

Effects of Experiment Learning Strategy versus Expository and Cognitive Style for Physical Learning Result for Senior High School Student at Class XI of Senior High School

Prayekti

Universitas Terbuka. Jalan Cabe Raya Pondok Cabe Pamulang Tangerang Selatan 15418, Indonesia

Abstract

The research was aimed to know Effects of Experiment Learning Strategy versus Expository and Cognitive Style for Physical Learning Result of Senior High School Student at Class XI of Senior High School. Data was collected by test and observation. It is processed by ANCOVA and different test (t-test). (1) The result showed that all learning system groups have an increasing of physical learning result with learning on the two systems. (2) Average of student's physical learning result who has cognitive style of *field dependent* is higher than the student with cognitive style of *field independent*. (3) Experiment learning strategy gives an effect of higher increasing physical learning result than expository learning strategy. (4) Student group with cognitive style of *field independent* have lower average of student physical learning result who uses experiment learning than expository learning. (5) An increasing result achieved by student from pretest to post-test are higher because capability and skill of student when did an experiment.

Keywords: *cognitive style, field independent, field independent, expository, experiment, learning result.*

A. Introduction

Teacher should have tips to do learning in classroom, by applying a learning strategy means that the teacher has planned the capability owned by student after the learning. Learning strategy becomes parameter for learning achievement and the student capability becomes the learning target. Experiment learning strategy is one of learning strategy which can produce an excellence student in experiment and debate of physical subject with their classmate or other. The student who has habituation to do an experiment in every learning will make himself/herself having behavior to appreciate an opinion of other or respect to older people and also not to discriminate, only daily attitude and behavior will differ one and another. In every experiment conducted, the student is always doing critically and carefully in measuring or weighting and forward-looking if they see the instrument used and taking activities with step by step based on the experiment procedure. If the student were missing the step, then they would be destroying the instrument or an experiment can't be continued and the student will be loss an opportunity in experiment. If the student were missing in seeing the instrument, then they would not be appropriate in determining the big/number within scale of measurement tool. If student is wrong in counting the mathematical pendulum round, then the time needed would be longer and finally an experiment of mathematical pendulum to determine the result gravity to be greater and it would not be accordance with earth gravity on the equator. Student can measure length of rope with doing an experiment for earth gravity, if they are wrong in measuring, then it would result in the pendulum rope round to be slower and producing the greater gravity.

In experimenting, the student must be careful and also proper in measuring, so that the experiment result obtained will be more perfect. If the student do an experiment carelessly, they will get bad result of experiment. So that, student should be meticulous, careful, neat, clean and orderly. If the student had this attitude, then this will form the complete, strong, neat, and ready people to face challenge and competition in global era. As an educator, teacher must prepare the student as good as possible, so finally that strong student will become strong generation in era of science and technology development.

To create the excellence and strong human needs an appropriate learning strategy. Then, the formulation problems of this paper are: to which extent the effects of experiment learning strategy versus expository and cognitive style toward physical learning result of student at class XI of Senior High School.

B. Literature Review

Expository Learning

Definition / meaning for learning strategy. Generally, strategy can be meant as outline to conduct in achieving the determined goals. Related with teaching, strategy can also be meant as general pattern of teacher and student activities in establishing learning activities to achieve the determined goals. According to Sanjaya, (2007: 126). In education world, strategy was meant as the plan contains about activities designed to achieve the determined education goals. From the opinion above, Dick and Carey (1996) also called that learning strategy is the set of material and procedure of learning used together to stimulate the student learning result (Sanjaya, 2007: 126).

Expository learning is the learning conducted by teacher without taking into account of student's

capability and intelligence. Teacher assumes that student are the same between one and other, because they have passed the interest test (majoring) into Mathematical majoring and Natural Science (MNS), the student sit on each chair and listen the speech/explanation from teacher diligently and sometime write down in their book if the teacher's explanation is important to write. The material explained by teacher has already been exist on physical package book owned by teacher and student which borrowed from school library. Student can read it because this package book could be taken home. If the student were not getting from library, then they can download from Internet and print it. Expository learning conducted by teacher makes lazy for student and they tend to sit silent hearing the explanation and the very limited activities, student can't discuss with their classmate to debate the material, or they can't talk with their friend or ask to the teacher about something not understand yet. That makes a student to be lazy to think, all problems were given to teacher. It is not good for student, because in teen age should have high curiosity and interest, if these were not channeled, then it make student to be grumpy and emotion. Teacher should act wisely to student with asking to the student about this physical learning, teacher may not hesitate to replicate his/her explanation if the student were suspected not understand well.

Expository is from exposition concept which means giving an explanation. In learning context, expository is strategy conducted by teacher to explain facts, ideas, and other important information to the student. Expository learning is the strategy used by teacher without using special technique in organizing learning volume. Expository learning strategy presents the topics that tend to refer to presentation material existing on textbook, teacher doesn't pay attention what about presentation material in accordance with learning hierarchy from simple to complex is. Relationship between main material presented and not presented is not related in learning with expository strategy. Expository strategy is used by giving explanation first about definition, principles and concept of subject with giving an exercise example of problem solving in form of verbal, demonstration, question answer and tasking. The student follows the pattern determined by teacher carefully. Using of expository strategy leads to deliver subject material to student directly, and the student need to search and find facts, concept and principles by themselves because these were presented by teacher. Learning activity of expository strategy tends to be teacher-based learning.

The teacher is active giving the detailed explanation or learning information about learning material. Expository learning is often analogized by speech strategy, because it is the same with speech strategy in giving information. In general, teacher prefers using speech method combined with question answer. This strategy emphasizes to material delivering process verbally by teacher to student in order to understand optimally or it called as chalk and talk. Expository strategy has been widely opted because easy to do with simple preparation, saving time and energy, with one step directly can reach all student and can be done in classroom. Speech presentation is usually formal and taking place during 35 or only 5 minutes for informal. Speech can't be said as good or bad, but speech presentation must be assessed according to its using.

Expository learning strategy is basically the learning process conducted by teacher in general, with pattern of teacher-based material delivering. The term of expository is from exposition concept, which means giving an explanation. In learning context, expository is the strategy conducted by teacher to say or to explain the facts, ideas, and other important information for student. Expository learning was rooted from *information processing learning of learning received*.

Within expository learning, teacher tends to hold the control of learning actively, but the student is only receiving and listening what presented by teacher is. Although on this learning uses other strategy other than speech and helped by learning instrument, but the emphasizing is constantly on receiving process of subject material delivered by teacher. In expository learning, the student gets an information, skill and learning sources used, specially learning material arranged by teacher, and author of textbooks. In addition the student should be ready to receive what delivered by teacher is or following what programed by teacher is. The teacher usually does an experiment with demonstrating something to explain concept, principle, law, and certain theories. On the expository strategy, teacher conducts learning activity with more field study, and the student tends to be passive.

Thus, teacher always does the *direct instructional*, because this strategy can consume part of time to listen learning material delivered by teacher. In learning by expository strategy, teacher has an important role for learning process with doing activities actively, but the student is relatively passive receiving and following what presented by teacher is. Learning by expository is a teacher-centered learning process, the teacher has the function as the main information giver. Lining with the opinion, teacher's activities in expository learning are: interpreting syllabus, arranging the subject content, selecting teaching strategy, dictating discussion topics, and creating decision about amount of material learning with assignment conducted.

Physical Experiment

Experiment (from Latin: *ex-periri* is meant to trial and error) is the set of action an observation, which conducted to check or change hypothesis or recognizing relationship causation between symptoms. In this research, the cause of a symptom will be examined to know whether the cause (independent variable) influence the effects

(dependent variable). This research is much used to get knowledge of natural science.

Physical experiment conducted by student and teacher becomes facilities to educate student. The student must be responsible to their own self, their group or student must be self-sufficient to do measurement. On experiment learning, the student is regarded as the adult people who can do and conduct when doing experiment in laboratory. If student solves Becker glass or thermometer, then they must report the teacher or laborant. Student must replace the broken instruments. On physical experiment, teacher can role as source or facilitator, teacher serves student to answer questions from other student about subject material or the using of instrument for experiment or to train student in using experiment instrument carefully in order not to happen an incident or broken of instrument. Teacher should be friendly in order to the student feel free or not fear to the instrument used, and teacher should try to support the student to like and habituate doing an experiment and finally the student makes the physical subject as their favorite subject. During this time, many people considers that physical as frightening subject that make lazy student, because physical subject has many formulations and computations should be mastered, which makes dizzy.

Therefore, teacher needs to support student doing physical experiment, so that the student like physical subject. Work of WinantoAdi, (2012), showed that using an effective experiment method is increasing student's cognitive learning result. This was indicated by cognitive learning result which shows 67,1 of the average of pretest value and 77,63 of the average of post-test value. While, t-count conducted was obtained t-count value as $< t\text{-table} (-16,750 < -2,023)$ and significance $< 0,05 (0,000 < 0,05)$. So that, using of experiment method is effective in increasing student's learning result.

Cognitive Style

One of student's characteristics is cognitive style. Cognitive style is a typical way of student's learning, both related with receiving way or information process, attitude for information, or habituation related with learning environment. Cognitive style is one of learning condition variable which becomes one of consideration material in learning design. Knowledge about cognitive style needed to design or modify learning material, learning objective, and learning method. Interaction from factors of cognitive style, objective, material, and learning method should be expected that student's learning can be achieved as maximum as possible. It is lining with some opinions of experts which stated that certain learning strategy needs certain learning style.

Cognitive style as typical student's learning and cognitive style is habituation of some in processing for informations. Cognitive style is part of learning style which illustrates the relatively constant behavior habituation of self-people in receiving, thinking, problem-solving and in keeping information. Cognitive style refers to individual cognitive process which related with understanding, knowledge, perception, thought, imagination, and problem-solving. Cognitive style is individual characteristic in thinking, feeling, remembering, problem-solving, and making decision. Good, neat, and systematic arranged information will be easier to receive by certain individual. As the behavior characteristics, cognitive style stays on track ability and personality with manifested on some activities and media. Cognitive style showed any variation between individual within his/her approach for one task, but that variation wouldn't show intelligence level or certain capability. As the behavior characteristic, individual with the same cognitive style is not always the same in capability. Even individual with different cognitive style will have greater inclination in different capability.

Every individual has different style when processing information. Todd said that cognitive style is individual step in processing information through responsive strategy for the task received. In other section, Woolfolk showed that within cognitive style stays a different ways to see, recognize, and organize an information. Every individual will select the prefer ways in processing and organizing as a response for their environment stimulation. There are individual with quick response and also slow response. These ways are also related with attitude and personal quality (Anita E. Woolfolk, 1993:128).

According to Woolfolk, individual with cognitive style can display individual variation in attention, reception, information, remember, and thought arising or different in cognition and personality. Cognitive style is the pattern formed by their way to process information. It tends to be stable although not always changing. In general, cognitive style were achieved and patterned in longer time as a continuum. Cognitive style position within learning process can be ignored. This is accordance with Reigeluth's (2009) view that in learning variable, cognitive style is one of student's characteristic entering into learning condition variable, beside other characteristic such as, motivation, attitude, talent, interest, thought capability, and so on. As one of student characteristic, cognitive style position in learning process is important for teacher or learning designer to pay attention, because learning plan delivered with considering cognitive style means presenting the learning material accordance with characteristic and potential owned by student. Learning situation will be created well because the learning is not impressed to intervene student's right. In addition the learning should be matched with cognitive process or student cognitive development.

Growing and activating of cognitive process is very closely related with characteristic of student cognitive process. Thus, increasing cognitive process in self-student needs attention for characteristic of every

individual student. In learning plan of organization for elaboration model and organization for textbooks, the teacher is important to test student's characteristic led to test about cognitive style before the plan arranged. By the cognitive style testing, teacher or learning designer can know about student's cognitive style as elaborated above.

Furthermore, how the cognitive style role in learning process is? Referring to expert's views about dimension of cognitive style above, according to Woolfolk (1993) that implementation of cognitive style within learning is very important to determine learning achievement. Student with cognitive style of *field dependent* (FD) will be global perceptual and feeling hard to process, easy to percept if the information manipulated is suitable with its context. Student with psychology differentiation of field independent (FI) will articulate and percept analytically. He/She can separate the stimuli within its context, but his/her perception is moderate when the context changing occurs. However, psychology differentiation can be improved by varied situation. Individual with FI category is usually using internal factors as direction in processing of information. Individual with FI will do the task not orderly and feel efficient with self-working.

Cognitive style has varied adaptive values from his/her cultural and social situation. In social situation, individual with FD is generally more interested in social situation framework, understanding face/love of others and interested in verbal messages process with social content, more taking into account an external social condition as feeling and attitude. On certain social situation, individual with FD tends to be friendly, such as being charming, easy adaptation, friendly, responsive, high curiosity, if they were compared to individual with FI. Individual with FI will feel stressed from external pressure in social situation, and they response the situation coldly, there is gap and insensitive. Learning presentation like this in physical learning would be much found particularly in geometry unit. Relating with strategy of learning organization for elaboration model studied in this research is by presenting framework of content, elaborating and giving synthesis for every subject, supporting student to develop their thought in giving imagination and describing the subject material learned. While within strategy of learning organization with book characterized by clear topic, resume, material requirements, content management, supporting table and picture and emphasizing an essential thing, supporting student in order to be able to develop imagination for understanding an object learned.

Student's characteristic who has special cognitive style characterized by: (a) imaginative thought, (b) thought in abstract problem, (c) receiving information and problem solving with mental image role, (d) analyzing visual object, always seeing its effects, (e) not easy influenced by criticism, (f) always taking into account the risk, (g) problem solving can be done quickly if with picture, table or graphic, (h) not needing detailed guidance in completing assignment, and (i) having a high mental rotation.

Method

Subject of study (population, sample, and sampling), according to Sugiyono (2008:115), population is generalization area consisting object/subject which has certain quality and characteristic determined by researcher to learn and then to extract conclusion". According to Sugiyono (2008:116) "sample is a part of total and characteristic owned by the population". According to Arikunto (2008:116) "Determining to take sample is as follows: If the sample is less than 100, then it would be better taken all until the research as population research. If the subjects were greater, then it could be taken between 10-15% or 20-55% or greater, it depends on more or less of: (1) Researcher capability based on available of time, energy and financial. (2) Small or large of observation area for every subject, because it would be related with more or less of budget. (3) More or less of the risk should be borne by researcher, for the researcher with big risk, of course big sample will be better of their result. This research population is student in XI class at State Senior High School of East Jakarta with total 12 parallel class. While the sample is from 2 classes in class XI, such as Class XI A and Class XI D based on lottery result conducted by teacher of its class, all classes are written on small piece of paper then rolled and entering into tube and rocked many times, then it could be excluded 2 classes which become the research sample. This research is categorized as correlational descriptive research which discloses the subject situation investigated, this research studied the significance of each variable for physical learning result of student at Class XI of Senior High School. According to Nasution S (1997:24-25), descriptive research is establishing the descriptive to provide a clear description about social situation of student in the class, compared with explorative research, the descriptive research is more specific with concentrate on certain aspects and often showing between various variables.

According to Sugiyono (2006: 11) the research based on its explanation level (clearness level) can be categorized as follows: (1) Descriptive research is the research with aim to know self-variabel value, both one variable or more (independent) without comparasion, or relating with other variable. (2) Comparative research is the research by comparing between some research. The variables are still the same with self-variable here, but the sample is more than one sample or in the different time. (3) Associative research, this is the research with aims to know effects or relationship between two or more variables. This research has highest level compared to descriptive and comparative because from this research can be built the functioned theory to explain,

forecast, and control the symptoms. According to Sugiyono, (2006:14), there are some type of research, such as: (1) Quantitative research, this is the research with obtaining data in form of numeric or qualitative data which numbered. (2) Qualitative research, this is the research with obtaining data in qualitative form or data in form of statement, scheme, and picture. Based on the theories above, this is quantitative descriptive research. The data obtained from the research population sample will be analyzed in accordance with statistical method used and the interpreted.

Result and Discussion

This research was conducted to know effects of expository learning strategy and experiment for student's learning result. The research was done on 72 students. The student is grouped based on learning strategy which has been given. 36 student of class XI was treated by an expository learning strategy and 36 student of class XI was treated by experiment learning strategy. Then, these were taken 27% students based on the lowest cognitive style score to represent student with cognitive style of field dependent and 27% students based on the highest cognitive style score to represent student with cognitive style of field independent to analysis process.

Based on the grouping result was obtained number of student and these can be grouped that 36 students are given learning by expository system and experiments, these were obtained 20 students on each group. So number of usable students in analysis are 40 students. Descriptively, average result of student physical learning before and after given learning are descriptively obtained that the student with expository learning have average result of student physical learning before given learning (pre test) is 22.2. After given learning (post test) has increased the average result of student physical learning is 66. On the student group with experiment learning, average result of physical before given learning (pre-test) is 21.75. After given learning (post-test) has increased the average result of physical learning is 62 based on the table, it showed that on overall learning system has occurred in increasing physical learning result after given learning with the two systems.

For knowing differences of increasing for student's physical result between student with treated by expository learning system and student with experiment learning system are used ANCOVA for analysis. But before analyzing, it was conducted the examination for assumption which relies on ANCOVA.

There are two assumptions which relies on ANCOVA, these are normality assumption and homogeneity of variety. Normality assumption examination was conducted by using Kolmogorov-Smirnov's test. Normality assumption would be stated as met if p-value of computation result is greater than $\alpha = 0,05$. By using software SPSS was obtained examination result of normality assumption for learning result. Coefficient of Kolmogorov-Smirnov is 0,629 with 0.823 p-value by normal explanation, and it was obtained 0.823 p-value to be greater than $\alpha = 0,05$ ($p > 0,05$). So that, from this examination can be concluded that normality assumption has been met.

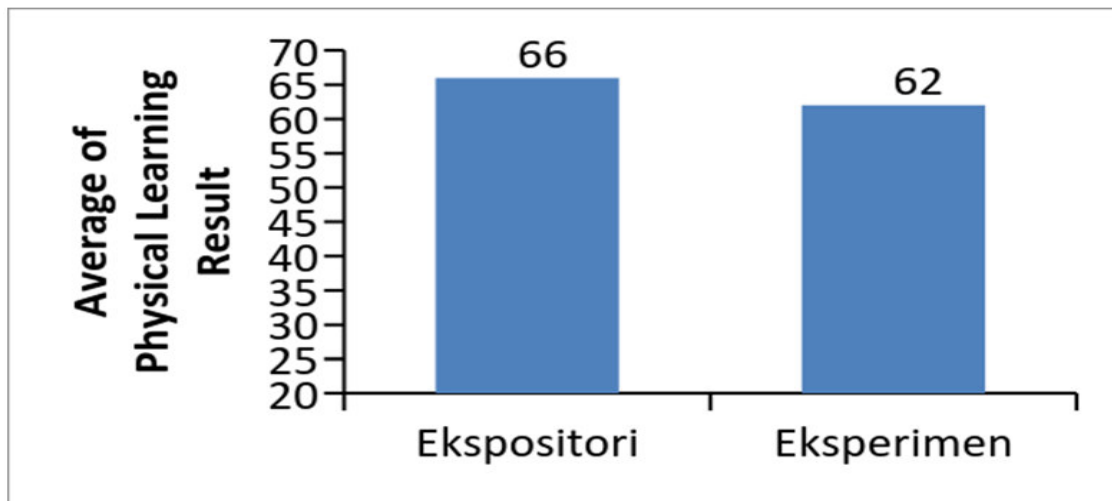
Examination of variety homogeneity assumption was conducted by using Levene-test. Variety homogeneity assumption were met if p-value of calculation result is greater that $\alpha = 0,05$. By 1,206 of coefficient Levene was obtained 0.321 p-value as greater than $\alpha = 0,05$ ($p > 0,05$). So that, from this examination can be concluded that variety homogeneity assumption had been met.

Based on result of ANCOVA, on variety source of pre-test value was obtained 0.355 p-value ($p > 0,05$). This showed that pre-test value didn't give significant effect for physical learning result. In other word, student's starting capability before given the learning was not influencing physical learning result.

On variety source of learning strategy was obtained 0,177 p-value ($p > 0,05$). This showed that learning strategy didn't give significant effects for physical learning result. Or in other word, there is no significant differences of average of student's physical learning result which treated by expository learning system and experiment learning system. Below is comparison for average of student's physical learning result after treated by post-test: expository group obtained 66 and 62 for experiment group.

Graphic for average of student's physical learning result after treated by different learning system:

Figure 4.1
Differences of Learning Strategy



Based on figure above showed that average of student's physical learning result who treated by expository system is higher than experiment learning system. But, the two learning systems didn't give significant different effect for physical learning result of student in class XI. On variety source of cognitive style was obtained 0,011 ($p < 0,05$) p-value. This showed that cognitive style gives significant effect for physical learning result. Or in other word, there is significant differences for average of student's physical learning who has cognitive style of field dependent and field independent. Comparison for average of student's physical learning result after treated post-test was known that average of physical learning result for student with field dependent is 68.0. While physical learning result of student with field independent is 60.0. Below is graphic for average of student's physical learning result after treated by different learning system. Average of student's physical learning result with cognitive style of field dependent is higher that student with cognitive style of field independent.

This showed that student with cognitive style of field dependent have higher physical learning result that student with cognitive style of field independent. On variety source of interaction was obtained 0,008 ($p < 0,05$) p-value. This showed that there was significant interaction effect between learning strategy and cognitive style for physical learning result. Or in other words, there are significant differences for average of student's physical learning result based on cognitive style and learning system treated. Below is comparison for average of student's physical learning result after treated post-test: average of student's physical learning result with expository learning system is 66.0. While student's physical learning result treated by experiment learning is 70. This evidenced that experiment learning strategy gas given higher effect for increasing physical learning result than expository learning strategy.

On the student group with cognitive style of field independent, it was known that average of student's physical learning result treated by expository learning system is 66.0. While student's physical learning result with experiment learning system is 54. This evidenced that expository learning strategy gave an effect of higher increasing for physical learning result than experiment learning strategy. Student group with cognitive style of field dependent, it was known that average of student's physical learning result treated by experiment learning has higher result than student with expository learning. While the student group with cognitive style of field independent, it was known thah average of student's physical learning result treated by experiment learning has lower than student with expository learning.

Conclusion

(1) Overall learning system groups were increasing of their physical learning result after treated by the two systems. (2) Average of student's physical learning result who has cognitive style of *field dependent* is higher than the student with cognitive style of *field independent*. (3) Experiment learning strategy gave higher effect for increasing a physical learning result than expository learning. (4) Student group with cognitive style of *field independent* showed lower average of student's physical learning result than student with expository learning.

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