






# Developing analytical skills through optimizing the learning process by science teachers in Nganjuk Regency

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ARTICLE INFO	ABSTRACT
<p><b>Article history</b> Received: 2021-06-01 Revised: 2021-08-16 Accepted: 2021-08-16 Published: 2021-08-17</p> <p><b>Keywords</b> Concept analysis skills Critical thinking MGMP Optimization of science learning Science teacher</p>	<p>Based on the results of the interviews, it was found that science teachers in Nganjuk Regency did not understand and master the skills of analyzing, especially with Biology material so that there was a need for training to practice analytical skills through optimizing learning. This training activity aimed to develop analytical skills through optimizing the learning process. This training activity involved 10 junior high school teachers who are members of the Science Subject Teacher Association (<i>Musyawarah Guru Mata Pelajaran/MGMP</i>) of Nganjuk Regency. The method used was observation and data were analyzed in descriptive qualitative. The implementation of the activities were divided into three stages, namely the preparation, implementation, and evaluation stages and feedback, as well as participant responses. The results of the responses based on the questionnaire were positive with a score of 3.82, very good training material at 3.82, and very good training conditions with a score of 3.84. There was an increase in the learning analysis skills of MGMP participants with a percentage of 82.40%.</p>
<p><b>Kata Kunci</b> Berpikir kritis Guru IPA Keterampilan analisis konsep MGMP Optimalisasi pembelajaran IPA</p>  	<p><b>Mengembangkan keterampilan analisis melalui optimalisasi proses pembelajaran oleh guru IPA di Kabupaten Nganjuk.</b> Berdasarkan hasil wawancara diperoleh bahwa guru IPA di Kabupaten Nganjuk belum memahami dan menguasai keterampilan menganalisis terutama dengan materi biologi sehingga perlu ada pelatihan untuk melatih keterampilan analisis melalui optimalisasi pembelajaran. Kegiatan pelatihan ini bertujuan untuk mengembangkan keterampilan analisis melalui optimalisasi proses pembelajaran. Kegiatan pelatihan ini melibatkan 10 orang guru SMP yang tergabung dalam MGMP-IPA Kabupaten Nganjuk. Metode yang digunakan yaitu observasi dan dianalisis secara deskriptif kualitatif. Pelaksanaan kegiatan dibagi dalam tiga tahap yaitu tahap persiapan, pelaksanaan dan evaluasi dan umpan balik, serta respon peserta. Hasil respon berdasarkan angket yaitu tanggapan positif dengan nilai 3.82, materi Pelatihan sangat baik sebesar 3.82, dan Kondisi Pelatihan sangat baik dengan nilai 3.84. Adanya peningkatan keterampilan analisis pembelajaran peserta MGMP dengan prosentase 82.40%.</p> <p>Copyright © 2021, Yakub et al This is an open access article under the <a href="#">CC-BY-SA</a> license</p> 

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## INTRODUCTION

Based on the 17<sup>th</sup> SDGs in the 2015-2030 period, the quality of education has an important contribution to the development of a country. In other words, there is no country without education (Rozhana & Sari, 2019). In this regards, science teachers as educators are required to be updated to any eras and issues that are around, which has an implication to learning process in their classroom, thus eventually will support the achievement of Sustainable Development Goals (SDGs) (Ardhi, 2018).

Science learning is a learning that integrates basic natural science and applied-based learning, thinking skill development, curiosity development, and caring attitude towards nature and social building (Darling-Hammond et al., 2020). Science learning is expected to be able to teach science teachers to develop their knowledge in integrating basic

knowledge so that students can understand the concept of analyzing science learning which incorporates of three aspects of scientific process and skill (Setyaningrum & Husamah, 2011; Zaenab et al., 2020). In order to encourage science teachers in elementary school and high school to achieve the competence, they are required to have interdisciplinary science skills which are expected can be applied in school learning that is congruent to 2013 curriculum (Wilujeng et al., 2010). It is essential for teachers to have the skill of designing science learning that meets the 2013 curriculum as well as its way of analysis (Harefa et al., 2021; Oviana, 2018).

Science analysis skills for teachers are abilities that must be mastered, hence, the real objectives of science learning can be achieved (Hakim, 2015; Kamamia et al., 2014). Each problem presented thoroughly is because the objects and problems of science are also holistic. Science is integrated by presenting concepts in Physics, Chemistry, Biology, Geography, Astronomy, and other aspects of the natural sciences (Hewitt et al., 2007).

Students' analytical thinking skills are still needed to be improved as based on the global index of cognitive skills on education achievement reported by The Learning Curve Pearson 2014, Indonesia was ranked 40 out of 40 countries. On average, Indonesian students are still at the stage of low-level thinking skill—it is on the level of acquiring knowledge and understanding. Analytical skills are the 4<sup>th</sup> (fourth) cognitive skills after knowledge acquisition, understanding, and application. A study at one SMPN in Sidoarjo recorded that students' analytical thinking skills were still low, because students' abilities were still at the level of memorizing, understanding, applying, and not at the level of analytical level yet (Widodo et al., 2018). Most schools in the targeted area of this community service (Nganjuk Regency) have trained their students the analytical skills, as it has been required in the Basic Competence (*Kompetensi Dasar*/KD). However, the lesson plans (RPP) developed have not shown any indicators of three analytical skills, as well as the assessment points developed. This condition can be an indicator that students' analytical thinking skills are still not well mastered. This issue is in line with empirical data that shows students' low ability in analysis skills can be improved through the application of the developed learning model as well as with other forms of exercises that are based on constructivist learning theories (Sudiby et al., 2016).

The Science Subject Teacher Association (*Musyawah Guru Mata Pelajaran*/MGMP) is an activity in guiding and training science teachers of junior high schools to be skillful in developing students' analytical skills using the development of Higher-Order Thinking Skills (HOTS) questions, thus, it is expected that students can understand the principles in understanding science learning concept. Considering this, activities that support the development of analytical skills in learning are needed and must continue to be trained through learning management, learning tool provision, and through the instrument of assessment used. Therefore, this training activity aims at developing analytical skills by optimizing learning process from science teachers in Nganjuk Regency. This activity is expected to improve teachers' skill in training students' analytical skill. The success of this training will improve students' learning quality, especially, for science teachers in Nganjuk Regency as our partners in this community service. Another advantage from this activity is to equip teachers to develop students' analytical skills as well as to give opportunity between teachers in information sharing related to their experience in analyzing their students' study result.

## METHOD

This community service was done in Nganjuk Regency that involved 10 junior high school associated in MGMP-IPA of Nganjuk Regency. Method used was observation that data were analyzed in descriptive qualitative. This method was implemented in three phases, they were preparation, implementation, and evaluation as well as feedback and participants' responses. In addition, to measure teachers' skill, pretest and posttest were applied. Answers derived in evaluation sheet during the test were data that used to measure participants' ability in understanding the training materials related to analytical skill concept.

### First stage: Preparation

At this stage, it includes information dissemination activities to partners, namely SMP science teachers in Nganjuk, duplicating and providing training modules, preparing tools and materials needed for complete and adequate training for participants. At the preparation stage, training evaluation tools and instruments needed to collect data were also prepared during the implementation of activities.

### Second stage: Implementation

In this activity, an explanation of the concept of classification of analytical skills was carried out by the activity implementation team and then the training participants carried out the practice of developing tools to train students' analytical skills and the practice of compiling and using the analytical skills assessment instrument of the trained students. This activity uses various methods, namely 1) lectures to convey information about the importance of the concept of classification of analytical skills in learning; 2) demonstrations were conducted to provide examples of the preparation of assessment instruments and their use in classroom learning; 3) the practice of preparing tools and instruments by training participants to train the skills of teachers to improve.

### Third stage: Evaluation

In this third stage, evaluation activities are carried out during peer teaching involved in the implementation of this service activity. Immediate feedback is provided when the evaluation is complete. The feedback is in the form of input for

improving the products and assessment instruments used, the overall learning steps in which there is a student learning assessment component. Evaluation of peer learning is carried out in the last part of the provision of training materials. Furthermore, monitoring is carried out regularly, both offline and online via WhatsApp groups.

## RESULTS AND DISCUSSION

This training aims to train Biology teachers' analytical skills so that students' analytical skills in Biology science can be better optimized. Here are some highlights given in science teachers training.

### The participants can master students' analytical skills based on learning materials

The training conducted to determine science teachers' understanding of critical thinking as a way to see how the critical thinking process at school was assessed by the teacher as a basis for analyzing problems that occur in everyday life, so that can be solved by the students as a goal in learning certain materials. As for the aspect of the reasoning pattern and its way to think logically was the form of the correlation of the mindset developed through science material presented. If the teachers are able and successfully apply it in the learning process as a form of thinking skills, it is recorded that they are successful in this training. This is also in line with the findings of several studies that affirm teachers' ability to master the material is success in managing critical thinking skills and these abilities will be applied to students in the classroom (Changwong et al., 2018; Karakoc, 2016; Murawski, 2014; Vong & Kaewurai, 2017).

The critical thinking material consists of interpreting, analyzing, inferring, evaluating, explaining, and also self-regulating (Ilmiah, 2021; Rokayana & Efendi, 2017; Utami et al., 2019; Wale & Bishaw, 2020). Based on the assignments accomplished by the participants, the results of the analysis of students on science material at high school was reported to obtain critical thinking in very good results. The participants were able to develop analytical instruments in various materials and were able to bring up aspects of critical thinking. Figure 1 below is one proof of the implementation of science teacher training in Nganjuk Regency.



Figure 1. Implementation of science teachers training in Nganjuk Regency

Based on the results of the development of teaching materials by participants in training students' analytical skills, it was found that participants were able to produce based on teaching materials that included C4, C5, and C6 in accordance with Bloom's taxonomy relevant to science material.

### Participants are able to develop instrument of student analysis

The activity of training student analysis was carried out to find out how the participants' skills were before and after the training. After the training, 82.40% of the participants could develop instrument of student analysis in different material. The percentage score before the training was 72.40%. Figure 1 shows an improvement before and after the training as recorded from the pretest and posttest.

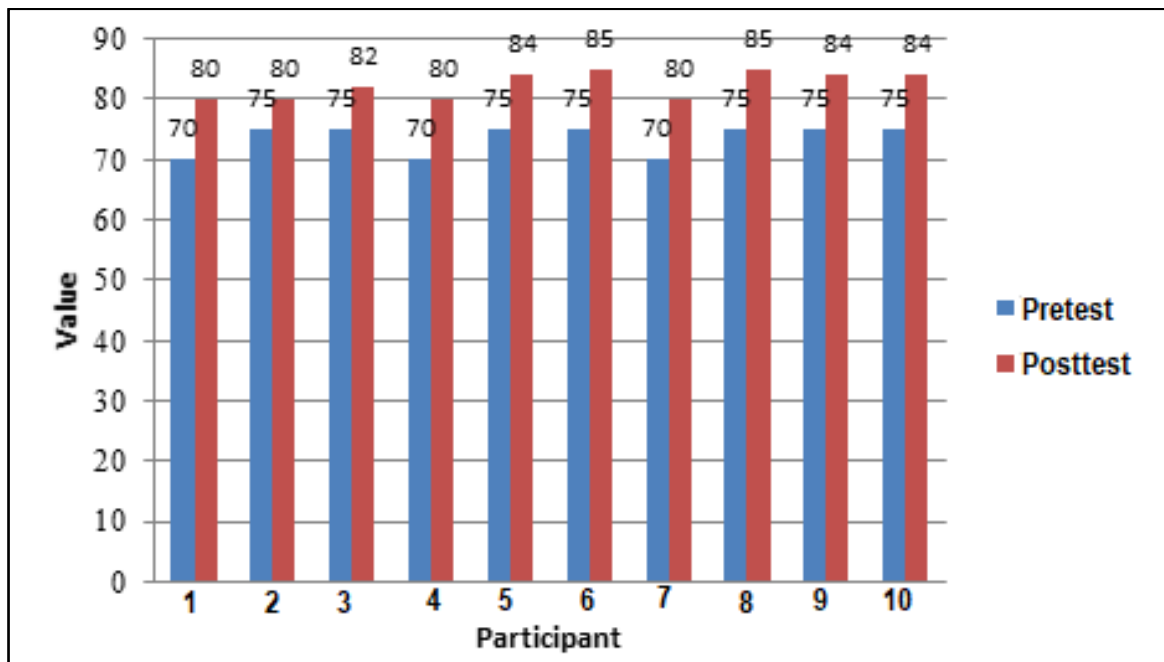


Figure 1. Improvement score of participants of training on student analysis

Based on the result obtained, it shows that science teachers were able to explore their abilities according to their respective fields of the material mastery in the classes they taught. This can be done by showing the characteristics of critical thinking in the materials developed. Critical thinking is not understanding a concept but also understanding at what level and which part of critical thinking can be developed by students and can be used in everyday life.

#### Participants' response

In the training session, participants were also required to fill in a questionnaire about their responses toward the overall implementation of this community service. The results of the responses are presented in Table 1.

Table 1. Participants' responses toward the activities

No.	Aspects	Participants										Average
		1	2	3	4	5	6	7	8	9	10	
Trainers												
1	The application of the principles of andragogy by trainer during material presentation	4	4	4	4	4	4	4	4	4	4	4
2	The clarity of material presentation by trainer	4	4	4	4	4	4	4	4	4	4	4
3	The speed of trainer to respond questions from the participants	3	4	4	3	4	4	3	4	4	3	3.55
4	The accuracy of trainer to respond questions from the participants	4	4	4	4	4	4	4	4	4	4	4
5	The politeness of trainer during training session	4	4	4	4	4	4	4	4	4	4	4
6	The ability of trainer in creating a friendly milieu during the training	4	4	3	3	4	3	4	3	3	3	3.36
7	The ability of trainer in creating a participant-centered training	4	4	4	4	4	4	4	4	4	3	3.82
Sub total												3.82
Training Material												
1	The compatibility of training materials with participants' need to develop their potency	4	4	4	4	4	4	4	4	4	4	4
2	The compatibility of training materials with participants' need to support their expertise to practice analytical skills into learning	4	4	4	4	4	4	4	4	4	3	3.82
3	The role of training materials to support material expertise in developing the ability to train analytical skill into learning	3	4	4	4	4	4	3	4	4	4	3.82
4	Up-to-date learning material	4	4	4	4	4	4	4	4	4	4	4
5	Completeness of material (media/props/materials/etc) needed to support the continuity of implementation of the training	3	4	3	3	4	3	3	3	4	4	3.45
Sub total												3.82

No.	Aspects	Participants										
		1	2	3	4	5	6	7	8	9	10	Average
Training Condition												
1	Time sufficiency allocated for the training	4	4	4	4	4	4	4	4	4	4	4
2	The quality of consumption served during training	4	4	4	4	4	4	4	4	4	4	4
3	Comfort of the training venue	4	3	3	4	3	3	4	4	3	4	3.55
4	Completeness of supporting facilities for the training	4	3	4	4	3	4	4	4	4	4	3.82
Sub total											3.84	

According to the data presented in Table 1, it is recorded that (1) from the aspect of trainer, score received was very good for 3.82, (2) from the training material aspect, the score received was very good for 3.82, and (3) from training condition aspect, the score was also very good for 3.84. This can be drawn that a positive response was achieved for this training. As for participants' feedback, it was accommodated by the project team and trainer, those were assignment and survey response that sent via media such as WhatsApp and also feedback given through online group.

## CONCLUSION

Activities in training to optimize students' analytical skills have been undertaken by science teachers at Nganjuk Regency. The results of the training was very good where teachers can master student analytical concept, it is recorded that an improvement was achieved higher for 82.40% compared to their skill prior to the training score. Thus, it is to remark that this training has received a positive responses from the participants.

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