Interaction between Learning Style and Gender in Mixed Learning with 40% Face-to-face Learning and 60% Online Learning

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Abstract—Student learning styles are important factors that have a strong impact on student performance in learning outcomes. That is why each learning method will produce different learning outcomes for students who have different learning styles. According to the previous study concluded that mixed learning produces learning outcomes that are superior to online and face-to-face learning models, but the questions are how is the difference between learning outcomes between student learning styles in mixed learning, and whether there is an interaction between mixed learning models and student learning styles towards learning outcomes. This study provides a scientific answer solution, by conducting experimental research of mix learning with a mixture of 40% face-to-face material learning and 60% online material learning for the subject of Algorithms and Programming. Based on 2-way ANOVA, T, and SCHEFFE tests towards student learning outcomes in this study, it is found: there are differences in learning outcomes between students who have different learning styles, the learning outcomes of male students achieve better learning outcomes than female students, and there is an interaction between student gender and student learning styles towards learning outcomes, where with further tests, it was found that there is no difference in learning outcomes based on student learning styles of all students except students who have a visual learning style with male sex achieving superior learning outcomes than students who have auditory and kinesthetic learning styles.

Keywords—Online; face-to-face; mixed learning; algorithm and programming; learning outcome; interaction

I. INTRODUCTION

Apart from the learning model, whether face-to-face learning models, online learning or training learning, all lead to the same principle, namely to advance learning so as to produce better learning outcomes. Whereas to find out the learning model whether the learning outcomes are better in learning certain subjects, scientific research is needed.

The achievement of learning outcomes in the cognitive domain is not only limited to the full effect due to the influence of the learning model, but there are other factors that also contribute to the cognitive success of learning in each course. The learning styles of students, student gender, and courses studied are among the factors that contribute to the learning outcomes in addition to the learning model/method.

Learning styles, also known as cognitive styles or learning preferences show how students prefer ways of learning [1][2] and are characteristic behaviors that tend to be relatively stable over time [1]. Learning style is defined as a person's natural way, one's habits and something more suitable for someone in absorbing, processing and mastering new information and skills [3] and is an integral component of the learning environment [4].

There are various learning styles from students, namely visual, auditory and kinesthetic learning styles. Therefore, it is not surprising if the learning style among students is different each other. Students with a visual learning style absorb information very well in the form of visual information such as maps, images, diagrams, graphics and the like [5][6][3][7]. In face-to-face learning this visual type student appreciates the information written on the board and printed material in the textbook [3]. Auditory students prefer learning through the ear or hearing senses [5]. Auditory students are comfortable to study with lectures and discussions. Students with auditory learning style types remember well the reading or saying aloud. Meanwhile, students with kinesthetic learning styles are more pleased if the learning process takes place with an activity or is directly involved in the learning process, in the sense of not having to listen and read [5]. In the classroom, this type of student concentrates more with active teachers, and remembers well when given the freedom to participate in class activities.

Student learning styles are important factors that have a strong impact on student performance in learning outcomes [6]. Student learning styles are important cognitive characteristics that influence the way of learning. However, research conducted by Eudoxie confirms that the learning outcomes of students in the face-to-face learning model are influenced by student learning styles [4]. When learning styles match the learning methods used, better learning outcomes will be obtained, but on the contrary when learning styles and learning methods do not match, learning outcomes significantly deteriorate [8].

Learning methods that benefit a group of students do not mean that this applies to other groups of students [3]. Each learning method will produce different learning outcomes,

depending on the likes or dislikes of students with learning models and also whether or not the learning model matches the learning style of students. The fact of previous study does show that there is a positive influence on online and face-to-face learning models on student learning outcomes with a determination coefficient of 0.25, or in other words, the effect of online learning and face-to-face learning outcomes is 25% [9]. A research was found that online learning can replace face-to-face learning in the cognitive field [10]. Furthermore, It was revealed that the effect of mixed learning model on student learning outcomes is 34.81% [11].

The strength of face-to-face learning is the intense intensity of interaction with learners, facilitating the convenience of cooperative learning and also the clarity of learning material [12]. While online learning is not only interactive, it can also provide learning time according to interests of student (in asynchronous online learning) and lecturers (in synchronous online learning), centered on students and students who build a learning environment [13]. Besides that, online learning also has the ability to utilize various forms of multimedia: text, audio, silent and moving visuals, and other forms for learning purposes [14].

Moreover, according to Roblyer & Doering (2013), online learning has more effective interactions compared to face learning [15]. In face-to-face learning, at least there is interaction between students and instructors and with other students as well as interactions between students and learning materials that are taking place. Whereas in online learning interactions occur between students and learning material presented in learning modules and with other students in collaborative learning in asynchronous online learning. In synchronous online learning, student cognitive interaction with lecturers occurs as in face-to-face learning.

Related to the relationship between learning styles and student gender, a previous finding indicated, there are differences in learning styles of students who study online and students who study face-to-face, where gender is a factor that influences the relationship between learning styles and student involvement in learning [16].

Based on the above description, the questions that arise are whether there are differences in learning outcomes between male and female students, whether student learning styles provide different learning outcomes, and whether there is an interaction between learning styles and gender on student learning outcomes, if so how the results of interactions occur between student learning style and student gender to learning outcomes. So, in turn, it is clear that research into how the interaction between learning style and gender in student learning outcomes in face-to-face and online mixed learning becomes very relevant and important, this research provides solutions to the answers to these questions.

In mixed learning, it should be noted, the best portion of the mix of online learning in mixed learning is between 30% and 79% [17], but according to Agosto et. al. (2013), to get the best mixed structure of blended learning through "trial and error" the learning process [12]. Whereas Heather Kanuka & Liam Rourke (2013) emphasize that there is no standard provision about how much the mixed portion of online

learning in blended learning [18]. Mixing levels of mixed learning can be done on: learning activities, the mix portion (weight) of teaching materials and/or program modules [19].

The advantages of mixed learning are actually in harmony with the fact that students have a positive attitude and flexibility to adapt to mixed learning [20]. Substantially mixed learning provides better effectiveness than learning that only uses face-to-face learning methods [21]. Mixed learning provides two learning environments namely face-to-face learning environment and independent online learning, so it can be said that mixed learning is a representation of a combination of the advantages of online learning and the advantages of face-to-face learning. In other words, due to mixed learning combines face-to-face learning and online learning, so that definitely mixed learning activities take advantage of online and face-to-face learning patterns. According to Sleator (2010), the future learning patterns involve a combination of face-to-face experience and online learning [22]. That is why or the main reason, why this research was conducted on a mixture of learning face-to-face learning and online learning with a choice of 40% mix portion of face-to-face learning materials and 60% mix portion of online learning material.

II. RESEARCH METHODOLOGY

A. Participants and the Context of the Study

This research was conducted on mixed learning with a mixture of 40% face-to-face lesson and 60% online lesson in Algorithm and Programming subject matter. The main objective of this study is to know the interplay between learning style and student gender on student learning outcomes in mixed learning with a portion of a mixture of 40% face-to-face learning and 60% online learning.

The population of this study is a class of computer science study program students in the first semester of the 2017/18 academic year at Bumigora University in Mataram, Indonesia. The total number of experimental class students is 50 students randomly selected from the population. The online learning module with the Moodle platform has been designed according to the Semester Teaching Plan and has passed a formative test [23] prepared on computer server of Bumigora University. Every student can study asynchronous online learning module at anytime and anywhere (ubiquitous). The online learning module on the computer server contains the subject matter portion of 60% of the total subject matter. Whereas face-to-face learning is done by the teaching lecturer according to the Semester Teaching Plan which contains 40% of the subject matter section of the total subject matter.

B. Learning Management System

In this study, the online learning module of the Algorithm and Programming courses used has been formatively evaluated and has been presented at the ICoCSIM international seminar in Mataram, Indonesia that will be published in the Scopus-indexed IOP proceeding [23]. The online learning module in this study uses the Moodle Learning Management System (LMS) application which is one of the best received by users in its segment to create efficient online learning sites. Specific Instructional Objectives, Time

Allocation, Learning Outcomes Indicators, Sub-teaching Materials, Subjects / Sub-topics, Sub-Subjects of Materials, Learning Methods, Learning Media, how to evaluate learning outcomes, and reference books that become learning references formulated in Learning Plans The semester is attached to the online learning module, and is also included with face-to-face lecturers, so as to realize the certainty of learning blended learning-1 mixture with a mix of face-to-face teaching materials of around 40% and online teaching materials of around 60%.

C. Data Collection Procedure

Data collection is done by surveying each student's learning style, and measuring student learning outcomes with quizzes, midterm, and final semester examination, while distinguishing students' gender based on student names that match the student's electronic entry form. After the data is collected, a summative evaluation or statistical hypothesis testing of the data collected is carried out. Statistical hypothesis testing uses the SPSS statistical application program.

D. Data Analysis

Because this research is inferential research where the research data is of type ratio, and is carried out on sample data, the research requirements testing is carried out, namely: test the normal data distribution and data homogeneity. Tests of validity and reliability and normality are carried out on learning outcome measurement instruments. While the instrument for measuring student learning styles uses standard VARK (Visual, Aural, Read/write, and Kinesthetic) instruments that have been tested for reliability and validity [4].

The 2-way ANOVA test was conducted to determine whether there was an interaction between student learning styles and gender on student learning outcomes, also whether there were differences in the influence of learning styles on student learning outcomes and whether there were differences in learning outcomes between male and female students.

The comparative analysis was carried out by T test of 2 independent samples in this study to find out the result of comparing learning outcomes between students who have male gender and students who have female gender in mixed learning. Because in the 2-way ANOVA test in this study there was an interaction between the learning style and gender of the students, then further tests were carried out using the SCHEFFE test to find out how the interactions between students' learning styles and student sex occurred.

Based on the previous discussion (in the Introduction), and also by paying attention to the lecturer style that is not the same as the student's learning style, it can make learning difficult for students who have different learning styles with lecturers in face-to-face learning [6], and by noting that online learning facilitates difference learning experiences and learning styles for diverse students [24]. Then the research hypothesis (H1) was decided as follows:

H1: There are differences in learning outcomes between students who have different learning styles towards learning outcomes in learning Algorithm and Programming subject.

With reference to the previous discussion (in Introduction) related to the influence of gender on learning outcomes and also with reference to the results of previous studies that there is a positive relationship between student learning styles and problem solving styles, and it is found that gender has an effect on the problem solving style by students [25], so the research hypothesis (H2) related to the influence of gender on learning outcomes is:

H2: There is a difference in learning outcomes between students who have male gender and students who have female gender in learning Algorithm and Programming subject,

Based on the previous discussion (in the Introduction) regarding interactions that occur in learning outcomes, and coupled with the facts that: (a). in mixed learning, classroom learning provides the social interactions needed for active learning, while online learning offers some flexibility, which is not commonly found in the classroom environment [20]; (b). online learning is a web-based learning environment in accessing learning materials, and realizing student and student interactions, with learning materials and with instructors at anytime and anywhere [26]; (c). scientists agree that the face-to-face classroom learning community offers real and meaningful interactions between students and teachers, where pure online learning cannot replace it [20], and research shows that the use of interactive computer technology in a collaborative approach to e-learning allows for specific educational purposes [27], hence the research hypothesis can be predicted (H3):

H3: There is interaction between gender and student learning styles towards learning outcomes in learning Algorithm and Programming subject.

Refer to the previous discussion in Introduction and taking into account that: visual experience is the main thing in learning to be able to understand and interact with the environment [28]; students with visual learning styles are not easily distracted (disturbed) with a noisy atmosphere; so that it can be decided the research hypothesis (H4) related to differences in learning outcomes between students diverse learning styles towards learning outcomes in mixed learning in this study is:

H4: There are differences in learning outcomes of mixed learning between students who have a visual learning style compared to students who have auditory and kinesthetic learning styles in learning Algorithm and Programming subject.

Moreover, it can be predited that students who have visual learning styles differ in learning outcomes compared to all students who have auditory and kinesthetic learning styles.

Facing a threat to internal validity, it is overcome by: (1) involving the appropriate face-to-face learning control group in mixed learning in this study, so that threats to the internal validity of history and maturation can be avoided; (2) students in online and face-to-face mixed learning have mostly equivalent initial cognitive abilities, where student samples are taken from high school graduate students who are equal (thus having equality in age and basic knowledge of

Algorithm and Programming lessons. So the internal threat of the validity of death or friction can be avoided.

Whereas, against threats to external validity, it is handled in the following ways: (1) avoiding "experimental or biased effects" i.e. deviations from experimental researchers, the mixed learning process is not carried out by researchers but by other lecturers. So that researchers become "blind" or "double blind" in influencing the results of studies. (2) Samples from mixed learning classes are random samples of representative populations, thus overcoming the threat of external validity from "selection-treatment interactions". (3) Mixed learning from this research is a new learning model conducted for Bumigora University students, and maintains that students do not know the purpose for research, so that effectively overcome the threat of reactive influence on external validity. (4) Students receive no more than one treatment, so there is no interaction between the previous treatment and after treatment. In other words the threat of external validity from various treatment disorders can be avoided. (5) The threat to external validity due to pretest treatment did not occur in this study, because this study did not carry out the pretest.

III. RESULT AND DISCUSSION

Instruments for determining student learning styles using VARK questionnaires are distributed to students at the beginning of face-to-face learning in mixed learning. This instrument was chosen because it is quite widely used by previous researchers who examined the related learning styles published in scientific journals and their validity and reliability. Descriptive analysis conducted on the results of the VARK questionnaire is known that the number of students who have a visual learning style is 18 students, who have a auditory learning style is 22 students, and who have a kinesthetic learning style is 9 students, as presented in Table I.

Table II shows the gender frequency distribution of students who received mixed learning treatment in this study. The number of male students is 31 students and the number of female students is 18 students.

TABLE I. FREQUENCY DISTRIBUTION OF STUDENT LEARNING STYLE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Visual	18	36.7	36.7	36.7
	Auditory	22	44.9	44.9	81.6
	Kinesthetic	9	18.4	18.4	100.0
	Total	49	100.0	100.0	

TABLE II. FREQUENCY DISTRIBUTION OF STUDENT GENDER

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	31	63.3	63.3	63.3
	Female	18	36.7	36.7	100.0
	Total	49	100.0	100.0	

Based on the results of the normality test using Shapiro-Wilk as shown in Table III, the significant value of the group of students with male gender is 0.131 and those with female gender are 0.514. Because the significant value is greater than the alpha value (significant value> 0.05), it can be concluded that the learning outcomes data of students learning mixed learning are normally distributed.

The significance of homogeneity of 0.935, 0.62 and 0.051 (> 0.05 of alpha value), shows the variable learning outcomes: quizzes, midterm test, and final exam in groups of students who get mixed learning are derived from homogeneous population data, with Levene Statistic values being 0.007, 3,659 and 4,021. So, the Levene test shows that mixed learning sample data is homogeneous, as shown in Table IV.

To ascertain the extent to which truth and trust in instruments measure student learning outcomes that have not been tested for validity and reliability that are used in this study, the validity test and calculation of reliability for the instruments used are used, as the results are shown in Table V and Table VI.

The validity test of the instrument of this research was carried out using Product Moment Correlation. Because testing validity for instruments that measure mixed learning outcomes as shown in Table V shows that Pearson correlation is 0.666, 0.960 and 0.977, it can be concluded that the research instrument for measuring mixed learning outcomes has high validity.

Cronbach's-Alpha was used in this study to measure the coefficient of internal consistency. The alpha coefficient for the three Cronbach's-Alpha items from the instrument reliability calculation of student learning outcomes in mixed learning is 0.745 (as shown in Table VI), indicating that items have good internal consistency (because after all, the reliability coefficient is 0.70 or higher of 0.70 is considered "acceptable" in most scientific studies).

Based on the 2-way ANOVA test as shown in Table VII, the significance value of student learning styles is 0.000 which is smaller than the alpha value (0.05). This means that learning styles affect student learning outcomes, or in other words there are differences in learning outcomes between students who have different learning styles towards learning outcomes. Thus the H1 hypothesis is accepted, or in other words the null hypothesis (H0) is rejected and the alternative hypothesis H1 is accepted. This means, there are differences in learning between students who have different learning styles towards learning outcomes in learning Algorithms and Programming subject.

TABLE III. OUTPUT RESULT OF NORMALITY TEST

GenderBld1		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Score Bld1	Male	.154	31	.058	.947	31	.131
	Female	.101	18	.200*	.955	18	.514

TABLE IV.   OUTPUT RESULT OF HOMOGENEITY TEST

	Levene Statistic	df1	df2	Sig.
Quiz	.007	1	47	.935
Midterm	3.659	1	47	.062
Examination	4.021	1	47	.051

The significance of the value of student gender (0.039) is smaller than the alpha value (0.05), meaning that the gender of the students significantly affected learning outcomes, or there was a difference in learning outcomes between students who have male gender and students who have female gender. Thus the H2 hypothesis is accepted, i.e. there are differences in learning outcomes between students who have male gender and students who have female gender in learning Algorithms and Programming subject.

While the significance value of the influence of gender and learning styles on student learning outcomes (0.017) is smaller than the alpha value (0.05). This indicates that there is interaction between gender and student learning styles towards learning outcomes, or gender and learning styles together have a significant effect on learning outcomes. So the H3 hypothesis is accepted, that is, there is an interaction between gender and student learning outcomes towards learning outcomes in the learning algorithm and programming subject.

Based on the results of comparison of learning outcomes between male students and female students using T test of 2 independent samples (as shown in Table VIII and Table IX), it is known that the significant value of the test results is 0.00 smaller than the alpha value of 0.05, this confirms that there is significant difference in learning outcomes between male and female students.

TABLE V.   VALIDITY TEST RESULT OF LEARNING OUTCOMES INSTRUMENT

		Quiz	Midterm	Examination	ScoreBld1
Quiz	Pearson Correlation	1	.588**	.515**	.666**
	Sig. (2-tailed)		.000	.000	.000
	N	49	49	49	49
Midterm	Pearson Correlation	.588**	1	.919**	.960**
	Sig. (2-tailed)	.000		.000	.000
	N	49	49	49	49
Examination	Pearson Correlation	.515**	.919**	1	.977**
	Sig. (2-tailed)	.000	.000		.000
	N	49	49	49	49
ScoreBld1	Pearson Correlation	.666**	.960**	.977**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	49	49	49	49
**. Correlation is significant at the 0.01 level (2-tailed).					

TABLE VI.   REALIBITY TEST RESULT OF LEARNING OUTCOMES INSTRUMENT

Cronbach's Alpha	N of Items
745	3

TABLE VII.   THE RESULT OF THE 2-WAY ANOVA TEST ON THE VARIABLE OF LEARNING OUTCOME AND FIXED FACTORS OF LEARNING STYLES AND STUDENT GENDER

Dependent Variable: ScoreBld1					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2014.296a	5	402.859	13.839	.000
Intercept	194554.820	1	194554.820	6683.576	.000
GenderBld1	132.524	1	132.524	4.553	.039
VAKBld1	893.167	2	446.584	15.342	.000
GenderBld1 * VAKBld1	262.640	2	131.320	4.511	.017
Error	1251.704	43	29.109		
Total	256275.000	49			
Corrected Total	3266.000	48			
a. R Squared = .617 (Adjusted R Squared = .572)					

Due to in the T test, the value of t is positive (4.213) and the average value of male students (7.63) is higher than the average value of female students (5.25), it can be concluded that students with male gender are superior to their learning outcomes compared to students with female gender in learning outcomes Algorithm and Programming course in mixed learning with 40% portion of face-to-face learning and 60% portion of online learning.

In the further test with the SCHEFFE test, as the results are shown in Table X, it was found that there were no differences in learning outcomes between male and female gender students with auditory and kinesthetic learning styles with all other students who had auditory and kinesthetic learning styles.

Likewise, there is no difference in learning outcomes between female gender students who have visual learning style with all students who have kinesthetic learning style, both male and female, and with male students who have visual learning style. All female students who have a visual learning style achieve different learning outcomes compared to all students who have auditory learning styles, both male and female. Further more, all male gender students who have a visual learning style differ in learning outcomes compared to all students who have auditory and kinesthetic learning styles, both male and female. This means that the H4 research hypothesis is accepted, namely there are differences in learning outcomes of mixed learning between students who have a visual learning style compared to students who have auditory and kinesthetic learning styles in learning Algorithms and Programming subject.

TABLE VIII.   THE AVERAGE VALUE OF LEARNING OUTCOMES OF THE RESULT OF THE T TEST TO COMPARE LEARNING OUTCOMES BETWEEN MALE STUDENTS AND FEMALE STUDENTS

Group Statistics					
GenderBld1		N	Mean	Std. Deviation	Std. Error Mean
ScoreBld1	Male	31	75.5742	7.62670	1.36979
	Female	18	67.0083	5.24565	1.23641

TABLE IX. THE RESULT OF THE T TEST OF COMPARISON OF LEARNING OUTCOMES BETWEEN MALE STUDENTS AND FEMALE STUDENTS

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
ScoreBld1	Equal variances assumed	3.060	.087	4.213	47	.000	8.56586	2.03330	4.47539	12.65633
	Equal variances not assumed			4.642	45.500	.000	8.56586	1.84528	4.85041	12.28131

TABLE X. SCHEFFE TEST (POSTHOC ADVANCED TEST) OF VARIABLE LEARNING OUTCOMES WITH FIXED FACTORS LEARNING STYLES * STUDENT GENDER

(I) InteractionBld1	(J) InteractionBld1	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
AFemale	AMale	-5.92	2.340	.289	-14.08	2.24
	KFemale	-3.25	3.242	.960	-14.56	8.06
	KMale	1.00	3.009	1.000	-9.49	11.49
	VFemale	-7.20	3.009	.352	-17.69	3.29
	VMale	-16.54*	2.340	.000	-24.70	-8.38
AMale	AFemale	5.92	2.340	.289	-2.24	14.08
	KFemale	2.67	3.085	.979	-8.08	13.43
	KMale	6.92	2.839	.330	-2.98	16.82
	VFemale	-1.28	2.839	.999	-11.18	8.62
	VMale	-10.62*	2.116	.001	-18.00	-3.24
KFemale	AFemale	3.25	3.242	.960	-8.06	14.56
	AMale	-2.67	3.085	.979	-13.43	8.08
	KMale	4.25	3.619	.924	-8.37	16.87
	VFemale	-3.95	3.619	.943	-16.57	8.67
	VMale	-13.29*	3.085	.007	-24.05	-2.53
KMale	AFemale	-1.00	3.009	1.000	-11.49	9.49
	AMale	-6.92	2.839	.330	-16.82	2.98
	KFemale	-4.25	3.619	.924	-16.87	8.37
	VFemale	-8.20	3.412	.347	-20.10	3.70
	VMale	-17.54*	2.839	.000	-27.44	-7.64
VFemale	AFemale	7.20	3.009	.352	-3.29	17.69
	AMale	1.28	2.839	.999	-8.62	11.18
	KFemale	3.95	3.619	.943	-8.67	16.57
	KMale	8.20	3.412	.347	-3.70	20.10
	VMale	-9.34	2.839	.076	-19.24	.56
VMale	AFemale	16.54*	2.340	.000	8.38	24.70
	AMale	10.62*	2.116	.001	3.24	18.00
	KFemale	13.29*	3.085	.007	2.53	24.05
	KMale	17.54*	2.839	.000	7.64	27.44
	VFemale	9.34	2.839	.076	-.56	19.24
Based on observed means. The error term is Mean Square(Error) = 29.109.						
*. The mean difference is significant at the 0.05 level.						

IV. Conclusion

Based on the results of statistical tests: ANOVA, T and SCHEFFE conducted on student learning outcomes in this study, it is known: that: (1) there are differences in learning outcomes between students who have different learning styles; (2) the learning outcomes of male students achieve better learning outcomes than female students; (3) there is an interaction between student gender and student learning styles towards learning outcomes (gender and learning style have a significant effect on learning outcomes); (4) there is no difference in learning outcomes based on student learning styles of all students except students who have a visual learning style with male sex achieving superior learning outcomes than students who have auditory and kinesthetic learning styles as well as students who have a visual learning style with female sex achieving superior learning outcomes than students who have auditory learning style.

Some constructive suggestions for the direction of future research are: (1) researching learning outcomes in blended learning with other mixed levels, so that it can be ascertained what level of mixed portions can produce better learning outcomes, including interactions that occur between learning styles and blended learning learning patterns in learning Algorithms and Programming and also in other lesson learning; (2) researching the differences in learning outcomes and interactions that occur from two or more blended learning patterns that have different mixed levels in other subjects besides the Algorithm and Programming subject.

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