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The Effect of Discovery Learning Model Assisted by Prezi And Cognitive Style Towards the Critical Thinking Ability of Islamic Senior High School (MAN) Students

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Abstract. This study aims at finding out: the effect of interaction between Discovery Learning model assisted by Prezi and cognitive style towards the critical thinking ability of MAN students. This research was conducted with 2x2 factorial designs and the subject of the study was Class XI at MAN 1 Semarang. The research hypothesis was examined with two way Analysis of Variance (Anova) statistical test, and then followed by the Tuckey test. The results showed that (1) there is the effect of Discovery Learning model assisted by Prezi and cognitive style towards the critical thinking ability of MAN students (F = 11.22; significance level 0.002; p <0.05), (2) there is the difference between the critical thinking ability of MAN students who learned with Discovery Learning model assisted by Prezi and Lecture Model (F = 30.21; significance level 0.000; p <0.05), (3) there is the difference between the independent field (FI) and field dependent (FD) cognitive style towards critical thinking ability of MAN students (F = 10.24; significance level 0.001; p <0.05). The conclusion of the research was Discovery Learning model assisted by Prezi and cognitive style influenced simultaneously towards the critical thinking ability of Students of MAN 1 Semarang..

Keywords: Discovery Learning; Prezi; Cognitive Style, and Critical Thinking Ability.

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INTRODUCTION

In the era of the industrial revolution 4.0, which is an era of the digital industrial world, has become a paradigm and reference in the current order of life. This situation is in line with the opinion of [1], said that the role of humans has been displaced by technology, this is also a problem of the industrial revolution which will fundamentally change the way work, work and relate to one another. This has an impact on the next generation which needs to develop themselves to be able to survive in the era of the industrial revolution 4.0.

The impact of this era is that technology is developing and the world of education as well. Teachers are required to always create innovative learning media, choose learning models that make students active so that the learning process becomes more interesting and must be able to prepare graduates who can keep up with the times. With the changes that occur later will encourage human resources in the future to change for the better in the hope that they will still be able to adjust to existing changes. The existence of these changes also requires students to have many skills that will be used in the world of work, skills in using media or technology within the framework of learning. Besides, students will indirectly carry out high-level thinking activities in solving every problem encountered.

The purpose of preparing the nation's generation to face changes in the era of the industrial revolution 4.0 is to equip students with competencies that support in the era of the industrial revolution 4.0. The competencies in question are knowledge, skills, and other attributes that can help students achieve their full potential. The skills intended are skills that support and encourage students to become whole individuals or individuals by mastering competencies in both collaboration and communication. Collaboration is very important because with the collaboration students can carry out activities actively, besides that students can develop their full potential or ability. With these differences in collaborative activities, it is hoped that students will also actively participate in communicating and indirectly encourage students to bring out their creativity.

Critical thinking involves inductive thinking skills such as recognizing relationships, determining cause and effect, working on open problems, and making conclusions and calculating relevant data. Besides, deductive thinking skills related to the ability to solve problems both simple problems and problems that are spatial, logical syllogism, and can distinguish between facts and opinions. Another critical thinking skill is the ability to detect something biased, make comparisons, evaluate, and contrast the information or data obtained.

This is in line with the opinion of [2], critical thinking organizes processes used in mental activities such as problem solving, decision making, convincing, analyzing assumptions and scientific discoveries. Critical thinking is ability to reason (to reason) in an organized way, it is also an ability to systematically evaluate the quality of thoughts of oneself and others. Likewise with opinion of [3], A mathematical model of learning that forms a logical thinking skills, critical, creative, consistent and growing confidence and character is a student-centered learning, among others through the stages of constructive, interactive and reflective

With the arrangement of quality, quality education and competency development in the industrial revolution era, it is expected to be able to support the creation of skilled, intelligent, competent and broad-minded students to compete with other human resources in the global era, especially in the industrial revolution era 4.0. Once the importance of critical thinking for students, then the teacher should prepare the components in the learning process to work optimally. To improve the learning process, we need an educational arrangement that is by paying attention to every element contained in the learning process. [4], stated that the learning model is very important. The learning model is one of the elements that must be considered because by paying attention to the learning model, the learning process will take place well, interesting, and not boring. In addition to the learning model, the role of the teacher is very influential on the educational process. It is indeed natural because the teacher's role as the spearhead is directly related to students as subjects and learning objects.

Based on this, there needs to be innovations in learning such as interesting and interactive learning models, both interactive among students, and or students with teachers during the learning process. In this case, the Discovery Learning model was chosen because with this model the learning process is more interesting and challenging. This is in line with the opinion of [5], that Discovery Learning is a teaching strategy that can be used by instructors to increase the involvement and relevance of content with students involved in teaching. Also the opinion of [6], stated that the excellence of the Discovery Learning model is to arouse students' curiosity and motivate them to continue working in finding answers, students also learn the ability to solve problems and critical thinking independently because they have to analyze and manipulate data. This is in line with the opinion of [7], that Discovery Learning is a learning process where students find domain knowledge from their own investigations or examples. Discovery Learning places more emphasis on finding concepts or principles that were not previously known.

Success in the learning process can be seen from the results of student learning and critical thinking skills. One internal factor that affects students' critical thinking skills is cognitive style. This is supported by the statement of [8] which stated that, in addition to being different in the level of problem solving skills, the level of intelligence, or the ability to think critically, students can also differ in the way they acquire, store and apply knowledge. Everyone has their own ways of liking what they see, remember and think. These interpersonal differences that persist in compiling and processing information and experiences are known as cognitive styles. Cognitive style consists of two types, namely Field Dependent (FD) and Field Independent (FI). Someone who has a field dependent cognitive style in receiving information more globally and has difficulty in critical thinking. Whereas someone who has an independent field cognitive style tends to be more analytical in receiving information.

Remembering the importance of efforts to improve critical thinking skills, efforts to improve the quality of learning need to be done. One learning strategy that can be done is through the use of instructional media, namely Prezi media. [9], stated that "Prezi presentation media is a software used for presentations that are almost the same as Power Point, but has other advantages in the form of Zooming that allows Prezi users to be able to enlarge and reduce the appearance of their presentation media with collaboration and attractive colors through the slides provided. In addition to presentations, Prezi can also be used as a tool to explore and share ideas on a virtual canvas. This is reinforced by the results of research by [10], which said that Prezi is a cloud-based presentation editor that allows the user to create presentations that zoom. The goal is to make presentations more dynamic in nature and not as linear in structure.

Based on the description above, researchers are very interested to know the effect of Discovery Learning model assisted by Prezi and cognitive style towards the critical thinking ability of students of class XI of MAN 1 in Semarang City.

RESEARCH METHODS

The research design used was quasi-experimental or Quasi-Experimental Designs using a 2x2 factorial design as a form of treatment.

Table 1. *2x2 Factorial Design*

Cognitive Style	Learning Model	
	Discovery Learning (A1)	Lecture (A2)
Filed Dependent (B1)	A1B1	A2B1
Field Independent (B2)	A1B2	A2B2

The instruments used in this study were students' critical thinking ability tests and cognitive style tests. The students' critical thinking ability tests had functions to measure: (1) categorization and grouping, (2) data reduction, (3) exposure/presentation of data that has been categorized, and (4) data interpretation, and (5) drawing conclusions based on collected data.

To measure the cognitive style of students used a standard test of GEFT cognitive style developed by [11]. Data obtained from the GEFT test, to classify students into the FI or FD cognitive style. If students get score ≤ 50% of the ideal score, then students are classified as having FD cognitive style and if students get score> 50%, then students are classified as having the cognitive style of FI [11].

Analysis of the data used was two way Anova test carried out to test the main effect and the effect of the interaction of data groups from two treatments, namely the Discovery Learning assisted Prezi-lecture model and the FD-FI cognitive style. Then a further test was conducted with the Tuckey test to find out the simple effects of learning models (A) and cognitive styles (B), and to test which groups had real influence and higher critical thinking abilities.

RESULTS

Start point Results

Before the data obtained from data collection was analyzed using two way Anova, a conditional test was conducted which was the normality and homogeneity test. The data normality test used Kolmogorov-smirnov at the significance level α = 0.05 on the four data groups that gave the Kolmogorov-Smirnov statistical value> 0.05 which means that the four data groups tested came from normal distribution populations. Then the homogeneity test of the students' critical thinking ability score data was done both in the experimental class and the control class using the Leven's test. Based on the results of the Levene's test all values in both the experimental class (discovery learning model assisted by Frezi) and the control class (lecture model) have a value (sig.) of 0.935> 0.05 which means that the variance of the two data groups is homogeneous.

Both the normality test and the variance homogeneity test were performed using the aid of Statistical Product and Service Solutions (SPSS) version 19. Following this, the results of the normality test in table 2 and the homogeneity in table 3,

Table 2. *Normality Test Results for Critical Thinking Ability*

Variable	***Kolmogorov-smirnov***	**Significance**	**Conclusion**
$A_1 B_1$	0,781	0,578>0,05	Normal
$A_1 B_2$	0,562	0,912>0,05	Normal
$A_2 B_1$	0,570	0,903>0,05	Normal
$A_2 B_2$	0,669	0,764>0,05	Normal

Table 3. *Homogeneity Test Results of Student Mathematics Learning Outcomes*

Variable	Significance Value	Significance Level	Conclusion
Critical Thinking Ability	0,851	0,05	Homogeneous

Local Instructional Theories

Activities in the learning process that cultivate students' creativity will build imagination and generate new ideas. This is in line with the opinion [12], creativity in schools provides students with experiences in situations where no answers are known, and there are several solutions as a basis for imagination. With the opportunity to express thoughts or ideas, it will train students to think critically about each opinion or problem encountered.

Based on this, there need to be innovations in learning such as interesting and interactive learning models, both interactive among students, and or students with teachers during the learning process. In this case, the Discovery Learning model was chosen because with this model the learning process is more interesting and challenging. [13], stated that the Discovery Learning model includes a learning model that requires students to be active, discover the concept of material and existing problems so that students can remember it for a long period of time, and requires students to be able to think critically. Research results [14], [15], also stated that student learning outcomes using the Discovery Learning model were better than student learning outcomes using conventional learning models.

Endpoint Results

Anova Test Results

Two way Anova Test Results are presented in table 4 below:

Table 4. *Testing Anova of Critical Thinking Ability*

Variation Source	JK	db	RJK	$F_{counting}$	F_{table} $\alpha = 0,05$
Between A	2,253	1	2,253	5,389	4,04
Between B	1,887	1	1,887	4,514	4,04
Interaction of A and B	5,362	1	5,362	12,828	4,04
In	19,563	48	0,418		
Total	29,346	51			

Based on the results of the data calculation of critical thinking ability using two way Anova obtained: that the source of interaction variation between learning models and cognitive styles on the dependent variable students' critical thinking ability in table 4, shows that the F value of 12.828> 4.04 with a significant level of 0.05, so Ho is rejected. The results of this test indicate that there is an influence of interaction between learning models (discovery learning assisted by Prezi and lecture) together with cognitive style (FI and FD) towards students' critical thinking ability.

Factor A Test Results (Learning Model)

Following data analysis is obtained results: there is the difference between the critical thinking ability of class XI MAN students who study with Discovery Learning model assisted by Prezi and lecture model. This can be seen in table 4, the F value of 4.514> 4.04 for a significance level of 0.05 which means that Ho is rejected or there is a difference between Discovery Learning method assisted by Prezi and lecture method gives a significant influence towards the critical thinking ability of class XI MAN students.

Factor B Test Results (Cognitive Style)

The third data analysis shows that: there is the difference between the independent and the field dependent cognitive style of the students' critical thinking ability, this can be seen in table 4, F value of 12.828> 4.04 with a significance level of 0.05 which means that Ho is rejected or there is the difference between independent field cognitive style and field dependent cognitive style towards students' critical thinking ability. Based on

the analysis of these data, it shows that students with both cognitive styles affect the critical thinking ability of MAN students.

DISCUSSION

The Effect of Interaction of Discovery Learning Model and Learning Style

These results indicated that the interaction of learning models and cognitive styles simultaneously affected students' critical thinking ability. This was possible because one of the models used was Discovery Learning assisted by Prezi, which in the learning process was able to enable students to obtain ideas so that learning was more meaningful. In addition, by using the Prezi media, students were more interested and happy to learn, as a result, students' critical thinking ability also gradually increased. In line with [16], stated that, the use of Prezi multimedia presentations can accommodate cognitive abilities at the level of remembering, knowing, and understanding. Thus, the type of use of Prezi's presentation multimedia is more appropriate. [17], the effectiveness of the medium is on the effective category. It is concluded that the Online Prezi instructional medium which was developed is eligible for use in learning. In the use of learning models are also in line with the opinion [18], that the use of discovery learning models significantly influences the improvement of students' critical thinking ability. It is known that the average increase in critical thinking abilities of the experimental class students is higher, with an average increase of 62.80 compared to the control class of only 27.49.

Learning outcomes if linked to students' critical thinking ability cannot be separated from internal factors and cognitive styles. Cognitive style is a factor that sufficiently influences the ability of each individual to solve a problem, especially in solving mathematical problems. Cognitive style is a typical way for students to learn, both related to how to receive and manage information, attitudes towards information, and habits related to the learning environment.

The Effect of Learning Model

The critical thinking ability of MAN students was influenced by the learning model used by the teacher, in this study students who in the learning process used the Discovery Learning model had critical thinking ability better than students taught by conventional models. This is consistent with the opinion [5], that Discovery Learning is a teaching strategy that instructors can use to increase the involvement and relevance of content with students involved in teaching. This is in line with the opinion [19], that the critical thinking ability of students whose learning uses the Discovery learning model is different or better than students whose learning uses conventional models.

The Effect of Cognitive Style

Cognitive style possessed by students also affected the critical thinking ability of MAN students. This is in accordance with opinion [20], indicating that FI subjects can evaluate results with significantly higher accuracy compared to FD subjects. When assessing their own experiences in FI learning it is easier to find usability problems from FD subjects. Likewise, [21], [22], stated that the FD cognitive style tends to work with external motivation, that is, seeking guidance and guidance from others, while FI views the problem analytically, is able to analyze and isolate relevant details, detect patterns, and critically evaluate an issue. Whereas [23], argued that the characteristics of these different cognitive styles can affect students' mathematical problem solving abilities and critical thinking abilities.

CONCLUSION

In general, the results of this study can be concluded that the interaction of learning models and cognitive styles simultaneously affect students' critical thinking ability. Specifically, based on the research objectives and the results of the analysis of research data and the discussions put forward, the conclusions can be drawn as follows: (1) there is the effect of Discovery Learning model assisted by Prezi and cognitive style towards the critical thinking ability of MAN students, (2) there is the difference between the critical thinking ability of MAN students who learned with Discovery Learning model assisted by Prezi and lecture model, and (3) there is the difference between the independent field cognitive style and field dependent towards the critical thinking ability of MAN students.

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