Building students’ habits of mind through process oriented guided inquiry learning

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Abstract. Learning should be able to develop knowledge, skills, and mindsets so that the graduates produced are those with integrated attitudes, abilities and knowledge as well as life skills. One of the ways of learning like that can be done through habits of mind. Habits of mind is very important to shape learning characters because of its implementation which synergizes cognitive, affective, and psychomotor abilities. Based on this background, this study aimed to obtain an overview of the learning process in building the habits of mind of students. The subject of this research were the second semester students of the Biology Education Study Program at one of the LPTKs in West Kalimantan. The number of research samples was 26 people, namely those who took the Environmental Knowledge course. Data were obtained using a Habits of mind questionnaire adapted from Costa and Kallick. There were sixteen items that represent data about habits of mind which consisted of three domains, namely cognitive, affective, and psychomotor. The results showed that the average students' habits of mind score was 3.82 out of a total score of 5.00. The percentage of the research results was 76.7% and it was included in the good category. Each domain, namely cognitive and affective, was in a good category while psychomotor was in a very good category. Thus it can be concluded that the process-oriented guided inquiry learning program applied to the Environmental Knowledge course can build students' habits of mind well in each learning domain.

1. Introduction
Habits of mind are the basis of behavior that can be formed through learning activities to build intelligence and character. In this case, habits of mind is defined as intelligent behavior that a person has to solve problems both in learning activities and in everyday life. Habits of mind consists of sixteen problem solving skills and plays an important role in the learning process and is effective in supporting reasoning, sensitivity, persistence, creativity, and expertise [1] [2].

The understanding and application of the 16 habits of mind indicators plays a role in providing skills to work and equipping individuals in using awareness / intention, thoughts and strategies so that they can achieve positive results. Students who have habits of mind can produce a balance between knowledge, attitudes, and skills. Habits of mind also directs students to the formation of a mature, superior, and intellectual personality [1][3]. Thus, it is necessary to have habits of mind habituated through the learning process. Choosing the right learning model is expected to build students’ habits of mind. One such learning model is Process Oriented Guided Inquiry Learning (POGIL).

POGIL is a process-oriented inquiry learning model which can encourage students to actively participate in using guided inquiry learning. It aims to develop their knowledge where a series of questions are used to improve thinking skills, problem solving, and metacognition [4]. In addition,
POGIL also requires students to be responsible for their own learning, to monitor their learning (self-management and self-regulation) and to reflect on learning. Process oriented components can be designed to train students’ skills and me to assist them in achieving concepts. In this case, the inquiry activity during learning makes students more aware of their learning needs [5].

Many studies have been conducted related to habits of mind, including five studies by [5][6][7][8][9]. However, this study does not focus on discussing cognitive, affective, and psychomotor aspects. Therefore, this study was conducted to describe the habits of mind of students in terms of cognitive, affective, and psychomotor aspects through the application of the Process Oriented Guided Inquiry Learning (POGIL). The results of the research can be used as a basis for finding alternative learning that can build the habits of mind of students.

2. Research Method
This research was conducted in the Biology Education Study Program, FKIP, Tanjungpura University. The subjects involved in this study were 26 second semester students who took the Environmental Knowledge course for the 2019/2020 academic year. The instruments used to collect data in this study were questionnaires and observation sheets which were adapted from Costa and Kallick. There are sixteen items that represent data about habits of mind which consists of three aspects / domains, namely cognitive, affective, and psychomotor [1][110]. Each item is divided into 5 levels, namely: Always (5), Often (4), Sometimes (3), Rarely (2), Never (1).

The data collection technique using a questionnaire was carried out after the learning process, that is through self-assessment. Each student was asked to choose a level that represented his or her condition from each item contained in the habits of mind questionnaire given. The habits of mind development of students at each meeting in the Environmental Knowledge lecture were recorded on the observation sheet. The data that has been collected were analyzed quantitatively. Every aspect of habits of mind is calculated the average and the total mean. The results of the questionnaire for each aspect were given the criteria and then interpreted in the form of a diagram.

3. Result and Discussion
Habits of mind which consists of 16 indicators [1] and is grouped into three domains, namely cognitive, affective, and psychomotor [10] obtaining an average score of 3.82 or with a percentage of 76.7% in Environmental Knowledge lectures through learning POGIL. Each aspect and its average score can be seen in Figure 1 below.

![Figure 1. Habits of mind average score for each aspect](image)

From Figure 1 above, it can be seen that the most prominent aspect is psychomotor (4.1 = excellent). These results are in accordance with the actual conditions where at the exploration or application stage of POGIL learning, most of the activities consist of practicum or observation activities which are dominated by psychomotor activities. The psychomotor aspect in this study includes 3 indicators as shown in Figure 2.
In Figure 3, it can be seen that students use the five senses they have in observing an object or using tools to make conclusions, so that the indicator of gathering data through all sense is built in students. Likewise with the interdependently thinking indicator, where the POGIL learning syntax is able to maximize student involvement and interaction so that they are able to work together with one another to help solve problems and practice communication skills and respect for others [11]. This is because from the beginning of the lesson, POGIL requires students to be able to work in groups with their respective roles. Meanwhile, the indicators of thinking and communicating with clarity and precision have the lowest average in the psychomotor aspect because there are still students who have not been fluent when conveying their ideas or thoughts and the language used still mixed with regional languages. The results of observations found that students had difficulty composing sentences when asking or answering questions, as well as when preparing reports. The results obtained are in line with research [9] on the habits of mind profile of students who are prospective teachers. This communication skill needs to be possessed by every student as a scientist so that in the future they can convey their findings to the wider community.

The results obtained from this study also showed that POGIL learning is able to build affective aspects with an average score of 3.9 and is included in the good category. The affective aspect in this study includes 8 indicators as shown in Figure 3.
In Figure 3, it can be seen that the affective aspect, namely the indicator of listening with understanding and empathy, gets a mean of 4.1. This means that through POGIL learning, students are able to pay attention to other students including not ignoring the thoughts, feelings, and ideas of other students, besides that they also try to empathize. This is supported by the finding humor indicator which also has a mean of 4.1 which shows that students know when they have to learn or joke and can use jokes that can break the ice, especially during group discussions so that they don’t boring. POGIL learning has the characteristics of learning teams with clear tasks so that it can foster empathy in students [12]. Meanwhile, the indicator of taking responsible risk has the lowest average (3.6) even though this indicator has shown that students are able to take responsibility for what they have done. This is consistent with Hanson where he explained that POGIL requires students to be responsible for their own learning [4]. If this category is owned, students will demonstrate a willingness to try new things such as strategies, methods, and ideas so that they can explore [2]. In general, POGIL learning can build students’ habits of mind regarding the affective aspects of Environmental Knowledge lectures. The indicator of striving for accuracy appears when students do practicum activities, both in the laboratory and in the field where almost all students try to work carefully.

The cognitive aspect based on Figure 1 has an average score of 3.5 and is included in the good category. The cognitive aspect in this study as shown in Figure 4.

The cognitive aspect is related to the mastery of concepts. POGIL learning is able to develop knowledge to master the concepts and a series of questions used in each phase of exploration, concept formation and application so as to improve students' thinking, problem solving, and metacognition skills [4] [13]. The guided inquiry component in POGIL can encourage students' ability to think critically and do problem solving use learning cycle activities [14] [15] well so that they have a good understanding of a concept through open and flexible thinking (thinking flexibility). This is in line with having metacognition indicators where students are successful finding information from various learning sources to build their own concepts. A series of questions that are characteristic of POGIL learning, in this case, are able to develop questioning and problem posing indicators well, so that student curiosity can continue to be explored. Environmental Knowledge Lecture with POGIL makes students have good potential in using what they have learned. This means that previously acquired knowledge and experience are tried to be applied to new conditions (applying past knowledge to a new situation). This is for example on the topic of environmental pollution. From the discussions carried out during the learning process, they can conclude something they can apply for the future. The example they put forward is that in the future, they will not be in the indoor gaming area (Timezone) for more than two hours because the sound generated by the game engine for a long time causes sound contamination and can damage hearing. Meanwhile, the potential that students have to think about how they can do something different from the existing ones and propose new ideas that can be developed in order to
compete globally. Classroom’s activities including practicum need to be designed so that students can bring out their creativity and innovation.

Students' habits of mind can be built through process oriented guided inquiry learning (POGIL) which consists of three aspects or learning domains, namely cognitive, affective, and psychomotor aspects. First, POGIL develops process skills and thinking skills. Second, POGIL develops content mastery. Third, POGIL also plays a role in helping students to take responsibility and practice their communication skills. Fourth, Learning through POGIL can make students persistent in solving problems given and have a sensitive attitude. In addition, POGIL can develop self-regulated students and make them motivated to learn because it is associated with learning by doing.

4. Conclusion
Based on the research findings, habits of mind can be built through Process Oriented Guided Inquiry Learning (POGIL) where the average score obtained is 3.82 or 76.7% and is included in the good category. The results showed that the cognitive and affective aspects were in the good category while the psychomotor aspects were very good. Meanwhile, the sixteen habits of mind indicators still need to be improved, especially the cognitive aspect by involving more research subjects and the use of learning techniques to complement the POGIL learning model.

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