Implementation of Relating, Experiencing, Applying, Cooperating, Transferring (REACT) Model to Students Learning Achievement in Chemical Basic Law Material at 10th Grade Students of SMA Negeri 1 Kalasan

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ABSTRACT: This study aimed to determine the significant differences of learning achievement at 10th grade students of SMA Negeri 1 Kalasan between the application of conventional learning models with learning models Relating, Experiencing, Applying, Cooperating, Transferring (REACT) in the domain of knowledge, attitudes, and skill on the Basic Chemical Law materials. This study also aimed to know students' response to learning using REACT model. This research was an experimental using Quasi Experimental Design, namely Posttest Only with Nonequivalent Groups Design. The population in this study was all students of 10th grade SMA 1 Kalasan in the academic year 2017/2018. This study used two classes as the study sample. The data were analyzed using Independent Samples T-Test parametric test for the knowledge and attitude domain, and Mann Whitney U non parametric test for the skill domain. The results of this study can be concluded that (1) there was no significant difference in student learning achievement in the knowledge domain, (2) there was no significant difference in student learning achievement in the attitude domain, and (3) there was significant differences in student learning achievement in the skill domain between the application of conventional learning models with REACT learning models in the Chemical Basic Law and (4) students gave a good response to the REACT learning model performed.

Keywords: REACT, Learning Achievement, Basic Chemical Law

INTRODUCTION

The implementation of education in the learning process is the main thing to be achieved namely success in the learning process. Success in the learning process is indicated by the success of students in achieving the learning objectives that have been formulated. To achieve the learning objectives, the teacher always expends power and effort to make the learning process meaningful, enjoyable and acceptable to students. Therefore, the learning system in Indonesia should be student centered learning (SCL).

Learning process for students is not only focused on listening, paying attention, and recording subject matter, but students are also required to discuss well, express opinions, and respond to ideas conveyed by friends [1]. This is in accordance with meaningful learning theory from Ausubel, namely learning should be meaningful for students to be able to solve problems that occur in life, but if learning is done based on memorization (rote learning) then it can be seen that the learning done cannot help students in learning and in obtaining knowledge information [2].

Based on the interview results conducted in SMA Negeri 1 Kalasan of 10th grade in chemistry lesson, it showed that the value of students in chemistry lessons reached the Minimum Completion Criteria (KKM) which was about 50% of the number of students in the class, because according to chemistry teachers in the school it is impossible if all students reach the KKM score because of the different characteristics. Based on the results of observations that made teacher often used lectures, discussions and lab work while carrying out the learning process.

Traditional learning is usually done using the lecture method that begins with the giving of a definition followed by an example [3]. However, constructive learning is able to make students build their own

knowledge by relating their initial knowledge with new knowledge obtained [4].

One of materials that is considered difficult by students is basic chemical law. This material is about discussion of the material in 10th grade even some semesters because the basic chemical legal material is abstract [5]. Basic chemical law material is included in chemistry which has abstract, concrete, and mathematical properties [6]. Basic chemical law material is material that is included in the Stoichiometry chapter. There are various kinds of laws in basic chemical law material, including: mass conservation law (Lavoisier law), fixed comparison law (Proust law), multiple comparative law (Dalton's law), volume comparison law (Gay-Lussac law), and Avogadro's hypothesis. The laws contained in the basic chemical law material are interrelated, so students are expected to be able to understand every law. If one of the legal concepts contained in basic chemical law material is not firmly embedded or in other words students do not understand one of the laws, then students can feel difficulties with other legal concepts to be studied [7].

One of the teacher's steps to make students actively learn chemistry is to apply Relating, Experiencing, Applying, Cooperating, Transferring (REACT) learning model. REACT model has five stages, namely Relating, in this stage students connect the concepts with their knowledge then in Experiencing stage, Students perform experimental activities (hands-on activity) and the teacher provides explanations directly to students to discover new knowledge. Applying, in this stage students apply the knowledge learned in everyday life. Cooperating, this stages conduct group discussions for students to solve problems and develop the ability to collaborate with friends. Transferring, in this stage students demonstrate the ability to learn the knowledge and apply it in new situations and contexts. The implementation of the REACT model with basic chemical law material is expected to improve student achievement in the class [3].

Navarra explains that REACT as a methodology instead of strategy being called by CORD- is a cyclic process. Each act of transferring is both the culmination of an iteration of the cycle and the catalyst for the next iteration [8,3].

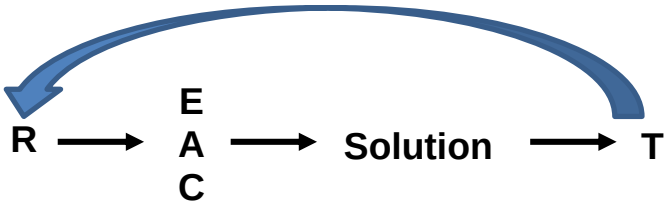

FIGURE 1. Cyclic process of REACT

METHODS

This research was an experimental using Quasi Experimental Design, namely Posttest with Nonequivalent Group Design. This study used a control class given learning with conventional learning model (C) and the experimental class given treatment using the REACT (E) learning model. Learning was ended by doing a Posttest to measure student learning achievement obtained during the learning process (T2) The design of this research can be seen in **TABLE 1**.

TABLE 1. Research design

Class	Treatment	Final condition
Control	C	T2
Experiment	E	T2

Population and Sample

This research was conducted in the second semester of class X of in SMA Negeri 1 Kalasan, Sleman, Yogyakarta. The population used in this study was all class X students at SMA Negeri 1 Kalasan. It consisted of five classes. The sample used in this study consisted of two classes namely the experimental class and the control class, each class consisted of 26 students. The sampling technique used in this study was purposive technique.

Data Collection Technique and Instrument

Data collection techniques in this study were test and non-test. The instruments used in the test method were learning achievement instrument of knowledge in the form of multiple choice, and the instruments

used in the non-test method consisted of attitude learning instruments in the form of attitude questionnaire sheets and skills learning achievement instruments in the form of observation sheets, more clearly it can be seen on **TABLE 2**.

TABLE 2. Data collection technique and instrument

Method		Instrument	Data
Test	Writing Test	Multiple choice	Learning achievement in knowledge domain
	Interview	Interview Guideline	Interview result
Non-Test	Questionnaire	Attitude questionnaire sheet	Learning achievement in attitude domain
		Response questionnaire sheet	Student response to REACT model
	Observation	Observation sheet	Learning achievement in skill domain

Instrument Validity and Reliability

The validation used in this study consisted of content and item analysis validation. The instrument that would calculate the validity of the content was the learning achievement test in knowledge domain, non-test instrument learning achievement in the attitudes and skills domain. The results of content validity in the learning achievement instrument of the knowledge and attitude domains can be continued with item validity and was feasible to use if the result of content validity was > 0.7. Content validity can be calculated using Gregory formula.

TABLE 3. Instrument content validity results

Instrument	CV	Conclusion
Learning achievement in Knowledge Domain	0.75	Analysis can be continued
Learning achievement in Attitude Domain	1.00	Analysis can be continued
Learning achievement in Skill Domain	0.98	Analysis can be continued

TABLE 4. Reliability test achievement results

Instrument	Reliability	Criteria
Learning achievement in Knowledge	0.78	High Reliability
Learning achievement in Attitude	0.76	High Reliability

Data Analysis Technique

The analytical pre condition test for the data on the learning achievement variable consisted of a normality and homogeneity test. The normality test was used to find out the data contained in this study that were normally distributed or not using the Shaphiro-Wilk criteria. The significance level used was 0.05. Furthermore, it was analyzed using SPSS v. 16. The decision of hypothesis testing in this study used the Independent Samples T-Test parametric analysis if the data were normally distributed and homogeneous. If the parametric analysis prerequisite test was not fulfilled, then hypothesis testing was carried out by using Mann Whitney U non-parametric analysis.

RESULT AND DISCUSSION

Based on the research that had been done, data obtained from the value of student achievement in the knowledge, attitude and skill domain. The results can be seen in **TABLE 5.**

TABLE 5. Data description

Class	N		Knowledge Domain	Attitude Domain	Skill Domain
Control (C)	26	Min	42.88	32.00	36.00
		Max	95.24	41.00	54.00
		Mean	76.60	35.92	45.80
Experiment (E)	26	Min	57.16	33.00	41.00
		Max	100.00	42.00	54.00
		Mean	74.18	36.76	50.23

Then the results of analysis requirement by Shapiro-Wilk test and Levene Test can be seen in **TABLE 6.**

TABLE 6. Analysis requirement test results

Domain	Class	Normality Test		Homogeneity Test	
		Sig.	Conclusion	Sig.	Conclusion
Knowledge	Control (C)	0.099	Normal	0.690	homogeneous
	Experiment (E)	0.191	Normal		
Attitude	Control (C)	0.212	Normal	0.801	homogeneous
	Experiment (E)	0.332	Normal		
Skill	Control (C)	0.188	Normal	0.081	homogeneous
	Experiment (E)	0.001	Abnormal		

TABEL 7. Hypothesis test results

Domain	Test Type	Sig	Conclusion
Knowledge	*Independent Samples T-Test*	0.473	Ho accepted
Attitude	*Independent Samples T-Test*	0.113	Ho accepted
Skill	*Mann Whitney U*	0.001	Ho rejected

Implementation of REACT model in learning process can be seen in **TABLE 8**.

TABLE 8. Implementation of REACT model in learning method

Theme		Treatment
Relating	Lavoisier Law	Students were given questions about chemical reactions that they had seen, namely combustion reactions. For instance: – What happens if wood or matches are burned? – What will be produced if we burn wood or matches?
	Proust Law	Students were given analogous questions like when Mother makes cakes in the kitchen. Each ingredient has its own dose. What kind of dose will produce a delicious flavored cake?
	Gay Lussac Law	Students were given question about what happens if a closed bottle is thrown into a fire?
	Avogadro Hypothesis	Students were given questions what if in a chemical reaction, a chemical compound has a different phase between the product and its reactants? Will this affect how to determine the amount of a substance or compound?
Experiencing		In this stage, students were asked to do laboratory activities (projects). Students worked in team where one team consisted of 4-5 students. The practicum consisted of several themes, namely – Law of mass conservation (Lavoisier Law), – Law of fixed comparison (Proust Law), – Law of volume comparison (Gay Lussac Law), and – Avogadro Hypothesis

Theme	Treatment
	Next, students were asked to make predictions, data analysis, and conclusions from several practicums done.
Applying	Students were asked to work on the questions on the worksheets that have been provided, make observational data, and conclusions. These questions related to the concepts that had been studied and the use of these laws.
Cooperating	The stage of Applying and Experiencing relates to the stage of Cooperating (working together) where students must work together to be able to carry out practical activities (hands-on activities), discuss in making observational data, analyze data and make conclusions and work on the problems that had been provided.
Transferring	In this stage students were asked to share knowledge that had been obtained in classroom and practicum to other students by writing lab reports. Students were assigned to make lab reports in accordance with the activities carried out during the practicum. This practicum report was made by each student and collected at the next meeting. Students were asked to review some applications of basic legal concepts in everyday life.

Based on the data from the hypothesis testing on TABLE 5, it showed that the significance value obtained for the knowledge domain was 0.473. The significance value obtained was > 0.05, so that Ho from the application of the REACT model was accepted and it can be concluded that there was no significant difference in student achievement in the knowledge domain. This is in line with the research conducted by Fakhruriza and Kartika [9] regarding the effectiveness of the REACT model in improving student learning outcome, the research stated that there was no difference in the learning outcomes of the knowledge between the control class and the experimental class. Factors that caused no significant difference in student achievement in the realm of knowledge namely the implementation of the REACT model that should be carried out optimally, but when it was not implemented optimally in the field. Then other factors, namely the division of lab groups and discussions at random so that the initial ability was not owned by students, and made the learning model that applied did not cause a difference in the student learning achievement. In accordance with Ausubel's learning theory, learning should be meaningful for students, if it is related to learning achievement in the knowledge domain, when the learning process takes place, the teacher should know the students' initial abilities so that the teacher can adjust the learning process to be implemented by applying the REACT model and the final results can affect the value of student learning achievement in the knowledge domain [10,11].

The data obtained from the results of attitude learning achievement were in the form of the value of the student's attitude questionnaire that consisted of several aspects namely religious aspects, responsibility, mutual cooperation, courtesy, honesty, and discipline. In TABLE 6. showed that the significance value obtained was 0.113, so Ho of attitude learning achievement was accepted and it is concluded that there was no significant difference in student attitudes learning achievement between the application of conventional learning models and REACT models in basic chemical law material. This is in accordance with the opinion expressed by Djaali [12] which states that the traits possessed by students are relatively constant and difficult to change, so that there is no significant difference in the learning achievement of the attitudes that occur. According to the Ministry of National Education [13] it can be caused because changes in behavior or attitudes that occur in students do not take place spontaneously but require a longer time and process and require support from the environment.

Based on TABLE 4. it can be known that the results of the student's learning achievement in the attitude that had been categorized in each aspect between the control class and the experimental class were almost same. The difference in criteria lied in the religious aspects and responsibilities. Mutual cooperation, courtesy, honesty and discipline between the control class and the experimental class did not have different criteria. In order to make it easier to see the difference in values between the control class and the experimental class, it can be seen in the attitude learning achievement graph made with the purpose to see the difference in the percentage of the attitudes in student learning achievement. The graph of the percentage of the student's learning achievement in the attitude is found in FIGURE 2. that

showed difference of each aspect in the percentage of learning achievement in the attitude.

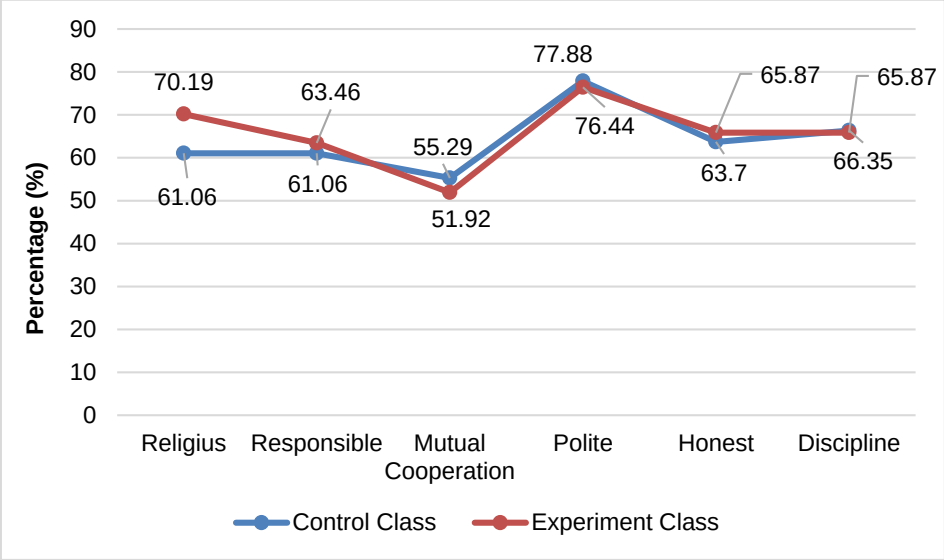

FIGURE 2. Percentage of questionnaire results of control and experimental class on each aspect

Skill assessment data for student's learning achievement obtained from the observation. Data were tested using precondition tests which included normality and homogeneity then tested by hypothesis testing. There were not normally distributed data then the next hypothesis test used the Mann Whitney U non parametric test. Significant value obtained from the hypothesis test was equal to 0.001. The significance value was <0.05, which means that the learning achievement of the skill was rejected and it can be concluded that there were significant differences in student achievement in the skill domain. This difference can be seen from the results of the average value in the domain of skills which showed that the value in the experimental class was higher than the control class according to the research conducted by Meita [14] which showed that the class given treatment using REACT model had a skill value in the process higher than the class that was not given treatment with the model. Differences that occur in the results of skill learning achievement can be caused by student's learning achievement, especially in the different skill domain with the difference of curiosity of the experimental and exploration activities.

The percentage of the average value of learning achievement results taken when the practicum took place as illustrated in **FIGURE 3**. Each theme in the practicum had a different percentage between the control and the experimental class. Based on **FIGURE 3**. it can be seen that the percentage of the results of skill learning achievement in the experimental class was higher than in the control class. This showed that the REACT model applied was able to cause differences in the results of student learning achievement in the skill domain. This is consistent with the research conducted by Farid [15] which states that the application of chemical learning with REACT can make students accustom to communicate, cooperate, and discussion.

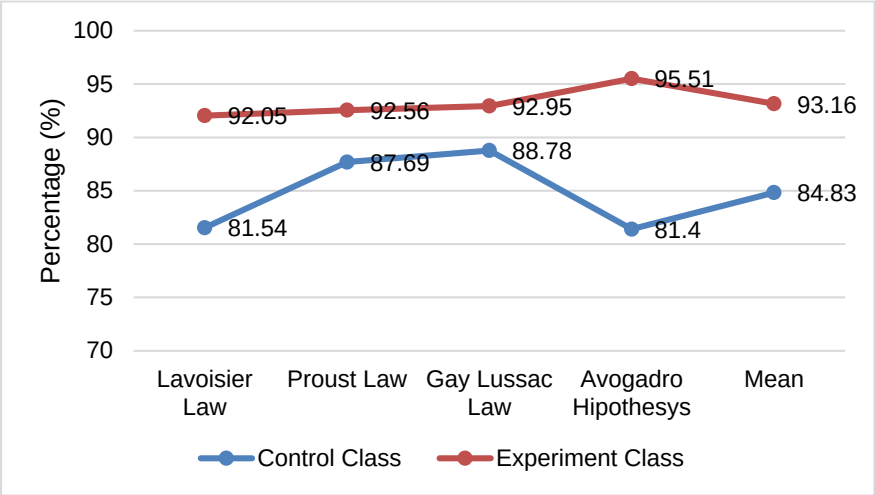

FIGURE 3. Percentage of student skill on each practicum theme

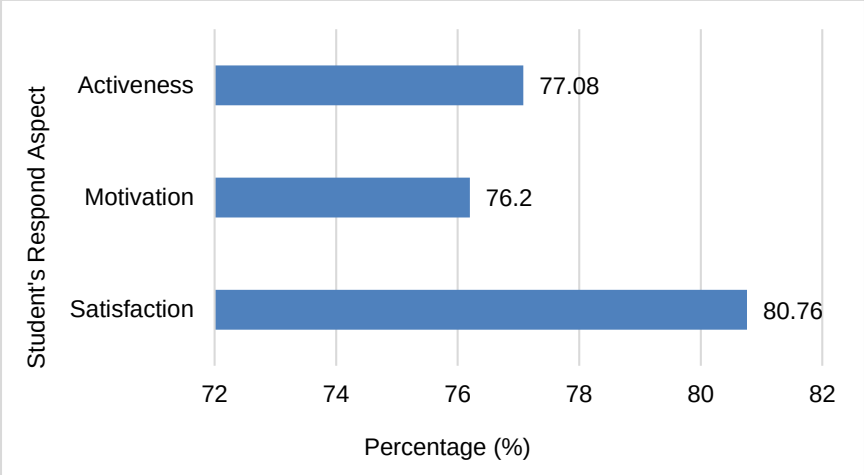

FIGURE 4. Percentage of student response to REACT learning

Based on student response data contained in FIGURE 4, it can be concluded that students favored teaching and learning activities using REACT model. It can be seen from the positive response that students gave from every aspect. These aspects include satisfaction, motivation and activity. On average, student give a good response from every aspect contained in questionnaire.

Assessment based on satisfaction, motivation, and activity aspect showed that students were satisfied (happy) in learning by applying the REACT model and making students more motivated and more active in learning.

CONCLUSION

Based on the results, it can be concluded that 1) there was no significant difference in student learning achievement in the knowledge domain, 2) there was no significant difference in student learning achievement in the attitude domain, and 3) there was significant differences in student learning achievement in the skill domain between the application of conventional learning models with REACT learning models in the Chemical Basic Law and (4) students gave a good response to the REACT learning model performed.

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