. OECD
- Pala, Aynur. 2011. The Need For Character Education . *International Journal of Social Sciences and Humanity Studies* Vol 3, No 2, 1309-8063.
- Prastowo, A. 2011. *Panduan Kreatif Membuat Bahan Ajar Inovatif*. Yogyakarta : Diva Press
- Prastowo, A. 2012. *Panduan Kreatif Membuat Bahan Ajar Inovatif*. Yogyakarta : Diva Press Sitepu. 2012. *Penulisan Buku Teks Pelajaran*. Bandung : Remaja Rosdakarya
- Rao, K.S., Semwal, R.L., Maikhuri, R.K., Nautiyal, S., Sen, K.K., Singh, K., Chandrasekhar, K., & Saxena, K.G. 2003. "Indigenous Ecological Knowledge, Biodiversity dan Sustainable Development in The Central Himalayas". *Tropical Ecology*, XLIV(1), 93-111.
- Sitepu. 2012. *Penulisan Buku Teks Pelajaran*. Bandung : Remaja Rosdakarya
- Tasiwan, S. E Nugroho, Hartono. 2014. Analisis Tingkat Motivasi Siswa Dalam Pembelajaran IPA Model Advance Organizer Berbasis Proyek. *Jurnal Pendidikan IPA Indonesia* 3 (1): 43-50.

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