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Research Article

Exploring the Indigenous Knowledge of Java North Coast Community (Pantura) Using the Science Integrated Learning (SIL) Model for Science Content Development

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Abstract
The research explores the indigenous knowledge of Java north coast community in Java Island, Indonesia. The research is carried out with prospective science teachers employing the Science Integrated Learning (SIL) model. The method adopted is descriptive research. The correlation test resulted in the sig. value < 0,05; therefore, there is a connection between the prospective science teachers' ability in exploring the indigenous knowledge and the science content development skills. It concludes that the explored indigenous knowledge using the SIL model is effective for science content development. The exploration results are useful for developing science content.

Keywords:
indigenous knowledge, Java North Coast, SIL model and science

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Introduction

Prospective science teachers must be able to develop learning content or materials since it reflects independence in preparing learning sources. One of the ways to develop content is by integrating science content with knowledge gained from plentiful sources which are suitable for the characteristics of the field and scope (O'Byrne *et al.,* 2015; Morrison, *et al.,* 2015; Hartell and Strimel, 2018). Prospective science teachers are expected to create the knowledge integration on their own since it will result in a quality science learning at schools. One of the strategies applied to science students in content development is by assigning them to explore the indigenous knowledge existed in a certain community. Each explored knowledge potentially has novelty, contextuality, and attractiveness. It is new since it has just discovered and limited to local wisdom only. However, the indigenous knowledge is beneficial as a learning source when it is integrated with science (Bohensky and Maru (2011); Rahayu and Sudarmin (2015); Setiawan *et al*., (2017); and Hartini *et al*., (2018). Moreover, the developed content as a result of the investigation definitely attracts learners to study the provided information, which is related to daily life (Emine, 2017).

The skills of prospective science teachers in developing science content was the learning outcomes of Science Lesson Planning course while the skills of exploring the indigenous obtained from Ethnoscience learning. These two courses' learning outcomes complemented each other. A prior study was carried out to 54 prospective science teachers of Integrated Science Education program, Universitas Negeri Semarang. It found that they had a good understanding of the required five aspects in content development: (1) content correctness; (2) the suitability of materials integrated with Science content; (3) strategies used to integrate content; (4) depth of content; (5) content evaluation to the development results.

The previous study has revealed an early description of prospective science teachers' knowledge of the aspects needed in developing content. In this research, the community's indigenous knowledge was the source of content development. The community's knowledge is contextual; thus, using it as a learning source is the way of preserving it from extinction. As we know, the shifting of cultural values has resulted in forgotten local cultural values; hence, a systematic preservation is required by integrating it with school learning. Science could not be separated from human's daily life as it is an applicative knowledge (Schroeder *et al*., 2009; Tursinawati, 2016). Furthermore, the indigenous knowledge survives for a long time at some places.

One area in Central Java where the community has many similarities in living habits is the Java north coast or known as Pantura. The Java north coast community stretch from Brebes Regency to Rembang Regency (Hapsari *et al*.,

2017). Geographically, Pantura has similar natural conditions with longitudinal coastlines where people set up shelters along the coast and have similarities in their livelihoods partly as fishermen. The Pantura people certainly have a lot of original knowledge so that it became an encouragement in this study to be used as a location explored by prospective science teachers.

Conceptually, the indigenous knowledge of Pantura community has not been systematically studied since it is just hereditarily experienced and not yet proven scientifically in terms of relation pattern between the empirical facts and its causes. A scientific test is needed before processing the traditional knowledge. The exploration of indigenous knowledge is the stage of a scientific test as a form of scientific responsibility on substantial correctness. After the exploration, much indigenous knowledge would be found and then verified scientifically. The excavated knowledge was limited to science as a source for science content development.

Appropriate strategies are required in exploring the community's indigenous knowledge and integrating it with scientific knowledge. After performing a literature review, an exploration and integration technique were determined which included in the syntaxes of the Science Integrated Learning (SIL). This is in line with Parmin *et al.* (2016) who stated that the SIL model is beneficial for finding and testing a community's indigenous knowledge oriented to scientific independence. The SIL's exploration syntax included scientific works done by identifying the community's indigenous knowledge through investigation on mass media (printed and electronic), observation, visitation, and documentation. The exploration was carried out either individually or in a group. The knowledge obtained from the exploration was sorted, keeping in mind that not all of it is scientifically approved. The non-scientific knowledge was then continued to the knowledge testing stage. The concept integration was done after exploring and finding the scientific indigenous knowledge. The techniques proposed by Fogarty in Parmin (2017) were adopted for the concept integration.

With this in mind, the formulated research problems were; (1) what is the indigenous knowledge possessed by Java north coast community?; (2) how is the content development skills of the prospective science teachers who made use of the exploration results?; (3) how is the relationship between the exploration and content development skills of the prospective science teachers? The indigenous knowledge, in this study, is limited to scientific knowledge learned in schools. The content development itself describes the ability of prospective science teachers to integrate, develop, contextualize, and complete the indigenous knowledge of science materials taught in schools.

Several studies on exploration skills and teaching materials development have been carried out and published to some reputable journals. Herwandi (2012)

revealed that exploration skills are necessary for teachers regarding the demands of education units-based curriculum, which means that the teaching materials have to be developed by inserting contextual information and knowledge existed in students' daily life. Chowdhury (2016); Afni *et al.,* (2014) stated that without exploration skills, teachers would find it difficult in generating students' motivation. Moreover, Esti (2010) thought that the digital era demands teachers to periodically update the information. Nevertheless, science teachers remain to face difficulties in discovering information so that most of them could not develop the teaching materials. As a result, they depend fully on books (Juwita *et al.,* 2017).

The exploration skill could enrich the prospective teachers' insight so that they can apply the principles of education units-based learning parallel to the curriculum demands. Based on the needs analysis and the gap between the teachers' expectations in developing content and the reality in school, the objectives of this study were; (1) providing experience for prospective Science teachers to explore learning resources in the community; (2) exploring the indigenous knowledge of the Java north coast (Pantura) community; and (3) measuring content development skills for prospective science teachers who utilized the exploration results. The successfully developed science content would be applied in science learning at schools. However, it was not a part analyzed in this study. The research limitation stood on measuring the prospective science teachers' content development skills.

Method

This research intended to explore the indigenous knowledge of Pantura native community, Central Java. The study employed descriptive methods referring to Sugiyono (2016) concerning its main objective of describing the indigenous knowledge. The research subjects were 58 prospective science teachers of Universitas Negeri Semarang attending the Science Lesson Planning course. Each student explored the indigenous knowledge individually since it was the output target that must be met in the course. The exploration results were used by them to develop science content. The content development of each student was measured by the lecturer through content assessment.

The exploration stages carried out by each student following the SIL model syntaxes had following stages; (1) the students traced information through both printed and electronic media about indigenous knowledge of the Pantura community in accordance with science content; (2) the students made field observations to the community directly to collect the data; (3) the students sorted the exploration results of the indigenous knowledge, only knowledge that has relevance to the science concept was picked to develop the concept; (4) the students developed science content on the basis of the obtained knowledge; (5) Each student presented a draft of science content development in the Science

Lesson Planning lecture; (6) The lecturer and students through class discussions provided feedback to the content development draft; and (7) the students individually produced the science content. The exploration was performed in Java north coast areas or so-called Pantura, which is depicted on the Figure 1.

Figure 1.
Java North Coast Areas
(Source: https://www.google.co.id/maps/place/Java)

The data covered; (1) the scores of exploration results on the indigenous knowledge; (2) the developed content by the students; (3) the relationship between the students' exploration skills and the science content development; and (4) the students' attitude after conducting the exploration. The assessment aspects of the exploration results include; (1) instruments employed; (2) location selection; (3) source of information, (4) gained indigenous knowledge and (5) report of the exploration results. Furthermore, the content development assessment was done by the lecturer, which consisted of the following indicators; (1) conformity with science content; (2) integration accuracy; and (3) ease of learning. The students' exploration scores were taken from the exploration report and the developed products. At the end of the lectures, the students were asked to fill in the questionnaires. The analysis of the exploration scores was performed by comparing the obtained scores with the maximum scores. The score criteria adopted the Arikunto (2012) as stated on the Table 1.

Table 1.
Criteria for Analysis

Percentage	Category
81-100	Very good
61-80	Good
41-60	Sufficient
21-40	Bad

0-20	Very bad

The content development products were validated by the lecturer. The score ranges from 1 (not feasible); 2 (less feasible); 3 (quite feasible); 4 (feasible); 5 (very feasible). In finding the relationship between the students' exploration skills and content development skills, a correlation test was performed using the product moment correlation. The analysis results were beneficial for further interpretation, that was to prove whether or not there was a connection between those two variables.

Results and Discussion

Indigeneous knowledge in the Java north coast community is various kinds of sources. The explored indigenous knowledge is presented on the Table 2.

Table 2.

Indigenous Knowledge in the Java North Coast Community

No	Indigeneous Knowledge
1	*Pare* fruit (*Momordica charantia*) is beneficial for breastfeeding women to prevent the occurrence of oral thrush which is characterized by white patches on the baby's mouth.
2	Utilizing the leaves of purslane (*Portulaca oleracea*) to stimulate breastmilk.
3	Purple sweet potato leaves extract (*Ipomoea batatas*) to reduce hot feeling and pain caused by ulcers.
4	Young *jengkol* leaves (*Pithecellobium lobatum*) to treat skin itch.
5	*Kamijara* leaves (*Cymbopogon citratus*) used as a herb to improve blood circulation.
6	*Tembelekan* leaves extract (*Lantana camara*) to treat a phlegmy cough.
7	Mulberry leaves extract (*Morus alba*) as a lowering of blood sugar levels.
8	*Serep* leaves extract (*Erythrina lithosperma*) to reduce body temperature when the fever comes.

The explored indigenous knowledge was more about the use of herbal plants to stimulate breast milk and traditional medicine. As the coastal community whose lifestyle is influenced by livelihoods as fishermen, it turned out that their indigenous knowledge is not directly related to fishing activities. The exploration findings illustrated the proximity of traditional community to nature. This exploration stage was evaluated based some aspects; (1) instruments; (2) location selection; (3) source of information; (4) presentation of the obtained data; (4) exploration results report. The score ranged from 1 to 100, and the prospective science teachers' average scores are presented in Figure 2.

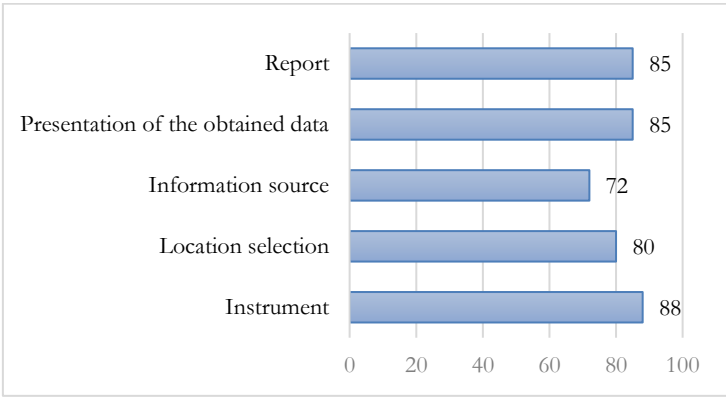

Figure 2.

The Average Score of the Exploration Stage

The students employed various information sources during the exploration; a family, local community members, or community leaders. The high score would be obtained if the students gained information from a family or community practicing the revealed indigenous knowledge. The results were the source for science content development. The validation results of the developed science content are seen on the Table 3.

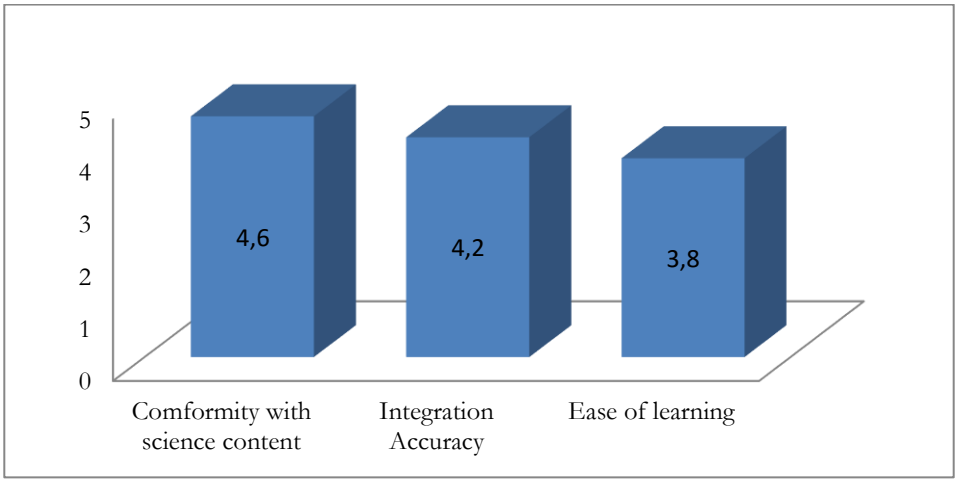

Figure 3.

The Validation Results of the Developed Content

The validation results carried out by the lecturer of Science Lesson Planning course revealed that the utilization of indigenous knowledge for content

development categorized as very feasible, the integration accuracy classified as feasible, and the ease of learning grouped as feasible. It means that the prospective science teachers were able to develop science content by making use of the indigenous knowledge as the supplementary materials. The analysis of the relationship between the students' exploration and science development skills is found in Table 3.

Table 3.

Correlation between the Exploration and Science Content Development

		Science Content Development Skills	Exploration Skills
Pearson Correlation	Science Content Development Skills	1.000	.654
	Exploration Skills	.654	1.000
Sig.(1-tailed)	Science Content Development Skills	.001	.005
	Exploration Skills	.002	.001

The results of the significant correlation value 0.002 <0.05. Therefore, there was a relationship between the prospective science teachers' exploration skills and science content development skills. Also, the research subjects responded positively to the learning activities of exploring the indigenous knowledge whose results have been integrated into science content for school learning. The students were interested in the learning activities and able to integrate the indigenous knowledge then develop it into science content materials. Moreover, they committed to doing the same thing for different places and content. The students' attitudes after joining the Science Lesson Planning course are presented in Table 4.

Table 4.

Attitudes of Prospective Science Teachers

Statements	Average score	Category	Response Criteria
I happily explored the indigeneous knowledge possessed by a certain community	3.40	Strongly agree	Positive
The obtained indigeneous knowledge could be integrated into science content in schools	3.10	Agree	Positive
As a prospective science teacher, I am able to develop science content for school learning	3.00	Agree	Positive
I am willing to make use of the indigeneous knowledge existed in other places to enrich science materials	3.10	Agree	Positive

The exploration has revealed the indigenous knowledge that could not be found in the recent science textbook. The 'normal' indigenous knowledge became meaningful when included as a learning source. For the prospective science teachers, a new awareness of uncovering other indigenous knowledge has emerged. The data collection took place in the Java north coast, which has a dynamic life since it is the transportation lines across the nation. Therefore, the values existed there are vulnerable to cultural shifts due to modern lifestyle (Pratomo *et al.,* 2017; Zambrana *et al.,* 2017; Hatfield *et al.,* 2018). When the original culture of a society is lost, the real loss is not only by the local community but also by the nation due to identity loss (Suneki, 2012; Sunandar, 2015). However, referring to Parmin, *et al.* (2016), not all indigenous knowledge can be used as learning resources since 'scientific' is the nature of modern knowledge.

The prospective science teachers were able to sort which of the indigenous knowledge related to science content and give boundaries which of the knowledge has scientific characteristics, keeping in mind many of it comes from myth. Therefore, the students clearly understand the importance of mastering the requirements of a scientific knowledge. There are a lot of types of non-scientific knowledge in Java Island influenced by traditional beliefs. Maftukhin (2015) explained that scientific knowledge has clear boundaries with modern knowledge, not all indigenous knowledge in society could be studied scientifically. This study reinforces the importance of mastering the basic concepts of scientific knowledge for prospective teachers who planned to transform traditional knowledge into scientific knowledge.

The exploration technique used refers to the exploration stage of the SIL model. Before integrating the traditional knowledge into scientific knowledge, the prospective science teachers were required to own several competencies such as planning, implementing, and reporting the exploration results supported with authentic data to prevent misleading. Thus, the findings of new knowledge must be supported by sufficient and reliable data. The exploration stage began with self-made instruments, indicating that the students' dependence on lecturer can be overcome by giving demands to determine their own strategies in seeking knowledge. As stated by Kurnianingsih, *et al.* (2017) that Indonesian teachers have a high dependence on textbooks as the main learning source when implementing learning in schools. Nuangchalerm and El Islami (2018b) also pointed out that the prospective of Indonesian science teachers should have the courage to use the existing learning resources to strengthen science content. Nuangchalerm and El Islami (2018a) suggest to Indonesian for stimulating curriculum and instruction for engaging students learn life science based on local wisdom such as Baduy's society. Moreover, El Islami, *et al* (2018) suggest to Indonesian for stimulating the curriculum and instruction to promote the nature of science by using the existing

learning resources from local wisdom. The method applied in this study provided an alternative solution to overcome the inability of teachers to develop content by fostering learning independence.

Prior to this research, many worried that the developed content integrated with indigenous knowledge would enhance the difficulty level. However, it turned out that the validation score was 3.8, meaning that the developed materials are easy to learn. This is in line with Mikroyannidis *et al.* (2015) who elucidated that the developed content tailored to the needs has a high level of appropriateness as a topic of study. Not all indigenous knowledge lived in the community was used as a reference for content development. Nevertheless, the students sorted which of the information fulfilled the criteria of scientific knowledge.

The correlation test results showed that there was a connection between the prospective science teachers' exploration skills and content development skills. The direct experience through field observation has motivated the students to further delve the indigenous knowledge grows in a certain community. This is parallel with Elvira *et al.* (2016) that knowledge emerging from the living environment has its own uniqueness so it creates curiosity for those who want to reveal it.

Following up the exploration stage, the integration of indigenous knowledge into scientific knowledge was performed. This integration stage is a form of cultural conservation as it perpetuates the knowledge to science books. The systematic observation techniques of the SIL model have become an alternative solution in overcoming the classic problem of teachers' unwillingness and inability to develop content. Fitria, *et al* (2015) and Priatna (2017) elucidated that cultural conservation is urgently done in Indonesia as a solution of modernization to prevent identity loss. In other words, this research has contributed to the preservation of the indigenous knowledge existed in the Java north coast community as it has been integrated systematically as a learning source.

Conclusion

The original knowledge possessed by the Java north coast community (Pantura) could be explored using the Science Integrated Learning (SIL) Model. The prospective science teachers have made use of the indigenous family as a resource for science content development. The correlation test resulted in the sig. value < 0,05, which means that there was a significant correlation between the exploration skills and science development skills of the prospective science teachers. Therefore, it concluded that the science content has been successfully developed by utilizing the indigenous knowledge owned by the Java north coast community (Pantura).

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