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Integrating Cangkringan's Local Potential in Science Education Through Subject Specific Pedagogy: Is It Really Integrated?

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ABSTRACT

Indonesia is a country with very rich in local regional potential. The local potential can be utilized as one of the natural science learning sources in junior high school. One of the local potentials that can be integrated with science lessons is food. This research aimed to conduct the study, analysis, and develop science subject specific pedagogy of natural science learning integrated local food in Cangkringan Sub-District to introduce chemical materials in junior high school, namely additives in food and its impact on health. This research was research and development (R&D) with 4-D model, consist of define, design, develop, and disseminate. Product eligibility is assessed by the validator using the product feasibility assessment sheet. Product feasibility assessment scores are then classified in product rating category classification. This research results is produce science subject specific pedagogy that consist of syllabuses, lesson plans, handouts, and student worksheets. The developed syllabus gets a feasibility score of 4.00, lesson plan gets a score of 3.80, the handout gets a score of 3.60, while the student worksheet gets a score of 3.80. Based on these results, overall, the science subject specific pedagogy developed gained a very good category.

Keyword: Cangkringan, Local Potential, Chemistry Education Concept

INTRODUCTION

Natural Sciences is one of the subjects learned in junior high school, with scope and objects in the form of nature and its contents. Natural science learning covers the realms of process, product, attitude, value, and morals. In the natural science learning process all elements including products, processes, scientific methods, and science applications in daily life must emerge, so that students can experience the learning process in its entirety, understand natural phenomena through problem solving activities, scientific methods, and mimic the way scientists work in finding new facts (Trianto, 2014).

One of the scope of natural science studies in junior high school is chemistry. Chemistry in junior high school help develop and improve students' skills in applying scientific methods and attitudes, because chemistry is synonymous with a process skills approach that emphasizes learning "how to acquire a concept?" instead of learning "what is a concept".

Chemical subjects learn everything about substances that include composition, structure and properties, changes in substances, and energy that accompany their changes. Nevertheless, in the junior high school, the chemistry scope is include a chemical material related to daily life as a provision for students to solve problems related to chemistry. In their research, Riezqia, Rahardini, Putu, & Wilujeng

(2017) and Syaban & Wilujeng (2016) revealed that learning process that related to real experience through things that are attached and close to students' daily life causes students have high enthusiasm participating in teaching and learning activities.

Natural science learning resources are not limited to theoretical textbooks provided by the government. The existence of the surrounding environment have high potential that can support learning activities (Prabowo, Nurmiyati, & Maridi, 2016). This statement is supported by Undang Undang Republik Indonesia No. 20 of 2003 on the National Education System, which states that curriculum development is carried out by referring to national standards of education and curriculum at all levels and types of education developed with the principle of correctiveness in accordance with the unit of education, the potential of the district and students, so that the learning process development in the school needs to refer to the local potential in the area. The local potential of the area is a learning resource that can be raised as a means of learning (Widowati, Wibowo, & Hidayati, 2013).

Research that develops integrated learning with local potential has been widely done. Setiawan & Wilujeng (2016) developing natural science learning with an integrated scientific approach to the local potential of onion plantations in Brebes, Central Java, Indonesia. That learning process is proven to be effective for improving students' process skills and cognitive abilities. Moreover, Anisa (2017) mention that natural science learning based on Jepara's local potential in the form of pottery and furniture making is effective to improve critical thinking skills, this is because learning is able to provide a direct experience for students to dig deeper information creatively and provide a deep understanding, thus, it make the learning activity more meaningful. Wilujeng, Prasetyo, & Suryadarma (2017) mention that natural science learning conducted with local potential as basis is effective when viewed from the point of learners' skills (i.e., process, generic, and critical thinking skills).

Based on the observations and interviews conducted at SMP N 1 Cangkringan, it is known that natural science learning in SMP N 1 Cangkringan is conducted separately, between the charge of Physics and Biology. The teacher was also separated, between physics and biology teachers. In addition to not complying with the demands of the 2013 curriculum that must be integrated to teach natural science, it also gives an indication that science learning with Chemical content is not learned maximally. In addition, there is also the fact that learning is still racing against textbooks theoretically. The obstacles encountered by teachers are their limited time and difficulty of finding references to the development of learning variations.

SMP N 1 Cangkringan that located in Cangkringan sub-district has various regional potentials, such as various kinds of local food, traditional arts, hereditary traditions, as well as regional customs ceremonies related to the nature and environment of Mount Merapi. It certainly becomes very potential, if the teacher wants to integrate it into science learning.

One of the material of junior high school that is chemically charged and close to daily life is additive material, contained in basic competency of 3.6 on 8th grade, regarding additives in food and its impact on health. In addition to being close to daily life, the material can certainly also be integrated with local potential, namely local food that students often encounter in the surrounding environment.

Integrated natural science learning with local potential certainly requires a learning device that supports the implementation and learning activity. Nowaday, however, the related learning device are still limited in the scope of integration and study. This research aimed to conduct the study, analysis, and develop

natural science subject specific pedagogy integrated with local potential, which aim to defend additive materials. The science subject specific pedagogy developed consist of syllabuses, lesson plans, handouts, student worksheets, and assessment instruments consisting of process skills assessment instruments, learning interests, and communication skills.

METHODS

This research is research and development (R&D). Research and development using a 4-D development model consisting of define, design, develop, and disseminate (Thiagarajan, Semmel, & Semmel, 1974). The define stage is the stage of defining, reviewing, and analyzing the needs and curriculum and concepts of learning. Assessment and analysis is conducted with observations and interviews. In addition, analysis of curriculum and material concepts is carried out so that the learning is designed to truly suit the needs of students and in accordance with the desired integration, namely integration with local potential. The design stage is the design process of the science subject specific pedagogy product. The develop stage is the development stage of science subject specific pedagogy, including due diligence. Meanwhile, disseminate is the dissemination stage of learning devices.

Product eligibility is assessed by the expert validator using the product feasibility assessment sheet. The eligibility data obtained is then analyzed using the following formula.

$$Average\ Score = \frac{Number\ of\ Scores}{Number\ of\ Validators}$$

The score obtained is then codified according to the classification of product assessment category according to the Widoyoko (2017) as follows.

Table 1. Product Rating Category Classification

No	Average Interval Score	Category
1	$3.25 < x \leq 4.00$	*Very good*
2	$2.50 < x \leq 3.25$	*Good*
3	$1.75 < x \leq 2.50$	*Low*
4	$1.00 < x \leq 1.75$	*Very low*

Source: (Widoyoko, 2017)

RESULT AND DISCUSSION

Chemistry needs to be introduced to junior high school students, because chemistry is as important as other sciences scope. Chemical science contains the meaning of asking questions, seeking answers, understanding answers, perfecting answers, both about the symptoms and characteristics of the environment through systematic means. Chemistry lessons focus on providing firsthand experience by utilizing and applying the concepts, principles, science facts of scientists' findings (Brown, Lemay, Bursten, Murphy, & Woodward, 2012). Therefore, students need to be helped to develop a number of scientific skills to understand the symptoms or natural phenomena.

The objectives of chemical science in junior high school are as follows.

1. Foster scientific attitudes that include honest, objective, open mind, tenacious and not quick despair, critical of scientific statements, and can cooperate with others.
2. Gain experience in the application of scientific methods through experiments.
3. Know chemistry as a necessary insight to the daily life.
4. The formation of a positive attitude and feel interested to learn more about chemistry because it feels the beauty in the regularity of natural behavior as well as the chemical ability in explaining various natural events and the application of chemistry in technology.

Based on these objectives, the study of chemistry in junior high school is expected to be emphasized more on the introduction of chemistry as part of science

by presenting more examples in daily life so that students' interest in the science can finally be used as a basic capital in mastery of chemistry in high school. Thus, the understanding of chemistry in junior high school can support the successful understanding of chemistry in senior high school which until now its achievements are still relatively low (Perkasa & Aznam, 2016).

Based on observations related to school conditions, student condition, and learning activities, it is known that most students of SMP N 1 Cangkringan are coming from Cangkringan sub-district, Pakem sub-district, and Klaten district. It certainly supports the learning plan by engaging the local potential of the surrounding area. The observation results also show that the environment of SMP N 1 Cangkringan can be said to be unhealthy, because there are some very dirty ponds. In addition, on the west side of the school which is directly adjacent to the plantation owned by residents and bamboo yard also gives the impression of lack of light. The south side of the school has a lot of grass – weeds in the classroom yard.

Learning activities are conducive. However, the learning activity is limited using references from goverments' textbook. Learning refers to the book. Student activities are also limited to discussions, so they have not trained communication or presentation skills. Students have effective discussions, but student activity is still lack, as students only ask questions when teachers approach the group. In addition, most male students tend to be rowdy and inactive during discussions.

The natural science material taken is related to additives in food and its impact on health. Based on the results of curriculum analysis, the basic competency achievement indicator is obtained as follows.

Table 2. Basic Competence and Indicator

Basic Competence	Indicator
Explaining various additives in food, addictive substances, and their impact on health	Giving examples of natural and artificial additives Identify various natural and artificial additives in food Explaining the impact of additive use in food Analyzing the impact and ways to prevent additive use Mentioning the types and examples of addictive substances in everyday life Explains how addictive substances work in the body Analyze the impact and ways of preventing the use of addictive substances

Based on the explanation above, because some limitations are only taken 3 indicators to then be developed into learning devices, namely giving examples of natural and artificial additives, identifying various natural and artificial additives in food, and explaining the impact of the use of additives in food.

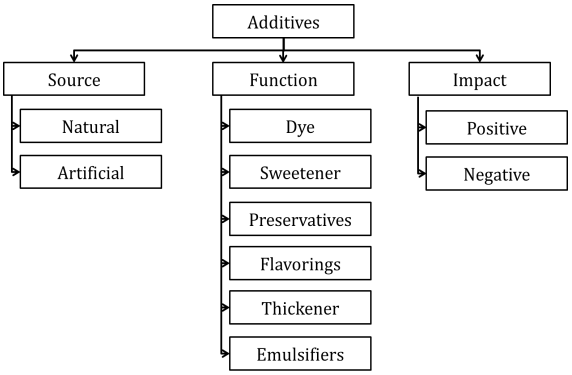

Figure 1. Concept Map

The science subject specific pedagogy developed consists of 2 meetings developed with a 5M scientific approach, discovery learning model, and delivered with discussion methods, practicum, and presentation. Discovery learning syntax in the learning process consists of stimulation, problem statement, data collection, data procession, verification, and generalization (Djamarah & Zain, 2013; Hanafi, 2016; Syah, 2013). Discovery learning model is chosen because it is able to facilitate students in learning, so that students are

able to find their own learning concepts (Arianda, 2018).

The science subject specific pedagogy developed are then assessed by experts. The results of the feasibility assessment are as follows.

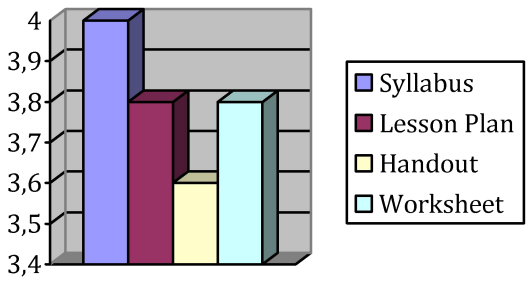

Figure 2. Product Feasibility Assesment Chart

Based on these results, it is known that overall, the science subject specific pedagogy developed fall into the category of very good.

The syllabus gets a score of 4.00 while lesson plan gets a score of 3.80. The syllabus and lesson plan were both developed in reference to Peraturan Menteri Pendidikan dan Kebudayaan No 22 of 2016 on Basic and Secondary Education Standard Process. Learning activities at the lesson plan are designed for two meetings. The first meeting was designed to study the material about additives in the form of preservatives. The allocation of time at the first meeting is 2 hours of lessons. The second meeting was designed to study the material about additives in the form of dyes. The allocation of time at the second meeting is 2 hours of lessons. The total time allocation is 4 hours of lessons.

Handouts get a score of 3.60. The handout was developed referring to the integration of additive natural science learning materials with the local potential of cangkringan food, indicators of basic competency achievement, and learning goals. Handouts are arranged in one book bundle consisting of cover pages, foreword, book content feed, table of contents, basic competencies and indicators of competency achievement, as well as a description of the material divided into each chapter. The material is presented in a retail way in accordance with competency achievement indicators. Handouts come with features such as images supporting learning materials as well as a glossary containing a list of definitions of foreign terms.

The student activity worksheet scored 3.80. The student activity worksheet developed refers to the syntax of discovery learning and it is the student's guide to carrying out learning process. Student worksheets also contain very interesting images. The materials presented are supported by highly interactive and communicative images, tables, and charts to be complemented by students, making it easier for students to find their own knowledge concepts in accordance with discovery learning-based learning principles. Student worksheets also contain self-help tasks that students must complete that aim to further strengthen students' abilities.

The integration of the local potential of Cangkringan food was chosen because it corresponds to the material taken, regarding additives in food. The integration can be realized in several elements of integration, such as Activities, Mini-Labs, Problem Solving, Technology, Skill Builders, Global Connections, Careers, and Science and Literature/Art (Hewitt, Lyons, Suchocki, & Yeh, 2007; Tillery, Enger, & Ross, 2013).

There are 2 types of additives trained in this learning device, namely preservatives and dyes. Following the syntax of discovery learning, learning process is carried out by practicum method. In addition to practicing process skills, practicum methods are believed encourage students to discover learning concepts and principles more deeply (Belton, 2016; Siska, Kurnia, & Sunarya, 2013).

Figure 3. *Jenang Dodol* (Left) and *Bolu Emprit* (Right)

One of the local foods tested in practicum activities is *jenang dodol* and *bolu emprit*. The ingredients used in practicum are also materials that are easy to obtain daily, such as turmeric extract, *secang* wood extract, *pandan* leaf extract, and liquid detergent. It is also intended that at other times, students can practice it themselves at home if they find other foods that need to be tested whether it contain additives or not. Of course, this supports the goal of science learning, which is help students to gain a deeper understanding of the environment so as to benefit the survival of daily life (Jeenthong, Ruenwongsa, & Sriwattanarothai, 2014).

In addition to the above materials, natural science is a learning subbject that is very attached to daily life, so there is a lot of material in science lessons that can be integrated with local potential. Sobiatin, Tibrani, Aznam, Saputra, & Fatharani (2020) in their research about the integration of Palembang's local potentoal in natural science learning, found that there are 16 types of palembang's local potential that contain natural science material so that it can be utilized as a learning resource.
Indonesia is a country that is very rich in potential, culture, and natural resources in each region. Dewi, Suryadarma, Wilujeng, & Wahyuningsih (2017) integrating the local potential of wood carving and pottery into natural science learning. Based on the research, it is proven that integrated natural science learning is able to improve students' critical thinking skills. In addition, scientific attitudes and science literacy can also be improved through the integration of natural science learning with local potential (Dwianto, Wilujeng, Prasetyo, & Suryadarma, 2017; B. Setiawan, Innatesari, Sabtiawan, & Sudarmin, 2017). This shows that there are a lot of local potential for each region to be integrated into natural science learning that help improve students' abilities.

CONCLUSION

This research has developed a local potential integrated science subject specific pedagogy in the form of local food in Cangkringan sub-district consisting of syllabus, lesson plan, handout, and student worksheet. The developed syllabus gets a feasibility score of 4.00, lesson plan gets a score of 3.80, the handout gets a score of 3.60, while the student worksheet gets a score of 3.80. Overall, the products developed are already included in the category of very good. However, the product still encounters some limitations. The products developed are limited to 2 types of additives, preservatives and dyes. In further research, it is expected to complement the learning device, so that it can become a whole learning device that cares for all additive materials for middle school graders.

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