



The effect of the flipped classroom approach and self-efficacy on a guided inquiry on students' creative thinking skills

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Abstract

This study aims to look at the effect of the flipped classroom approach on the guided inquiry model and student's self-efficacy on creative thinking skills on the reaction rate material. The study was conducted in class XI MIA SMA N 3 Jambi City with a 2 x 2 factorial design and the sample consisted of 2 classes chosen randomly. Data collection using test techniques, namely essay tests, includes indicators of creative thinking and non-tests, namely self-efficacy questionnaire data and field notes during the study. Analysis of the data used is 2-way ANOVA. The results showed that guided inquiry learning with the flipped classroom approach and high self-efficacy categories had high creative thinking abilities, but there is no interaction between learning models with self-efficacy towards creative thinking abilities on the reaction rate material because learning models and self-efficacy affect the results of students' creative thinking abilities independently. Based on the results of the study it can be concluded: (1) There is an influence of the flipped classroom approach on the guided inquiry model of students' creative thinking abilities on the reaction rate material (2) There is an effect of students' self-efficacy on the ability to think creatively on the material reaction rate (3) There was no interaction between the learning model and students' self-efficacy.

Keywords: Creative thinking skills, Flipped classroom, Guided inquiry, Reaction rate, Self-efficacy

1. Introduction

The ability to think creatively is very important to be trained in learning chemistry so that students have logical reasoning, clear views and rational explanations of things learned. One of the chemicals that require students to be

able to improve their creative thinking skills is the reaction rate. Students have difficulty in studying this material where students have not been able to construct the concept of chemical reactions that are close to real life into the calculation of the order and reaction rate, and apply it through an experiment. It is also proven that chemicals have difficulties in understanding terms, numbers difficulties and difficulties understanding chemical concepts (Ristiyani & Bahriah, 2016).

So that the concept of the reaction rate that has been received can be meaningful, then learning the material of the reaction rate needs to be prepared properly. One learning strategy that can be used is to implement a guided inquiry model that is learning based on "discovery". The inquiry learning model has an advantage because students will conduct research repeatedly and with ongoing guidance (Agustanti, 2012). Besides having advantages, inquiry learning has weaknesses, one of which is implementing it requires a long time so that teachers often find it difficult to adjust to the allotted time (Majid, 2014). It is also evident that there are perceived obstacles when implementing inquiry-based teaching instruction (IbTI), one of which is the lack of time during the learning process because the inquiry learning steps are too long and structured (Effendi-Hasibuan et al. 2019). Weaknesses of this learning model can be minimized with the help of online learning, one of them is flipped classroom.

The flipped classroom can be a solution to this problem, because it rearranges time inside and outside the classroom. With the flipped classroom method, students will not spend much time listening to long lectures in class, but will have more time to solve problems individually and collaboratively through distance learning with peers. This is evident that active learning using the flipped classroom method supported by collaborative has a positive effect on student learning outcomes (Rau et al. 2017). The integration of the guided inquiry learning model with the flipped classroom approach has been developed by previous researchers, namely the development of the inquiry-flipped classroom model to improve the ability of argumentation. The syntax that has been developed consists of 8 steps, namely orientation, formulating problems, reviewing, formulating hypotheses, collecting data, testing hypotheses, making conclusions, and post-testing (Ramadani, 2019). However, this development has not been experimented into the learning process and following previous researchers' suggestions that the development of this model can be done to improve other skills. Then the syntax of an inquiry-flipped classroom that has been developed can be used and experimented into the learning process to improve students' creative thinking abilities.

The integration of guided inquiry models with the flipped classroom approach makes them both effective when combined. This is evidenced by students who were given the treatment of learning through inverted classroom inquiry learning models having a better understanding than students who did not use this learning model. Besides, researchers found that there was a positive effect on the

application of the flipped classroom learning model, namely increasing students' motivation in learning because they were more confident while studying in class and research (Paristiowati et al. 2017). So by applying this learning model students' self-efficacy will also influence the improvement of students' ability to think creatively. In line with this, there is a positive relationship between self-efficacy and learning outcomes in the realm of knowledge.

However, not all students have a high level of self-efficacy, this is evidenced in the results of interviews at SMA Negeri 3 Kota Jambi, said the ability of creative thinking and student learning outcomes is still low, this is because teachers usually give homework to students because of insufficient time at school when learning process takes place. Of course, this makes the readiness of students in learning is not optimal and finally students do not dare to express opinions when learning, and student confidence in doing low problem-solving. This makes the ability of students to think creatively low. So it is necessary to bring up the confidence and confidence or self-efficacy in students when learning because with the high level of self-efficacy students are expected to be able to think creatively and creative activities of students will be increased. So it is true that the inquiry model with the flipped classroom approach can be applied in the chemistry learning process (Silaban, 2017).

Based on the description above, the writer wants to integrate the flipped classroom approach with the guided inquiry model and find out its influence with students' self-efficacy on creative thinking skills in the reaction rate material.

2. Methods

This research was conducted at SMAN 3 Jambi City class XI MIA on the reaction rate material. This study was included in a quasi-experimental study with 2 x 2 factorial design research designs. For the design of the research design is in Table 1.

The population in this study were students of class XI MIA at SMA N 3 Kota Jambi in the 2019/2020 school year. The sampling technique was done by simple random sampling and obtained two sample classes namely class XI MIA 6 as an experimental class with a total of 35 students and class XI MIA 5 as a control class with a total of 35 students.

This research data collection technique is a test technique such as an essay test which includes aspects of creative thinking and non-test techniques such as student self-efficacy questionnaires and in the form of field notes during the research process. In collecting a student's self-efficacy category data a questionnaire was used with a Likert scale while for the results of creative thinking skills results from an essay test was used which included aspects of creative thinking abilities that had been validated and tested.

The data analysis technique used is a descriptive, prerequisite test and hypothesis test. The prerequisite tests used were the normality test or the Kolmogorov-Smirnov test and homogeneity test using the Levene test. To test the hypothesis, researchers

used data analysis techniques with a two-way analysis of variance (ANOVA) with interactions with a significant level of $\alpha = 0.05$ or 5%.

Table 1
Factorial design 2x2

Learning model (X)	Experiments The Guided-Flipped Classroom Inquiry Model (X ₁)	Control (Guided Inquiry) (X ₂)
Self Efficacy (Y)		
High Self Efficacy (Y ₁)	X ₁ Y ₁ (Creative Thinking Skills)	X ₂ Y ₁ (Creative Thinking Skills)
Low Self Efficacy (Y ₂)	X ₁ Y ₂ (Creative Thinking Skills)	X ₂ Y ₂ (Creative Thinking Skills)

2. Results and Discussion

The data obtained in this study are the results of the creative thinking abilities of students who learn with the flipped classroom approach on the guided inquiry model (X₁) and students who learn with the guided inquiry model without the flipped classroom approach (X₂) by paying attention to the level of students' self-efficacy in learning, i.e. high and low self-efficacy. Data on the results of students' creative thinking abilities are summarized in [Table 2](#).

Table 2
Data on the results of students' creative thinking skills based on learning models

Class	Highest value	Lowest value	mean
Control (non flipped classroom)	88	58	78.183
Experiment (flipped classroom)	95	65	82.866

Based on table 2, learning outcomes in the experimental class or class learning with the flipped classroom approach in the guided inquiry model are higher than class learning with the guided inquiry model without the flipped classroom approach.

Before testing the hypothesis, the prerequisite test is done by testing the normality and homogeneity of the data groups. This pre-test is carried out using SPSS version 16. Data from the normality test and homogeneity test are summarized in [Table 3](#) and [Table 4](#). In [Table 3](#), the results of the analysis show the significant value of the Kolmogorov-Smirnov calculation is higher than 0.05. This means that the results of the creative thinking ability of the two samples are normally distributed.

Table 3
Data normality test results of students' creative thinking skills

	guided inquiry learning class	Kolmogorov-Smirnov ^a		
		Statistic	df	Sig.
learning outcomes	<i>non flipped classroom</i>	.127	35	.171
creative thinking skills	flipped classroom	.126	35	.178

Table 4
Homogeneity test results of students' creative thinking skills

F	df1	df2	Sig.
1.758	3	66	.164

Based on the homogeneity test results above, it shows that the significant value of variance is greater than 0.05. This means that the results of students' creative thinking abilities from the two samples were declared homogeneous.

Furthermore, the hypothesis test was performed using the two-way variance analysis (ANOVA) technique with interactions at the significance level $\alpha = 0.05$ or 5% using SPSS version 16 after previously measuring the results of students' creative thinking abilities. Data description of the results of students' creative thinking abilities with the category of students' self-efficacy is presented in [Table 5](#).

Table 5
Description of the results of students' creative thinking skills with the category of students' self-efficacy

Guided inquiry class	Self-efficacy	mean	Sample
<i>non flipped classroom</i>	high	81.0526	19
	low	75.3125	16
	Total	78.4286	35
<i>Flipped classroom</i>	high	85.4815	27
	low	80.2500	8
	Total	84.2857	35
Total	high	83.6522	46
	low	76.9583	24
Total		81.3571	70

Based on the table above, it appears that the difference in the average value of students' creative thinking abilities in the two research groups. The average value of the group of students learning with the flipped classroom approach in the guided inquiry model with a high level of self-efficacy was 85.48. Meanwhile, the average score of the same group of students but with a low level of self-efficacy was 80.25.

The average value of a group of students learning without a flipped-classroom approach to the guided inquiry model with a high level of self-efficacy was 81.05. Meanwhile, the average value of the same group of students but with a low level of self-efficacy is 75.31. The difference in the average scores in the two groups above shows, the average value of the group of students with a high level of self-efficacy was 83.65, and the group of students with a low level of self-efficacy was 76.95.

Furthermore, the results of hypothesis testing are performed by a two-way variance analysis (ANOVA) technique with interactions. The Calculation of data on the results of hypothesis testing is presented in [Table 6](#).

Table 6
ANOVA testing results in students' creative thinking abilities

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1055.446 ^a	3	351.815	6.470	.001
Intercept	374307.271	1	374307.271	6.884E3	.000
learning model	316.517	1	316.517	5.821	.019
self_efficacy	434.307	1	434.307	7.988	.006
learning model* self_efficacy	.933	1	.933	.017	.896
Error	3588.626	66	54.373		
Total	467973.000	70			
Corrected Total	4644.071	69			

Based on the table above, it appears that the results of the first hypothesis test on the learning model line show a sig value <0.05 which is equal to 0.019. So Ho's decision was rejected and H₁ was accepted, which means that there was an influence of the flipped classroom approach on the guided inquiry model of students' creative thinking abilities on the reaction rate material proved correct. To see a graph of the results of students' creative thinking abilities based on the learning model presented in [Fig 1](#).

The influence of the flipped classroom approach on the guided inquiry model is evidenced by the results of students' creative thinking abilities that are higher than students who learn with the guided inquiry model without the flipped classroom approach. In the learning process students who learn to use the guided inquiry model with the flipped classroom approach are more focused and active when the problem solving process is in the classroom. This is because students have been given a teaching video before the learning process begins. Students are given freedom with flexible time to understand and watch the video provided. So that in the learning process in the class students will have stock of information related to the material to be discussed and students are ready for the problem solving process in the classroom. This is consistent with the theory that in applying inverted classes, remembering and understanding are low-level thinking that is practiced outside the

classroom. While in class students study with a focus on higher-order thinking such as applying, analyzing, evaluating, and creating (Zainuddin, 2017). This makes the ability of students to think creatively and emerge better. This is also consistent with inquiry learning that learning using inquiry-based modules is effective for improving student learning outcomes (Pratiwi et al. 2019; Perangin-angin et al. 2019).

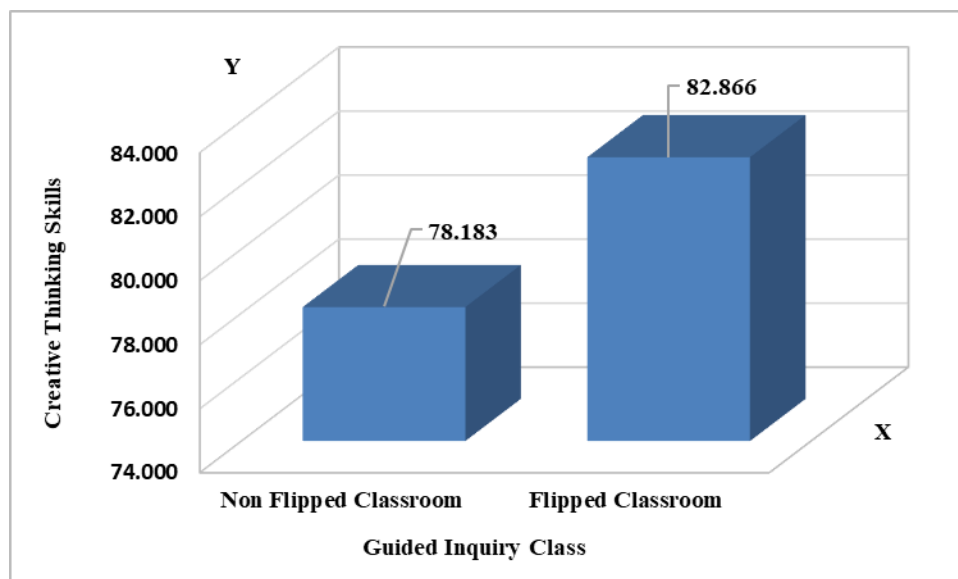


Fig 1. The mean results of students' creative thinking skills based on the learning model

While in the learning process students who learn to use guided inquiry models without a flipped classroom approach are more passive because there is no readiness of students to understand the material to be discussed in the classroom. So the material given by the teacher during the learning process is still new for students. In the application of this learning takes more time so that the application is less than the maximum and the delivery of incomplete material which ultimately gives students the burden of homework. Because the steps of the guided inquiry learning process are not carried out well, this is what makes the results of students' creative thinking abilities less than optimal. So, guided inquiry learning with the flipped classroom approach is more effective than guided inquiry learning without the flipped classroom approach in improving students' creative thinking abilities. It is also proven that learning with flipped classroom has the potential to help students learn to collaborate more with friends than they do with traditional learning (Foldnes, 2016).

The results of the second hypothesis test on the self-efficacy row show the sig value < 0.05 which is equal to 0.006. Then H_0 's decision was rejected and H_1 was accepted, which means that there was an effect of self-efficacy on students' creative thinking abilities on the reaction rate material proved correct. To graph, the results of students' creative thinking abilities based on students' level of self-efficacy can be seen in Fig 2.

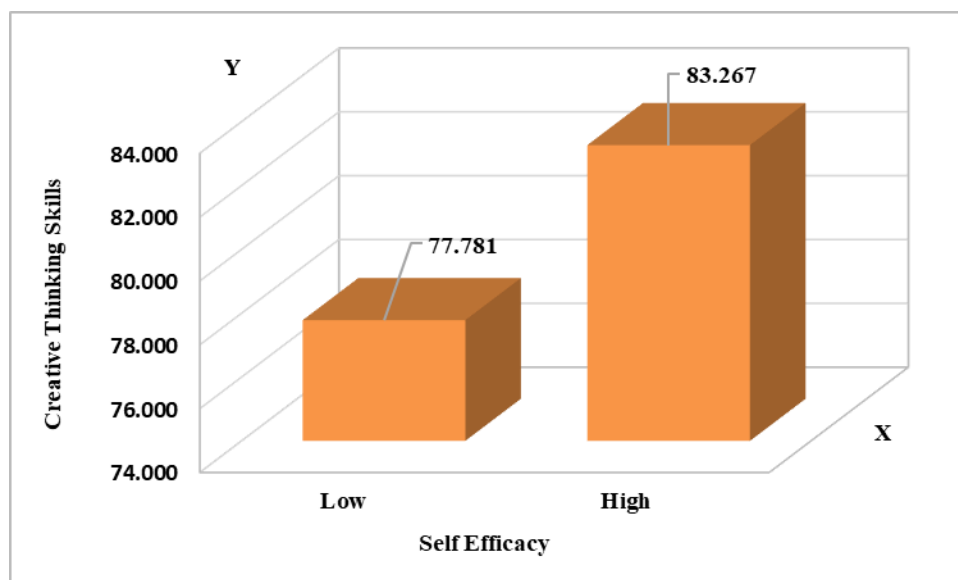


Fig 2. The mean results of students' creative thinking skills based on the level of self-efficacy

The influence of the level of students' self-efficacy is evidenced by the results of the creative thinking abilities of students who have high self-efficacy is greater than students who have low self-efficacy. The results of this study are strengthened by the existence of a positive relationship between self-efficacy and learning outcomes in the realm of knowledge. The higher the level of self-efficacy students have, the better achievement and student learning outcomes ([Majidah et al. 2013](#)).

When the learning process in the experimental and control class students who have a high level of self-efficacy are bolder in learning, they are confident in their abilities and are confident in their own opinions. Then when the learning process students who have a high level of self-efficacy are more active in learning this can be seen at the stage of formulating the problem, formulating hypotheses, and when carrying out the practicum so that at the time of evaluation or repetition students have a high value of the ability to think creatively. The theory says that individuals who have high self-efficacy tend to do certain tasks, even though those tasks are difficult ([Bandura, 1997](#)).

While students who have low self-efficacy tend to be silent and not brave in expressing their opinions when learning is proven at the time of formulating the problem, and conducting investigations or practicums students are just silent and rely on other friends to work in groups so that during evaluation tests or tests students get less than optimal learning outcomes. This is due to a lack of confidence, readiness, self-confidence and the desire of students in learning. The results of this study reinforced that students with low self-efficacy will tend to give up when completing a difficult task, because they assume that they are not able to complete it, so that makes motivation too low and results in student academic achievement ([Isnadini et al. 2014](#)).

The results of the third hypothesis test on the learning model line * self-efficacy show the value of $\text{sig} > 0.05$ which is equal to 0.896. Then H_0 's decision is accepted and H_1 is rejected, which means there is no interaction between the learning model with students' self-efficacy in influencing the ability to think creatively on the reaction rate material. The interaction graph between the guided inquiry learning model (flipped classroom and non-flipped classroom) and students' self-efficacy (high and low) in influencing the ability to think creatively can be seen in Fig 3.

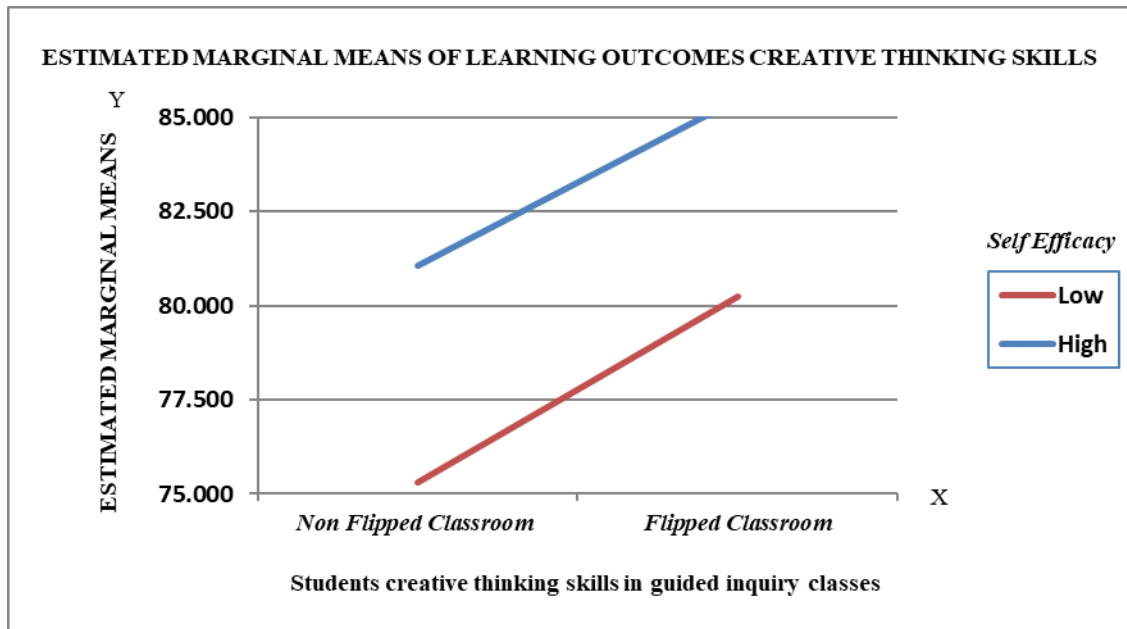


Fig 3. Interaction between learning models and students' self-efficacy

Based on Figure 3 above, the results of students' creative thinking abilities are applied in guided inquiry learning (non flipped classroom and flipped classroom) with the level of student self-efficacy (low and high) does not produce crossing or non-intersecting lines this means between learning models with self -efficacy affects the results of the ability to think creatively independently. So this can be interpreted as the absence of interaction between the learning model with students 'self-efficacy towards students' creative thinking abilities on the reaction rate material.

The guided inquiry learning model influences the results of the ability to think creatively independently. This is because students are given the treatment of learning with the flipped classroom approach helped by the teaching videos recorded by the teacher. The results of this study are strengthened by other findings that learning the flipped classroom has a positive influence on student learning outcomes in the aspect of skills (Damayanti et al. 2016). So that with the flipped classroom approach students already have provisions and information related to the material to be studied in class and make students more active in the problem-solving process in class, ultimately making student learning outcomes

better than the learning outcomes of students who learn with guided inquiry models without the flipped approach classroom.

Student self-efficacy (high and low) influences the results of students' creative thinking abilities independently. This is because that self-efficacy is a belief in students in doing an action during the learning process. Thus, students with high self-efficacy categories will produce better creative thinking skills compared to low self-efficacy levels. The results of this study are strengthened by other findings saying that students' creative thinking abilities are influenced by students' self-efficacy (Hari et al. 2018).

3. Conclusion

Based on the results of research and discussion it can be concluded as follows: (1) there is the influence of the flipped classroom approach on the guided inquiry model of students' creative thinking abilities on the reaction rate material with a value of $\text{sig} < 0.05$ which is 0.019. This is proven by the results of students' creative thinking abilities higher in the application of the guided inquiry model with the flipped classroom approach. (2) Then there is the effect of students' self-efficacy on the ability to think creatively on the material reaction rate with a value of $\text{sig} < 0.05$ which is equal to 0.006. This is proven by students who have high levels of self-efficacy producing higher creative thinking abilities compared to students who have low self-efficacy. (3) And there is no interaction between the learning model and students' self-efficacy towards the ability to think creatively on the material reaction rate with a $\text{sig value} > 0.05$ which is equal to 0.896. This is because the ability to think creatively is independently influenced between learning models with student self-efficacy between learning models with self-efficacy. Based on direct observation during the learning process and data analysis, the researcher decides to give a suggestion that is, the Flipped Classroom learning model can be used as an alternative for teachers to create interactive learning activities in the classroom so that the learning outcomes produced are following the targets to be achieved.

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