

DEVELOPING TEACHING MATERIAL OF WRITING SCIENTIFIC PAPER USING CONSTRUCTIVISM APPROACH

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Abstract: The aim of this study was to develop teaching material with constructivism approach to improve student skill in writing scientific paper. This study also aim to test effectiveness of product in learning process of writing scientific paper in classroom. R2D2 development model was used in this research to achieve these research objective. R2D2 development model consists of four focuses, namely definition, design and development, effectiveness test, and dissemination. Its implementation in field, this research refers to nonlinear focus. Dification focus was done by setting product and team participation. Design and development focus were done by designing teaching material and development process. Development process was done by practitioner test, expert test, product test in field, and effectiveness test of product in field. Data of expert test, practitioner test, and product test in field form qualitative data, while effectiveness test data in field form quantitative data. Qualitative data was analyzed by domain technique. Domain include format, content, material organization, and language aspect of product. Quantitative data was analyzed by SPSS 16.0 for windows. Results of development research was teaching material of writing scientific paper with constructivism approach. Teaching material development product has specific characteristic that different with conventional teaching material. Uniqueness was reflected in using of constructivism approach in learning with four activities, namely (a) orientation, (b) exploration of concept, (c) interpretation/concept inquiry, and (d) concept application. Result of effectiveness test of product showed that learning process with teaching material of development product improve learning outcomes in writing scientific paper. The increase can be seen from difference significant between pretest score and posttest score on learning scientific paper with constructivism approach.

Key words: teaching material, writing of scientific paper, constructivism approach

Writing scientific paper is an activity that required from student. With skillful in writing scientific paper student can complete their studies on time. Therefore, skill of writing scientific paper is important and beneficial for student to support their studies smoothness and success in college (Wahab and Lestari, 2000). Scientific paper is a paper that presents idea, description, or problem solving systematically presented objectively and honestly by using standard language, and supported by fact, theory, and empirical evidence (Brusaw, et al., 1982). Based on that definition, there are five basic characteristics of scientific paper, namely characteristic in term of (a) substance, (b) format, (c) delivery strategy, (d) use of language, and (e) support. The fifth characteristic of scientific paper indicate that writing a scientific paper is complex skill.

Accordingly, from a number of types of scientific paper that is done by most students in college is paper. It caused by a lot of paper done by student to

fulfill task programmed structured each course in each semester. Usually on each course, student work an average of 2-3 papers in one semester. Thus, writing paper is writing scientific paper skill is important for student.

As with other type of scientific paper, paper also has four main characteristics, namely grain structure, component, author's attitude, and use of language. The fourth main feature of paper can be used as a guide for student in writing paper. Student must know four main characteristics of paper so that they can write paper correctly and quality.

Based on results of preliminary studies and author's teaching experience can be identified two factors cause lack of knowledge and student's skill in writing scientific paper, namely use of poorly aligned approach in learning of writing scientific paper and unavailability of teaching material of writing scientific paper with adequate quality from research result systematic and purposeful.

Accordingly, appropriate solution to improve writing skills of scientific paper of student, quality of process, and quality of learning outcomes were to implement constructivism approach. Constructivism approach was implemented, both as an approach in learning process as well as cornerstone in development of teaching material of writing scientific paper. Implementation of constructivism approach in development of teaching material meant that constructivism approach was evident in process of learning of writing scientific paper.

Product from process of development can provide benefits for lecturer and student. Benefit for lecturer is development of product can be used as a reference/guide for carrying out process of learning of writing scientific paper with constructivism learning model being a trend at this time. Benefit for student are product of this development can assist student in learning process, as a guide and learning resources that can assist them in learning of writing scientific paper. Expected that development product of teaching material can develop inspiration, motivation, creativity, productivity, and reasoning power of student in writing scientific paper.

Process of learning with constructivism approach was to shape personality of student as human responsible, independent, critical, creative, productive, willing to give and take, sensitive to surrounding environment, social pirited, and democratic. Social interaction in learning process of writing scientific paper with constructivism approach can be formed when student discuss in group, either in small group or large group (class discussion).

Application of constructivism approach in learning of writing scientific paper realized in form of four activities, namely (a) orientation, (b) concept exploration, (c) interpretation/concept discovery, and (d) application of concept (Nunuy, 2005). Orientation activity carried out by making agreement between lecture and student about material used, learning process, tasks, and evaluation process. Exploration activity carried out by student reading scientific paper and number of examples of literature, browsing internet, ask peer and lecturer, inquiry, etc. Activity of interpretation/invention made by student working independently, working in small group, working in large group, presentation of result of work in small group and large group, self-evaluation, deepening of

material. Application of concept activity realized by student by activity of writing scientific paper, theme selection, identification of topic, and editing script of scientific paper.

Teaching material of writing scientific paper with constructivism approach as product development can be used as means of improving student skill in writing scientific paper, quality of learning process, and achievement of students of writing scientific paper. At time of testing effectiveness of development product has been shown to improve student skill in writing scientific paper, quality of learning process, and outcomes/learning achievement. Teaching material of writing scientific paper with constructivism approach as product of development can also be used to increase motivation, interaction, creativity, productivity, reasoning, social sensitivity, mutual give and take other people's opinion, as well as democratic attitude of student in learning.

METHOD

Development model used was A Recursive, Reflective, Design, and Development Model (Willis, 1995; 2000) known by acronym R2D2. R2D2 model consists of three focuses, focus of (a) definition, (b) design and development, and (c) dissemination. Focus of dissemination was not done in this study as it pertains to publish product and product implementation in field on wide scale. R2D2 model was used as model for development in line with constructivistic paradigm that animate of teaching material developed.

Definition focus was done by setting of product development and participatory team building. Product development was teaching material of writing scientific paper constructivism approach. Successful participatory team was formed consisting of (a) student, (b) lecturer, (c) practitioner, and (d) expert. Expert team consists of (a) subject matter expert of writing scientific paper, (b) learning method expert of writing scientific paper, and (c) learning technologist.

Focus of design and development done by designing teaching material and test practitioner, expert testing, product testing in field, and test effectiveness of product. Test effectiveness of product take place to determine whether or not effective when product development applied in learning process of writing scientific paper in field. Expert test result, test of product on field, and test effectiveness of product used to revise end of product development.

Development of data divided into two segments, namely quantitative and qualitative data. Qualitative data in form of descriptive data and reflective data. Descriptive data in form of comment, criticism, suggestion, correction, and judgment was given by practitioner and experts of product. In addition, data also in form of descriptive utterance (oral and written) of lecturer, student, lecturer and student behavior, and attitude of lecturer and student in learning process. Data in form of comment and reflective interpretation or commentary on descriptive data by researcher. On the other hand, quantitative data was pretest score and posttest of student ability in writing scientific paper obtained from execution of product effectiveness test.

Data source of development were practitioner, expert, student, lecturer and learning process. Data from practitioner and expert in form of comment, criticism,

suggestion, correction, and assessment of teaching material design of writing scientific paper. Data from student in form of speech (verbal and written), behavior, attitude of student in learning process, and scores of student's scientific paper before and after learning process. Data from lecturer in form of speech (verbal and written), behavior, attitude in learning process, teaching material documents, comment, criticism, suggestion, correction, and an assessment of teaching material design of writing scientific paper. On the other hand, data from learning process (effectiveness test) in form of pattern of student-student interaction, student-lecturer, student-content, student participation in learning process, and reflection of learning process.

Activity of development data analysis divided into three segments, namely (a) analysis of data from practitioner and expert, (b) analysis of data while testing product, and (c) data analysis of test effectiveness result. Data analysis activity of practitioner and expert performed by domain analysis technique. Data grouped by content domain, format, and language based on teaching material developed. Each data domain was done reflection to make conclusion of data analysis result. Conclusion from data analysis result was used to revise teaching material of writing scientific paper.

Activity of data analysis of effectiveness test carried out by statistical analysis. Difference test of score in pretest and posttest of learning process by using development product performed by paired sample t test. Activity of data analysis from product effectiveness test results was done by using statistical performed SPSS 16.0 for Windows. The reason, statistical analysis device was the latest version at time of this data analysis activity carried out. SPSS version 16.0 has high sharpness and completeness analysis adequate analysis so result were more accurate, more complete, and facilitate researcher in interpreting research result.

RESULT

Description of teaching material development of writing scientific paper product was began with an explanation of development process. It was necessary because product development result starting from development process and then followed by description of development product.

Development Process

Development of teaching material with constructivism approach was intended to improve student skill in writing scientific paper. Systematic of teaching material developed based on learning process order and adaptation of instructional material format by Ministry of Education in 2008. Composition of teaching material was done in collaboration with lecturer to gain common perception about format of material developed. Revision activity conducted after teaching material tested by practitioner, expert, and material testing in learning process. From practitioner test activity, expert tes, and material test obtained as input of material revision purpose.

Design of teaching material based on result of collaboration with lecturer and observation examples of teaching material of writing scientific paper. Based on result of collaboration and sample observation obtained thirteen units

instructional material developed in line with number and type of base competence. Characteristic of teaching material developed were as follows. Teaching material consist of ten essential components, namely (a) Unit..., (b) Subject/topic of learning, (c) Base competence, (d) Learning objective, (e) Learning instruction, (f) Description of material teaching, (g) Learning activity 1 and 2, (h) individual activity, (i) Self-assessment, and (j) Deepening teaching material. Components were arranged in order of execution of learning process, input from lecturer, examples teaching material format, ease of implementation in learning process, and format that show learning with constructivism approach. Format indicating constructivism learning approach was shown in part (a) description of teaching material, (b) learning activities 1, 2, and 3, (c) individual activity, and (d) self-assessment.

Lesson topic/subject was developed in line with base competence and collaboration with lecturer. Development of learning topic was done by inductive pattern that was relevant to constructivism approach. With this pattern, student can construct their own knowledge and skill learned through concept exploration activity. Characteristic of teaching materials development with inductive pattern was exposed many examples as possible at beginning, followed by exploration activities.

Base competence was developed in line with competence standart, ideas with lecturer, and student learning need. Base competence formulation was more emphasis on development of three areas of competence, namely cognitive, psychomotor, and affective domain. It was intended that student has knowledge, skill, and positive attitude in learning of writing scientific paper.

Learning objectives were developed in line with base competence. Development of learning objectives were intended to provide direction and target to be achieved during learning process. Development of learning objectives will also provide direction to lecturer in implementing evaluation process and learning outcomes.

Instruction developed based on base competence and learning objectives, ideas together with lecturer, student learning style, and its relevance to learning with constructivism approach. Its meant that learning process can be accomplished in accordance with learning objectives that have been defined.

Description of teaching material developed in collaboration with lecturer and sample of teaching material with inductive pattern. In part, it was presented in form of example of teaching material in line with base competence and learning objectives. Exposure of examples used as illustration to facilitate student in understanding of teaching material. It expected that from exploration activity student can build generative knowledge and skill on their mind constantly.

Part of learning activity was place to pour finding of student after he observed number of illustrations/example, after he makes process construction, and after his exploration activity. Finding of student in form of tangible expression of his own knowledge and skill to build his observation on number of illustration. Segment of finding development based on collaboration with lecturer and example of relevant teaching materials development.

Learning activity was also designed in form of creative activity. Activity in form of creative activity of student in forming small group (4 students) to discuss teaching material relating of writing scientific paper. They talk to each other and ask each other to explain to his friend. Student who has weak knowledge ask student who intelligent and clever and he shall provide an explanation to support his friend who was still need. Here role of lecturer as resource and place student asked if student has difficulty in learning and provide an explanation if there were materials were difficult to solve. Creative activity developed in collaboration with lecturer and consideration of creative learning process so that student feel has whole learning process.

Individual activity part was work must be completed individually by student related to topic of lesson learned. That part was done by student after he conduct exploration activity. Individual working part was developed in collaboration with lecturer and on basis of deepening material individually by student.

Part of self-assessment activity was to assess of individual student's work by student himself. Part of it was also seen as form of reflection on student learning process undertaken to check level of attainment of knowledge and skill acquired. Tat activity was intended to check correctness of student work based on guideline set forth in assessment rubric. Student was asked to correct his own work if he find any discrepancies with signs in assessment rubric. That segment was developed based on individual assessment result and collaboration with lecturer on basis of improving quality of individual student's work.

Part of deepening of material was developed to deepen knowledge and skill of student in writing scientific paper. It expected that with deepening of material, knowledge and skill of student can be continuously improved. Part of deepening of material was developed based on result of collaboration with lecturer and on basis of quality improvement of knowledge and skill of individual student.

After completion of design process, the next development step was practitioner test and expert test to solidify teaching material development product. Process of practitioner test and expert test conducted to obtain solid material. Collaboration with practitioner and expert conducted to obtain input from practitioner and expert. Practitioner designated to validate of teaching material was lecturer that teach Indonesian Scientific subject and lecturer of writing scientific paper. They were the ones who have competencies and skills in learning of writing scientific paper. Group of experts appointed to conduct test was expert of learning content of writing scientific paper (EoC), expert of learning of methodology of writing scientific paper (EoMet), and expert of learning technologists (EoLT). Result of review by expert group was in form of comment, suggestion, criticism, repair, and appraisal guideline as outlined in assessment or poured directly in format of instructional material.

Collaboration with practitioner and expert intended to test overall instructional material consisting of nine essential components, namely (a) lesson topic/subject, (b) base competence, (c) learning objective, (d) learning guidance, (e) description of teaching material, (f) learning activities 1, 2, and 3, (g)

individual activity, (h) individual assessment, and (i) deepening of material. Test result by practitioner and expert in form of comment, criticism, suggestion, improvement, and an assessment of nine essential components of teaching material. Practitioner and expert were also given authority to provide comment, criticism, suggestion, improvement, and judgment on other aspect beyond nine essential components of teaching material. Other aspects, such as font type and consistency of terminology, physical appearance, display graphic, and lay out material. Test activity by practitioner and expert intended to establish all components overall teaching material.

Deskription of test result of expert and practitioner were grouped based on following critical component contained in instructional material, namely (a) cover, (b) feasibility of content, (c) presentation, (d) layout, (e) graphic, and (f) language. At the end of this section was stated result of expert tes and practitioner test on the other aspects of teaching material, such as font type and consistency of terminology, physical appearance, display graphic, and lay out. More explanation as follows.

1. Cover

Components of material cover tested by practitioner and expert were (a) show harmony in selecting illustration/drawing in accordance with content of teaching material and (b) show attractiveness in selecting illustration/drawing in accordance with content of teaching material. Based on practioner test and test experts result can be stated that material cover need to be revised or redesigned to look more attractive, more relevant between material cover/learning content, and easily recognizable from afar. Revision component of material cover poured directly on development product of teaching material. Practitioner test and expert test result of component material cover can be seen in Table. 1 below.

Table 1. Test Results of Teaching Material Cover Component

Numb.	Data Source	Test Result
1.	Practitioner 1	It is too general
2.	Practitioner 2	It is commonly used
3.	Practitioner 3	Need to design a more attractive
4	EoC	Enlist the help of designer to look more attractive
5.	EoLMet	Redesigned to make it more attractive
6.	EoLT	Too stereotype, ask for help from a book cover designers

2. Eligibility of content

Feasibility of content component in teaching material was tested by expert and practitioner were (a) show compliance with competence standart and base kompetensi, (b) show suitability of learning need of student in writing scientific paper, (c) show its suitability for teaching material of writing scientific paper, (d) show compliance with substance of writing scientific paper, (e) show conformity with benefit to addition of insight knowledge, and (f) show compliance with values and social morality in teaching material. From the practitioners test and expert test result can be stated that feasibility of material/content of learning was appropriate to the need of learning of writing scientific paper. Material/learning

content development product was viable implemented in learning process of writing scientific paper skill. Practitioner test and expert test result of feasibility component content of teaching material can be seen in Table. 2 below.

Table 2. Eligibility Test Result of Material/Learning Content Component

Numb.	Data Source	Test Result
1.	Practitioner 1	It is appropriate
2.	Practitioner 2	It is appropriate
3.	Practitioner 3	It is appropriate
4.	EoC	It's very appropriate
5.	EoLMet	It is appropriate
6.	EoLT	It has been ok

3. Technical presentation

Presentation of instructional material technique components tested by expert and practitioner was (a) show clarity of purpose, (b) show feasibility of order of presentation, (c) show student learning motivation, and (d) show completeness of information in material. From the practitioner test and expert test result can be stated that technical feasibility of presenting instructional material was appropriate. That was, presentation of instructional material in format of teaching material has been declared eligible. Practitioner test and expert test result of presentation materials technique component can be seen in Table 3. below.

Table 3. Test Result of Presentation Technique of Teaching Material Component

Numb.	Data Source	Test Result
1.	Practitioner 1	It is appropriate
2.	Practitioner 2	It is appropriate
3.	Practitioner 3	It is appropriate
4.	EoC	It's very appropriate
5.	EoLMet	It is appropriate
6.	EoLT	It has been ok

4. Layout

Layout of material component tested by practitioner and expert were (a) show compatibility appeared of consistent layout, (b) show harmony in determining layout, and (c) show harmony in determining layout, so as to facilitate understanding of teaching material. From the practitioner test and expert test result can be stated that necessary expert assistance/book designer/lay outer in publishing to organize of teaching material to make it look more attractive and easily understood by student. Revision of layout material component poured directly on development product of teaching material. Practitioner test and expert test result of teaching material layout component can be seen in Table 4. below.

Table 4 Test Result of Teaching Materials Lay out Component

Numb.	Data Source	Test Result
1.	Practitioner 1	Need to restructure an exciting
2.	Practitioner 2	Need expert help of book designer
3.	Practitioner 3	Need expert help to lay out
4.	EoC	Sorely need expert help to lay out
5.	EoLMet	Need lay outed by someone who is an expert

6.	EoLT	Ask expert assistance/book designer/builders lay out in publishing
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5) Graphic

Graphic component of material tested by practitioners and experts were (a) show suitability the use of font (type and size of letter), (b) show suitability of layout, and (c) show suitability of design and display material. From the practitioner test and expert test result can be stated that it was necessary expert assistance/book designer/lay outer in publishing to organize of teaching material graphic to look more attractive and easily understood by student. Revision of material graphic component poured directly on teaching material development product. Practitioner test and experts tes results of material graphic component can be seen in Table 5. below.

Table 5. Test Results of Teaching Materials Graphic Component

Numb.	Data Source	Test Result
1.	Practitioner 1	Need to restructure an exciting
2.	Practitioner 2	Need expert help of book designer
3.	Practitioner 3	Need expert help to book lay out
4	EoC	Sorely need expert help to lay out
5.	EoLMet	Need lay outed by someone who is an expert
6.	EoLT	Ask expert assistance/book designer /builder lay out in publishing

6) Linguistic

Component of language in teaching material tested by practitioner and expert were (a) appeared readability, (b) show clarity of information, (c) show compliance with standard Indonesian rule, and (d) show the use of Indonesian effectively and efficiently in teaching material exposure. From the practitioner test and expert test result can be stated that component of language of teaching material was appropriate. That is, the use of Indonesian language used to describe of teaching material was accordance with rules of scientific Indonesian. Teaching material was communicative and easily understood and internalized by student. Practitioner test and expert test result of language component of teaching material can be seen in Table. 6 below.

Table 6. Test Result of Linguistic Component ini Teaching Material

Numb.	Data Source	Test Result
1.	Practitioner 1	It is appropriate
2.	Practitioner 2	It is appropriate
3.	Practitioner 3	It is appropriate
4	EoC	It's very appropriate
5.	EoLMet	It is appropriate
6.	EoLT	It has been ok.

Revision of teaching material based on result of practitioner test and expert test described above, in form of comment, criticism, suggestion, improvement, and as outlined in assessment of teaching materials and format teaching materials. Practitioner test and expert test result were used to revise

overall important component of teaching material. Revision of teaching material were also committed against typing error, mistake of diction use, not completeness of physical appearance, not completeness of graphical display, not completeness of layout, formatting error, error in content, and language errors. Revise result form thirteen units of teaching materials that steady and ready to be tested in field of teaching material.

Trial in field of teaching material was done through collaboration with lecturer and student. Collaboration with lecturer and student were meant to engage lecturer and student in process of development since development of teaching material. It was important because student and lecturer as potential user must know process of teaching material development.

Test of teaching material place in two stages, namely test of material in small group and test of material in large group. This was done to obtain as much input as possible from lecturer and student. Broadly speaking, result of pilot testing of material presented as follows. First, in general development product of teaching material can be tested properly. Teaching material can be implemented properly in learning process. This was possible because lecturer was also involved in development/design of teaching material.

Secondly, there were number of flaws found in teaching material. Weakness were typing error, text readability, error of words and terms used, sentence not clear, lack of clarity in learning task, and organization of teaching material. Ambiguity sentence was generally contained in learning activities 1, 2, and 3 that it was sometimes confusing student in learning task. Fault lies in organization of teaching material overlapping material that have similar properties.

Thirdly, there were things that need to be considered by lecturer in teaching of writing scientific paper with constructivism approach. Lecturers need to prepare student mentally as well as possible. Student need to be told from beginning that active participation in learning process was key demand. Student was required to build on their own knowledge and skill from beginning to write series of scientific paper. Students was also required to interact with material, peer, and resource person to acquire scientific knowledge.

Fourth, it takes relatively a lot of time in implementation of learning with constructivism approach. It was caused by constructivism approach need set up of learning orientation process to final agreement.

Revision of teaching material was performed after each material test at each meeting. Revision of teaching material was done by way of reflection and discussion held together student. Based on trial result and reflection of teaching material, revision was made to typing error, legibility of text, and error terms were used, sentence not clear, lack of clarity in learning task, and organization of teaching material. The refinement result poured directly in revision of teaching material. Based on final result revisin obtained thirteen topics/instructional material unit viable and steady.

Development Product

The end product of development process was thirteen units of teaching material that ready to implement in writing scientific paper learning with constructivism approach. Development product was ready implemented in learning process by all parties with an interest in improving student skill of writing scientific paper, process quality, and quality of learning outcomes. Following briefly presented final product of development process of teaching material.

Teaching material can determine student success as whole. Therefore, preparation of instructional material by lecturer deemed important. Teaching material is essentially an integral part of syllabus, namely planning, prediction, and projection that will be carried out during learning process. Broadly speaking, it can be argued that teaching material were knowledge, skill, and attitude that must be mastered by student in order to meet a predetermined competence standart.

Teaching material occupy an important position of overall curriculum, so it should be prepared for implementation of learning process can reach target. Target must be in accordance with competence standart and base competence to be achieved by student. Specified material for learning activitie that matter should really support achievement of competence standart and base competence, as well as indicator of learning achievement.

Instructional material selected as optimal as possible to assist student in achieving competence standart and base competence. Things that need to be attended associated with selection of instructional material were type, scope, sequence, and treatment of these materials. Here's how to prepare teaching materials presented.

1. Identify competence standart and base competence

Before preparing teaching material prior identification of those aspects of competence need to be learned or mastered by student. These aspects need to be determined, because each type of standart and base competence require different material in learning process. Before starting learning process must be determined whether standart and base competence student who haas mastered including cognitive, psychomotor, or affective. Cognitive domain was defined competencies include knowledge, comprehension, application, analysis, synthesis, and evaluation. Psychomotor domain were defined competencies include early motion, semiroutin, and routine. Affective domain was defined competencies include providing response, appreciation, assessment, and internalization.

2. Identify types of teaching material

Identification process was related to compatibility between material with level of activity/learning domain. Appropriate material to be determined based cognitive behavior emphasize intellectual aspects, such as knowledge, understanding, and thinking skill. Thus, type of material was suitable for cognitive fact, concept, principle, and procedure.

Teaching material appropriate to affective domain was determined by behavior that emphasizes aspect of feeling and emotion, such as interest, attitude, appreciation, and how to adjust himself. Type of material suitable for affective

domain includes taste and appreciation, such as giving response, acceptance, internalization, and assessment.

Appropriate teaching material for psychomotor domain determined by behavior that emphasizes aspect of motor skills. Type of material suitable for psychomotor domain consists of initial movement, semiroutine, and routine, such as writing, drafting, design, and others.

Material will be taught should be properly identified so that achievement of competence can be measured. By identifying types of material that will be taught, lecturer can determine which teaching method will be used. Each type requires a method of teaching material, strategy, media, and evaluation system are different. Therefore, teaching material have a strategic function for lecturer. Strategic functions are as follows.

- (a) Guideline for lecturer who will direct all activities in learning process, as well as substance competency that should be taught to student.
- (b) Guideline for student who will direct all activities in learning process, as well as substance competency to be learned and mastered.
- (c) Evaluation of achievement/mastery of learning outcomes for lecturer.

Associated with exposure to material in this study was developed based on learning sequence of writing scientific paper with constructivism approach. The sequence were (a) orientation, (b) exploration of concept, (c) interpretation/invention of concept, and (d) application of concept. Teaching material has been developed through series of tests, namely practitioner test, expert test, field trial, and test of effectiveness of product for benefit of improving student skill of writing scientific paper, quality of process, and quality of learning outcomes. This teaching material of development products prepared by inductive patterns relevant to constructivism approach. With inductive pattern, it expected that student can easily build their own knowledge and skill learned. Description of characteristics of teaching material prepared by inductive pattern was described number of examples at beginning and end with deepening of material.

This development of teaching material refers to base competence in learning of writing scientific paper. Base competence that developed into teaching material was thirteen points. Therefore, teaching material were also developed in thirteen units. Detail of thirteenth base competence developed to be material as follows.

- a. Nature of scientific paper.
- b. Nature of scientific paper.
- c. Choosing theme and identify topic of paper.
- d. Topic limitation of paper.
- e. Formulation of paper title.
- f. Formulation of paper problem.
- g. Formulation of paper thesis.
- h. Formulation of paper a framework.
- i. Development of idea and paragraph cluster.
- j. Quotion.
- k. Scientific Indonesian.
- l. Reference.

m. Editing paper.

Based on result of adaptation, characteristic of teaching material developed were as follows. Teaching material consists of seven major components, namely (a) Unit-to ..., (b) Learning instruction, (c) Description of teaching material, (d) learning activities 1, 2, and 3, (e) individual activity, (f) self-assessment, and (g) study material as follow up.

The components were arranged in order of learning process, input from lecturer, examples of teaching material format of writing scientific paper, ease of implementation in learning process, and format that show characteristics of constructivism learning. Format that show characteristic of constructivism shown in components of (a) description of teaching material, (b) learning activities 1, 2, and or 3, (d) individual activity, (e) self-assessment, and (f) deepening of material. Implementation in learning process was done by constructivism approach for learning four activities, namely (a) orientation, (b) exploration of concept, (c) interpretation/inquiry concept, and (d) application of concept.

Effectiveness Test of Development Product

Effectiveness test development product for purpose of obtaining information about effectiveness of product in learning process of writing scientific paper. Effectiveness test was done by performing different test student achievement before and after learning process by using development product (providing treatment). Achievement of student in writing a scientific paper was realized in form of score. Design used was pretest and posttest design single group.

From statistical test result obtained information that there was difference between pretest score and posttest score on learning process of writing scientific paper that utilize development product. Difference score was very significant was happening. Pretest mean score was 74.96 average in paper compotition and posttest score in paper compotition was 89.04. Average score gained from implementation of this (use development product) was 14.08. Result of paired sample t test (single group) showed significance (2 tailed) $p = 0.000 < \alpha = 0.005$.

That meant that there were significant difference between pretest scores and posttest scores. From the result, it appears that use of counting development product in learning process of writing scientific paper significantly affect achievement of student in learning of writing scientific paper. Thus, it can be concluded that an increase of student achievement in learning of writing scientific paper significantly between before and after learning process.

DISCUSSION

Teaching material of writing scientific paper development product has number of advantages and soul constructivism. It was positive impact of utilization of constructivism approach that has number of advantages. Constructivism approach used as cornerstone in development of teaching material (Clements & Batista, 2002). Constructivism soul and number of advantages were apparent in learning process that utilizes development product. More

constructivism soul on any kind of materials development product can be seen in result of research in above.

Result of this development also proves superiority constructivism approach compared to approach of behaviorism/conventional in process of learning of writing scientific paper. Constructivism approach as model of generative learning proven to improve student writing skill, scientific paper, quality of process, and quality of learning outcomes.

Learning with constructivism approach is also intended to provide an opportunity to student's responsible for completing common task. Based on explanation above constructivism approach can motivate student to perform variety of learning activities so that he is challenged to complete task in creative and responsible.

Based on above explanation it is clear that constructivism approach has number of advantages in learning process of writing scientific paper than approach of behaviorism/conventional. Therefore, development of products with constructivism approach can be used to develop learning process of writing scientific paper in college more broadly. Here is presented development of writing scientific paper learning with constructivism approach in higher education.

Writing scientific paper is language skill that can be acquired with practice on an ongoing basis (Gere, 1985). In learning with constructivism approach, skill of writing scientific paper can be obtained through learning by using teaching material on their own development product. Learning with constructivism approach is said to be of their own learning (Piaget, 1981). Self-learning means learning on basis of ability to build on their own knowledge and skill through number of significant interaction with surrounding environment and sociocultural environment (Vygotsky, 1978). In this case students are also given flexibility to develop their own learning strategies and styles.

Learning with constructivism approach requires student to build knowledge and skill in her own mind (Piaget, 1981). Lecturer can assist process in a way that makes learning more meaningful information to provide opportunity for student to discover or implement their own ideas. Lecturer can give student ladder that can help student achieve higher level of understanding, but it must be pursued so that student themselves are climbing ladder. Thus, for learning more meaningful for student and lecturer, constructivism approach is good solution to be implemented.

In learning of writing scientific paper with constructivism approach, lecturer don't become dominant role as giver of knowledge and skill. Role of lecturer can be replaced, but not entirely, with teaching material that have been prepared. Teaching material as development product can be utilized student in acquiring knowledge and skill in writing scientific paper.

Teaching material that have been developed are designed and carefully structured so that student is not only easy to understand concept about writing scientific paper but also can practice writing scientific paper independently. Competence map has been formulated and well-crafted, description of teaching material delivered systematically, and examples have been clearly spelled out. Similarly, training and guidance given on an ongoing basis so that expected

competence, which express idea well, requirement of good paragraph compose, effective sentence, choosing word/diction appropriately, applying rule of writing, spelling and punctuation correctly, and pay attention to rule of scientific writing in text can be achieved by student.

Regarding evaluation process, Brown (1996) stated that learning, including learning of writing scientific paper in college can be done in two ways, namely process evaluation and evaluation of learning outcomes. Process evaluation was conducted to determine pattern of student interaction, initiative, creativity, and performance of student during learning process of writing scientific paper. Evaluation of learning process was done by using observation sheet instrument and learning journal of development product. Evaluation of learning outcomes were intended to determine student achievement of writing scientific paper. The evaluation was done by using learning outcomes assessment rubric and portfolio instrument of development produk.

Learning evaluation of writing scientific paper conducted to determine student achievement in writing scientific paper (Cohen, 1980). Learning evaluation of writing scientific paper designed and prepared in accordance with teaching material, learning process, aspects that must be mastered in activities of student in writing scientific paper, and result of writing scientific paper.

Learning with constructivism approach calls for seriousness and nature of high democratic (Chidren Dream, ____; Basuki, 2008). It is because in process of learning with constructivism approach should be prepared all facilities student learning and mental readiness. Democratic nature is necessary to create learning environment that is open, willing to accept suggestion, opinion, and ideas are different, avoid domination of one party, and help each other, and shared responsibility. Democratic qualities in such learning should be developed to prepare student to face all problems of an increasingly complex nation.

Result of this research was relevant to Zulianto finding (2007) about development of argumentation learning model based on process approach for Junior High School class VII. In one aspects of the research that was developing of teaching materials of writing argumentation. It was said that development of teaching material can improve quality of argumentation writing process and learning outcomes of student in writing argumentation in Junior High School class VII. Sukirno's study (2008) also on development of learning in writing narrative device model with quantum learning strategy on Senior High School student. One aspect developed by Sukirno was teaching material of narrative writing. He said that development of teaching material can improve quality of narrative writing process and learning outcomes of narrative writing in Senior High School student. Last was result of Syamsi' research (2011) on development of writing learning instrumen based on process-genre approach for Junior High School student. One aspect of Syamsi's research was development of teaching material of writing based on process-genre approach. Development of teaching material of writing by process-genre approach can also improve quality of process and learning outcomes of students' writing in Junior High School. Based on results of development research can be stated that result of teaching material development of writing scientific paper in this study supports results of previous development

research, which can be used to improve quality of learning process and learning outcomes of writing scientific paper.

CONCLUSION

In implementation of teaching material of development product has been proved to improve student's skill in writing scientific paper. Improving of student's skill can be seen from two aspects, namely an increase in student participation and increase student achievement. Apparent, increase in student participation can be seen in student active participation, both physically and mentally in learning process. On the other hand, increasing in student achievement score can be seen from increasing in their learning outcomes, ie, difference between pretest scores and posttest scores. Increasing of student achievement was very significant. Improving of student achievement can also be seen comparison between scores of learning outcomes with constructivism model by leveraging development product and score with conventional model without benefit of development product. Comparison between the two show that learning outcomes scores with constructivism learning model was higher than score of learning outcomes with conventional learning model. Comparison between the two were also significant. It shows that learning model with constructivism approach can improve quality of students' learning processes and outcomes significantly.

Teaching material of this development of product has number of advantages. Evident that from result of experiment activity carried out showing that learning with constructivism model with utilize teaching material of development product can improve learning performance of student in writing scientific paper. The proof can be seen from presence of significant difference between pretest scores and posttest scores on learning that utilized teaching material of development product (learning with constructivism model). Difference between the two was significant. Similarly, that process of learning that utilized teaching material of development product showed superior result compared to learning process that didn't utilize teaching material of development product (learning model of behaviorism/conventional). Difference occurred between the two was significant.

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