Anatolian Journal of Education
e-ISSN: 2547-9652

April 2024 ● Vol.9, No.1
www.e-aje.net
pp. 215-230

Effects of Learning Strategies and Learning Styles on Learning Performance in The Social Sciences Subject of Disaster Mitigation

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This research aimed to investigate the impact of learning strategies with learning styles on learning performance in disaster mitigation. Problem Based Learning (PBL) and Direct Instruction (DI) are the strategies used. The learning styles used as moderator variables are kinaesthetic, visual and auditory. The research subjects included two junior high schools, SMPN 1 Sidoarjo and SMPN 1 Maospati, with a total of 122 students. The two-way ANOVA analysis technique was used to process the data obtained statistically. This research indicates that PBL strategy with visual learning style is superior to DI strategy with other learning styles in terms of learning achievement in disaster mitigation. This research has shown that considering the specific learning strategy and learning style of students contributes to positive learning outcomes in disaster mitigation.

Keywords: learning strategies, learning styles, disaster mitigation, learning performance, learning

INTRODUCTION

In learning the teacher needs to design the implementation of learning strategies that involve more active student involvement (Settles, 2012). However, the important role played by students in terms of their ability, which has received less attention, is their ability to solve problems. Yet, problem solving requires clear direct instruction from the teacher in terms of task learning.

Problem-solving skills in disaster mitigation are especially important for school children, because children are the most vulnerable group during a disaster, especially those who were in school at the time the incident took place (Agustiana et al., 2013). During a disaster, school buildings are destroyed, reducing the life span of school students and teachers who are very valuable and disrupting the right to education as a result of the disaster (Paton, 2003).

In addition to problem-based learning strategies, direct instruction (DI) strategies can be used as alternative strategies in learning disaster mitigation materials. Kim & Axelrod (2005), argue that the DI strategy requires teachers to regulate and control the content and knowledge procedures to be

Citation: Prasetya, S. P., Fadirubun, F. F., Sitohang, L. L., & Hidayati, A. (2024). Effects of learning strategies and learning styles on learning performance in the social sciences subject of disaster mitigation. *anatolian journal of education*, 9(1), 215-230. https://doi.org/10.29333/aje.2024.9115a

acquired by students so as to increase focus on what students must learn and achieve. It requires very careful planning and execution on the part of the teacher to be effective (Stockard & Wood, 2018). DI entails that every detail of skill or content is carefully defined, and demonstrations and training schedules are carefully planned and implemented.

Another factor that needs to be considered in optimizing the learning achievement of disaster mitigation in social science subjects is student characteristics in the form of learning styles. This was also conveyed by Taconis et al., (2001); Slavin, (2020), revealed that learning conditions affect the efficiency and effectiveness of learning strategies, meaning that the efficiency and effectiveness of implementing learning strategies is influenced by student characteristics. One characteristic that cannot be manipulated is the student's learning style.

In Indonesia, disaster mitigation education is designed, developed and implemented especially in areas that are prone to disasters (Hasanah et al., 2016). The disaster mitigation must be learned in social science material (Maryani, 2010). When linked to the Merdeka Curriculum in Junior High Schools, disaster mitigation is one of the learning achievement that must be mastered by students. The learning achievement in this disaster mitigation material are "*able to analyze the relationship between the geographical conditions of the area and the characteristics of the community and understand the potential of natural resources and their relation to disaster mitigation*" (Kemenbdikbud, 2022).

In 2021, 2.384 disaster events were recorded in the country, 386 of which occurred in the East Java region (Sudarmawan, 2021). Following these records, the province is implementing disaster mitigation in its school's curriculum. It is implemented in order to minimize the risk due to disaster. Some disaster mitigation learning includes, among others, introduction to the types and locations of disaster risks, efforts to prevent or anticipate disasters, how to handle disasters, how to save yourself, and how to survive in disaster situations (Smit & Wandel, 2006; Puspitawati et al., 2017).

Although schools in East Java have been pursuing learning about disaster preparedness as a subject to the present day, the level of learning remains low. This is the case in two junior schools in the province, namely SMPN 1 Sidoarjo and SMPN 1 Maospati, Madiun. Reports from an observation and discussion in the two schools suggested that the low learning achievement is caused by the fact that the students are not activated in the learning activities. In the learning process, the students are only asked to listen to and remember a series of disaster preparedness materials from the teacher. The reports describes that these results happen because teachers still use learning strategies that are teacher centered. Besides that, the ability of students in analyzing disaster mitigation is very weak, students tend to memorize so they quickly forget. Prasetya (2014) explained that learning that makes students passive and only teacher-centred will result in low learning outcomes. Thus, such a result, therefore, calls for re-examining.

With this in mind, the main aims of this research are 1) to explain differences in learning achievement between students using PBL strategies and DI strategies, 2) to explain differences in learning achievement between groups with auditory, kinaesthetic and visual learning styles, and 3) to analyse the interaction between learning strategies and learning styles.

Literature Review

The importance of students' active involvement in learning was put forward by Gleason et al., (2011) which states that students must have their learning abilities raised by mastering and being able to implement their knowledge to be directed to be able to find problems, analyze problems to make solutions to problems according to their own ideas. The task of learning is not to pour information into students' heads, but to involve students' minds actively by connecting correct and useful concepts to solve problems (Mizokami, 2017); (Setiawan & Supiyandi, 2018).

Student-centered learning that explores students' ability to solve problems actually allows it to be applied to disaster mitigation material (Maryani, 2010). Disaster mitigation preparedness education in

schools is defined as practical thoughts and efforts in solving problems to reduce or eliminate all forms of disaster risk (Salsabila & Dinda, 2016). Solving problems in learning is done by prioritizing and/or prioritizing other educational processes so that students can actively develop a culture of preparedness in facing the threat of danger from a disaster (Setyowati, 2019).

The implementation of teaching methods that are lectures from the teacher alone makes students' activeness in learning relatively low (Nurhaliza. et al., 2021). Most students tend to only be able to imitate what the teacher does (Savira et al., 2018). Students are not able to use textbooks effectively. They tend to re-record concepts in textbooks, so they spend a lot of time and learning becomes inefficient.

Applied learning must pay attention to several important components, namely strategies and student characteristics (Reigeluth & Alison, 2009). Thus it is necessary to consider what strategies and student characteristics are so that they can optimize disaster mitigation learning achievement. Research chooses to use the learning strategies that are applied are PBL and DI designed by Arends (2012).

Stages of problem-based learning strategies, namely: 1) student orientation to problems, 2) organizing students to learn, 3) guiding individual and group investigations, 4) developing and presenting results, 5) analyzing and evaluating the problem-solving process. The stages of the direct instruction strategy are: (1) convey objectives and prepare students, (2) demonstrate knowledge and skills, (3) Guide training, (4) check understanding and provide feedback, (5) provide opportunities for further training and application (Arends, 2012).

Paying attention to the characteristics of disaster mitigation material as part of social science subjects that require a strong material understanding relationship regarding disaster mitigation through problem solving efforts, a problem-based learning strategy is needed that can encourage a learning process with optimal learning achievement for the development of all potential students. According to Uliyandari et al. (2021) in PBL, learning is carried out by oriented problems in a concrete form. Problems can be in the form of events on objects on the earth's surface that are associated with understanding the concepts of disaster mitigation that will be learned; Learning begins after students are faced with real problem conditions. Through the PBL learning method, students understand how they construct meaningful knowledge. All the knowledge gained will be analyzed both individually and in joint discussions or practicing the results of solving problems that have been developed together (Ulger, 2018).

DI (Direct Instruction) strategies can be applied to any subject, but this strategy is best suited for performance-oriented subjects (Stockard, 2011). Disaster mitigation requires understanding orientation in learning. To gain a comprehensive understanding of the concept of disaster mitigation, students must go through a series of concepts that must be mastered step by step. In disaster mitigation, there are three concepts of important stages, namely pre-disaster, when a disaster occurs, and post-disaster.Vitale & Kaniuka (2012), assume that these declarative and procedural concepts must be understood comprehensively by students. Strategies that emphasize procedural and declarative knowledge are direct instruction; Farchatun & Indrayati (2015), argues, in implementing DI strategies, teachers teach according to disaster mitigation measures, starting from defining disaster mitigation and its components, analyzing the disaster mitigation cycle, classifying types of disasters in Indonesia, disaster mitigation strategies (mapping, dissemination of information/socialization, monitoring, early warning).

In addition to learning strategies, many other factors influence learning achievement. Slavin (2020), states that the need to provide teachers involve student characteristic factors to accommodate their learning modalities. Almost the same thing was conveyed by Marton & Pang (2006), who argued that diversifying learning strategies in various kinds of lessons according to the objectives and topics of the lesson taking into account a variety of different learning styles would be able to optimize student

learning achievement; (Awla, 2014), to be able to implement an effective learning strategy, it takes the involvement of the conditions or characteristics of students. student characteristics that are expected to influence learning achievement are student learning styles.

Learning innovations carried out in disaster mitigation learning through problem-based learning strategies and direct instruction, where learning is focused on problems with up-to-date themes in the areas where students live. According to (Mortimore, 2003; Suryani et al., 2014), through the application of appropriate learning strategies taking into account different learning styles, learning social sciences in disaster mitigation material is expected to achieve optimal learning achievement.

Consideration of the determination of variables on the cognitive aspect as a variable based on the study of cognitive learning achievement as a learning orientation in solving and understanding disaster mitigation (objects of social science subject disaster mitigation) and easy to measure. Assessment of learning achievement in the cognitive aspect used refers to the opinion of Reigeluth (1999), includes four levels, namely memorized information, Understand relationships, apply skills, apply generic skills. The learning achievement in this study are the cognitive domain at the level of Understand relationships and applying/solving skills). This is in line with the objectives of disaster mitigation material in Social Sciences subjects, that students have the competence to understand and solve problems in Social Sciences subjects, especially in disaster mitigation materials (Sugiharyanto et al., 2014).

Through appropriate learning strategies by facilitating learning modalities, namely students' learning methods or learning styles, learning achievement regarding understanding disaster mitigation will be optimized. Learning styles that match the instructional strategy are very important (Malacapay, 2019). Jacobsen et al. (2009) argues that learning styles have important implications that remind teachers of the need to diversify learning strategies according to student learning styles because there is no learning strategy that is liked by all students. Effective teachers use a variety of learning strategies to achieve different goals.

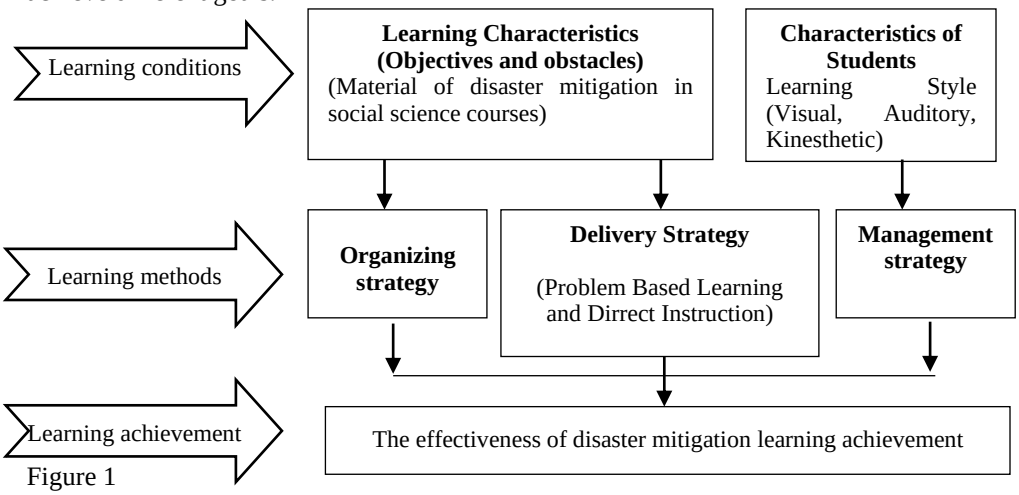

Figure 1
Conceptual framework adapted from Reigeluth & Alison (2009).

METHOD

Research Design

Quasi-experimental method with 3 x 2 patterned factorials was used to carry out this research. The 3 x 2 factorial designed in this research is the learning style which consists of three types, namely visual,

auditory and kinesthetic, learning strategies which consist of two, namely PBL and DI. The two variables were analyzed for their interactional influence on disaster mitigation learning achievement.

The independent variable is the learning strategy, which includes the PBL strategy and the DI strategy. Then the attribute independent variable (moderator) is the student's learning style. While the dependent variable in the research is the learning achievement of disaster mitigation which is measured at the level of relationship understanding and problem solving ability (apply skills) which are classified in the learning taxonomy of Reigeluth (1999). The determination of the two levels of disaster mitigation learning achievement is adjusted to the Merdeka curriculum that applies to junior high schools, namely the learning objectives of disaster mitigation in junior high schools with learning achievement having the ability to understand and solve disaster mitigation problems.

Table 1
Research data analysis design

Treatment variable (A) / Attribute variable (B)		Strategy	
		Direct Instruction (A_1)	Problem Based Learning (A_2)
Learning Style	Auditory (B_1)	B1A1 (19 student)	B_1A_2 (18 student)
	Visual (B_2)	B2 A1 (21 student)	B_2A_2 (21 student)
	Kinesthetic (B_3)	B3A1 (20 student)	B_3A_2 (21 student)

Information:
A_1 B_1 = direct instruction with auditory learning style
A_2 B_1 = problem based learning with auditory learning style
A_1 B_2 = direct instruction with a visual learning style
A_2 B_2 = problem-based learning with a visual learning style
A_1 B_3 = direct instruction with kinesthetic learning styles
A_2 B_3 = problem-based learning with kinesthetic learning style

The researcher is concerned with the independent variables, and wants to assess both the effects separately and together (Arikunto, 2019). Both independent variables are manipulated, this design allows analysis of main effects to be carried out for both experimental variables as well as analysis between treatments. For both experimental variables and analysis between treatments. The factorial design grouped subjects according to several treatments and groups to be observed (Tuckman, 1999). The design of the research procedure table 2 is as follows:

Table 2
Research design

Group	Pretest	Group treatment	post test
1	O_1	X_1Y_1	O_2
2	O_1	X_1Y_2	O_2
3	O_1	X_1Y_3	O_2
4	O_1	X_2Y_1	O_2
5	O_1	X_2Y_2	O_2
6	O_1	X_2Y_3	O_2

dapted from Tuckman, (1999).
Information:
X_1 = implementation of PBL
X_2 = implementation of DI
Y_1 = auditory learning style
Y2 = visual learning style
Y3 = kinesthetic learning style
O_1 = pretest
O_2 = = postes

Research Subject

The research subjects were students of SMPN 1 Sidoarjo and SMPN 1 Maospati, Madiun, 2022-2023 academic year. Subjects were determined in this research through two stages, namely: (1) assigning schools to groups of problem-based learning strategies (experimental class) and direct instruction strategies (control class), (2) assigning classes where all students will receive treatment of problem-based learning strategies (experimental class) and direct instruction strategies (control class).

Table 3
Research subjects

Group	Academic year	Schools	Class	Student	Gender	
					male	female
Control (DI)	2022-2023	SMPN 1 Sidoarjo	VIIA	32	16	16
	2022-2023	SMPN 1 Sidoarjo	VIIB	30	17	23
Experiment	2022-2023	SMPN 1 Maospati	VIIA	29	16	13
(PBL)	2022-2023	SMPN 1 Maospati	VIIB	31	15	16

Research Procedure

In carrying out the experiment the following steps were applied: (1) giving a learning style questionnaire. Students are given instruments regarding learning styles with the aim of identifying their learning styles (visual, auditory, kinesthetic), (2) carrying out a pre-test using disaster mitigation learning achievement instruments in the form of essays to test students' initial abilities regarding disaster mitigation material to be studied, (3) carry out learning treatments (experiments), (4) carry out post-tests.

The learning treatment that has been carried out eight times by applying the PBL and DI strategies, is then carried out posttest. The test is used to determine the outcome of the applied treatment. This test is given to each student after the subject of discussion in carrying out the disaster mitigation learning process has been completed. This posttest activity tested the differences between the PBL group with the DI group on the learning achievement of disaster mitigation. Next, analyze the interaction with learning styles on the cognitive aspects of disaster mitigation learning achievement.

Research Instruments

The research instruments consist of: (1) learning achievement test consisting of pre-test and post-test, (2) learning style questionnaire (DePorter & Hernacki, 2001).

This test instrument was given before and after treatment. The test was developed in an open description format consisting of 10 questions with a value for each question from 0 to 5 so that the maximum score achieved is 50. The value of learning achievement is obtained by dividing the total number of scores obtained by 5 then multiplied by 10. Thus, if a student gets a score perfect then the learning achievement will get a score of 100. The final score refers to the school's assessment standard, which is between 0-100. Post-test data from the cognitive aspect is used to analyze the influence between research variables. The level of ability measured includes the realm of understanding and problem-solving abilities.

The learning style instrument is a questionnaire adapted from DePorter et al., (2014). The developed questionnaire is a checklist containing statements that must be answered using a score between 1 to 4 which contains 12 statements from each learning style. The questionnaire contains statements containing indicators of visual, kinesthetic and auditory learning styles.

In the three instruments each student will fill it out. The score obtained from each instrument represents the learning style. Scores are then compared. The highest score of the instrument shows the

tendency of students' learning styles. With this instrument students can be grouped into three categories, namely kinaesthetic, auditory, and visual learning styles.

Data Analysis Technique

This research compares the treatment of PBL and DI strategies based on learning style modalities on learning achievement. Then carry out an analysis of the influence between learning strategies with learning styles on disaster mitigation learning achievement. Two-way ANOVA analysis was performed to test the established variables; This study involves independent, moderator and dependent variables, so it uses a factorial design for its analysis (Sugiyono, 2015). To test the data in this study, it was applied through two stages, in the form of prerequisite test and hypothesis test**.**

FINDINGS

Description of Learning Outcome Data

The description of the pretest data in the PBL class was reviewed in several ways, such as a mean of 46.86, a minimum score of 25.65, a maximum score of 63.86. The pre-test data for the DI class is the mean 47.05, the minimum score is 24.12, the maximum score is 62.23. The pre-test data for both classes were then subjected to a different test with a P-value of 0.870, which means that it is greater than the significant value of 0.05. It can be concluded that the two pretest data (initial knowledge) of the two classes are not significantly different.

Completed pretest analysis, then the implementation of learning with PBL and DI strategies was carried out on disaster mitigation material for eight meetings. To find out the extent of its effectiveness, after learning, posttest activities are carried out. Posttest is the result of learning disaster mitigation material.

Data regarding the learning achievement of disaster mitigation materials by applying problem-based learning strategies (PBL) can be divided into three categories, namely: (1). PBL on visual learning style (PBL-V) number of students (N) 22, mean score 81.22, standard deviation (SD) 7.90378; (2). PBL on auditory learning style (PBL-A) number of students (N) 20, mean score 71.5, standard deviation (SD) 6.52525; (3) PBL on kinesthetic learning style (PBL-K) number of students (N) 18, mean score 79.44, standard deviation 7.90549.

Data regarding the learning achievement of disaster mitigation materials by applying the direct instruction (DI) strategy can be divided into three categories, namely: (1). DI on visual learning style (DI-V) number of students (N) 22, mean score 78.14, standard deviation (SD) 9.01478; (2). DI on auditory learning style (DI-A) number of students (N) 18, mean score 74.44, standard deviation (SD) 7.93520; (3) DI on kinesthetic learning style (DI-K) number of students (N) 22, mean score 70.23, standard deviation 7.93984. A description of the learning achievement of disaster mitigation can be explained in the table 4.

Table 4
Summary of learning achievement data on disaster mitigation materials

Strategy	Learning_style	Mean	Std. Deviation	N
PBL	Visual	81.2273	7.90378	22
	Auditoriy	71.5000	6.52525	20
	Kinestetik	79.4444	7.90549	18
	Total	77.4500	8.51405	60
DI	Visual	78.1364	9.01478	22
	Auditoriy	74.4444	7.93520	18
	Kinestetik	70.2273	7.93984	22
	Total	74.2581	8.86129	62
Total	Visual	79.6818	8.52295	44
	Auditoriy	72.8947	7.28118	38
	Kinestetik	74.3750	9.09688	40
	Total	75.8279	8.80335	122

Assumption/Prerequisite Testing

Before the hypothesis is carried out, it is necessary to test the assumptions/requirements first. Assumption testing is carried out through normality and homogeneity tests of data. Data normality testing uses Shapiro-Wilk and Kolmogorov-Smirnov. Below is table 5 of the results of the data normality test.

Tabel 5
Tests of normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Strategi	Statistic	df	Sig.	Statistic	df	Sig.
learning_outcames	PBL	.082	60	.200*	.984	60	.596
	DI	.115	62	.060	.973	62	.184

**. This is a lower bound of the true significance.*
a. Lilliefors Significance Correction

Table 5 shows the significant value in the Shapiro-Wilk and Kolmogorov-Smirnov tests for both the PBL and DI strategies, all of which have a value greater than 0.05, means that the data presented is normally distributed.

Furthermore, testing the homogeneity of the data was carried out. The calculation of the homogeneity test was carried out by the Levene test. The following is table 6 regarding the results of the data homogeneity test.

Tabel 6
Test of homogeneity of variances

learning_outcames			
Levene Statistic	df1	df2	Sig.
.135	1	120	.714

Table 6 shows a significant value on the Levene test of 0.714 or greater than 0.05, which means that the learning outcome data is homogeneous. Because all the data has met the homogeneous and normal criteria so that it can be continued to test the hypothesis.

Hypothesis Test

Below is presented table 7 of the results of hypothesis testing implementing the two-way ANOVA technique.

Table 7
Summary of calculation results of the two-way variance analysis technique at the significance level α = 0.05

Dependent Variable: Learning achievement of disaster mitigation					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2093.178a	5	418.636	6.667	.000
Intercept	695879.628	1	695879.628	11081.788	.000
strategy	294.740	1	294.740	4.694	.032
learning style	997.508	2	498.754	7.943	.001
strategy * learning style	716.244	2	358.122	5.703	.004
Error	7284.207	116	62.795		
Total	710861.000	122			
Corrected Total	9377.385	121			

a. R Squared = .223 (Adjusted R Squared = .190)

Table 7 above summarizes the two-way ANOVA test. There are two ways of taking conclusions, namely: comparing the P-value with significance. the desired level of confidence is 95%, the significance level is 100-95 = 5% or 0.05. The P-value of the learning strategy is 0.032; The P-value of the learning style is 0.01; The P-value of the influence between strategies with learning styles is 0.04. Because all P-values <0.05, the treatment has a significant effect on the parameters.

There are significant differences in the learning achievement of disaster mitigation between groups implementing PBL and DI strategies. There are significant differences in the learning achievement of disaster mitigation between groups with visual, auditory and kinesthetic learning style modalities. There is an influence between strategies with learning styles on learning achievement of disaster mitigation.

Referring to table 7, it can be concluded that each influence between learning strategies with learning styles, namely the interaction of PBL with visual learning styles (PBL-V), PBL with auditory learning styles (PBL-A), PBL with kinesthetic learning styles (PBL-K), DI with a visual learning style (DI-V), DI with an auditory learning style (DI -A), DI with a kinesthetic learning style (DI -K) have varied impacts on disaster mitigation learning achievement. Referring to the average value, it can be concluded that the best interaction in improving learning achievement in disaster mitigation is the interaction of PBL strategies with visual learning styles (PBL -V) with a score of 80.59 and then followed by successive interactions of PBL -K (79.44), DI- V (75.6364), DI-A (72.83), and PBL-A (71.50), DI -K (70.22).

Because the treatment has a significant effect on the parameters, it is necessary to carry out further tests to compare the individual effects of each treatment. The next test is a post hoc test using the Bonferroni test to see which groups are different (learning style group). The following is table 8 post hoc results of the Benferroni test.

Table 8
Post hoc test

Bonferroni

(I) Learning_style	(J) Learning_style	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Visual	Auditoriy	6.7871*	1.75489	.001	2.5241	11.0501
	kinesthetic	5.3068	1.73119	.068	1.1014	9.5122
Auditoriy	Visual	-6.7871*	1.75489	.001	-11.0501	-2.5241
	kinesthetic	-1.4803	1.79510	1.000	-5.8409	2.8804
kinesthetic	Visual	-5.3068	1.73119	.068	-9.5122	-1.1014
	Auditoriy	1.4803	1.79510	1.000	-2.8804	5.8409

Based on observed means.
The error term is Mean Square(Error) = 62.795.
**. The mean difference is significant at the ,05 level.*

From table 8 the Post Hoc Test above shows that the groups that show differences in learning achievement of mitigation (marked with an asterisk "*") are the "visual" and "auditory" groups, this is also evidenced by the p value of 0.001 which means it is smaller than at a significant value of 0.005.

DISCUSSION

Effect of Learning Strategies on Learning achievement of Disaster Mitigation

The results of hypothesis testing with two-way ANOVA show evidence that there is a significant difference between the group that carries out learning with the PBL strategy and the group of students who learn with the DI strategy. Based on the calculation of the average value, overall the implementation of the PBL strategy has a better effect than the implementation of DI on disaster mitigation learning achievement.

Factors that can make the learning achievement of disaster mitigation on the PBL strategy superior to the DI strategy are:

First, the advantages of problem-based learning strategies compared to direct instruction because problem-based learning strategies are in accordance with the character of disaster mitigation material. According to Maryani (2010) and Lestari (2008), problem-based learning strategies provide opportunities for students to analyze existing problems through discussion activities and group work regarding disaster mitigation. As stated by Qurrotaini & Nuryanto (2020), disaster mitigation is essentially a problem-solving activity in the form of analysis that uses all the capabilities of mastering the concept of disaster mitigation in the form of pre-disaster analysis, disaster events, and post-disaster. All three are used to analyze disaster mitigation to produce the desired disaster spatial information, for example for mapping information on disaster-prone areas.

According to Surjati & Wiwoho (2014); Silviariza et al. (2023), Problem-based learning is the right strategy to improve competence with geospatial references (spatial space on the earth's surface). Disaster mitigation is part of the real problems that exist in geospatial; Geospatial-related problems need to be solved by students themselves through a comprehensive study of disaster mitigation problem solving, including involving social factors (Woa et al., 2018).

Second, problem solving makes students active in the student learning process (Slavin, 2018); (Choden & Kijkuakul, 2020). Problem solving in disaster mitigation plays a major role in learning activities and their resolution. Through problem solving activities in aspects of disaster mitigation capabilities are important such as implementing rules on problems that are rarely encountered, finding patterns, generalizing, communicating, etc. can be developed in a more positive way; It is possible for students to gain experience to use the knowledge and abilities they already have by forming cognitive structures through assimilation and accommodation processes (Degeng, 1997). Meaningful learning

is very important because students try to relate new phenomena to their knowledge structures. That is, the learning strategy must match the abilities (characteristics) of students and must be relevant to the cognitive structure of students (Joyce et al., 2009).

In contrast to the direct instruction strategy which emphasizes the importance of achieving learning goals that must be achieved by students according to standards in the curriculum (Rosmi, 2017). In the direct instruction strategy the teacher must monitor step by step until the learning objectives are achieved. The teacher's dominance in learning activities makes it difficult for students to develop understanding, which so far has been more often taught using the lecture method (Zahrian, 2014). This learning causes the teacher to become the center or main source of knowledge, so that students cannot develop their thinking patterns. Students tend to accept what the teacher gives. The teacher does not give flexibility to students to construct their knowledge, even though students themselves have basic knowledge to be developed (Lardika & Tulyakul, 2020).

Third, PBL triggers an increase in students' new understanding through cognitive conflict. The findings of Puspasari (2017); (Mustofa & Hidayah, 2020), concluded that in the process of meaningful learning it is very important to provide cognitive conflict so that students can assimilate and accommodate to form new knowledge in strengthening intellectuality and problem solving abilities. Woolfolk (2010), suggests that cognitive conflict is developed to explain when a student is faced with an anomalous situation that does not suit him or his preconceptions in learning. Anomalous data have had a significant impact on science learning by being used extensively in teaching to promote conceptual change; Stimulating problems into cognitive conflicts in learning can help students reconstruct their knowledge. With this reconstruction students will more easily connect the knowledge that is being studied with the knowledge that has been studied before. Such learning activities will provide meaningfulness to students through the process of critical thinking that occurs (Limo´n, 2001). The problems presented in learning to students will lead to conflict situations or disequilibrium. Students will try to find a new balance through various processes such as discussing with friends, seeking new information or trying various experiences through assimilation. If students are able to solve their problems, they will experience a new balance (Verawati & Afifah, 2018).

Effect of Learning Styles on Learning achievement of Disaster Mitigation

The two-way ANOVA analysis also revealed that there were significant differences between groups of each learning style on disaster mitigation learning achievement. The group with the visual learning style obtained better learning results than the group with the kinesthetic and auditory learning styles.

Based on the average score of the disaster mitigation learning achievement test, it can be explained that the visual learning style gets the best score compared to the kinesthetic and auditory learning styles. Almost the same conditions from Irawati's et al. (2021) research, that 45% of children who have a visual learning style have better learning achievement than kinesthetic and auditory learning styles; Visual modality helps students to remember subject matter that is directly seen so that it affects the learning achievement obtained (Chania et al., 2016). In disaster mitigation learning, many materials are presented in visual media such as pictures, diagrams, animations, demonstrations, or videos. Providing information through videos, pictures, infographics or diagrams regarding disaster mitigation material is a positive stimulus to be responded to well by students who have this visual modality.

The importance of visual style in learning disaster mitigation was also raised by Prasetyo, (2022), who revealed that disaster mitigation uses visual media that exist on earth that communicates geographical phenomena (disaster phenomena) to students. Material visualization of natural disasters is an important component for analyzing the relationships between factors that influence disasters on the earth's surface.

The results of these findings provide information especially for Social Sciences teachers that in implementing the learning process, teachers must identify and provide more support for learning styles (Rahman & Yanti, 2016). After knowing the student's learning style and the most prominent intelligence tendencies it has, the teacher adjusts it to the student's learning style (Isnanto, 2022). How to adapt to student learning styles, among others:

First, for visual students, where they absorb more information through their eyes, things that can be done to maximize their learning abilities are: (1) by letting them sit on the front bench so they can immediately see what the teacher has written or drawn on the board. write, (2) besides writing make more charts, diagrams, flow-charts, maps explaining something, (3) provide visual media in the form of disaster mitigation images and aerial photographs, ask them to interpret several objects on the earth's surface, (4) rewrite what is on the blackboard, (5) use different colors on the writing.

Second, for auditory students, where they absorb more information through hearing, things that can be done to maximize their learning abilities are: (1) when studying, let them read aloud and loudly, (2) often ask questions to them, making class discussions, using recordings, (3) letting them explain in words, (4) letting them write down what they understand about one subject and study in groups.

Third, for kinesthetic students, where they absorb more information through physical movement, things that can be done to maximize their learning abilities are: (1) practice more, simulations and role playing, (2) allow students to stand up when explaining something, (3) perform demonstrations or live performances of a process, (4) make models or examples, (5) learning does not have to be formally seated, it can be done by sitting in a comfortable position, although it is not usually done by other students, (6) allowing students to memorize something while moving, walking or pacing for example, (7) allowing students to stand when explaining something.

Interaction of Learning Strategies and Learning Styles on Learning achievement

The two-way ANOVA analysis also indicates that there is an intercept in the strategies and learning styles used which are statistically significant to the learning achievement of disaster mitigation. That is, the achievement of student learning achievement is not just due to the implementation of learning strategies, but also due to the impact of the characteristics or conditions of students in the form of learning styles.

The findings of this research support several experts, among others: Reigeluth (1983), argues that learning principles place characteristic variables (student conditions) and learning methods as givens, and provide learning achievement as observed variables. According to Woolfolk (2010), the suitability of strategies and learning styles will make students motivated and improve their learning achievement more quickly; Student steps that students consciously use to increase proficiency, store, remember, recall, and use new information if it is in accordance with student activities or behavior that can accommodate receiving and entering information will help students feel happy and motivated in their learning activities (Nurellah et al., 2016).

The learning achievement of disaster mitigation with PBL are not always better, depending on the learning styles possessed by students (Noer, 2016). PBL interaction with visual learning styles is the best interaction in improving disaster mitigation learning achievement. It can also be concluded, as discussed above, that PBL with a visual learning style separately can improve student learning achievement.

The combination of PBL strategies and visual learning styles mutually reinforce one another (Sulistyawati et al., 2018). PBL strategies and visual learning styles achieve better learning achievement because: (1) PBL is viewed as an integration of various visual-associated learning media. The integration of various visual-associated media in disaster mitigation has increased the relationship between understanding and application, (2) PBL provide actual, open-ended problems

that challenge students to identify them with the integration of visual analysis, (3) PBL strategies provide groups that have responsibility responsibility to solve problems in order to achieve common goals.

CONCLUSION

Referring to data processing and discussion of what has been concluded about several main points related to the impact of strategies and learning styles on disaster mitigation learning achievement in social science subjects for junior high school students in class VII the results of this study can explain: 1) learning achievement disaster mitigation between the study groups with PBL and DI strategies was significantly different. Overall the learning achievement of disaster mitigation students who implement treatment with the PBL strategy are higher than the learning achievement of disaster mitigation students who implement the treatment with the DI strategy. This proves that the PBL strategy has a better impact on disaster mitigation learning achievement than the DI strategy, 2) there are significant differences in disaster mitigation learning achievement between students that have visual, kinesthetic, and auditory learning style modalities. The tendency of the visual learning style to be better on disaster mitigation learning achievement than the group that has kinesthetic and auditory learning style modalities. Visual learning styles get better scores than kinesthetic and auditory in the two learning strategies applied (PBL and DI), and 3) there is an influence between learning strategies and learning style modalities on disaster mitigation learning achievement. The best learning achievement for disaster mitigation are groups who have a tendency towards a visual learning style and are taught using PBL strategies. this This research has shown positive learning outcome in terms of PBL learning strategy for the visual student's learning style with regard to the disaster mitigation. Nevertheless, further research is needed to refine subject delivery, research techniques and methods to assess and measure improvement in learners' learning and application of factual information.

ACKNOWLEDGEMENT

The authors thank the dean of FISH, Universitas Negeri Surabaya and the dean of the Tarbiyah Faculty of IAI Al-Fatimah Bojonegoro who have agreed to facilitate this research collaboration.

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