THE EFFECT OF PJBL WITH WBL MEDIA AND COGNITIVE STYLE ON STUDENTS' UNDERSTANDING AND SCIENCE-INTEGRATED CONCEPT APPLICATION

Safaruddin*[1], I. N. S. Degeng[2], P. Setyosari[3], N. Murtadho[4]

[1,2,3,4]Malang State University, Malang, Indonesia

ABSTRACT

The purpose of this study is to find out the effect of PjBL with WBL media as an instructional strategy and direct instructional (DI) strategy on the understanding (intercept) and the concept application of science-integrated learning media. The method of this research is Quasi-Experimental with 2x2 factorial design. The number of respondents is 110 pre-service teachers consisting of 68 respondents for the experimental class and 42 respondents for the control class. The sampling technique is purposive sampling with a class as an experimental class and another class as a control class. MANOVA is used to analyze the data. The result of the test shows that: (1) there is a difference in the average score of learning outcomes in understanding and science-integrated conceptual application among pre-service teachers who are taught with Web-based PjBL and DI strategies. The average score of understanding the concept of developing science-integrated learning media with a Web-based PjBL strategy is 88.81, DI is 85.69. The average score of the concept application with Web-based PjBL strategy is 89.07, DI is 85.69; (2) there are differences in the average score of understanding learning outcomes and the application of the concept of developing science-integrated learning media between pre-service teachers who have a cognitive style of FD and FI. The average score of understanding the concept of FD is 88.08, FI is 86.12. The average score of the concept application FD is 87.37, FI is 88.29. From these data, it can be concluded that the Web-based PjBL strategy has a better contribution than DI in improving the learning outcomes of understanding and application of the concept of developing science-integrated learning media.

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Keywords: PjBL; website learning; cognitive style; conceptual understanding; science-integrated

INTRODUCTION

Learning innovations must be in line with the times, therefore pre-service teachers who take education in college need to be given skills according to their times so that pre-service teacher in conducting learning also continue to innovate (Fletcher et al., 2016; Reinhardt et al., 2019; Supermane & Tahir, 2017; Wisetsat & Nuangchalerm, 2019). As a pre-service teacher, one of the courses that must be taken is Learning Media, as the development of the learning era is directed towards an integrated curriculum (Rich et al., 2019; Taseman et al., 2020). Curriculum integration is one of the elements in it, namely science-integrated learning of ecosystem theme, science-integrated learning can build cognitive structures that can bridge early knowledge with related learning experiences to create deeper and organized understanding and facilitate understanding of material relationships from one context with other contexts such as the theme of ecosystems which are integrated with learning Indonesian culture and arts (Binns et al., 2020; Fazio & Gallagher, 2019). The skills of pre-service teachers in terms of understanding and applying science-integrated learning become absolute as a provision

*Correspondence Address
E-mail: sarthi339@gmail.com

to facilitate the transfer of knowledge to students from various disciplines. This is in line with the government's recommendation to conduct integrated learning at all levels of education. The reality of the implementation of science-integrated learning is still far from expectations and even learning is still dominated by scientific disciplines such as the ecosystem theme discussed only ecosystems from a scientific perspective even though the theme of ecosystems can be integrated with Cultural Arts, Indonesian Language, Religious Education, etc. This can be seen from the results of the analysis of the learning planning document, as well as the results of interviews and observations of pre-service teachers.

Learning media have a contribution to all disciplines (Ilmi & Sunarno, 2020). Science-integrated learning needs to be designed to make it easier to understand the relationship of material from one context to another, therefore, it needs to be designed science-integrated learning that can also provide meaningful learning (Amini, 2017) and it is very important to achieve deep understanding (Nie et al., 2019). Therefore, in developing science-integrated learning media one of which can be done by involving pre-service teachers directly (Sarmi et al., 2019), involving pre-service teachers in designing science-integrated learning media (Weitzel & Blank, 2020) through learning strategies project-based (Sumarni & Kadarwati, 2020). The design of science-integrated learning media begins with the analysis of KI and KD, then creates themes and identifies KI and KD from various subjects that have the same theme which is the theme of ecosystems.

The use of technology supports the design of planning and information system in an instructional. The use of technology is passed through the integrative process (Baya'a et al., 2019) as a replacement or a conventional learning supplementary which is believed to give an effective result for educators and learners (Ghavifekr & Rosdy, 2015)Communication, and Technology (ICT as well as increase creativity (Shubina & Kulakli, 2019). One of the technologies use integratively is by using website media. Therefore, a web-based instructional has been developed by any institution or academic organization over the globe because the benefits are enormous for educators and learners (Mkrttchian et al., 2019). In recent studies, it is reported that a web-based instructional can solve the communication collaboratively in the instructional and arouse the interest and enthusiasm of learners in learning efficiently (Han, 2019). Besides, it can also increase the result of learning and is efficient in the use (Sari & Suswanto, 2017). Nevertheless, a web-based has obstacles such as inadequate support from educators. The problem of the application of technology-based media, in addition to human resources, is also facilities that still need to be improved to minimize the negative impact of the media into a useful educational media.

In addition to the use of media, the use instructional strategy also affects the result of learning (Degeng, 2013) the use of instructional strategy which is suitable for the need of class (Buchori et al., 2017), such as characteristic of learners and subject (Hakim et al., 2018). The strategy and environment in the 21st century will: (1) available the learning environment which is supported by the quick access of technology; (2) independent learning; (3) online and blended learning; (4) digital and open content, and (5) project-based learning (PjBL). Considerations in choosing a learning strategy include paying attention to the characteristics of the material, the characteristics of students as well as supporting facilities to see this, Web-based PjBL becomes one of the alternative learning to achieve learning objectives.

Learning in the current era is not only to memorize theory but also highlights more on meaningful learning activities. The stresses on the importance of meaningful learning are reported by Smaldino and Lowther. They explained that to achieve a good understanding can be achieved through meaningful learning (Smaldino et al., 2014). One of the many ways to create meaningful learning is by PjBL strategy which is believed to promote learners to auto construct knowledge and skill as well as believed to have more advantages to develop a concept and motoric skill (Deswila et al., 2020; Putranta & Supahar, 2019; Rusman, 2017). The PjBL strategy is a way to provide opportunities for pre-service teachers to construct their knowledge and develop the potential they have.

In the education system, PjBL instructional strategy is one of the constructivism strategies which is often applied in the instructional (Kızkapan & Bektaş, 2017; Salim et al., 2019). PjBL is an instructional strategy centered on the learners which are based on the principles of contextual learning. The learners are actively involved in learning to achieve their goals through social interaction and any knowledge (Kokotsaki et al., 2016). This condition is supported by the newest studies showing that the use of PjBL strategy can increase independence learning and skill (Ismuwardani et al., 2019). Providing opportunities for pre-service teachers to be directly involved

in learning, in addition to increasing their knowledge, can also provide opportunities and responsibilities for independent learning.

PjBL is an instructional strategy centered on active learners that characterized by learning autonomy, constructive investigation, goal determinant, collaborative, communicative, and reflection in real-life (Kokotsaki et al., 2016). The core of PjBL is a real-life that attracts the learners' interest and promotes the learning thoughts of learners when gaining and applicating their new knowledge (Efstratia, 2014). PjBL is supported by the constructivism learning theory that is a collaborative instructional strategy. It stresses primarily on the learning activities rather than educator activities that focus on the activities of active learners in getting the direct experience "learning by doing" (Kızkapan & Bektaş, 2017). Also, the findings of some studies have shown that PjBL positively supports instructional so that it is recommended to apply in other subjects (Chiu, 2020; Maulana et al., 2019). The strategy syntax of PjBL consists of pre-project and post-project. Pre-project covers: (1) problem identification; (2) creating a design and project implementation schedule; (3) doing research; (4) arranging the product prototype; (5) assesing, reviewing, and revising the product; (6) finalization and publication of the product (Abidin, 2014; Han & Bhattacharya, 2001; Moore et al., 2016).

Dominik May has proposed that online instructional can provide trans-global countries without limitation on the distance and time (Moore et al., 2016). The use of integrative instructional media in the learning (Schuster et al., 2016) such as WBL has a high chance because it can increase the activities among the users who are the key to the teaching and learning process (Bugawa & Mirzal, 2018). Besides, WBL is positively responded to by any educator. However; it has very many obstacles, such as the slow speed of internet connection, support facilities, and lack of technical support (Asuman et al., 2018). Thus, an experimental study is needed to find out how the information theory can be implemented, and one of them is by online learning support (Wong et al., 2019). Considering that there is a significant obstacle and opportunity to implement the WBL, therefore; the writers did experimental research by combining between a cognitive strategy of PjBL and WBL by designing a website as an instructional media which was equipped with course material, tutorial, discussion forum as well as gathering project. The design is described in the following website description.

BL consists of: (1) a set of materials arranged in files containing procedures of an android-based instructional media development. It is begun from preparation and supporting software to form an android application to visual design and material development that will be made an application; (2) a set of materials in the form of a tutorial that contains steps to make instructional media. The availability of instructional materials provides the learners who are going to study with choices in the form of files or using tutorial/video; (3) discussion forum provides a panel discussion for the students to discuss related materials and progress report of the project implementation with their peers or lecturers; (4) evaluation consisting of understanding ability instrument and implementation of instructional materials either before or after the implementation of the instructional process.

Besides the factor of the strategy use and media in instructional, there is also an internal factor of the learners that can influence their learning outcomes, that is a cognitive style (Aldarmono, 2012). Cognitive style is a different point of view of a person to see, know, and manage the information (Pramusinta et al., 2019; Woolfolk, 1993). The result of studies has shown that there is a positive correlation in higher rank between cognitive style and the ability to solve problems that are by 39% and 61% influenced by cognitive style (Ulya, 2015). If it is seen from the information process theory, the learners with a cognitive style of Field Independent (FI) can solve problems better than the learners with a cognitive style of Field Dependent (DF) (Sa'dijah & Sudirman, 2016).

A cognitive style is a consistent form of behavior that determines how every individual gains and processes information (Hsieh et al., 2020; Sellah et al., 2017) and affects the path of development and the mind of thought (Baron, 2020). In a simple illustration, a cognitive style means a unique way of an individual to gain and build their knowledge (Sellah et al., 2017). Cognitive style is classified into two types; cognitive style of field-dependent (FD) and cognitive style of Field Independent (FI) (Atsuwe & Thaddeus, 2019). The characteristics of FD; (a) has a keen interest to other people; (b) physically sociable with other people (c) psychologically has a high social sense. On the other hand, the characteristics of the cognitive style of FI: (a) not so interest to other people; (b) physically keep a distance from other people;(c) psychologically prefer to have a non-social situation.

The learning outcomes are what will be learned either as knowledge, skill, or attitude (Scott, 2011). In this study, the writers focus on the result of learning (LO) in the form of a cog-

nitive domain on the level of understanding (C2) and Implementation (C3). Understanding ability is an individual ability to understand something, memorize it, and explain it in detail about what has been learned with their own words (Scott, 2011). It has characteristics of implementing the understanding in the form of new information through many types of communication modality (Marzano & Kendall, 2006). Implementation skill (C3) is a skill in applying an application from an understanding concept.

Besides, the result of studies has shown that there is a correlation between learning style, the use of learning strategy as well as the learning outcomes of learners with a cognitive style of FI in that the learners with FI are better compared with the learners with a cognitive style of FD (Payung et al., 2017). The result of research by Pratya has shown that attitude and cognitive style of learners influence the learning achievement at every stage (Nuankaew et al., 2019)

One of the considerations to determine the strategy and media in instructional is by concerning on the learners' characteristics, and material as well as supporting facilities. The material "android-based developing learning media" is not enough by memorizing concepts and developing steps, but it needs direct theory application exercises. To achieve learning objectives in the form of concept mastery and their application in the development of science-integrated learning media of ecosystem themes for pre-service teachers is not enough just with papers and presentations so that strategic innovations in achieving learning objectives do. The use of lecture strategies in a conventional way has not provided direct experience and learning how to design, use, and evaluate media that have been created, besides students also cannot explore their potential to the fullest.

This study aims to analyze: (1) the impact of the use of the PjBL and DI strategies on the learning outcomes of understanding and application of concepts to the material development of integrated learning media on ecosystem themes; (2) the effect of cognitive style on learning outcomes of understanding and application of concepts on the material development of integrated learning media on ecosystem themes; (3) The interaction between strategy and cognitive style on the learning outcomes of understanding and application of concepts. The focus of the study is to find the effect of the use of PjBL strategies on the learning outcomes of understanding and application of the concept of developing science-integrated learning media, the effect of cognitive styles on the results of understanding learning

and application of concepts, the interaction between PjBL strategies and cognitive styles on the results of understanding learning and application of concepts tested on the courses of media and learning technology with materials for developing science-integrated learning media.

Based on the results of the analysis of the researchers in previous studies, material analysis, and observations both in instructional supporting facilities (internet availability, smart sharpen/PC) or on the characteristics of students, the researchers rarely find the results of previous studies related to PjBL combined with media websites. Therefore, the researchers conducted a study on the use of the PjBL and DI strategies and their effects on the ability to understand and apply concepts; the influence of cognitive style on the ability to understand and apply concepts; the interaction between the use of the PjBL strategy and cognitive style on the ability to understand and apply concepts in the technology and learning media course.

METHODS

This research uses a quasi-experimental design to test the causal effect hypothesis from the manipulated predictor consisting of a type of treatment and presenting a comparison that does not have a degree of control found in the true-experimental design (Shaughnessy et al., 2012). Quasi-experimental is taken due to determining subject not based on the randomize sampling, but it is based on the chosen classes by the campus authority (Setyosari, 2013). The research design uses factorial 2x2 involved two groups; the experimental group with WBL-PjBL and control group with direct instructional strategy. The following is a table of research design with quasi-experimental 2x2, which is adapted from Shaughnessy (Shaughnessy et al., 2012) and Creswell (Creswell, 2010).

Table 1. Factorial Research Design 2 x 2

Variable Moderator		Independent Variable Instructional Strategy (X)	
		PjBL (X_1)	DI (X_2)
Cognitive Style (y)	Field dependent (y_1)	X1, Y1	X2, Y1
	Field independent (y_2)	X1, Y2	X2, Y2

This research is designed to see the influence between PjBL strategy with WBL media and the influence of DI on the understanding (intercept) and concept application science-integrated learning media. The control class or experimental class by implementing the instructional process and then evaluated, analyzed, and compared. The result is in the form of understanding skill and implementing between control class and experimental class.

Participants in this study were pre-service teachers of the Muhammadiyah University of Sidoarjo, totaling 110 people consisting of class A: 30 people, class B: 30 people, and class C 50 people. Before learning, activities begin all students taking a cognitive style test. However, cognitive style test results are not a reference in classifying students because the student has been determined by the campus regarding the division of rooms or classrooms. Class selection in this study used cluster random sampling. After randomization to determine the control group and the experimental group, we selected 60 students as the control class using the PjBL learning strategy and 50 students using the DI learning strategy. The teaching team between the experimental group and the control group was the same, so the only difference between the two groups was the learning strategy used.

The pre-test and post-test data collection were carried out in classes A and B as many as 60 students as the experimental class (PjBL) and class C as many as 50 people as the control class (DI). Classifying technique is not random but it accepts existing classes that have been determined by the campus, where the research is conducted, (Setyosari, 2013). To determine the initial ability of students used pre-test data, while to determine the effect of the use of PjBL and DI learning strategies used post-test data as a comparison, while to find out the learning style, tests are carried out before the learning process takes place both in the control class and the experimental class.

The cognitive style test uses an adapted instrument from H.A Witkin, Ottman, and Raskin, that is *Group Embedded Figures Test (GEFT)* (Witkin et al., 1971). The test instrument consists of three parts; first, some exercises of seven pictures to finish in two minutes; second and third, a real cognitive style test with 18 pictures to finish in 18 minutes, up to 20 minutes for all test. The scoring determination of each instrument based on the GEFT provision in that the correct answer = 1 and the wrong answer = 0, so that the range of the gained scores by the test takers is 0-18 = FD and the score 1-18 FI and score of 9= neutral (Aldarmono, 2012). However, the neutral score is not calculated in this research.

The understanding skill instrument and concept application science-integrated used a validated test instrument in the form of multiple choices with 18 items and with 6 essay test items. The multiple-choice instrument is scored for correct answer =1, and wrong answer = 0 so that the maximum scores of multiple-choice =18; the essay score instrument (maximum/number) = 5 so that the maximum scores = 30. The scoring techniques of the multiple-choice and essay are guided by the provided rubric scoring guide.

Before the research, a preliminary study is conducted which includes the preparation of research instruments and sharing with lecturers of media and learning technology related to the research activities carried out. Some instruments prepared in this regard are (1) cognitive style instruments in the form of questionnaires, (2) RPS and RPP media, and learning technology course that uses project-based learning strategies and direct learning. (3) Questionnaire for understanding concepts and application of concepts and (4) conducting briefing about procedures for using learning strategies that will be used by lecturers in this study.

The stages of the activities carried out in the implementation of this study are: (1) providing pretest for both the experimental class and the control class, (2) identifying the cognitive styles of both groups of students by using the Group Embedded Figure Test (GEFT) test adapted from (Witkin et al., 1971), (3) carry out learning activities using a predetermined strategy with a frequency of 8 meetings each and 2x50 minutes/meeting, (4) making observations, and (5) doing the posttest. The results of the pre-test and post-test were collected for a quantitative analysis to look for differences and their interactions with the two treatment groups. The results of the pre-test and post-test were analyzed quantitatively using SPSS version 23 to look for differences and their interactions with the two treatment groups. Before testing hypotheses, normality tests and data homogeneity tests are first performed. The data normality test uses the Kolmogorov-Smirnov test, while the homogeneity test uses the Levene test with a significance level of 5% ($\alpha = 0.05$).

This study uses multivariate analysis of variance (MANOVA) to test six hypotheses: first, there are significant differences in the learning outcomes of understanding concepts between students taught using the PjBL strategy with the DI strategy; second, there are significant differences in the learning outcomes of application concepts science-integrated learning media between students taught using the PjBL strategy and the DI strategy; third, there are significant differences in the learning outcomes of understanding concepts

between students who have FD and FI learning styles; Fourth, there are significant differences in the learning outcomes of application concepts between students who have FD and FI learning styles; fifth, there is an interaction between PjBL and DI strategies with FD and FI learning styles on the ability to understand concepts; sixth, there is an interaction between PjBL and DI strategies with FD and FI learning styles on the application of concept concepts science-integrated learning media. The development of integrated learning media on ecosystem themes through the PjBL strategy provides opportunities for pre-service teachers to explore the potential and sharpen skills in designing science-integrated learning media as a provision for a professional teacher.

RESULTS AND DISCUSSION

This study took place at Universitas Muhammadiyah Sidoarjo. The taken samplings were 110 pre-service teachers; A group (treatment) in which 68 pre-service teachers were treated or taught by PjBL and B group (control) without treatment in which 42 pre-service teachers were taught by direct instructional strategy. We had presented the data from the identification of cognitive style before analyzing both pretest and posttest as described in the following table 2.

Table 2. Result of the Students' Cognitive Identification Style

Students' Cognitive Style	Instructional Strategy Group PjBL (Group A)	Strategy Group DI (Group B)	Sum
FD	42	19	61
FI	26	23	49
Sum	68	42	110

Referring to the result of cognitive style identification as described in table 2 above, it is known that the students of PAI more dominantly have the cognitive style of FD than the cognitive style of FI. In the groups with a strategy of PjBL, the students with the cognitive style of FD are 42, and the students with the cognitive style FI are 26. In the groups of an instructional strategy of DI, the students with the cognitive style of FD are 19, and the students with the cognitive style of FI are 23.

Having Passed through a requirement test phase, we further did a data analysis of the study. In this research, we used an analysis data technique of multivariate analysis of variance (MANOVA). The result of the data analysis can be seen in table 3 in the following.

Table 3. Result of Multivariate Test

Effect		Score	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	,999	61629,334[b]	2,000	105,000	,000
	Wilks' Lambda	,001	61629,334[b]	2,000	105,000	,000
	Hotelling's Trace	1173,892	61629,334[b]	2,000	105,000	,000
	Roy's Largest Root	1173,892	61629,334[b]	2,000	105,000	,000
Instructional	Pillai's Trace	,284	20,821[b]	2,000	105,000	,000
	Wilks' Lambda	,716	20,821[b]	2,000	105,000	,000
	Hotelling's Trace	,397	20,821[b]	2,000	105,000	,000
	Roy's Largest Root	,397	20,821[b]	2,000	105,000	,000
Cognitive Style	Pillai's Trace	,081	4,639[b]	2,000	105,000	,012
	Wilks' Lambda	,919	4,639[b]	2,000	105,000	,012
	Hotelling's Trace	,088	4,639[b]	2,000	105,000	,012
	Roy's Largest Root	,088	4,639[b]	2,000	105,000	,012
Instructional * Cognitive Style	Pillai's Trace	,016	,837[b]	2,000	105,000	,436
	Wilks' Lambda	,984	,837[b]	2,000	105,000	,436
	Hotelling's Trace	,016	,837[b]	2,000	105,000	,436
	Roy's Largest Root	,016	,837[b]	2,000	105,000	,436

a. Design: Intercept + cognitive style + Instructional + Instructional * Cognitive Style

b. Exact statistic

About the four methods of the multivariate test; *Pillai's trace, Wilks' Lambda, Hotelling's Trace dan Roy's Largest Root, the data in table 5 above,* i.e. instructional strategy column shows the score of 0.012 and cognitive style column shows the score of 0.000 where 0.012 and 0.000 are smaller than alpha 0.05 (p<0.05). It means that Ho is rejected and can be concluded that: 1) The Understanding (intercept) and concept application science-integrated learning media simultaneously are different in the use of instructional strategy (PjBL with WBL media and DI); 2) The understanding (intercept) and concept application science-integrated learning media simultaneously are different in

the sense of cognitive style (FD and FI). Another case with the instructional strategy in column interaction (PjBL with WBL media and DI) and cognitive style (FD and FI) has shown that the significant score of 0.436 is higher than alpha 0.05(p<0.05). It means that Ho is accepted and can be concluded that there is not any significant interaction between the instructional strategy (PjBL with WBL media and DI) and cognitive style (FD and FI).

To test the influence of inter variables, a statistic test was done to test the hypothesis. The result of the inter variable test can be seen in Table 4 as follows.

Table 4. Analysis Result of MANOVA Per-variable Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	Concept Intercept Score (Posttest)	290,520[a]	3	96,840	8,896	,000
	Concept Application Score (Posttest)	366,144[b]	3	122,048	10,686	,000
Intercept	Concept Intercept Score (Posttest)	760145,568	1	760145,568	69832,191	,000
	Concept Application Score (Posttest)	773155,771	1	773155,771	67696,319	,000
Instructional	Concept Intercept Score (Posttest)	182,686	1	182,686	16,783	,000
	Concept Application Score (Posttest)	336,599	1	336,599	29,472	,000
Cognitive Style	Concept Intercept Score (Posttest)	47,942	1	47,942	4,404	,038
	Concept Application Score (Posttest)	45,429	1	45,429	3,978	,049
Instructional * Cognitive Style	Concept Intercept Score (Posttest)	6,118	1	6,118	,562	,455
	Concept Application Score (Posttest)	10,901	1	10,901	,954	,331
Error	Concept Intercept Score (Posttest)	1153,844	106	10,885		
	Concept Application Score (Posttest)					
Total	Concept Intercept Score (Posttest)	837518,000	110			
	Concept Application Score (Posttest)	849198,000	110			
Corrected Total	Concept Intercept Score (Posttest)	1444,364	109			
	Posttest_AK	1576,764	109			

a. R Squared = ,201 (Adjusted R Squared = ,179) b. R Squared = ,232 (Adjusted R Squared = ,210)

The result of hypothesis test 1 in table 4 is that F =16.783 and p-score =0.000;(p<0.05). It means that Ho is rejected and H1 is accepted, which also means that there are different learning outcomes on the understanding concept science-integrated learning media between the students taught by a cognitive strategy of PjBL with WBL media and the students taught by a strategy of DI. The result of hypothesis test 2 in table 6 is found that F =29.472 and p-score = 0.000; (p<0.05). It means that Ho is rejected and H1 is accepted, which also means that there are different learning outcomes on understanding and concept applica-tion science-integrated learning media between the pre-service teachers taught by a strategy of PjBL with WBL media and the students taught by a strategy of DI.

The result of hypothesis test 3 in table 4 is found that F = 4.404 and p score= 0.038;(p<0.05). It means that Ho is rejected and H1 is accepted which also means that there are different learning outcomes on the understanding concept science-integrated learning media between the students with the cognitive style of FD and the students with the cognitive style of FI.

The result of hypothesis test 4 in the table 6 is found that F = 3.978 and p-score = 0.049;(p<0.05). It means that Ho is rejected and H1 is accepted, which also means that there are different learning outcomes on concept applicati-on science-integrated learning media between the students with the cognitive style of FD and the students with the cognitive style of FI. The result of hypothesis test 5 in the table 4 is found that F = 0.562 and p-score = 0.455; (p>0.05). It means that Ho is accepted and H1 is rejected, which also means that there is not any interaction between cognitive strategy (PjBL with WBL media and DI) and the cognitive style (FD and FI) toward the learning outcomes on the understanding con-cept.

The result of hypothesis test 6 in the tab-le 4 is found that F = 0.954 and p score= 0.331; (p>0.05). It means that Ho is accepted and H1 is rejected, which also means that there is not any interaction between the strategy of (PjBL with WBL media and DI) and the cognitive style (FD and FI) toward the learning outcomes on con-cept application. In other words, it is said that the pre-service teachers taught by PjBL strategy with WBL media and DI and cognitive style of FI and FD have a concept understanding scores which are not far different seen in Figure 2 and 3 in the following.
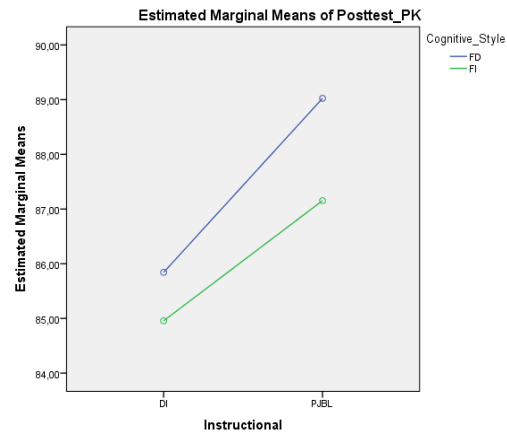

Figure 2. Interaction Graphic between Instruc-tional Strategy and Cognitive Style on the Learn-ing Outcomes of Understanding (intercept) Con-cept

The interaction graphics in figures 2 and 3 have shown that the two lines are not crossed so that it supports the MANOVA test. It means that there is not any interaction between the use of an instructional strategy of (PjBL with WBL media and DI) and cognitive style (FD and FI) either on the learning outcomes of understanding concepts or on the learning outcomes of concept application.
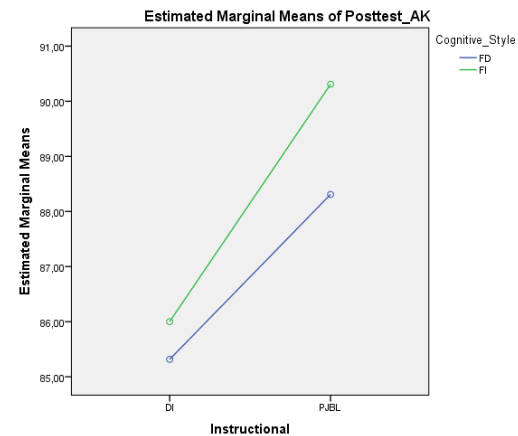

Figure 3. Interaction Graphic between the In-structional Strategy and Cognitive Style on the Learning Outcomes of Concept Application

The hypothesis test using SPSS 23 version has shown that there is a significant difference either in the learning outcomes of conceptual un-derstanding of the learning outcomes of concept application science-integrated learning media between the students taught by the strategy of PjBL with WBL media and the students taught by DI strategy. The average score of the lear-

ning outcomes of conceptual understanding with PjBL strategy and with WBL media is = 88,31, whereas the average score for DI is = 85.36.

The average score of the learning outcomes of concept application science-integrated learning media using the strategy of PjBL with WBL media is 89.07, whereas the average score for DI is 85.69. It can be concluded that the use of PjBL strategy with WBL media is better than the strategy of DI in the sense of increasing the learning outcomes of understanding (intercept) and concept application. This finding is in support of the previous evidence by Premawardhena who has claimed that the instructional integrated with a website can increase the learners' performance as well as provide an opportunity to interact online to broaden their insights. Besides, the use of media such as a computer, tablet in any instructional has a significant contribution on the children's development (Aldabbus, 2018; Papadakis et al., 2016; Ramadhani et al., 2019).

The hypothesis test result using SPSS has shown that there is a significant difference either between the learning outcomes of conceptual understanding of the learning outcomes of concept application between the students with the cognitive style of FD and the students with the cognitive style of FI.

The average score of the learning results of the students' conceptual understanding with a cognitive style of FDis 88.03, whereas the average score of FI is 86.12. The average score of the learning outcomes on the concept application understanding of the students with a cognitive style of FD is 87.38, whereas the average score of FI is 88.29. It can be concluded that the students with the cognitive style of FD have better ability in the learning outcomes on the concept of understanding than the students with the cognitive style of FI. On the contrary, the students with the cognitive style of FD have the learning outcomes on concept application better than the students with cognitive style (Andheska et al., 2020). This factual evidence supports the previous studies that the cognitive style is important to be one of many considerations in choosing the strategy and the use of instructional media (Margunayasa et al., 2019; Marwazi et al., 2019).

The hypothesis test result related to the interaction between the use of cognitive style instructional strategy of the students based on the procedure test result has shown that there is not any interaction between the instructional strategy and cognitive style either on the learning outcomes of concept application or the learning outcomes of understanding concept.

The result found that F = 0.562 and p-score = 0.455; (p>0.05), which means there is not any interaction between cognitive strategy (PjBL with WBL media and DI) and the cognitive style (FD and FI) on the learning outcomes of the understanding concept. The result of hypothesis found that F = 0.954 and p score= 0.331; (p>0.05). This study is in line with the prior research reporting that cognitive style has an only indirect effect on the instructional, no interaction between the use of learning strategy and cognitive styles toward achievement (Yudiernawati et al., 2015; Martínez-Bernal et al., 2016).

The results show that the PjBL strategy combined with website-based learning media contributes to the improvement of learning outcomes in understanding and application of the concept of science-integrated learning media, the development of science-integrated learning media has an important role, namely: 1) it sharpens the skills of pre-service teachers in designing science-integrated learning media to realize meaningful learning, comprehensive assessment, and coordination with teachers from various disciplines in harmony; 2) science-integrated learning media makes it easy for students to understand the material comprehensively from various subjects; 3) it provides understanding that various scientific disciplines are related to each other both in the perspective of science, technology, and religion, etc.

The use of PjBL strategies with web media facilitates students who have both the FD cognitive style and the FI cognitive style to achieve learning goals according to the characteristics of each cognitive style, this is indicated by the results of the analysis. If viewed in terms of the ability to understand concepts, students who have a cognitive style of FD have better concept understanding abilities than students who have the cognitive style of FI, when viewed in terms of the ability to apply concepts, students who have a cognitive style of FI can apply concepts better than students who have a FD cognitive style. Nevertheless, the results of the analysis show that there is no interaction between the PjBL strategy and cognitive style on the learning outcomes of understanding and application of this concept corroborating the findings of research conducted by Yudiernawati et al. 2015 & Martínez-Bernal et al. 2016.

Development of science-integrated learning media for pre-service teachers through stages of KI and KD analysis, Classification of KI and KD according to the theme, Development of Competency Achievement Indicators (GPA) in each KD, science-integrated media design,

evaluation of science-integrated media, product revision and production. The development of science-integrated learning media provides direct experience for pre-service teachers to develop their potential (Fitzgerald, 2020), the development of science-integrated media in the form of Student Worksheet products (LKS), Crossword Puzzles (TTS), Illustrated Stories (CerGam) to mobile applications.

CONCLUSION

Based on the results of the research analysis and discussion, it can be concluded that the use of PjBL strategies is effective in increasing learning outcomes in understanding and conceptualizing the development of science-integrated learning media. Differences in cognitive style influence the learning outcomes of understanding and the application of concepts in the development of science-integrated learning media. The development of science-integrated learning media with the theme of ecosystems contributes to improving the learning outcomes of understanding and application of the concept of pre-service teachers, providing hands-on experience and sharpening the skills of pre-service teachers in designing science-integrated learning media to realize meaningful and comprehensive learning, as well as learning media integrated with the theme of ecosystems facilitating teachers and students in connecting the context of science material with other material.

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