

# Development Potential of Teaching Materials for Environmental Education Based on Local Potentials of Riau Province in Higher Education

Rudy Haryanto<sup>1\*</sup> Suwondo<sup>2</sup> Sri Wulandari<sup>3</sup>

1. Graduate Program of Biology Education, University of Riau Jl. Binawidya Km 12.5, 28291, Pekanbaru Riau, Indonesia
2. Graduate Program of Biology Education, University of Riau Jl. Binawidya Km 12.5, 28291, Pekanbaru Riau, Indonesia
3. Biology Education Study Program, University of Riau Jl. Binawidya Km 12.5, 28291, Pekanbaru Riau, Indonesia

## Abstract

The implementation of an excellent Environmental Education enables the improvement in environmental potentials according to the characteristics of its region. However, teaching materials for environmental education in higher education tends to be limited for students. This research was conducted to identify development potentials of teaching materials based on local potentials in higher education. The study on local potentials was conducted in Riau Province integrated with the environmental education curriculum in the Faculty of Teacher Training and Education (FKIP) at Universitas Riau. The research was conducted in November-December 2018. It employed a descriptive qualitative approach, where the data collection was conducted through observation, interview, and literature review. The analyzed parameters included (1) analysis of environmental education curriculum in FKIP at Universitas Riau; (2) Identification of local potentials in the form of local environmental problems in Riau Province; and (3) analysis of the development potentials of teaching materials for environmental education based on local potentials of Riau Province in learning at Higher Education. The research results revealed that Environmental Education in the Faculty of Teacher Training and Education (FKIP) Universitas Riau has Sub Achievement which become the lecture topics in the form of describing various environmental problems both local and global levels, as well as the causes and effects for humans and environment. On the other hand, Riau Province has various environmental problems which have become global and national issues. The problems of Riau Province, which become global issues are the increase of greenhouse gas emission and global warming. Meanwhile, the problems of Riau Province, which become the national issues are deforestation, forest and land Fires, environmental pollutions, and abrasion. The complexity of local potentials regarding the environmental issues in Riau Province can be integrated into learning environmental education in FKIP at Universitas Riau. The integration could be conducted by developing as teaching materials in the form of modules to support the reinforcement of environmental education implementation in Higher Education..

**Keywords:** environmental education, higher education, local potentials, learning sources

**DOI:** 10.7176/JEES/9-6-12

**Publication date:** June 30<sup>th</sup> 2019

## 1. Introduction

Environmental education is one of the essential means in the efforts of forming environmentally-knowledgeable generation. Environmental education has a vital role in developing a society which is aware and concerned about various environmental issues and has the knowledge, attitude, commitment, and skill to work both as individuals and collective in order to solve and prevent the emergence of environmental problems (Sutoyo, 2007).

The implementation of environmental education in higher education is considered crucial to be able to increase the students' environmental caring character. According to Oztas (2009), students as teacher candidates must possess exemplary knowledge and personalities so that in managing learning, they can convey the values of environmental care well. Besides, the implementation of environmental education from elementary to secondary education demands the presence of teacher candidates who master the concept of environment and can integrate environmental education into the learning process.

One of the universities which have implemented environmental education is Universitas Riau (UNRI). This implementation places Environmental Education as General Skills Course (MKKU) which is required by all students of the Faculty of Teacher Training and Education (FKIP) since 2016. The research results by Suwondo,

et al., (2017) reveal that there are several challenges in implementing environmental education in Universitas Riau, among them are: (a) students' difficulties in mastering the taught theories since they belong to multidisciplinary knowledge; (b) the correlation and balance of field practicum and theories are not optimum so that students are unable to understand the environmental problems significantly; (c) limitation/ provision of accurate information and teaching material sources as learning references; and (d) the lack of awareness in environmental care among students' selves. Prastowo (2011) explains that teaching materials have a significant role in achieving the success of the learning process. The module of teaching materials functions as (1) independent teaching material, (2) substituting the function of the teacher, (3) as an evaluation instrument, and (4) as reference material for students.

Based on the problems above, reinforcement efforts are needed for environmental education, which raises the local environmental issues in Riau Province in learning environmental education in Universitas Riau. Therefore, a study on Development Potential of Teaching Materials for Environmental Education based on Local Potentials of Riau Province in Higher Education was conducted.

## 2. Method

This research was conducted to identify the local potentials in Riau Province, which can be integrated into the learning of Environmental Education in FKIP at Universitas Riau. The research was conducted in November-December 2017. The research employed a descriptive qualitative approach in which the data collection was conducted through observation, interview, and literature study. The collected secondary data were obtained from various sources such as journal, research report, books, and other sources which are relevant and accountable.

The analyzed parameters were (1) analysis of environmental education curriculum in FKIP at Universitas Riau; (2) Identification of local potentials in the form of the ecosystem and local wisdom of Riau Province; and (3) analysis of the integration in learning. The data analysis was conducted qualitatively by integrating the local potentials in learning educational education.

## 3. Results and Discussion

### 3.1 Environmental education curriculum in FKIP at Universitas Riau

Environmental Education Course in FKIP at UNRI discusses about the concept and application of environmental education in life and learning; identifies various environmental problems, both in local and global levels such as climate change, fires, pollutions, forest degradation and peatlands, as well as natural disasters such as flood, abrasion, landslides, and drought; analyzes various efforts in environmental management which covers the aspects of planning, utilizing, controlling, maintaining, law supervising and enforcement.

The advantages of this course for the students are to understand various concepts of the environment as well as implementing it in life and learning according to the knowledge field that they have. Generally, the material concept in the environmental education course can be categorized as presented in Table 1.

Table 1. The Description of Environmental Education Curriculum of FKIP UNRI

No.	Sub CPMK	Course Materials
1	Describing the basic concept and the application of environmental knowledge.	Basic Concept, Scope, Position and Principles and application of environmental knowledge
2	Describing the basic concept and the characteristics of various ecosystem typology.	Basic concept and types of ecosystem both terrestrial ecosystem /(land) and aquatic ecosystem (waters)
3	Describing various environmental problems both local and global levels, as well as the causes and effects for humans and the environment.	Local and global environmental problems, as well as causes and effects for humans and the environment.
4	Describing various efforts in managing a sustainable environment.	Various efforts in environmental management in the perspectives of: <ul style="list-style-type: none"> <li>o policies, environmental ethics, and</li> <li>o Local wisdom.</li> </ul>

No.	Sub CPMK	Course Materials
5	Conducting observation, analysis, and finding solutions for various environmental problems surroundings.	Case studies on observing environmental problems and formulating the efforts of environmental management.

Good learning pays attention to each sub achievement of learning, which is correlated with the learning materials. Learning materials can be developed by paying attention to the predetermined course achievement. According to Kemenristekdikti (2016), learning materials can be renewed or developed according to needs development. The materials are developed by observing Sub-CPMK. Constitution No. 20 of 2003 explains that the curriculum in all educational levels can be developed with the diversification principle according to the educational unit, regional potential, and the characteristics of the students. Furthermore, in Article 36, it is emphasized that the elements that need to be paid attention to in curriculum construction are: (a) the increase of potential, intelligence, and interest of students; (b) the diversity of regional and environmental potentials; (c) the demands of regional and national developments; (d) the development of knowledge, technology, and arts; and (e) the dynamics of global development.

The implementation of environmental education in learning must be supported by relevant learning sources. Learning sources is everything which supports the learning process, including service system, learning materials, and environment. According to Suratsih (2010), learning source can be interpreted as everything which can give easiness for students in obtaining some information, knowledge, and skills in teaching and learning process. One of the forms of learning source is teaching materials.

One of the problems of environmental education is limited teaching materials (Suwondo et al., 2017). Therefore, the development of teaching materials is needed in order to enrich learning sources for environmental education implementation. According to Prabowo et al., (2016), the use of relevant teaching materials can support the pursuit of learning objectives well. Excellent teaching material is constructed by involving the local potentials so that it presents various data and contextual examples in the students' surrounding areas.

### 3.2 Environmental Problems in Riau Province

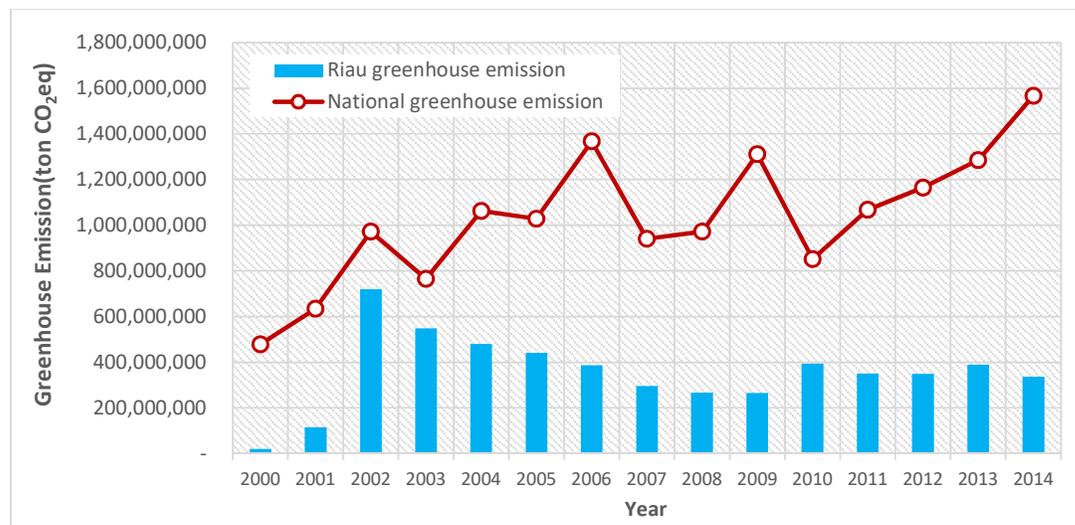
Riau Province has various environmental problems such as greenhouse gas emission increase, global warming, deforestation, forest and land fires, environmental pollutions, and abrasion. Those problems have become global and national issues in Indonesia. The identification results of environmental problems in Riau Province are as follows.

#### 3.2.1 Greenhouse Gas Emission of Riau Province

Riau Province has a relatively significant contribution to the National greenhouse emission around 4%-74%. The most significant greenhouse emission source in Riau Province originates from the land sectors such as forest and land fires which continuously occur in the last 20 years in Riau Province. Riau Province as the second highest emission province in Indonesia in 2010. The greenhouse emission in Riau Province originates from 4 (four) fields, including (1) agriculture, (2) Energy, (3) Land, and (4) Waste management; in which in 2014, the greenhouse emission reached up to 336 million tons of CO<sub>2</sub>eq or equals to 21% from the total of national greenhouse emission.

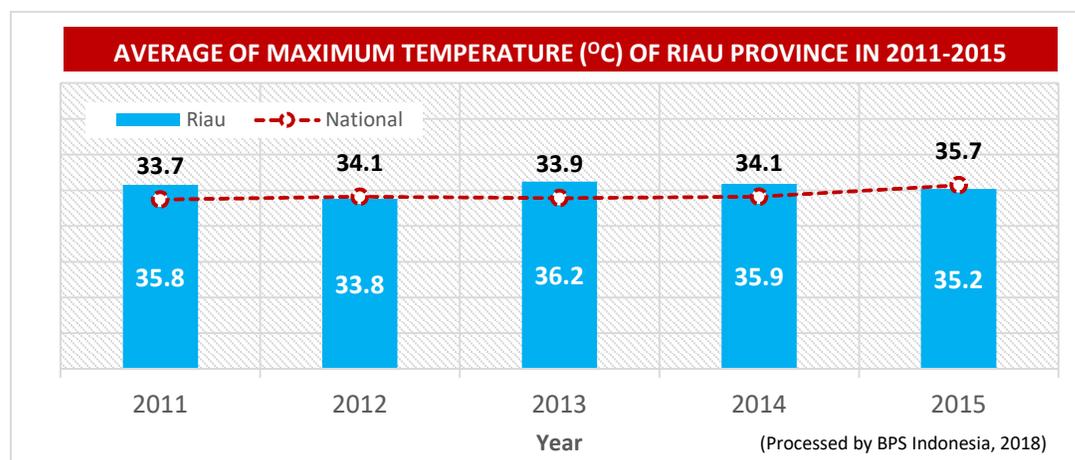
#### 3.2.2 Global Warming

The increase of greenhouse gas in the atmosphere means the more solar radiation retransmitted by the surface of the earth is absorbed by the greenhouse gasses. This causes more solar radiation will be retransmitted back towards the earth surface. Accordingly, the temperature of the earth is increasing. The average value of maximum temperatures of Riau Province in 2011, 2013, and 2014 around 35.8-36.2 0C. This number exceeds the average value of national maximum temperature (33.7-35.0 0C) (BPS Indonesia, 2018).



(Processed from the data of <https://www.signsmart.menlhk.go.id>)

Figure 1. Riau Greenhouse Emission in 2000-2014



(Processed by BPS Indonesia, 2018)

(Processed from The Indonesian Central Bureau of Statistics (BPS) data, 2018)

Figure 2. Average of Maximum Temperature (°C) of Riau in 2011-2015

### 3.2.3 Deforestation

The deforestation process in Riau Province occurs rapidly. Within the last 24 years (1982-2015) Riau Province has lost the natural forest coverage of 3.7 million ha. In 1982, the natural forest coverage in Riau Province was 6,415,655 ha (78% of the area of Riau Province, 8,225,199 Ha). Until 2005, the rest of the natural forest was 2,743,198 ha (33%). Within the period, each year on average, Riau Province loses the natural forest with the area of 160,000 Ha/year, and within the period of 2004-2015, the lost natural forest reached up to 200,000 ha (Jikalahari, 2015).

### 3.2.4 Forest and Land Fires

Forest and land fires become an annual agenda in Riau Province, particularly in drought season in the last 20 years. The observation results of Sipongi KLHK in 2011-2018, Riau Province each year experiences fires. The most significant fire occurred in 2014 reached up to 6,301 ha. In 2018, this forest and land fire stroke back and exceeded the incidence in 2016-2017. The data of forest fire area in 2018 are estimated to increase considering the presented

data are only in January-September not until December 2018.

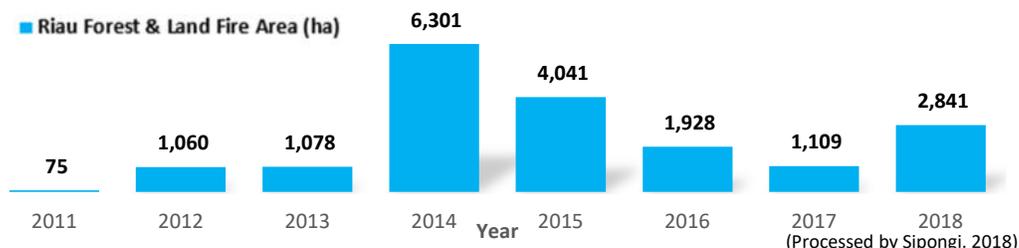


Figure 3. The Summary of Forest and Land Fire area (Ha) of Riau Province in 2011-2018  
 (Processed by Sioungi, 2018)

### 3.2.5 Environmental Pollution

Pollution is the contamination of organism, energy substance, and or other components into the environment or the change in the environmental order into the environment or the change in environmental order by human activities or by natural process so that the quality decreased until a certain level; therefore, the environment can no longer function according to its means (The constitution Number 32 of 2009). The Environmental Quality Index (EQI) in Riau Province is categorized as poor and always below the National EQI (2009-2016), which is around 50.72 – 56.73 (KLHK, 2017). According to KLHK (2017), EQI with a score of 50 - 60 is included as poor.

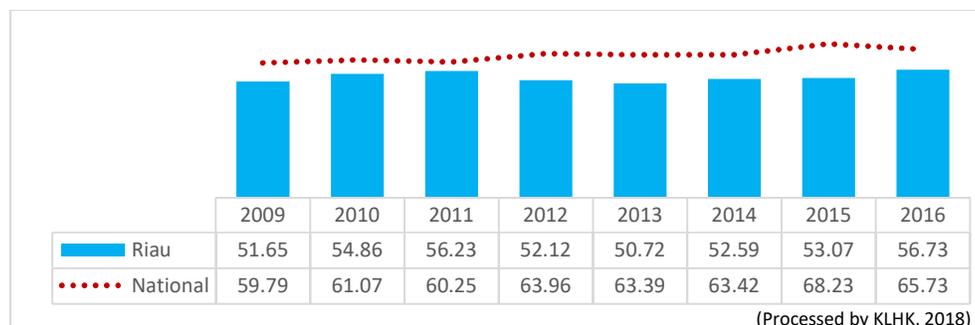


Figure 4. The Environmental Quality Index of Riau Province in 2009-2016  
 (Processed by KLHK, 2018)

### 3.2.6 Abrasion

The incidence of abrasion in Riau Province occurs in the coastal area such as in the northern area of Bengkalis Island. The highest abrasion level occurs in the on the western end of the island. Coastal abrasion also occurs on the southern end of the island. The overlapping change results of the coastal line in the last 26 years, which is between 1988 and 2014; the average abrasion per year increases is 59.02 ha/year (Sutikno, 2015).

Table 2. Abrasion Rate of Riau Province (1988-2014)

Period	Abrasion	
	Luas (ha)	Rata-rata (ha/year)
July 1988-March 2000	543.16	46.56
March 2000-July 2004	187.86	43.35
July 2004-January 2010	399.66	72.67
January 2010-january 2014	374.24	93.56
<b>Total</b>	<b>1,504.93</b>	<b>59.02</b>

(Sutikno, 2015)

The complexity of environmental problems in Riau Province has illustrated the representative data of environmental problems both in the global and national level. However, all this time, the present data and facts in

the surrounding area have not been explored and documented well in learning. Whereas, various environmental issues can become local potentials, which are developed as learning sources. According to Prabowo et al., (2016), the diversity of local potentials in a specific region can be well established into learning sources. The learning which raises local potentials have advantages such as presenting various data and contextual examples in the surrounding area of the students. Hence, it can increase their knowledge on the importance of the environment for human's life, which eventually can foster the feeling of belonging and responsibility on the sustainability of local potentials in their regions.

According to Triyanto (2009), learning can be conducted using surrounding problems as the initial problems in gathering and integrating new knowledge. Elaine et al., (2016) assert that various studies have been conducted consistently and concluded that learning based on the surrounding problems could increase the retention of long-term knowledge and the implementation of the actual knowledge. Derevenskaia (2014) explains that learning using local potentials in the surrounding enables students to study the ecological and biological disciplines more effectively and further. The learning can shape a systematic approach in observation and research, develop practical skills, as well as raise the students' psychology in terms of responsibility for their surrounding environment.

### 3.3 The Integration of Environmental Problems in Riau Province in learning Environmental Education in Higher Education

Based on the identification results on various local potentials in Riau Province and Environmental Education Curriculum in FKIP UNRI, then integration analysis between the components of local potential and sub CPMK which can be developed. The results of the analysis data showed that local potentials in the form of environmental problems in Riau Province could be integrated into learning environmental education in FKIP UNRI. Sub CPMK which can be integrated is describing various environmental problems both in local and global levels, as well as the causes and effects for humans and the environment. Sub-CPMK discusses about materials regarding various environmental problems as well as its impacts both global and local levels.

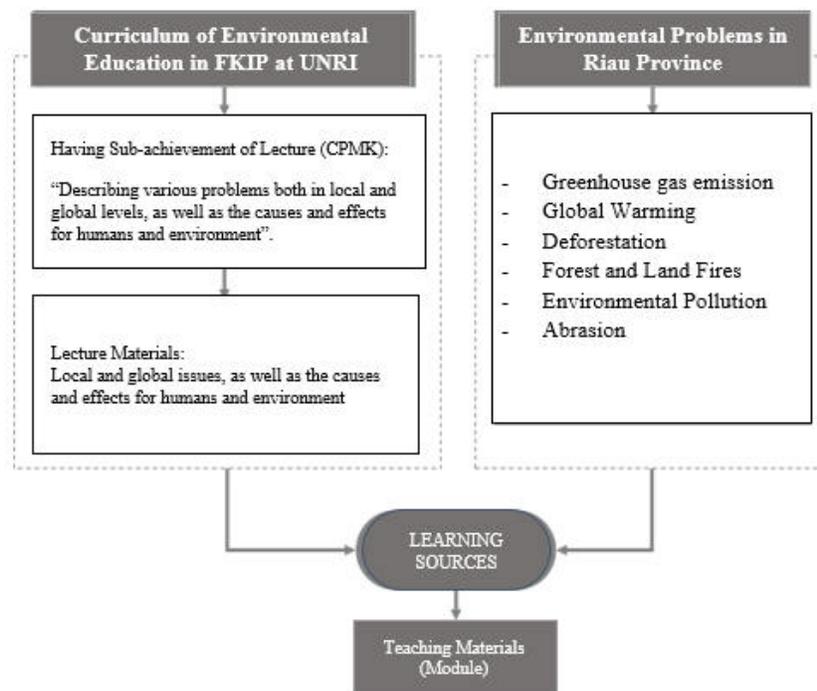


Figure 5. The integration of Environmental Problems in Riau Province as Environmental Education

The integration of local potentials with environmental education curriculum can be conducted as learning source enrichment in the form of teaching materials. Besides, the integration of local potentials in learning can be conducted in direct learning activities. The integration can be conducted in the initial stage (apperception and motivation), main activity, and/or individual and scientific group assignments in learning.

Module, one of the forms of teaching materials which is constructed thoroughly and systematically, contains a set of planned learning experiences and designed for assisting students in mastering specific learning objectives. The primary purpose of the module is to increase efficiency and effectiveness of learning, including time, fund, facility, and energy to achieve the objectives optimally. Besides, the module can be an independent learning facility so that students can learn according to their own pace. The module is written using the same instructional strategies as used in the learning.

The module construction aimed to provide teaching materials according to the curriculum demands by paying attention to educational needs. The module is constructed by paying attention to the characteristics of learning materials and students as well as their social backgrounds. Indriyanti (2010) explains that the advantages obtained from learning using a module are: (a) increasing students' motivation; (b) educators and students know certainly the part of the module which has or has not succeeded; (c) students achieve results according to their abilities; (d) learning materials are equally distributed in one semester; (e) education is more empowering, since the learning materials are constructed according to their academic level. Prastowo, (2011) asserts that module has an essential function as (1) independent teaching materials, (2) substituting the function of educator, (3) as an evaluation tool, and (4) as a reference for students.

The integration in the form of enrichment such as module needs to pay attention to basic principles of learning development. According to Kemenristekdikti (2016), learning development in the form of enrichment of learning materials is renewable or developed according to the development of needs. The materials are developed by paying attention to Sub-CPMK. Besides, Kemenristekdikti (2017) explains that each planning of learning process in higher education is constructed in semester learning plan (RPS) should contain CPMK, Sub-CPMK, and material content as well as the learning process which will be conducted. Dimiyati & Mudjiono (2002) describe that the learning process must pay attention to the expected material content and competency achievement.

According to Prastyawan (2011), curriculum and learning in each educational unit can perform a development according to the needs and regional advantages. Depdiknas (2003) explains that learning innovation can be conducted in the curriculum, learning process, and management, which are forested through activities, creativity, and professionalism. Curriculum innovation is indicated by various learning plans which will be developed by each educator according to the regional characteristics and students' needs.

The content of local potentials is chosen based on the results of need analysis by considering the relevance of learning material content. According to Udin (2009), innovation through the development of learning materials can be conducted by paying a closer look at regional characteristics on an educational unit. The content of local potentials is presented in the form of real examples on each learning material discussion including (1) various typical types of the ecosystem in Riau Province; (2) current issues on environmental problems in Riau Province; and (3) local wisdom in environmental management in Riau Province. According to Hamdani Hamid (2013), the development activities of learning material content needs to be adjusted with the development of knowledge and characteristics of students as well as local potentials in their regions.

#### **4. Conclusion and Suggestions**

Based on the research results, it can be concluded that Environmental Education in FKIP at Universitas Riau has learning sub-achievement which can be integrated with the environmental problems of Riau province in the form of teaching materials specifically module of environmental education based on local potentials. The lecture topics which can be developed are describing various environmental problems both in local and global levels, as well as the causes and effects for human and environment. The problems of Riau Province have become global issues, are the increase in greenhouse gas emission, and global warming, while the problems of Riau Province which have become the national issues are deforestation, forest and land fires, environmental pollution, and abrasion. The complexity of local potentials in Riau Province can be integrated into learning environmental education in FKIP at Universitas Riau. The integration can be conducted by developing teaching materials in the form of the module to support the reinforcement of environmental development in Higher Education.

#### **References**

- Badan Pusat Statistik [BPS] Indonesia. 2018. Statistik Indonesia Tahun 2018. BPS Indonesia. Jakarta.
- Badan Pusat Statistik [BPS] Riau. 2018. Riau Dalam Angka Tahun 2018. BPS Riau.
- Departemen Pendidikan Nasional [Depdiknas]. 2003. Pelayanan Profesional Kurikulum 2004: Kurikulum

- Berbasis Kompetensi. Jakarta.
- Derevenskaia, O. 2014. Active Learning Methods in Environmental Education of Students. *Procedia - Social and Behavioral Sciences* 131 (2014): 101-104
- Dimiyati & Mudjiono. 2002. *Belajar dan Pembelajaran*. PT. Rineka Cipta. Jakarta.
- Hamdani Hamid. 2013. *Pengembangan Sistem Pendidikan di Indonesia*. Pustaka Setia. Bandung.
- Elaine, H.J.Y., Goh, K., 2016, Problem-Based Learning: An Overview of its Process and Impact on Learning, *Journal of Health Professions Education*, 2 (2016), 75-79.
- Indriyanti, N.Y dan Susilowati, E. 2010. *Pengembangan Modul*. Lembaga Penelitian Dan Pengabdian Masyarakat. Universitas Sebelas Maret. Surabaya.
- Kementerian Lingkungan Hidup dan Kehutanan [KLHK]., 2017, *Status Lingkungan Hidup Indonesia*. Direktorat Jendral Pengendalian Pencemaran dan Kerusakan Lingkungan, KLHK, Jakarta.
- Kementerian Riset, Teknologi dan Pendidikan Tinggi [Kemenristekdikti]., 2016, *Panduan Penyusunan Kurikulum Pendidikan Tinggi*, Direktorat Jenderal Pembelajaran dan Kemahasiswaan, Kemenristekdikti, Jakarta.
- Kementerian Riset, Teknologi dan Pendidikan Tinggi [Kemenristekdikti]., 2017, *Penyusunan Rencana Pembelajaran Dan Perangkatnya*. Direktorat Jenderal Pembelajaran dan Kemahasiswaan, Kemenristekdikti, Jakarta.
- Oztas, F., Kalıpcı, E., 2009. Teacher Candidates' Perception Level of Environmental Pollutant and Their Risk Factors. *International Journal of Environmental & Science Education*, 4 (2): 185-195.
- Prabowo, D.L., Nurmiyati., Maridi. 2016. The Development of Local Potential-Based Module on Ecosystem Subject Matter as a Teaching Materials SMA Tanjungsari, Gunungkidul. *Proceeding Biology Education Conference*, 13 (1): 192-195.
- Prastowo, A. 2010. *Panduan Kreatif Membuat Bahan Ajar Inovatif*. Diva Pers. Yogyakarta.
- Prastyawan, 2011. Inovasi Kurikulum Dan Pembelajaran, *Jurnal Al Hikmah*, 1 (2): 170-181
- SIGN-SMART., 2017. *Grafik Total Emisi Riau*. [terhubung berkala]. [http:// http://signsmart.menlhk.go.id](http://http://signsmart.menlhk.go.id) [23 Agustus 2017].
- Sipongi-Karhutla Monitoring Sistem., 2017. *Rekapitulasi Luas Kebakaran Hutan dan Lahan (Ha) Per Provinsi Di Indonesia*. [terhubung berkala]. <http://sipongi.menlhk.go.id> [23 Agustus 2017].
- Suratsih. 2010. *Pengembangan Modul Pembelajaran Biologi Berbasis Potensi Lokal Dalam Kerangka Implementasi KTSP SMA Di Yogyakarta*. Penelitian Unggulan. Universitas Negeri Yogyakarta. Yogyakarta.
- Sutikno, S. 2015. Analisis Laju Abrasi Pantai Pulau bengkalis dengan Menggunakan data satelit. *Proceeding Water Management for Hydrological Restoration In Tropical Peatland*, 616-625.
- Sutoyo. 2007. Paradigma Perlindungan Lingkungan Hidup. *ADIL: Jurnal Hukum*. 4(1): 193-206
- Suwondo, Darmadi, Rudy, H. 2017. Implementation of Environmental Education to Support Sustainability of Green Campus Program in Universitas Riau. *Proceeding of The 1st UR International Conference on Educational Sciences*, 634-639.
- Triyanto, 2009. *Mendesain Model Pembelajaran Inovatif Progresif*. Kencana Prenada Media Group. Jakarta.
- Undang-Undang Republik Indonesia Nomor 20 Tahun 2003 Tentang Sistem Pendidikan Nasional.
- Undang-Undang Republik Indonesia Nomor 32 Tahun 2009 Tentang Pengelolaan dan Perlindungan Lingkungan Hidup.
- Udin Syaefuddin Sa'ud, 2009. *Inovasi Pendidikan*. Alfabeta. Bandung.