The effectiveness of applying contextual approach based on environment toward chemistry learning achievement and scientific attitude

E Nurvitasari, R Z Maarebia and N B Sumanik
Department of Chemical Education, Faculty Of Teacher Training and Education, Universitas Musamus, Merauke, Indonesia
E-mail: evy_fkip@unmus.ac.id

Abstract. This research aimed to know the effectiveness of applying contextual approach based on environment toward chemistry learning achievement and scientific attitude students in aspect (a) differences of students chemistry learning achievement if the early knowledge chemistry uses statistically (b) differences of students scientific attitude in experiment class after the teaching-learning process with contextual approach based on environment (c) differences of students scientific attitude between experiment and control class. The method of this research is to experiment with one-factor design (chemistry learning), two samples (control and experiment class) and one covariable (early knowledge students). In the experiment class using a contextual approach based on the environment while in control class using a conventional approach. Chemistry learning achievement measured with an achievement test and then analyzed with one way ANCOVA. Scientific attitude measured with scientific attitude questionnaire and then analyzed with one sample and two-sample t-test. Base on the ANCOVA analysis get value F0 = 4,431 with Ftable = 3.96 . This matter shows that significant differences in students chemistry learning achievement with the contextual base on environment approach if the early knowledge chemistry uses statistically. Result of one sample t-test shows that the value t = 0,465 with t table = 1,67, it can be concluded that is no significant differences of students scientific attitude in experiment class after teaching-learning process with the contextual base on environment approach. Result of two-sample t-test shows that the value t = 0,05 with t table = 1,67, it can be concluded that is no significant differences of students scientific attitude between experiment and control class.

1. Introduction
Chemistry is part of one of the science subjects in junior high school. Most junior high school students consider science subjects especially chemistry difficult, so students already feel less able to learn it first. This might be because the presentation of chemical material is less interesting and boring. One of the reasons for science learning is considered difficult because of the paradigm that develops in students. Science is identified as a lesson that is only filled with mathematical formulas and has no benefits in daily life [1]. According to [2] the difficulties of students in studying chemistry can be derived from difficulties in understanding the term, difficulties in understanding chemical concepts, and difficulty in calculating. Therefore for the presentation of interesting material, the teacher must have the ability and develop his teaching method in such a way that it involves the activeness of
students in the teaching and learning process. With student involvement, it is expected that students are more interested and motivated so that the expected learning goals can be achieved well. [3] states that most chemistry is abstract, chemical material is sequential and develops rapidly, taught in a form that is simpler than reality, involves more than just solving questions, and requires a lot of learning.

Science learning in junior high school that is teaching-centered is still commonly found, this gives the impression that teachers are the main source of knowledge. The use of inappropriate methods in science learning makes students often memorize very factual material. This gave rise to a superficial understanding of the material and the assumption that the material they learned was difficult. And ultimately impact on learning outcomes that do not meet the minimum completeness criteria.

On the other hand, science studies are not only about mastering knowledge in the form of facts, concepts, or principles but also a process of discovery [4]. This is a challenge for educators to create learning that provides a lot of direct learning experience and is problem-oriented. Learning that is oriented to mastery of the material is successful in short-term remembering competition, but is less successful in equipping students to solve problems in long-term life. There is a tendency today to return to the idea that students will learn better if the environment is made natural. Learning is more meaningful if students experience what is learned, not just knowing. According to [5] environment-based learning in building human resources with superior character is to make the surrounding environment a topic or material that is associated with the learning that is in the learning design. Learning that links matter with surrounding life is called contextual learning. According to [6] one science learning approach to link material to the real situation of students in the life of the community in which they will work and live is a contextual approach. One of the learning approaches that give a chance to construct the knowledge is contextual approach [7].

Contextual learning is a conception that helps teachers associate the content of lessons with real-world situations and motivates students to make connections between knowledge and their application in their lives as family members, citizens, and labor [8]. CTL involves seven main components of effective learning, namely: constructivism, questioning, inquiry, learning community, modeling, and authentic assessment. This approach is very practical, fun and not boring because it fuses more on the real world of students [9].

Learning with an environment-based contextual approach is a learning concept that helps teachers associate subject matter with real situations around students by using the surrounding environment as objects, media, and learning resources and involving them both directly and indirectly during learning. This encourages students to make a connection between the knowledge they have and their application in everyday life. Thus the concentration of learning increases and understanding the concept becomes better so that learning achievement is expected to increase. Efforts that can be made to implement environment-based learning include [10] provide knowledge about the environment to students, strive for the tools and learning objects used to come from the environment collected by both teachers and students, providing opportunities for students to carry out investigations according to their abilities through reading and observation, then expressing the findings in the form of presentations or other written works.

SMP Negeri 1 Wedi Klaten is a junior high school located in a rural area, even though SMP Negeri 1 Wedi Klaten is a favorite junior high school, students who are accepted are smart because it is based on the high national exam scores in elementary school. The highest IPA value of 9.50 and the lowest IPA value is 6.50, with an average national science test score of 8.44. The teacher in SMP Negeri 1 Wedi uses conventional methods or lectures, whereas, in reality, the lecture method has disadvantages, among others, is only able to develop students to listen, remember, and record and it is difficult to know precisely the level of understanding and acceptance of learning by students, thus resulting in science learning achievements still not meeting the completeness limit. In classical learning, the teacher is very dominant as a center of learning resources and students are generally passive. So to overcome this problem it is necessary to select the right learning method so that it can improve student learning achievement, one of which is to use an environment-based contextual approach.
Integrated components in environment-based contextual learning include inquiry, constructivism, and learning communities that try to link or involve the surrounding environment by providing direct experience in learning. This condition strongly supports the growth of scientific attitudes as students' affective competencies towards the objects or material they learn. Learning that is meaningful and dynamic increases the brain activity of students so that it is expected that chemistry learning achievement will increase. The learning process that brings students to the environment or vice versa fosters an attitude of interest, interest, and curiosity towards the object of study to solve problems naturally so that with this approach students' scientific attitudes can be honed. Besides, students' love for the environment and the surrounding community can be well-honed and have an impact on the opinions of students and the community about the chemistry that is very interesting and close to the life around. This is part of strengthening character education in the learning industry era 4.0.

2. Methods
The method used in this study is the experimental method with the design of one factor (chemistry learning), two samples (control class and experimental class) and one covariable (students' initial chemical knowledge). The population in this study were students of class VII SMP N I Wedi. Learning in the experimental class uses an environment-based contextual approach while in the control class uses a conventional approach. Learning achievement was measured using a chemistry learning achievement test which was then analyzed by one-track children. Regression analysis was conducted to determine the effective contribution of initial knowledge to students' chemistry learning achievement. Correlation between chemistry learning achievement and covariable initial chemistry knowledge can be determined by linear regression analysis of one predictor. Scientific attitudes are measured using scientific attitude questionnaires which are then analyzed by t-test with subjects and different t-test subjects.

3. Result and discussion
3.1. The Effectiveness Of Applying Contextual Approach Based On Environment Toward Chemistry Learning Achievement
To achieve success in the learning system, an appropriate learning method is needed in the learning process [11]. The environment-based contextual approach is said to be effective one of them if it can improve student chemistry learning achievement. The learning process with an environment-based contextual approach refers to seven components, namely constructivism, inquiry, questioning, learning community, modeling, reflection, and authentic assessment. The more important thing is the environment that is used as an object, learning resources and student learning materials either directly or indirectly. Students are brought in a real environment or environment that is presented in the classroom during the learning process. Such an atmosphere makes students discover new knowledge in a fun way and make learning more meaningful and dynamic.

In the experimental class, the teacher explained the concept of learning with an environment-based contextual approach. Each teacher meeting expresses the objectives or learning competencies that students must master after learning. Group formation was carried out in each group consisting of 8 students. This division of groups is an effort to apply aspects of learning society. Where a group of students is bound by learning activities. Learning together will be better than self-study. Students are expected to exchange opinions and creative ideas in solving problems. Learning begins with an apperception to encourage student curiosity and provide opportunities for students to ask questions. Question and answer conducted are one of the efforts to form a basic concept in students as a provision to exploit new knowledge that will be obtained during observation or experimentation. Observation is an activity of observing learning objects to get information as an effort to find new knowledge. Observations are carried out around the school environment. Students in the group observe the objects that have been determined by the teacher. The objects observed are not only those
in the surrounding environment but also objects that are deliberately carried by the teacher. The results of the observations are discussed by teachers and students.

The teacher becomes the director and facilitator during the observation. For example in the observation of iron trellis or trash cans made of iron. Students are directed to identify the nature of corrosion or bonding on iron, after which the teacher directs students' attention to the new iron nails and compares them to the iron trident. From there, it is expected that students can predict the occurrence of corrosion events in their environment. At the beginning of the observation, many students were confused, because they were the first time observing. The majority of students feel enthusiastic and can find new information. Some students are more pleased with the delivery of material by the teacher. The results of observations are discussed by the teacher and students together, the teacher as a guide and straighten out things that are not right. After obtaining new concepts and knowledge from observation, the teacher and students together conclude what is learned. At the end of the lesson, the teacher gives a group assignment which is to bring materials that are in the student's environment to be used as learning objects at the next meeting. The next meeting discussed the characteristics of acid-base substances and their classification. Conducted by observation method. Students bring materials from home and try to identify them by recognizing their characteristics using indicators. After that, the teacher explains the classification of acid-base. The task for the next meeting is to bring household materials that are predicted to be acidic or basic.

The teacher's next meeting explained acid rain and pH. Then the students experiment according to the referral from the LKS with materials brought from home. In the group, each student discussed and presented the results of the experiment in front of the class. After that, the teacher explains natural phenomena related to acid-base. At the end of the study, the researcher tells that the next meeting is a test, so the teacher reminds students to study well. Giving assignments to students is intended so that learning takes place on an ongoing basis. In learning the teacher acts more as a designer of learning strategies, facilitators and motivators as well as learning resources. The response of the experimental class students is quite good can be seen from the emergence of many questions every time the learning takes place. The condition of a representative room with adequate facilities to support learning takes place well. The effectiveness of the application of environment-based contextual approaches to learning achievement can be identified through learning achievement tests conducted after all the material is completed.

Learning with a conventional approach is done in the control class. Similar to the experimental class, the learning process takes place four times with the proportion of the same lesson hours with the experimental class. Learning with a conventional approach is dominated by lecture, demonstration, question and answer and problem training methods.

At the beginning of the meeting, the teacher explained the learning competencies that must be mastered by students, giving apperception through question and answer. Submission of acid-base material on how to determine the acidic properties of a substance. Demonstrations are carried out because this method is a method commonly used by science teachers in this junior high school.

Learning evaluation at each meeting through the pretest and posttest. Pretest aims to encourage students to prepare themselves before learning takes place. Posttest aims to evaluate how deeply students understand the material presented. But in its implementation posttest is sometimes not done because the teacher is not right in allocating time. There are differences in an activity that are so striking between the control class and the experimental class. In the experimental class learning activities are relatively more dynamic. Providing direct learning experience to students dominates the learning process so that learning is student-centered.

The application of an environment-based contextual approach looks easy because of the existence of concrete learning objects, but in the implementation of learning takes more time than the conventional approach. Besides, the teacher must develop a learning scenario that is mature so that the material delivered is coherent so that it is easy to understand and does not exceed time. During the learning process, the teacher must also be able to manage the class so that the learning conditions remain controlled, conducive and the students' attention remains focused on the lesson so that
saturation can be avoided. In the control class, interactions only occur between students and teachers, because the learning concepts used tend to be teacher-centered, not student-centered. This limits students to develop their affective and psychomotor competencies.

The overall material evaluation was carried out after the subject matter was finished using learning achievement questions in the form of multiple-choice questions. The question of learning achievement is made by the teacher through logical and empirical validity. Logical validity is done by making a grid of questions before compiling the problem itself, while empirical validity is done by testing the problem in a class other than the sample class. The class used for validation is class VIII A SMP N 1 Wedi which amounts to 24 students. From the calculation of the validity, the test states that of the 35 items compiled only 29 items were declared valid. Some items are invalid because of the test factor itself, for example, the difficulty level of the question that is too high or too low so that all students can answer or may not be able to answer the question. Another factor that causes invalid items is a factor in the implementation of tests and student response factors.

The question that was declared valid was used as an instrument in collecting data on the learning achievement of chemistry in the control class and the experimental class. The timing of the tests between the control class and the experiment is accidentally sequential. This is beneficial because it can reduce the chance of students asking each other about test questions to other friends that can lead to bias in research.

| Source of Variance       | JK     | Db   | MK     | F.0  |
|--------------------------|--------|------|--------|------|
| Between Groups (A)       | 254.6272 | 1    | 254.6272 | 4.431 |
| In Group (D)             | 4424.8232 | 77   | 57.4652 | -    |
| Total (T)                | 4679.4504 | 78   | -      | -    |

The results of the learning achievement test between the control class and the experiment had a large difference. The average value of the experimental class is 76,1750 while in the control class is 72,4675. When compared with the average value of initial knowledge, the experimental class students experienced a higher increase compared to the control class. This happens maybe in control class learning it seems monotonous. Tests are carried out together with other subject tests. This causes students to lack focus in learning the material being tested.

Learning the control class seems to be more materially packed so that the results of learning achievement will be better than the experimental class. The factors that support learning outcomes are not only in terms of material and students' initial abilities, but psychological or emotional factors, as well as the learning environment, also contribute greatly to student learning outcomes.

Learning that is dominated by lectures and question and answer will give the impression of being monotonous, less challenging and boring. This causes a response, interest, and level of concentration on the material delivered is lacking. The material presented is still factual and informative. If the method of delivery cannot attract the attention of students, the material cannot be captured properly by the students and finally, the material is only memorized without the process of connecting with the initial knowledge.

Learning achievement data obtained in the form of learning achievement test scores. Through the one track ANCOVA test, the value of $F_0 = 4.431$ while $F_{table} = 3.96$. Because the value of $F_0 > F_{table}$, $H_0$ is rejected and $H_1$ is accepted. It can be concluded that there is a positive and significant difference in chemistry learning achievement of students who take part in learning with an environment-based contextual approach with students who follow learning with conventional
approaches. An environment-based contextual approach has succeeded in improving chemistry learning achievements because:

1. Encourage students to make connections between the material learned and its application in daily life so that there is a strengthening of memory and understanding of the material.
2. Creating dynamic learning conditions so students are motivated to learn.
3. Students are actively involved in learning by using cognitive, affective and psychomotor abilities through providing direct experience.
4. There is a positive response from students so that learning takes place effectively.

The obstacles faced by researchers are:

1. Difficulties in allocating time in the learning process.
2. Conditioning when students make observations.

Initial knowledge also influences the process of constructing new knowledge in the cognitive structure of students so that it will affect their learning achievement. Initial knowledge can be in the form of material that has been taught or from everyday experience. Initial knowledge will make it easier for students to understand the material. Furthermore [12] suggested that for meaningful learning to occur then new concepts or knowledge must be associated with existing concepts in the cognitive structure of students. Early knowledge of students' chemistry is not only obtained from learning in school, but the daily experience can also be used as initial knowledge. The combination of the material taught with everyday experience results in an understanding of strong and deep concepts.

The relationship between initial knowledge and chemistry learning achievement is indicated by the results of the regression test where the price of $r_{XY} = 0.612$ shows that there is a positive relationship between the achievement of learning chemistry and initial knowledge. The price of $R^2 = 0.374$ is obtained so that the effective contribution of initial knowledge to learning achievement is $37.4\%$.

### 3.2 The effectiveness of applying contextual approach based on environment toward scientific attitude

The contextual approach is a learning concept that helps the teacher associate the material he teaches with real-world situations and encourages students to make connections between their knowledge and their application in their daily lives as family members and society [13]. The environment-based contextual approach is said to be effective if it can improve students' scientific attitudes. In the curriculum cited by [14], it is stated that one of the goals of chemistry subjects is to foster the scientific attitude of students. The scientific attitude is closely connected with the results of learning learners [15]. The effectiveness of the environment-based contextual approach to scientific attitudes is measured by scientific attitude questionnaire instruments. Questionnaires were given twice in the control and experiment classes, before and after learning. Validation done is logical and empirical validation. Logical validation is by compiling a grid of questionnaire statements. Empirical validation was carried out by testing the questionnaire in class VIII A. The validity test results stated that the questionnaire as many as 39 items were all valid while based on the reliability test obtained a value of 0.914 which means that the questionnaire was reliable to measure students' scientific attitudes.

The first questionnaire was carried out before learning began while the second questionnaire was conducted after the learning was completed, namely at a sequential time after the learning achievement test. This may not be right, but given the time given for this study is relatively short because it approaches the Ramadhan month holiday so that researchers do not have the opportunity to find the right time.
Increased scientific attitude of students to study chemistry can be seen from the results of the t-test. The t-test is the same as the subjects conducted to determine whether there are differences in scientific attitudes before and after learning in the control and experimental classes. In the experimental class, a slight increase in the average scientific attitude before and after learning is 151.9250 to 152.6250. But because the range of the scientific attitude score is 39-195, an increase of 0.7 is not a significant increase. This is evidenced by the value of \( t = 0.465 \) and \( t_{\text{table}} = 1.67 \) so that it can be concluded that there is no statistically significant difference in scientific attitude before and after learning with an environment-based contextual approach.

In the control class, there was also a slight increase in the average scientific attitude before and after learning, which was 151.5250 to 152.1250. But because the range of the scientific attitude score is 39-195, an increase of 0.6 is not a significant increase. This is evidenced by the value of \( t = 0.460 \) and \( t_{\text{table}} = 1.67 \) so that it is concluded that there is no statistically significant difference in scientific attitudes before and after learning with conventional approaches.

Different t-test subjects were conducted to determine differences in scientific attitudes between the control class and the experimental class after the learning process with different approaches. Obtained results of different t-test subjects, namely the average gain value of the experimental-control are \( t = 0.05 \) while \( t_{\text{table}} = 1.67 \). This shows that statistically there is no significant difference in the scientific attitude between the control class and the experimental class after learning.

The absence of an increase in scientific attitudes in the control class and the experimental class is because the students' initial scientific attitudes are classified as high so that they need more appropriate learning and a longer time to improve them. The time used for this study was less than one month. Instilling affective aspects in students in the learning process is not an easy thing that can be achieved with a short time. Remembering character and attitude can only be formed through a complex process and with experience and learning that is carried out intensively and sustainably.

Learning processes that involve students directly with the surrounding environment should be able to improve their scientific attitude. The environment-based contextual principles applied in learning such as constructivism, learning and inquiry communities are combined with the direct involvement of the environment as objects and sources of learning can stimulate curiosity and critical thinking in responding to problems presented in learning and everyday life.

Increasing the score of the scientific attitude questionnaire in the experimental class is greater than the control class, so it can be said that the environment-based contextual approach can improve the scientific attitude of students in learning chemistry. This can be seen from the difference in scores from the initial and final scientific attitude questionnaires as explained above. Although in nominal terms there has been an increase in the scientific attitude of students in learning chemistry in both the control class and the experimental class. However, statistically with the t-test concluded that it is not proven that the environment-based contextual approach can improve students' scientific attitudes in learning chemistry significantly.
4. Conclusion

Based on the results and discussion, it can be concluded that there are significant differences in chemistry learning achievement between students who take part in learning using an environment-based contextual approach with students who take learning using conventional approaches if students' initial chemical knowledge is controlled. There was no significant difference in students' scientific attitudes after attending learning using an environment-based contextual approach. There is no significant difference in scientific attitudes between students who take part in learning using an environment-based contextual approach with students who take learning using a conventional approach.

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