The effect of learning models

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Submission date: 28-Aug-2020 09:50AM (UTC+0200)
Submission ID: 1375374352
File name: The_effect_of_learning_models.pdf (518.91K)
Word count: 3865
Character count: 21541

AIP Conference Proceedings

The effect of learning models and emotional intelligence toward students learning outcomes on reaction rate

Cite as: AIP Conference Proceedings **1868**, 030011 (2017); https://doi.org/10.1063/1.4995110
Published Online: 04 August 2017

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The Effect of Learning Models and Emotional Intelligence toward Students Learning Outcomes on Reaction Rate

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Abstract. This research focused on the effect of learning models and emotional intelligence in students' chemistry learning outcomes on reaction rate teaching topic. In order to achieve the objectives of the research, with 2x2 factorial research design was used. There were two factors tested, namely: the learning models (factor A), and emotional intelligence (factor B) factors. Then, two learning models were used; problem-based learning/PBL (A1), and project-based learning/PjBL (A2). While, the emotional intelligence was divided into higher and lower types. The number of population was six classes containing 243 grade X students of SMAN 10 Medan, Indonesia. There were 15 students of each class were chosen as the sample of the research by applying purposive sampling technique. The data were analyzed by applying two-ways analysis of variance (2X2) at the level of significant $\alpha = 0.05$. Based on hypothesis testing, there was the interaction between learning models and emotional intelligence in students' chemistry learning outcomes. Then, the finding of the research showed that students' learning outcomes in reaction rate taught by using PBL with higher emotional intelligence is higher than those who were taught by using PjBL. There was no significant effect between students with lower emotional intelligence taught by using both PBL and PjBL in reaction rate topic. Based on the finding, the students with lower emotional intelligence were quite hard to get in touch with other students in group discussion.

INTRODUCTION

Due to both external and internal factors, Indonesia education problems nowdays still result in the quite complicated issues. There are eight external factors affecting the quality of education in Indonesia, namely: teachers, infrastructures, facilities, curriculums, activities, teaching learning processes, evaluations, and school managements. Furthermore, the students are inherent with the internal factors, such as health, dissability, emotional intelligence (EI), intellectual, interest, talent, and motivation. The EI is the capability of individuals to recognize their own, and other people's emotions, to discern between different feelings and label them appropriately, to use emotional information to guide thinking and behavior, and to manage and/or adjust emotions to adapt environments or achieve one's goal [1]. EI is compared and contrasted with a measure of abstract intelligence but not with a personality measure, or with a personality measure but not with a measure of academic intelligence [2]. The few incremental validity studies conducted on EI have shown that it adds little or nothing to the explanation or prediction of some common outcomes (most notably academic and work success).

In education, teachers naturally play an important role in achieving the succesful learning outcomes. The objectives of teaching learning process are lied on the teachers' quality who are very competent both in determining and applying models of learning in a proper way in the classrooms. Yet, most Indonesian teachers still tend to use classical teaching method, such as teacher center method. This method is commonly known as monotonous way as the teachers dominantly deliver the teaching materials in front of the classroom without students' involvement in teaching learning process at all. Surely, such kind of activity extremely affects students' learning outcomes and

The 4th International Conference on Research, Implementation, and Education of Mathematics and Science (4th ICRIEMS)
AIP Conf. Proc. 1868, 030011-1–030011-7; doi: 10.1063/1.4995110
Published by AIP Publishing. 978-0-7354-1548-5/$30.00

students' motivations. Since students' motivation is getting lower, it makes most students do not achieve standard-passed criteria that already decided by schools.

Indoensia chemistry teachers are highly demanded to use the interesting models of learning because most chemistry discussions consist of many concepts. The variety of concepts is found in chemistry from simple to complicated concepts. One of teaching material which contains many complicated concept is reaction rate that taught in grade XI senior high school in Indonesia. The more complicated concept, the more interesting model of teaching must be used by teachers, because, the unappropriate model of teaching create students' negative perception againts chemistry. To avoid using unsuitable teaching method toward reaction rate teaching materials, the teachers have to be careful in choosing the teaching method in order to make the students are interested in studying this materials. In short, the only key of successful teacbing learning process is on teachers' hand.

In addition, there are two models of learning that might be used by teachers in teaching reaction rate, namely; proble based learning (PBL) and project-based learning (PjBL). Both the models can improve the critical thinking skills. Critical thinking, one of the skills associated with thinking, is the evaluation of our own and others' ideas with no prejudices. It is concerned with how we think rather than what we think [3,4]. These two learning models allow the students to have some valuable classroom activities, such as; conducting the research, integrating both theory and practice at the same time, and applying the knowledge and skill in solving the problems found, then, those kinds of thing indirectly create the independent students [5,6].

Problem-based learning focuses on the solving the real problem in which this model of teaching gives the students a great opportunity to undertake some activities, such as; blending with teamwork, receiving the feedback from teachers, and doing the discussion, thus, all these activities can be used to investigate, and to study the final report [7]. Problem-based learning presents a problem using problem analysis sheet. Students in group discussions to find the problem, formulate and analyze problems, formulate hypotheses, find solutions to solve problems and make conclusions [8]. In other words, the sudents are not only encouraged to involve in teaching learning process more actively, but also improving students' critical thingking to solve problems given through teaching materials.

While, project-based learning is centralized in students' involvement of problem solving phase, and focused on giving the students some opportunities, namely; to enhance the knowledge through comprehensive reading and writing the final report, to work in a group discussion, and to produce the worth output [9]. Project-based learning (PjBL) is typically considered an approach to teaching in which students respond to real-world questions or challenges through an extended inquiry process [10]. There are many studies in the decade showed that project-based learning is an efficient teaching strategy to enhance students" learning motivation and help students to engage into the learning activities [11].

Beside that, the result of the research states that the student attitudes are considerably related to motivation and success [12]. Having high skills and talents is not enough for students to complete a task successfully and to make them like an activity as they are doing it. In order to sustain students' motivation, a positive opinion about the learning task and an internal stimulus is needed. Attitudes and beliefs are accepted as the pioneers of behavioral objectives. The probability of having willingness about learning tasks and sustainability of efforts is higher in students with a positive attitude.

Relating to explanation above, students' achivement is not only coming from external factors yet it is also affected by internal factors. such as; health, dissability, emotional intelligence, intellectual, talent, interest, and motivation.. Yet, most education policy just pays a close attention to students' intellectual, instead, most people also think that high intelligence students are easier to achieve the success than lower intellegince students, but this claim is not true, indeed. Emotional intelligence (EI) is also considered to be the main factor in reaching the life goals.The emotional intelligence (EI) is the main sources for motivation, information, and innovation, so emotional intelligence is useful not only for enriching students' learning outcomes in teaching learn process, but also for upgrading students' life goals [2]. Thus, each student has different emotional intelligence which play an important role in learning outomes and achievemtent. Some previous researhes found the great impact of emotional intelligence. Mursid and Intan conlude that there is an interaction between teaching strategy and emotional intelligence in students' chemistry learning outcomes [13].

Based on the background of research, the writer would like to conduct the research on the interaction between models of learning and emotional intelligence, furthermore, this study also investigates the effect of models of learning and emotional intelligence in students' chemistry learning outcomes.

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RESEARCH METHODOLOGY

The population of the research was 243 grade X students of state senior high school SMAN 10 Medan, Indonesia which consits of six classes. The sample of the research was taken two times. Firstly, 4 classes were chosen representatively, then secondly, sampling purposive was used to determine 15 students of each class based on the homogenity. In addition, there are two independent varibles used in this research; models of learning, and emotional intelligence, while, the dependent variables is students' reaction rate learning outcomes.

Research Design

In this research, experimental design by using factorial design 2X2 was applied [14]. There were two factors investigated, namely; 1) the factors of models of learning (A) which consist of two terms; problem-based-learning PBL (A1) and project based-learning PjBL (A2), 2) the factors of emotional intelligence (B) which has two categories; high(B1) and low (B2). Detailly, the factors of research design is shown in table 1.

TABLE 1. Research Design of Integration Between Models of learning and Emotional intelligence [14]

Models of learning (A)	Emotional intelligence (B)	
	High(B_1)	Low (B_2)
PBL (A_1)	A_1B_1	A_1B_2
PjBL (A_2)	A_2B_1	A_2B_2

Note: there are four interactions, namely;
A_1B_1 : Integration problem-based learning (PBL) and high emotional intelligence
A_1B_1 : Integration problem-based learning (PBL) and low emotional intelligence
A_1B_1 : Integration project-based learning (PjBL)and high emotional intelligence
A_1B_1 : Integration project-based learning (PjBL)and low emotional intelligence

Based on the reseach design above, following statistical formula was used:

$$Y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \epsilon_{ijk}$$

$$i= 1,2 \; ; \quad j = 1,2 \; ; \quad k = 1,2,3,\ldots\ldots\ldots 10$$

where :

Y_{ij} = Students' learning outcomes integrated with ij (stage-i from teaching model factors and stage-j from emotional factors
μ = The average of students' learning outcomes
α_i = The effect of treatment stage-i
β_j = The effect of emotional intelligence
$(\alpha\beta)_{ij}$ = The effect of interaction between learning model factors stage-i and emotional intelligence factors stage-j
ϵ_{ijk} = The effect of error during the test againts students stage-k integrated with ij (stage-i from learning model factors and stage-j from emotional factors

Data Analysis

Data were analyzed using two-way Analysis of Variance (ANOVA) to find out the effect of learning models and emotional intelligence toward students' learning outcomes in reaction rate topic. Before the research data were analyzed by using ANOVA, normality and homogeneity of the data should be tested in advance. The normality test used Chi-squared test, and homogeneity test used F test. The significance level was set to 0.05.

Research Instrument

This research was used two kinds of research instrument, namely: questionnaire, and test. Questionnaire was made to measure students' emotional intelligence in which the studenst were repectively asked to answer 53 questions. In order to obtain the data, scala Likert which had positive scales (4,3,2,1) and negative scales (1,2,3,4) was used to measure each question provided. Besides, there were 40 queestions of the test used to measure students' learning outcomes. The test given was multiple choice which had five options for each question.

FINDING AND DISCUSSION

In this research, all the instrument used was tested through validity testing, reliability testing, difficulty level of each item, power difference, and distructor effectiveness. Firstly, based on analysis, 20 items of the test were relatively valid. Secondly, The technique used was KR-20 at the level of significant $\alpha = 0.05$ (N= 20), then the data obtained were $r_{observed} = 0.824$, while $r_{table} = 0.444$ in which $r_{observed} > r_{table}$, then it showed that all the instruments were reliable. After that, the difficulty item level testing was valid as well that there were 3 items of easy questions, 12 items of fair questions, and 5 items of difficult questions. While, based on analysis of power difference, there 8 items with fair power difference, 10 items with a good-power difference, and 2 items with an excellent power difference.

After questionnaire distribution, emotional intelligence (EI) differences between group of experiment I and II were found. In group of experiment I, the highest EI was 191, and the lowest EI was 107. While, in group of experiment II, the highest emotional intelligence EI was 212, while, the lowest was 108. In group of experiment III, the highest EI was 192, and the lowest was 117. Group experiment IV was slightly different in which the highest EI was 222, the lowest was 133. Before the research data were analyzed by using two-way Analysis of Variance (ANOVA), normality and homogeneity of the data should be tested in advance. The testing of normality was being used to know whether the sample taken was normally distributed or not. The technique used was Chi-squared test at the level of significant $\alpha = 0.05$ and $\chi^2_{observed} < \chi^2_{table.}$ for each group were normally distributed. After normality test had been calculated, the further data needed is homogeneity test. Homogeneity test aims to find out whether the variance of the data is homogenous or not. The technique used was F test. All the data obtained showed that students' chemistry learning outcomess were distributed normally and homogenously.

Hypothesis Testing

Based on posttest data analysis, the average students' learning outcomes for each treatment combination are presented in Table 2. The students' learning outcomes taught by using PBL with higher emotional intelligence was 85.36 ± 5.40. While students' learning outcomes taught by using PjBL with higher emotional intelligence was 75.46 ± 7.32. Then, students' learning outcomes taught by using PBL with lower emotional intelligence was 74.83 ± 5.20, Yet, students' learning outcomes taught by using PjBL with lower emotional intelligence was 75.21 ± 6.83.

TABLE 2. The Average Students' Learning outcomes Taught by Integration of Models of learning and Emotional intelligence

Models of learning (A)	Emotional intelligence (B)	
	High(B_1)	Low (B_2)
PBL (A_1)	85.36 ± 5.40	74.83 ± 5.20
PjBL (A_2)	75.46 ± 7.32	75.21 ± 6.83

The hypothesis testing was undertaken by analysis of variant (ANOVA) with $\alpha = 0.05$. Based on the testing hypothesis clearly showed there was no significant effect of model of learning (factor A) in students' chemistry learning outcomes, otherwise, students' learning outcomes was significantly affected by emotional intelligence (factor B). Then, there is an interaction between models of learning (factor A) and emotional intelligence (factor B) in students' chemistry learning outcomes. The summary of those factors is visualized detailly in table 3.

TABLE 3. The Summary of Variance of Learning models and Emotional intelligence in Students'Chemistry Learning Outcomes

Variance	Db	JK	KT	Fobserved	F(0.05)(db)
Treatments	3	964.6	-	-	
Factor A	1	260.43	260.43	3.778	4.00
Factor B	1	400.43	400.43	5.810	4.00
Interaction AB	1	303.74	303.74	4.407	4.00
Error	56	3,860	68.92	-	-
Total	59	4,824.6	-	-	-

The table 3 showed that there was the interaction between learning models (factor A) and emotional intelligence (factor B) in students' chemistry learning outcomes. In details, the interaction between factor A and factor B is shown in figure 1. From the figure 1 found that there is interaction between learning models and emotional intelligence in students' chemistry learning outcomes. For example, the students' learning outcomes taught by PBL (A1) with higher emotional intelligence (B1) got higher score than students with lower emotional intelligence (B2). On the other hand, the students' learning outcomes taught by PjBL(A2) with higher emotional intelligence (B1) got score almost the same as students with lower emotional intelligence (B1). However, this data should be proven by advanced statistical test. In other words, *Least Significant Difference Test* (LSD) testing is required to know each simple factors effect [14]. The tests were conducted to determine the effect of learning model factors for B1 (higher emotional intelligence) and for B2 (lower emotional intelligence).

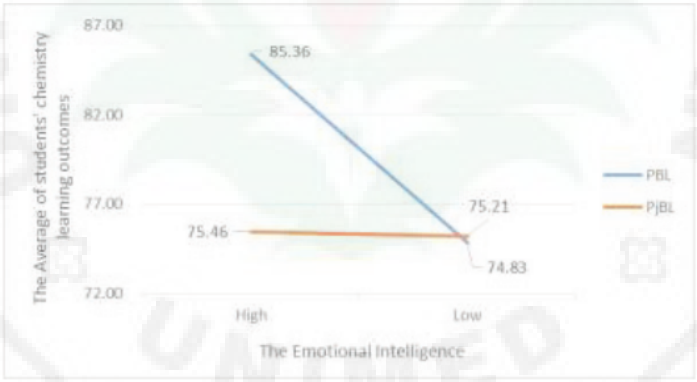

FIGURE 1. The Interaction Learning models (factor A) and emotional intelligence (factor B) in Students' Chemistry Learning outcomes

The result showed that the integration between models of teaching and emotional question may lead to the higher students' learning outcomes in reaction rate topic. It found that emotional question aspect to the students' achievement and is very important for academic success [15]. Furthermore, they also found a significant positive correlation between EI and academic achievement indicates that academic success does not only depend on cognitive aspects of intelligence rather it is affected by emotional abilities [15, 16]. This study showed that EI and teaching models altogether give a great effect to the students' achievement. It proves that students have different emotional question level. Yet, it is undeniable that emotional intelligence is the essential learning source used to reach not only learning success but also life success. In this matter, success covers anything related to learning outcomes in which the students are demanded to involve actively in each learning process, so the students will not understand the materials more easily but also will be able to answer any questions provided.

The data shown that the using of PBL combining with higher emotional intelligence significantly affected students' learning outcomes with the highest score obtained was 85.36 ± 51.40. Otherwise, students with lower emotional intelligence taught by using PBL got lower score which was 74.83 ± 5.20. While, students' learning outcomes taught by using PjBL combining with higher emotional intelligence was 75.46 ± 7.32, and students' learning outcomes taught by using PjBL combining with lower emotional intelligence was 75.21 ± 6.83. It found

that students with higher emotional intelligence taught by using PBL have the greater learning outcomes rather than students taught by using PjBL. The finding of the reseach was similar with the reseach was conducted by Goleman which found that the equality of intellectual and emotional intelligence is the main source for students in getting the high learning outcomes [17]. In addition, in group of experiement III (PBL with higher EI) found that the students' with higher emotional intelligence will easily get the great learning outcomes taught by using PBL. The application of PBL in chemistry studying usually allows the students to work together and to share what they will have done in group discussion.

Furthermore, the result shown that there is no siginficant effect between students with lower emotional intelligence taught by using both PBL and PjBL in reaction rate topic. The students' learning outcomes taught by using PBL combining with lower emotional intelligence was 74.83 ± 5.20, and students' learning outcomes taught by using PjBL combining with lower emotional intelligence was 75.21 ± 6.83. This matter showed that the students with lower emotional intelligence seemed a bit hard to blend with other students in group discussion. The students were hard to believe others, then they would rather being selfish, whereas, PBL and PjBL demand the students to improve their higher critical thinking through working with others in a group discussion. In order to inolve with others, the students are asked to be responsible with their own tasks. Related to this matter of fact, the students with lower emotional intelligence surely have difficulties in getting the fantastic learning outcomes if the teachers are not qualified enough in determing the appropriate learning models.

For those reasons, it can be recommended that combining learning model and student's emotional intelligence to teach reaction rate topic must be used. For reaction rate topic, students with higher emotional intelligence will be more effective, if they are taught by using PBL, but students with lower emotional intelligence will be no more effective, if they are taught by using both PBL and PjBL. Yet, both using of PBL adn PjBL on reaction rate topic could not give a great impact to the students with lower emotional intelligence. Shortly, the further research on reaction rate topic needs to be conducted to investigate the most appropriate learning models for students with lower emotional intelligence

CONCLUSION

In relation to the result and finding of the research, it can be concluded that :

- Emotional intelligence (EI) gives a great effect to the students' learning outcomes in reaction rate topic. While, both problem-based learning (PBL) and project-based learning (PjBL) do not significantly affect to the students' learning outcomes in reaction rate topic.Yet, if emotional intelligence and learning models are integrated all together, there will an interaction between them which significantly affect to the students' chemistry learning outcomes.
- There is a significant effect between students with higher emotional intelligence taught by different learning models. Students with with higher emotional intelligence taught by using PBL have the greater learning outcomes rather than students taught by using PjBL in reaction rate topic.
- There is no significant effect between students with lower emotional intelligence taught by using both PBL and PjBL in reaction rate topic.

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