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## DEVELOPING PARTICIPATIVE AND COLLABORATIVE LEARNING MODEL OF SCIENTIFIC WRITING SKILL AS A WAY OF PROMOTING STUDENTS' SOCIAL AND EMOTIONAL INTELLIGENCE

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### ABSTRACT

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The purpose of this research is to develop a learning model of participative and collaborative scientific writing skill to promote students' social and emotional intelligence. This research is also intended to produce skilled graduates in terms of scientific writing and to enable the graduates to possess social and emotional intelligence. This is developmental research. In order to achieve research objectives, a developmental model of A Recursive Reflective Design and Development Model (R2D2) and Research Development Research (RDR) are used. The data consist of qualitative data and quantitative data. The technique used to analyze the data involved domain analysis techniques to analyze the qualitative data, and statistical analysis techniques for the quantitative data. The result of this developmental research is a participative and collaborative learning model of scientific writing to develop students' social and emotional intelligence. This research also has delivered a distinctive developmental product compared to a conventional learning model, including concept orientation, concept exploration, concept interpretation, concept application, and evaluation. In addition, a participative and collaborative learning model of scientific writing skills should be developed continuously and be promoted to students who are interested in scientific writing, as it can be used to develop students' social and emotional intelligence. On the other hand, lecturers can utilize this product to improve the quality of the learning process, the results of learning scientific writing and developing students' social and emotional intelligence in which this model can be employed as an alternative model to enrich the learning process.

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## INTRODUCTION

Scientific writing cannot be produced individually. As suggested by Wahab and Lestari (1999, p. 23) that scientific writing should be created in a participative and collaborative manner by all students to obtain a high-quality scientific work. Similarly, learning process of scientific writing should also be conducted in a participative and collaborative way. It means that students actively cooperate and collaborate in their study groups in choosing themes, defining topics, identifying problems, formulating problems, reviewing literature, developing paragraphs, discussing issues, summarizing and compiling referrals (Supriyadi, 2015, p. 243). In producing a writing scientific paper students are required to be actively engaged in their groups.

Students' obstacles in choosing the theme and determining the topic of scientific work, as well as developing it into a full scientific work must be assisted, and collaboratively produced through participation of all members of their study group to obtain themes and topics, as well as high-quality scientific work (Turabian, 1970, p. 109). Similarly, writing process of other essential components in a scientific work will gain high-quality results when it is produced through participation and collaboration of all members of the group.

In addition, participative and collaborative scientific writing learning can be utilize to encourage the participation of study group member, their hardworking, responsibilities, democracy and tolerant, give and take, helping each other, respecting diversity, and other good characters of students (Segal, 2012, 136; Supriyadi, 2010, 74). As stated by Basuki (2008, p. 214) that participative and collaborative learning of scientific writing is a type of learning where students can enhance their democratic attitude, solidarity, discussion, responsibilities, sharing ideas, giving and taking their peer's opinion, correcting each other's work, and help each other in the process of learning. Therefore, participative and collaborative learning of scientific writing is necessary to develop students' social and emotional intelligence.

Participative and collaborative learning of scientific writing is intended to change students individualism character to obtain an achievement (Supriyadi, 2017, p. 1). Students assume that their achievement is an individual achievement that does not involve others assistance include their friends. An individualist student does not need a friend to share ideas, for cooperation, for a group project, shared responsibilities, to tolerate, to give and take, for democratic attitude. It should be addressed as early as possible, or otherwise, it will be dangerous and will produce teachers who have the individual attitude that cannot provide an example of tolerance and democratic attitude to their students. Therefore, strategic and systematic efforts are necessary to produce students with tolerant attitudes and noble character.

As suggested by Vygotsky (2002, p. 126) that in participative and collaborative learning of scientific writing, students' engagement both physically and psychologically have to become priority. Students are encouraged to participate and collaborate to discover the knowledge and skills they are learning through interaction within their study groups in various ways, such as observation, discussion, questioning, invention, collaboration or experimentation. Lecturers should also provide the opportunity for students to be responsible in completing their tasks independently.

Participative and collaborative learning demonstrates a number of advantages compared to conventional learning, as participative and collaborative learning offering students' active participation as a central focus in the learning process (Shymansky, 1992, p. 96). Also stated by Basuki (2008, p. 214) it is assumed that participative and collaborative learning can actualize a democratic learning experience. As a democratic

learning model where students can be participative, discuss, share ideas, give and take their peer's opinion, correct each other's work, and help each other in the process of learning.

Participative and collaborative learning is cooperative (Nur, 1998, p. 78; Slavin, 1995, p. 91). A cooperative learning process arises when students work together to achieve similar learning goals. The objective of classroom management in cooperative learning is to help students develop intentions and tips to work together and interact with other students. There are three important things to consider in classroom management in cooperative learning: grouping, cooperative enthusiasm, and classroom setting.

By referring to the principle of participative and collaborative learning that promises an innovative-creative-constructive-cooperative learning process, it is important to consider the process of learning scientific writing skills adopting participative and collaborative learning models (Izza, 2014, 12; Pakpahan, 2013, p. 9). It is based on the observation of scientific writing process that tends to be conventional and lecturer-centered. The conventional learning process does not give students the freedom to participate, collaborate, and be independent in developing their knowledge and skills. In conventional learning, lecturers play a dominant role in developing students' knowledge and skills. Students' knowledge and skill about the scientific writing comes from the lecturer because the lecturer is trained to explain the concepts of scientific writing to the students and to give a number of tasks that must be completed by the students. Their task must be completed with the scientific concepts described by the lecturer.

The application of participative and collaborative learning of scientific writing is considered appropriate for students because the substance of learning materials of scientific writing demands the participation, collaboration, and independence of students in their knowledge and scientific writing skills. Learning materials of scientific writing skills cannot be solely explained theoretically and verbally by lecturers but must be constructed by students themselves through participation, collaboration with colleagues under the guidance of lecturers, and independent learning. Learning materials of scientific writing skills require students' high-level and critical thinking ability (Haffernan & Lincoln, 1986, p. 156). Therefore, the learning process of scientific writing skills must be experienced and constructed by the students themselves through participation, collaboration, and interaction with their social environment (Vigotsky, 1978, p. 146). Students' neighborhood in the form of peers, lecturers, experts, and community.

Participative and collaborative learning of scientific writing view students as learning subjects rather than learning objects. Students as learning subjects will attempt to find their own way of choosing themes, identifying and selecting topics, formulating topics into headlines, formulating problems, writing frameworks, preparing theses, developing ideas and clusters of paragraphs to discuss proposed issues, and drawing conclusions. The process of knowledge construction and scientific skills are not solely completed by students themselves, but also through the process of participation, collaboration, and interaction with the social environment and under lecturers' supervision (Izza, 2014, 12; Pakpahan, 2013, p. 9). Students should not be allowed to gain knowledge and scientific writing skill by their self without supervision from their lecturer.

In addition, the development of a participative and collaborative learning model of scientific writing is conducted in order to assist lecturers in the learning process.

Lecturers need specific guides in implementing a participative and collaborative scientific writing process. Lecturers will not be able to implement a participative and collaborative learning skill properly without a guide in the form of a learning model. It is assumed that with the availability of a participative and collaborative study of scientific writing model, the lecturers can implement the process of learning scientific writing skills correspond to the principles of participative and collaborative learning. On the other hand, this learning model can also be applied to encourage hard work, responsibility, democracy, tolerance, give and take, help each other, respect for diversity, understanding each individual's character, improving interest in learning, and innovative learning (Basuki, 2008, 214). So, the quality of the learning process and the students' writing skills can be improved.

Participative and collaborative learning which is known as generative learning is assumed to be able to actualize an innovative-creative-constructive-cooperative learning process of scientific writing skills and treat students as the focus of learning. Concept orientation activities, concept exploration, conceptual interpretation, concept application, and evaluation are a series of participative and collaborative learning processes that explicitly focus on the students (Nurjanah, 2005, p. 89). In the process of constructing knowledge and scientific writing skills, students need to take some steps, such as concept orientation, concept exploration, concept finding/interpretation, concept application, and evaluation. Students' comprehensive knowledge and scientific writing skill that is achieved and experienced by their self will stick in their mind (Piaget, p. 1970, p. 79). It will be different if the knowledge and skills of scientific writing are "fed" by the lecturer through verbal explanation and concept. A verbal concept programming will not stay longer on student's mind.

A developed learning model of scientific writing has unique feature compared to conventional learning. The uniqueness can be seen in participative and collaborative learning steps, such as concept orientation, concept exploration, concept interpretation, concept application and evaluation (Nurjanah, 2005, p. 105). The number of steps above enriches the learning process which reflects an innovative-creative-constructive-cooperative learning process of scientific writing skills and treats students as the focus of learning (Nur, 1998, 79).

In a more specific context, an actualisation of participative and collaborative learning model development of scientific writing skill is important and necessary for lecturers and students in the learning process of scientific writing. The reason is: participative and collaborative learning model of scientific writing is a steady and realistic guidance that can be utilize by lecturers and students to actualize an innovative-creative-constructive-cooperative learning process of scientific writing skills and treat students as the subject of learning in constructing knowledge and their scientific writing skill. This learning model of product development has been tested through a series of tests, such as: testing by experts: conducted by the experts in scientific writing material, expert in scientific writing study method, technological learning expert, testing by practitioner, and real test on small group and large group.

## **METHOD**

The learning development model of scientific writing used is a Recursive, Reflective, Design, and Development Model (Wilis, 1995, pp 12-23; 2000, pp. 9-14) and *Research Development Research* (Borg & Gall, 1983, p. 179) which is known as R2D2 and RDR. The R2D2 model consists of three main focuses: (a) establishment, (b) design and development, and (c) dissemination or dissemination focus.

Dissemination/dissemination focus was not conducted as it relates to product publishing and product implementation in the field on a broad scale. Model R2D2 is used as a developmental model because it is in line with the participative and collaborative learning paradigm that animates the teaching materials being developed. Meanwhile, the RDR model consists of three activities: (a) preliminary study, (b) development, and (c) effectiveness test.

The establishment focus is to provide product development and formation of participative teams. Product development is a participative and collaborative model of scientific writing. Successful participative teams consist of (a) students, (b) lecturers, (c) practitioners, and (d) experts. The team consists of (a) the expert of the scientific writing material (the term referred to as AMat), (b) the expert of the scientific writing method) (the term referred to as AMet), and (c) the technology learning expert (the term referred to as ATp).

The design and development focus in R2D2 is in line with D in RDR which is conducted by designing the learning model and implementing practice test, testing by an expert, and real product test. The result of the practice test, testing by an expert, and real product test can be applied for a final revision of product development. The second R in the RDR is an effectiveness test of product development after the completion of the development process and final revision. Product effectiveness test is conducted to determine the feasibility of the product.

Developmental data is divided into two: qualitative data and quantitative data. Qualitative data is a descriptive and reflective data. Descriptive data include comments, criticisms, suggestions, corrections, and assessments provided by practitioners and experts on product design. In addition, descriptive data is also in the form of speech (oral and written) from lecturers, students, the behavior of lecturers and students, and the attitude of lecturers and students during the learning process. Reflective data are in the form of comments and interpretations or interpretations of the descriptive data. On the other hand, the quantitative data are the initial test scores and the final test in scientific writing, in the form of student papers which are derived from the implementation of the product effectiveness test.

The data sources are practitioners, experts, students, lecturers, and learning process of scientific writing. Data from practitioner and expert include comments, criticisms, suggestions, corrections, and assessments on the learning model of scientific writing. Data from the students is delivered in the form of spoken and written language, behavior, students' attitude during the learning process, and also the score of students' scientific work before and after the learning process. Data from lecturers include comments (spoken and written language), criticisms, suggestions, corrections, and assessments on the learning model of scientific writing. On the other hand, data from the learning process of scientific writing include students' interaction pattern between students and students, students and lecturer, students and materials, student participation in the learning process, reflection, and score of product development effectiveness test.

Analysis of development data is divided into three, i.e. (a) data analysis from practitioners and experts, (b) data analysis during product trial, and (c) data analysis of product effectiveness test results. The data that is provided by practitioners and experts are analyzed by using domain analysis techniques. The data is grouped by content domain, format, and language based on the developed learning model. A reflection is conducted for each data domain, to create a summary of analysis results. The summary is used to revise the learning model.

The data analysis of product effectiveness test was completed through statistical analysis. A t-test with paired samples is used to measure the differences between pre-test score and post-test score. The data analysis of product effectiveness test result was completed by using SPSS 18.0 *for Windows* (Santoso, 2008, p. 84). The reason is: the statistical analysis tool is the latest version of when this data analysis is conducted. SPSS version 18.0 has a high level of accuracy and comprehensive analysis, so the results are more accurate, more complete, and it also facilitates the user in interpreting the results.

## RESULT

In the development of participative and collaborative learning model of scientific writing, the developmental process is conducted, product development is produced, and product effectiveness test is carried out. The development process is intended to obtain as much input from testing by expert, testing by practitioner, and real test to improve product design. Product development is a participative and collaborative model scientific writing that is qualified to be implemented in the learning process. Meanwhile, product effectiveness test is conducted to examine whether the product development is effective or not. Those activities can be described as follows:

*First, the process of development.* The process of learning model development is completed by collaborate with the lecturer of Scientific Writing Subject. The collaboration with lecturer is conducted in order to design and develop learning model. There are some agreement that are made from the collaboration regarding learning model that has been developed, learning model design, testing by practitioner, testing by expert real test, and product effectiveness test. The process of learning model design which collaborate with lecturers is intended to obtain a common perception of the learning model format.

Therefore, a set of participative and collaborative learning models of scientific writing skills is successfully developed. Characteristics of developing learning model as follows: The learning model consists of six critical components: introduction, participative and collaborative learning concepts of scientific writing, the advantages of participative and collaborative learning, the purpose of participative and collaborative learning, the participative and collaborative learning characteristics of scientific writing, and participative and collaborative learning implementation of scientific writing. The implementation of scientific writing learning consists of preparation stage, general explanation, technical explanation, and material delivery stage.

The introduction contains the importance of the learning model developed in the study and the foundation that is used to develop the learning model. Introduction also contains the purpose of the implementation of learning model development. Introduction is developed on the basis of collaboration with and idea-brainstorming with lecturers.

The concept of participative and collaborative learning is developed based on the idea-brainstorming with the lecturers. The participative and collaborative learning concept contains the ways how learners grasp the knowledge and skills learned, the things that influence the learner, and the lecturer's role in participative and collaborative learning.

The advantages of participative and collaborative learning are developed based on the idea-brainstorming with the lecturers. This section reveals the advantages of participative and collaborative learning of scientific writing compared with conventional learning. The purpose of participative and collaborative learning, the participative and collaborative learning characteristics of scientific writing, and participative and

collaborative learning implementation of scientific writing are also developed based on the idea-brainstorming with the lecturers.

Participative and collaborative learning implementation of scientific writing is also developed based on its smooth implementation in the learning process. Participative and collaborative learning is designed to facilitate students to learn. It can be achieved if students have freedom to learn independently in accordance with their own learning styles under lecturers' supervision.

Learning models that have been designed then tested by practitioners and testing expert. It is conducted to review the learning model and to obtain a feasible learning model. Collaboration with practitioners and experts is performed to get input from practitioners and experts. The one that is appointed to be a practitioner is the supervisor of Scientific Writing Course. They have competencies and skills related to scientific writing learning. It is important to be noted that the material taught in a scientific writing course is the concepts of scientific writing and the practice of scientific papers composition.

The team that is appointed to validate consists of: (a) the expert of the scientific writing material (referred to as AMat), (b) the expert of the scientific writing method (referred to to as AMet), and (c) the technology learning expert (the term referred as ATp). The review of the result from practitioner and expert include comments, criticisms, suggestions, corrections, and assessments on the learning model of scientific writing which are recorded in a scoring guide or learning model design. Testing by practitioners and experts are intended to stabilize the components of the overall model learning design: introduction, participative and collaborative learning concepts of scientific writing, the advantages of participative and collaborative learning, the purpose of participative and collaborative learning, the participative and collaborative learning characteristics of scientific writing, and participative and collaborative learning implementation of scientific writing.

Practitioners and experts also have the authority to provide comments, criticism, suggestions, improvements, and assessments on other aspects beyond the six main components of the learning model. Those aspects are font type, font size, the consistency of the terms, physical appearance, graphical display, and layout.

The next step is the trial of the learning model design in the field. The experimental design of the learning model is done in two stages, i.e., small group trial and large group trials. It is conducted through some collaboration between lecturer and students by implementing participative and collaborative learning model design of scientific writing and getting as much input from lecturers and students for learning model accomplishment.

Learning model design is revised in every meeting after the experiment. It is carried out through discussion and work reflection between lecturer and students. Based on the experiment result and reflection, the revision is conducted on the typos, wrong word and term, and also in empty sentences, layout imperfection, and other language aspects in learning model. The revision result is recorded in the revision of learning model design. The revision result is a set of feasible participative and collaborative learning model of scientific writing and is ready to be tested for its product development effectiveness.

*Second, Product Development.* The final product of the implementation process is a set of participative and collaborative scientific learning model of scientific writing that can be used to develop students' social and emotional intelligence. It is ready to be implemented in the learning process by all parties concerned with the improvement of

students' scientific writing skills, process quality, and quality of learning outcomes. Here is some brief explanation about the final product of the development process of a participative and collaborative learning model of scientific writing.

The learning model is developed based on the collaboration among supervision lecturer, their ideas-brainstorming, the samples of scientific writing learning model, its convenience to be implemented in the learning process, and consideration on students' need.

The development model result consists of six important components: introduction, participative and collaborative learning concepts of scientific writing, the advantages of participative and collaborative learning, the purpose of participative and collaborative learning, the participative and collaborative learning characteristics of scientific writing, and participative and collaborative learning implementation of scientific writing which is divided into: general explanation, technical explanation, and learning implementation. The components of the implementation guides include the following

*Introduction.* This section contains the background of the importance of a participative and collaborative learning model of scientific writing. It exposes that the importance of the learning tools of the development result to improve students' scientific writing skills, process quality, and quality of learning outcomes, the role of lecturers in participative and collaborative learning of scientific writing, participative and collaborative learning in scientific writing, and the importance of participative and collaborative learning in a university.

*The Concept of Participative and Collaborative Learning of Scientific Writing.* In the concept of participative and collaborative learning of scientific writing, it explains how the students acquire knowledge. In the concept of participative and collaborative, lecturers do not transfer the knowledge to the students in a perfect way. Students have to build their knowledge and skills based on their experience in interaction, participation, and collaboration within their study group. The lecturer is only as a facilitator, supervision, sources, and motivator.

*The Advantages of Participative and Collaborative Learning of Scientific Writing.* Participative and collaborative learning has some advantages compared to conventional learning in the realm of scientific writing. In participative and collaborative learning, students are treated as the focus of learning. It can be seen from students' engagement in acquiring the knowledge and skills through some interaction, participation, and meaningful collaboration in their socio-cultural environment. Therefore, students have to be independent and active in acquiring the knowledge and skills through some interaction, participation, and meaningful collaboration in their socio-cultural environment. The socio-cultural environment includes colleagues, lecturers, material, learning strategy, relevant expert, and other people.

*The Purpose of Participative and Collaborative Learning of Scientific Writing Skill.* The purpose of participative and collaborative learning is to improve students' active participation intellectually and emotionally in the learning process, and also to improve their scientific writing skill, process quality, the quality of learning result, and develop students' social and emotional intelligence. . Students are encouraged to participate and collaborate to discover the knowledge and skills they are learning through interpretation in various ways, such as observation, discussion, questioning, invention, collaboration or experimentation. This learning model also give a chance to students to be responsible to complete the group tasks with their peer.

*The Characteristic of Participative and Collaborative Learning.* Participative and collaborative learning has some unique characteristics compared to conventional learning. It emphasizes some changes in students' attitude at the end of the learning process, students' engagement and their knowledge become the primary purpose.

*The implementation of participative and collaborative learning of scientific writing skill* The implementation is divided into three groups: preliminary activities, main activity, and closing actions. *First*, preliminary activities are filled with orientation activities, i.e., opening lectures with activities delivering KD, learning objectives, an evaluation system that will be used, and apperception. *Second*, primary activities include concept exploration activities, concept interpretation activities, and concept application activities. *Third*, closing activities are filled with reflection activities, inferences, and formative evaluations.

*The last stage is effectiveness test of product development.* The effectiveness test of product development is intended to obtain information whether the product development is effective or not when it is implemented in participative and collaborative learning of scientific writing process in the field. The test is conducted by doing a pre-test and post-test to measure students ability before and after the product development is implemented in the learning process. Their achievement is recorded in the form of scores.

Based on the results of a statistical test it is obtained that there is a difference between the pre-test score and post-test score on the process of learning scientific writing between the one that does not utilize product development and the one that utilizes product development. The score shows some significant differences. The average score of pre-test (papers) was 74,96, and the average score of post-test (papers) was 89,04. The value of score differences was 14,08. The result of t-test shows the significant (2 tails)  $p=0,000 < \alpha=0,005$ .

It means that there are significant differences between pre-test score and post-test score. Based on the results of the calculation, the utilization of product development in the process of participative and collaborative learning of scientific writing has a positive effect on student learning achievement. Also, it can be stated that there is a significant improvement in students' scientific writing between after the learning process is implemented.

In addition, the students' skill on scientific writing and learning process quality are also improved. Improvement in the quality of scientific writing process can be seen from their increasing interest, motivation, participation, and collaboration of students physically and psychologically, interaction with peers, lecturers, experts relevant to the field of study, the attitude of willing to give and accept opinions of others, tolerance, responsibility, social sensitivity, and democratic attitudes in learning.

## **DISCUSSION**

This product development learning model has a participative and collaborative spirit. The spirit is presented in all components of the learning process implementation guide. In its implementation, the participative and collaborative spirit can be seen in student activities during the learning process in order to construct knowledge independently through a number of meaningful interactions with their socio-cultural environment (Vygotsky, 1978). Therefore, the process of scientific writing learning corresponds the principles of participative and collaborative learning.

As stated earlier that the purpose of developing a participative and collaborative learning model of scientific writing is to improve the learning process, scientific writing

skills, learning outcomes, develop students' social and emotional intelligence. Based on the effectiveness test, this product development can increase students' scientific writing skill, process quality, quality of achievement, and also develop students' social and emotional intelligence.

The improvement of students' writing ability can be observed from the increasing of scientific writing qualities before and after the implementation of participative and collaborative learning. It is also can be observed from the interaction that is increased in the learning process. That interaction occurs mutually between lecturer-student-learning materials-media and learning strategies. The interaction requires students' engagement both physically and emotionally (intelligence, talent, interest, motivation, awareness, and emotion) in the learning process. Learning quality improvement can be seen from the significance score between pre-test and post-test.

On the other side, the development of students' social intelligence appears in their social attitude development such as: respecting each other, helping each other, democratic, discipline, hard-working, and responsibility (Waliman, dkk., 2001, p. 123), et al. It also appears in their ability in managing their emotion, such as self-control, maintaining interpersonal relationships, maintaining self-esteem, self-awareness, social sensitivity, and personal social adaptation abilities.

From the learning model design experiment, it is obtained that there is an improvement in scientific writing skill and student participation in the learning process. Students are motivated, enthusiastic, passionate, physically and psychologically active in following the stages of scientific writing learning process. An improvement in scientific writing skill is essential for students to support their success in university life. Scientific writing skill is absolute for students since they will struggle with their scientific task.

Many things that can be completed by students if they are skilled in scientific writing, such as skilled in preparing observation reports, skilled in preparing papers, compiling articles, preparing research reports, and also expected to be skilled in preparing their undergraduate thesis as their final project (Gocsik, 2005, p. 11). Therefore, scientific writing skills need to be trained continuously and sustainably (Mardanu, 2007, p. 9) To prepare students to live in the community when they become teachers. It is expected that they can become professional teachers and can continuously carry out scientific activities to improve the quality of their professionalism (Depdiknas, 2005, p. 79).

This product development learning model has a participative and collaborative spirit. A participative and collaborative spirit that based on constructivism philosophy (Bruner, 2001, p. 35) Used as a foundation in the development of scientific writing learning model so that it will produce a learning model with participative and collaborative spirit. Participative and collaborative learning treat students as the center of learning (Izza, 2014, p. 36; Pakpahan, 2013, p. 57) and being active in constructing knowledge and skills through active participation in the learning process and meaningful cooperation within their study group.

Participative and collaborative emerge on the whole learning model components. The learning process is designed to enable students, both physically and psychologically active in constructing the knowledge and skills being learned. In a participative and collaborative learning process, lecturers no longer dominate the learning process, but rather to empower the students' active role as the subject of learning. Lecturers act as facilitators, motivators, peer, and a resource if students have learning difficulties and have not received satisfactory answers from his peers (Davis, 1990, p. 187). The role of lecturers is to train students to learn independently, responsible for the tasks given, able

to solve problems, and able to work with their peers. In that case, students' scientific reasoning should be developed to avoid a static and imitative learning pattern that results in the lack of student creativity. That process is a learning process that has a participative and collaborative learning spirit (Izza 2014, p. 36; Pakpahan, 2013, p. 57).

There are a number of benefits that students can take from participative and collaborative learning of scientific writing; to create a classroom where students will become active learners rather than passive observers. Students are responsible for the knowledge and skills being learned. Learning will become more meaningful and fun. Students will work hard to achieve their learning goals.

The lecturers' responsibilities in participative and collaborative learning are to assist students in achieving their learning objectives. It means that lecturers are the one who mostly manages the classroom as a team that works together to invent something new for students. Lecturers also facilitate students with adequate learning resources. Lecturers organize learning environments and strategies that enable students to learn. A conducive learning environment is needed to enable students to learn optimally. Learning should focus on how students use new knowledge (Buzan, 2012, p. 109), so the learning strategy is more important than the outcome.

Lecturers should listen to students when they are giving an opinion, or expressing their ideas. The lecturer is no longer a determinant of student progress but furthermore as a student companion in achieving the competence of learning. As suggested by Nur (1998, pp. 45-47); Suparno (1997, p. 71) There are five elements that need to be considered by lecturers in participative and collaborative learning of scientific writing, such as the learning process have to recognize students' existing knowledge, it has to be started from whole to the parts, it also should be emphasized on the comprehension by arranging the temporary concept; sharing to gain input and feedback from others, revising, and developing concepts, learning is emphasized on practicing directly to the knowledge and skills being learned, and reflecting on learning strategies and developing knowledge and skills.

Considering the conditions of conventional scientific writing learning which lead to lack of writing skills, process quality, learning outcome quality, social and emotional intelligence. This development product can be utilized to actualize participative and collaborative learning of scientific writing to improve students' scientific writing skills, process quality, learning outcome quality, and also social and emotional students.

In addition, Doolittle & Camp (1999, p. 211) suggest that in this case learning tool is a participative and collaborative learning model that can promote interaction and cooperation among students and their community. In the effectiveness test, this product development has been proved that it can increase students' scientific writing skill, process quality, quality of achievement, and also develop students' social and emotional intelligence. Other things that accompany the learning process of scientific writing also increased, such as learning interest and motivation, learning interaction, cooperation with peers, responsibility, solidarity, and also their social and emotional intelligence (Supriyadi, 2015, p. 211), and also other things that support students' learning spirit

This product development learning model has a participative and collaborative spirit. It is a positive effect of the implementation of participative and collaborative learning as the basis of scientific writing model development (Clements & Batista, 2002, p. 180). This participative and collaborative learning spirit stands out in the learning process (when it was being tested).

This product development can be used to fulfill the need for participative and collaborative learning model in scientific writing compared to a conventional learning

model. This product development can be applied as guidance in the learning process, learning process interaction, and evaluation process includes the process and the result. By utilizing a participative and collaborative feasible learning model, it is expected that students' scientific writing skills, process quality, learning outcome quality, social and emotional intelligence can be optimally improved. The use of this product development in the learning process has been proved that it can improve students' writing skill, process quality, learning result quality, students' social and emotional intelligence.

The development model of learning model is also designed and developed to assist students to participate more actively in the learning process, both physically and psychologically (Basuki, 2008, p.215). Students' physical engagement in the learning process emerge in discussion activities, question, and answer, study group presentation, reflection, and search for enrichment materials. It is clear that all these activities require the active participation of the entire physical aspect of the learning process. The students' psychological engagement can be seen in student's thinking, initiating, creating, contributing ideas, problem-solving, and offer suggestions in the process of learning. Meanwhile, students' social and emotional intelligence emerge in their sense of responsibility, hard work, discipline, adaptation, self-control, and democratic attitudes. The increase of these four aspects indicates their interest and motivation in the process of producing scientific writing.

The result of this research also proved the advantages of participative and collaborative compared to conventional learning in the process of scientific writing. Participative and collaborative learning of scientific writing as a generative learning model (Bereiter, 1994, p. 22) has been proven that it can increase students' skill in scientific writing, process quality, result quality, and also social and Emotional Intelligence. This learning model also gives a chance for students to be responsible for completing the group tasks with their peer. In the effectiveness test, participative and collaborative able to motivate students in following several activities so they are challenged to be responsible for completing their task creatively.

The result of this research is relevant to the previous knowledge about learning tools and model development. A number of studies include Zulianto's (2007) about the development of argumentation learning model based on the process approach for the seventh-grade students in Junior High School. The research mentioned that one aspect that is being developed is the teaching materials about writing argumentation. He suggests that it can improve students' process and learning results quality of writing an argumentation in Junior High School. The next research is Sukirno's (2008) also about the development of a model of learning device of narrative writing with quantum learning strategy in high school students. One aspect that is developed by Sukirno is the teaching material of narrative writing. He suggests that it can improve students' process and learning results quality of narrative writing in Senior High School.

The third study was by Syamsi (2011) about the development of writing-learning tools based on the genre-process approach for junior high school students. One of his aspects is material development based on genre-process approach. It also can improve students' process and learning results quality of writing in Senior High School. Based on those results of development research, it can be suggested that this product development result support the results of previous development research, which can be used to improve the process and to learn result quality of scientific writing, and also to develop students' social and emotional intelligence.

## **CONCLUSION**

Based on the result of this development research, it can be concluded that in its implementation, this development product has been proven to increase students' scientific writing skill. It can be seen from two aspects, including participation and collaboration among students and students' achievement. Participation and collaboration among students can be seen from their active engagement both physically and psychologically in the learning process. It also can be seen from the improvement of their score which is the deviation between pre-test and post-test score. There is a significant improvement in students' learning achievement. The improvement in their achievement is also can be seen from the comparison between the resulting score when the product development and the conventional development are implemented. Comparison between the two shows that the score of learning outcomes by utilizing product development is higher than the score of learning outcomes with conventional learning model. The comparison between the two is also significant.

On the other hand, scientific writing learning that utilizes product development can also develop students' social and emotional intelligence. The development of social intelligence appears in the development of students' social attitudes, such as helping each other, give and take, tolerance, responsibility, discipline, precise, and democratic attitudes. It also appears in their ability in managing their emotion, such as self-control, maintaining interpersonal relationships, maintaining self-esteem, self-awareness, social sensitivity, and personal social adaptation abilities. It shows that participative and collaborative learning of scientific writing can improve process quality, student learning outcomes, and develop students' social and emotional intelligence significantly.

This learning product is feasible to be implemented in the learning process of scientific writing because it has been through several validation tests. The validation includes validation by the practitioner, by an expert, and validation in the field. Validation in the field was completed through several experiments to gain information about effectiveness result between learning tools of product development and conventional learning tools. Validation by practitioner was completed by the lecturer of scientific writing, while validation by the expert was completed by AMat, AMet, and ATp. This learning product is feasible to be implemented in the learning process of scientific writing.

Based on the result of the experiment, it has been proven that participative and collaborative learning has shown some advantages compared to conventional learning in the realm of scientific writing. It also can increase students scientific writing skill, learning process quality, and learning result quality. In addition, participative and collaborative learning model of scientific writing able to develop students' social and emotional intelligence.

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