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How Competence of Production, Attention, Retention, Motivation, and Innovation Can Improve Students' Scientific Writing Skills

Indrya Mulyaningsih
Institut Agama Islam Negeri Syekh Nurjati, Indonesia
Corresponding Email: indrya.m@gmail.com

Wahyudi Rahmat
Universitas PGRI Sumatera Barat, Indonesia
Email: wahyudi@upgrisba.ac.id

Djohar Maknun
Institut Agama Islam Negeri Syekh Nurjati, Indonesia
Email: maknundjohar@gmail.com

Winci Firdaus
Badan Riset dan Inovasi Nasional, Indonesia
Email: winc001@brin.go.id

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Abstract
This research aimed to prove the role of production, attention, retention, motivation, and innovation in students' scientific writing skills at the Islamic Study College (PTAI) in Cirebon. This experimental research used a quasi-experimental design and a nonequivalent control group design. The experiment was conducted in two groups, experiment and control groups. The research samples included Lecturers from a public Islamic University. The experiment group samples were 38 students of the Philosophy of Religion Department. The control group consisted of 33 Islamic Guidance and Counseling Department students. The collection technique used was tested, comprised of a pretest and posttest. The two groups were given the same tests (pretest and posttest), and the results were compared. The instrument used in this research was a test. Validity determination for the scientific writing ability variable was not measured statistically but through construct validity. The reliability test resulted in a reliability coefficient from an assessor of 0.82, while all assessors' average rating reliability coefficient was 0.93. The normality test results on scientific writing ability data with the control class show Lo = 0.106 < Lt = 0.154. Meanwhile, the normality test on the experiment class's scientific writing ability data results in a maximum Lo of 0.106 and Lt = 0.144. The balance test results show the score of tcount = 1.51 < ttable = 1.67. The data analysis with t independent test resulted in the score of tcount > ttable (10.45 > 1.65). This shows that the competence of production, attention, retention, motivation, and innovation can improve students' scientific writing skills.

Keywords: Competence; students; writing ability; writing skill

Introduction

Writing effectively in the scientific field calls on a wide range of skills, one of which is thinking critically (Bair & Mader, 2013). As one of their qualities, an individual capable of critical thinking will make an effort to locate information and sources that they know they can trust to be true (Zuchdi, 2009; Munandar, 2012). It is possible to acquire this talent through consistent practice and by paying attention to a variety of tough aspects of different types of jobs that need critical thinking (Cottrell, 2017). Regarding education, the teacher must act as a facilitator, guide, and mediator between the individual student and the other students (Borup et al., 2019; Yendra et al., 2018; Tiawati et al., 2022). It is not impossible to estimate a person's intelligence quotient (IQ) based on the depth of their capacity for critical thinking. Intelligence can be described as "the talent or skills to acquire and utilize knowledge for the goal of problem-solving and adapting to the world," as stated by Woolfolk et al. (2013). Another factor that can affect a person's creative potential is that person's level of intelligence (Rodrigues et al., 2019). The brain's functioning is connected to various characteristics, including the ability to think analytically, intelligently, and creatively. Harvey (2019) states that the brain's functioning can be broken down into five distinct components, which are intricately tied to one another. Emotional functioning, social functioning, cognitive functioning, physical functioning, and reflective functioning are components that make up this aspect.

One of the most important skills a student needs to have to be considered a part of the academic community is the ability to produce scientific work (Kalliopi & Kalogiannakis, 2019; Yusutria & Rahmat, 2019; Helda et al., 2020; Pujo Leksono & Tiawati, 2020). This is one of the most important abilities that a student needs. This is perhaps one of the essential characteristics of a student to integrate well into the academic community. The term "scientific work" can refer to various items, including reports, papers, essays, reviews, activity reports, and proposal documents (Aspers & Corte, 2019). The fruits of one's labor in the academic world are not the same as those of one's labor in writing for the general public. "truth therein should be universally refutable, piercing across country, language, and even cultural limitation" about scientific activities (Mart, 2012). In addition, science practice is governed by a set of predetermined rules in a general sense and connection to particular institutions (Yusri et al., 2019). This point is driven home even more because every organization has its in-house design aesthetic that it adheres to.

According to the findings of the research conducted by Iordanou et al. (2019), it was found that students frequently focus their attention entirely on the subject matter of the topic while ignoring the component of the scientific job that involves writing. This was discovered as a result of the fact that students frequently focus their attention entirely on the topic's subject matter. Pupils still have difficulty mastering the style of written linguistic expression (Fatimah, 2019). This is a problem that has not been resolved. Most students can only successfully reproduce the material they have been encouraged to learn verbally (Mulyaningsih et al., 2019; Rahmat, 2017). This is the case even when they have been given multiple opportunities to do so. This lends credence to the notion that writing is a communication analogous to spoken language. Consequently, the sentences utilized are frequently rather lengthy and feature a comparatively low amount of punctuation compared to the several other forms of sentences. The reader will undoubtedly have a more difficult time understanding what is being communicated to them as a direct consequence.

To a considerable extent, the level of success that learning scientific writing will have will rely on many different aspects. These factors include the student, the teacher, the model, and the evaluation of the student's learning. The learning process can't be successful if the attributes learner does not align with the characteristics of the model utilized as a source of instruction. Consequently, students' capacity to write scientifically needs to be taught utilizing a model capable of establishing, improving, and expanding upon this skill. The Social Learning Theory served as the major theoretical foundation for constructing this learning model in theory itself. The construction model was underpinned by this unique learning theory, which served as the basis for the work. As it develops further, this theory will finally become known as the Social Cognitive Theory when it fully evolved. This name will be given to it when it is complete.

Bandura is generally credited with being the one who first proposed this idea. " to understand the learning process in individuals, this theory combines behaviorist theories of reinforcement with cognitive psychological perspectives' (Bandura, 2018:130). In the broadest meaning of the term, children learn through observing other people's actions and by emulating role models' behaviors through the cognitive and emotional processes of attention, memory, reproduction, and motivation (Ahn et al., 2020). Schunk & Usher (2012) assert that most human learning occurs in a social environment. This lends credence to what we already knew to be true. Simply witnessing how other people behave, think, and act can help a person enhance their knowledge, rules, abilities, methods, confidence, and attitude.

A student could look at a model as an illustration to gain information about its compatibility with other systems and its effects on those systems. Because students typically have a limited understanding of how scientific research is carried out, they need to be able to present a working example or model as part of their educational experience. Likewise, students typically have a limited understanding of how scientific research is conducted. In addition, it is the lecturer's responsibility to supply the students with various models or instances that would facilitate simpler learning on the part of the students. In addition to this, one of the most significant aspects of the learning process that contributes to its overall success is one's level of motivation.

Consequently, it is hoped that increasing the amount of Social Learning Theory incorporated into education will increase students' ability to write scientifically. Attention, retention, production, and motivation are the four components that the Social Learning Theory identifies as present in the learning process. However, the research given here adds the fifth factor, and that factor is innovation. Because innovation is a subset of creativity, the innovative potential of an individual grows in direct proportion to the extent to which that individual is creative. Therefore, when referring to the separate components, we will refer to them as PARMI (production, attention, retention, motivation, and innovation). In light of the material offered thus far, developing a learning model based on PARMI is necessary to improve students' ability to write scientifically.

Research method

This experimental research employed a quasi-experimental design and a nonequivalent control group design. Two different groups, an experimental and a control group, participated in the experiment. The trial group employed a scientific writing learning model based on PARMI. The control group did not use PARMI but followed a more conventional learning strategy. The following phase contrasts the performance of the two groups in their scientific writing scores. Participants in the research sample were students and lecturers from some faculty on Islamic. In addition, MKDU Indonesian Language lecturers were also included. The experiment participants were divided into 38 groups, each consisting of a student from FUAD's Philosophy of Religion Department (FA). In addition, a random sample of 33 students from the Islamic Guidance and

Counseling Department served as the control group's representatives (BKI). The sample selection was established after considering the parameters of independence, homogeneity, and normalcy.

The research covers two variables. The dependent variable was scientific writing ability, and the independent variable was the traditional learning model. The collection technique used was a test composed of a pretest and a posttest. The two groups were given the same test (pretest and posttest), and the results were compared. The test asked the students to compose a paper with assessment criteria: 1) using agreed format or systematics; 2) using scientific linguistic style; 3) containing novelty and creativity of idea; 4) compatibility of the problem with competency; 5) containing the accurate source of information and data; and 6) there were appropriate analysis, synthesis, and conclusion. Figure 1 shows the research design in the model test phase.

Experiment Class	*Pre-test*	X	*Post-test*
Control Class	*Pre-test*		*Post-test*

Figure 1. Research design
(Source:Creswell, 2012)

The design shows two randomly selected groups, the experiment, and the control groups. X mark indicates that treatment is given. The two groups were given a pretest and a posttest. The two tests were given to examine the difference in results obtained using PARMI based scientific writing learning model and the traditional learning model. This research used the test to collect data on students' scientific writing abilities. The students were asked to compose the paper, given that: 1) it was written on letter size, 80-gram paper; 2) using Times New Roman font of 12 sizes, and 3) using 1.5 space with the following margin: top 4 cm, left 4 cm, right 3 cm, and bottom 3 cm. The aspects assessed were: 1) using agreed format or systematics; 2) using scientific linguistic style; 3) containing novelty and creativity of idea; 4) compatibility of the problem with competency; 5) containing the accurate source of information and data; and 6) there were appropriate analysis, synthesis, and conclusion. The outline and instrument of the scientific writing ability test are attached.

Validity determination for the scientific writing ability variable was not measured statistically but through construct validity based on the theories used as scientific writing ability assessment indicators. The achievement indicators of scientific writing were that students were able to write a paper under measurement criteria covering the following aspects: 1) using an agreed format or systematics with a weight of 10; 2) using scientific linguistic style with a weight of 15; 3) containing novelty and creativity of idea with weight 15; 4) compatibility of the problem with competency with weight 15; 5) containing the accurate source of information and data with weight 20, and 6) containing the accurate source of information and data with weight 25.

The instrument-written test used to collect the data should have high reliability to ensure the instrument's confidence level in various subjects. The reliability of scientific writing ability test items was calculated using the rating statistic formula. There were three assessors: researcher, lecturer of MKDU Indonesian Language, and lecturer with the department's scientific competency. Validity and reliability tests were conducted on 30 Philosophy of Religion Department (FA) students who have taken MKDU Indonesian Language. The reliability test resulted in a reliability coefficient of 0.82 from an assessor. The average reliability rating coefficient from all assessors was 0.93, showing that the reliability of the scientific writing ability test was high. The hypothesis was classified into two, zero hypothesis and alternative hypothesis. The zero hypothesis symbolized H_o, stating that there is no difference. On the contrary, the alternative hypothesis symbolized H_a, stating that there is a difference (Nilesh, 2013).

Before testing the hypothesis, a prerequisite test was conducted on the data analysis (Nilesh, 2013). Data analysis in this research is the prerequisite test that covers data normality and variance homogeneity.

Normality test

A normality test was used to ensure the research data's normality so that the results could be generalized for the population. This normality test was conducted using Lilliefors statistical technique. The normality test criteria at significance level 0.05: H_o was that if $L_{count} > L_{table}$ the data were not normally distributed, and H_a was that if $L_{count} < L_{table,}$ the data were normally distributed (Budiyono, 2015). Below is the normality test on the posttest results on the control and experiment classes.

Table 1. Normality test results

Variable	N	L_o	L_t	Test
Control Class	33	0.106	0.154	Normal
Experiment Class	38	0.106	0.144	Normal

The normality test on the scientific writing ability data with the control class resulted in a maximum L_{count} of 0.106. With critical score L_{table} for *Liliefors* test with n = 33 and significance level $\alpha = 0.05$, $L_t = 0.154$. In line with the comparison result above, it is apparent that $L_o = 0.106 < L_t = 0.154$, thus, we may conclude that the data were derived from a normally distributed population. Meanwhile, the experiment's normality test on the scientific writing ability data resulted in a maximum L_o of 0.106. With critical score L for *Liliefors* test with n = 38 and significance level $\alpha = 0.05$, $L_t = 0.144$. In line with the result of the comparison above, it is apparent that $L_o < L_t$, thus we may conclude that the data were derived from a normally distributed population.

Variance homogeneity test

The variance homogeneity test was conducted to compare the score variance of scientific writing ability with the control and experiment classes. The technique used was *Bartlett* test technique. The hypothesis proposed: H_o is if $\chi^2_{count} \geq \chi^2_{table}$ the score variance of scientific writing ability is heterogeneous and H_a is if $\chi^2_{count} \leq \chi^2_{table}$ the score variance of scientific writing ability is homogeneous with significance $\alpha = 0.05$. Below are the results of the posttest variance homogeneity test with the control and experiment classes.

Table 2. Variance homogeneity test results

Samples	dk	1/dk	S_i^2	log S_i^2	(dk) log S_i^2	χ^2_{count}	χ^2_{table}	Test
Control	32	0.03	76.18	1.88	60.22	2.30	3.481	homogenous
Experiment	37	0.03	41.16	1.61	59.74	3.25	3.481	homogenous

The homogeneity test on the score variance of scientific writing ability with the control class resulted in $\chi^2_{count} = 2.30$ and $\chi^2_{count} = 3.25$ with the experiment class. The Chi-Square calculation with dk = 1 and significance level $\alpha = 0.05$ and n = 32 resulted in $\chi^2_{table} = 3.48$, and with n = 37 resulted in $\chi^2_{table} = 3.48$. This shows the control class $\chi^2_{count} \leq \chi^2_{table}$ ($2.30 \leq 3.48$). The same applies to the experiment class $\chi^2_{count} \leq \chi^2_{table}$ (3.25 ≤ 3.48). Therefore, H_o is rejected, and H_a is accepted. Thus, we may conclude that the variance was homogenously distributed.

Balance test

The balance test aimed to test the similarity in each group's scientific writing ability. The statistical test used was *t*-test with a significance level $\alpha = 0.05$. The hypothesis proposed: H_o if score $t_{count} > t_{table}$, the score variance of scientific writing ability of the groups was imbalanced. H_a if score $t_{count} < t_{table}$, the score variance of scientific writing ability of the two groups was balanced. The result of test shows score $t_{count} = 1.51 < t_{table} = 1.67$. Therefore, we may conclude that the control group's scientific writing ability was equal to that of the experiment group. Some faculty conducted this phase at an Islamic University in Indonesia. This place was chosen for effective reason. This phase was conducted in three months, from September 2015 to November 2015.

Result and discussion

Scientific writing ability pretest data

A pretest and a posttest of the PARMI-based scientific writing learning model for the General Basic Subject (MKDU) Indonesian Language were carried out. The purpose of the test was to evaluate how well the candidate utilized the components of scientific writing, which are as follows: 1) the format of the paper; 2) the linguistic style; 3) the originality of the idea; 4) the topic that was presented; 5) the data and source of information; and 6) the analysis, synthesis, and conclusion.

A score of 10 was awarded to those who performed best in the paper format. The second, third, and fourth components each received a score of 15 for their greatest possible point total. A score of 20 was the maximum possible for the data and sources of data aspects. The greatest possible score, 25, was awarded for the final consideration.

Control class's pretest data

1. Control class's pretest central tendency and distribution tendency

The scientific writing ability exam results are summarized below, highlighting the central tendency in bold. The maximum score is 55.42, and the lowest score is 25.83. A total of 39.81 is the average score that was attained. The score of 35.00 is the one that appears most frequently (the mode). The middle point, or the median, of the data is 38.33. 29.59 is the range that the data fall inside. The following statistics comprise the distribution tendency: the standard deviation is 7.34, and the variance is 53.93.

2. Control class's pretest score frequency distribution

The most common range of points that the students obtained, as shown by the frequency distribution of their results, was between 31 and 36. This is evidence that they have not yet reached their full potential in their ability. Table 3 presents a statistical analysis of the frequency distribution of scientific writing skill scores.

Table 3. Frequency distribution of control class's pretest score

Interval Class	$f_{absolute}$	$f_{relative}$	F
25 – 30	2	6.06	2
31 – 36	11	33.33	13
37 – 42	10	30.30	23
43 – 48	5	15.15	28
49 – 54	2	6.06	30

55 – 60	3	9.09	33
	33	100	

Based on table 3, the results of the scientific writing ability exam, control class, with class intervals of 25-30 of as many as 2 students, class intervals 31-36 of as many as 13 students, class intervals 37-42 as many as 23 students, class intervals 43-48 as many as 28 students, class intervals 49-54 as many as 30 students, and class intervals 55-60 as many as 33 students. It is clear from these findings that students' scientific writing skills in control classes have not improved significantly, as seen by the results of the student's writing assignments in those classes. The results of the scientific writing ability test administered to the control class during the pretest are displayed in Figure 2 as a histogram and a polygon, respectively.

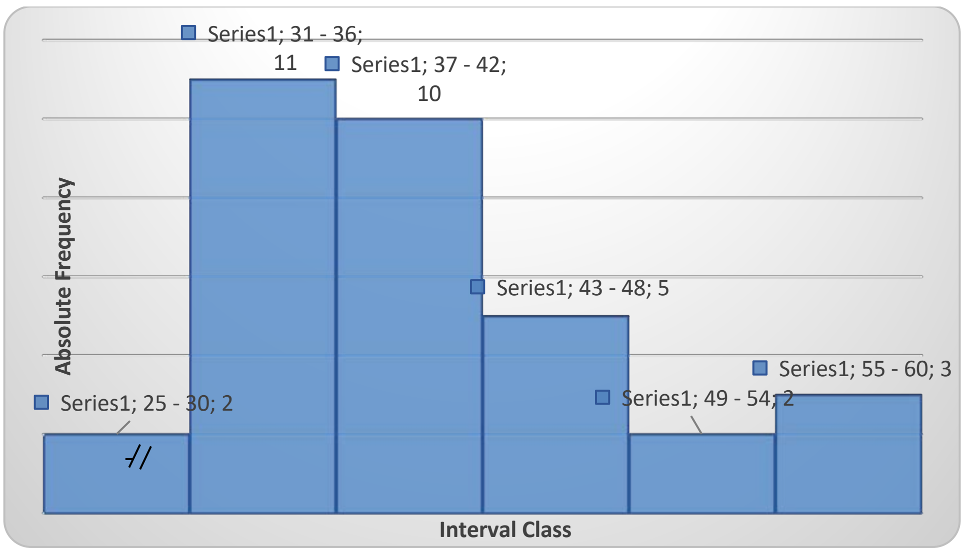

Figure 2. Histogram and polygon of control class's pretest score frequency

The part of scientific writing ability known as "analysis, synthesis, and conclusion" has the highest average score out of the other five components of scientific writing ability. Therefore, the number 40.15 is displayed as the average in the figure. Figure 3 contains all information regarding the average in the category of scientific writing skills compiled.

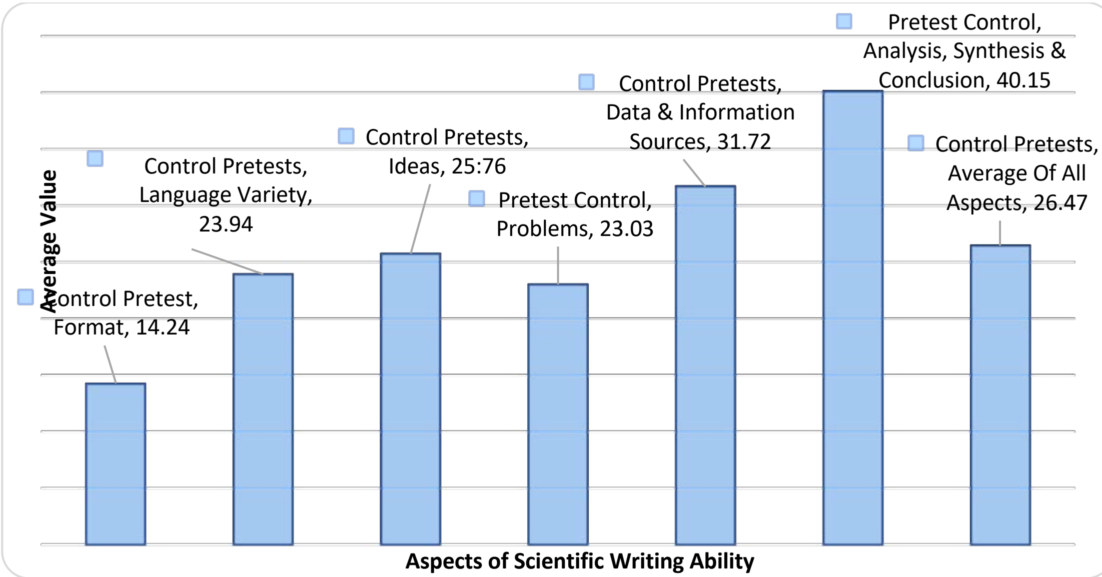

Figure 3. Pretest average score per aspect of scientific writing ability with control class

Based on figure 3, the average scientific writing ability exam control class, which has the highest assessment percentage, is in the indicators of analysis, synthesis, and conclusion. In other words, students can analyze, and analyze the data and infer the data very well. Meanwhile, in the format indicator, it becomes the lowest percentage with an average score of 14.24, concluding that students have not been able to apply the format of writing scientific papers. Hence, it also appears that students have not understood and are not careful in understanding the format.

Experiment Class's Pretest Data

1. Experiment class's pretest central tendency and distribution tendency

The scientific writing skill test findings provide insight into the following central tendency, which can be summarized as follows: There is a range of possible scores, with the highest possible being 55.42 and the lowest being 25.83. It was determined that a total average score of 38.88 was obtained. The score of 35.00 is the one that comes up the most often in the results (the mode). The value of 36.75 is what is known as the data's median value. 29.59 is the interval that the data are contained inside. The standard deviation is 7.33, and the variance is 53.77, indicating a tendency toward distribution. Look at the file, which contains the comprehensive results of the computation.

2. Experiment class's pretest score frequency distribution

The most common range of points that the students obtained, as shown by the frequency distribution of their results, was between 55 and 60. This is evidence that they have not yet reached their full potential in their ability. Table 4 presents a statistical analysis of the frequency distribution of scientific writing skill scores.

Table 4. Frequency Distribution of Experiment Class's Pretest Score

Interval Class	$f_{absolute}$	$f_{relative}$	F
25 - 30	3	9.09	3
31 - 36	13	39.39	16
37 - 42	12	36.36	28
43 - 48	5	15.15	33
49 - 54	2	6.06	35

55 - 60	3	9.09	38
	38	100	

Based on table 3, the results of the scientific writing ability exam, experiment class, with class intervals of 25-30 as many as 3 students, class intervals 31-36 as many as 16 students, class intervals 37-42 as many as 28 students, class intervals 43-48 as many as 33 students, class intervals 49-54 as many as 35 students, and class intervals 55-60 as many as 38 students. Based on these results, it can be seen through the results of students' scientific writing skills in experiment classes their competence has improved significantly. Figure 4 presents a histogram and a polygon depicting the relationship between the experiment class and the scientific writing skill pretest score.

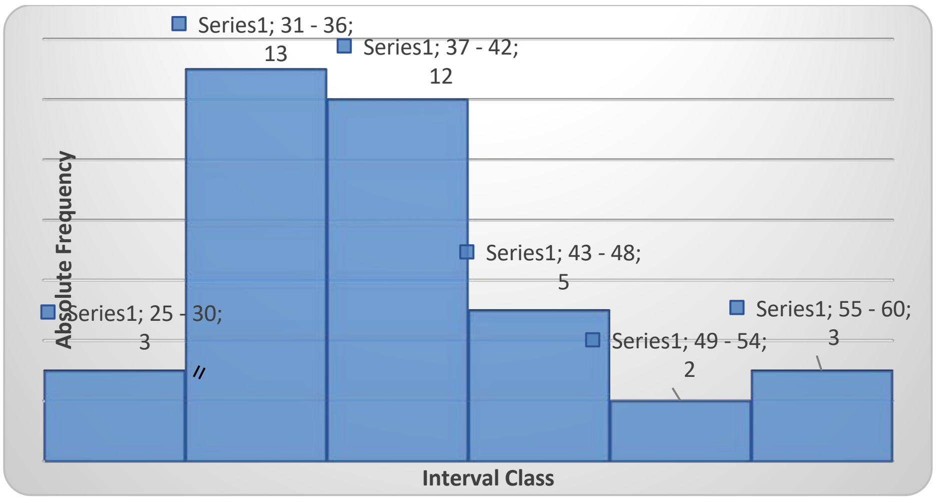

Figure 4. Histogram and polygon of experiment class's pretest score

Based on figure 4, the ability to evaluate, synthesize, and make conclusions is the aspect that receives the highest score of 63.64 out of a possible 100 points when it comes to scientific writing skills. The entire data set about the mean is presented in Figure 5, which was analyzed in terms of one's level of proficiency in scientific writing.

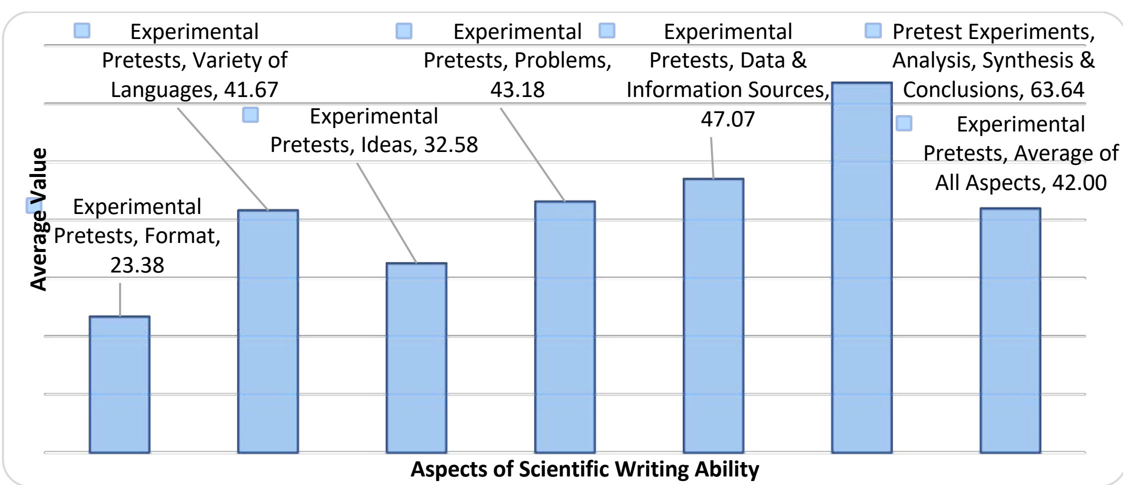

Figure 5. Pretest average score per aspect of scientific writing ability with experiment class

Based on figure 5, the average experimental class scientific writing ability exam with the highest assessment percentage is found in the analysis, synthesis, and conclusion indicators. In other words, students can analyze, and analyze data and infer data very well. Meanwhile, the format indicator is the lowest percentage, with an average score of 23.38, concluding that students can apply the format of writing scientific papers well. However, it is still the lowest assessment indicator, so students need to improve their ability to understand scientific writing formats.

Scientific writing ability posttest data

The participants in both the control group and the experiment group were given a test of their ability to write scientific reports after receiving treatment to evaluate their level of development and determine whether or not they had progressed. The information about the two is shown below in a table and figures, respectively. This is followed by a summary of the data that is presented.

Control class's posttest data

The scientific writing ability test results led to the discovery of the following core tendency, which is taken from the outcomes of the test: The score that has the least value is 42.92, and the score that has the most value is 78.33. A score of 62.99 out of 100 is considered the overall average. The score of 62.50 is the one that comes up the most frequently in the data (the mode). 63.33 is located exactly in the middle of all of the numbers. 35.41 is the interval in which all the data may be found. The standard deviation is 8.73, and the variance is 76.20; this indicates a tendency toward distribution. Table 5 presents a statistical analysis of the frequency distribution of ability scores for scientific writing.

Table 5. Frequency distribution of control class's posttest score

Interval Class	$f_{absolute}$	$f_{relative}$	f
42 – 48	3	9.09	3
49 – 55	4	12.12	7
56 – 62	5	15.15	9
63 – 69	12	36.36	22
70 – 76	7	21.21	30
77 – 83	2	6.06	33
	33	100	

Based on table 5, the results of the scientific writing ability exam, control class, with class intervals of 42-48 of as many as 3 students, class intervals 49-55 of as many as 7 students, class intervals 56-62 as many as 9 students, class intervals 63-69 as many as 22 students, class intervals 70-76 as many as 30 students, and class intervals 77-83 as many as 33 students. It is clear from these findings that students' scientific writing skills in control classes have not improved significantly, as seen by the results of the student's writing assignments in those classes. The frequency distribution can be realized in histogram and polygon, as in figure 6.

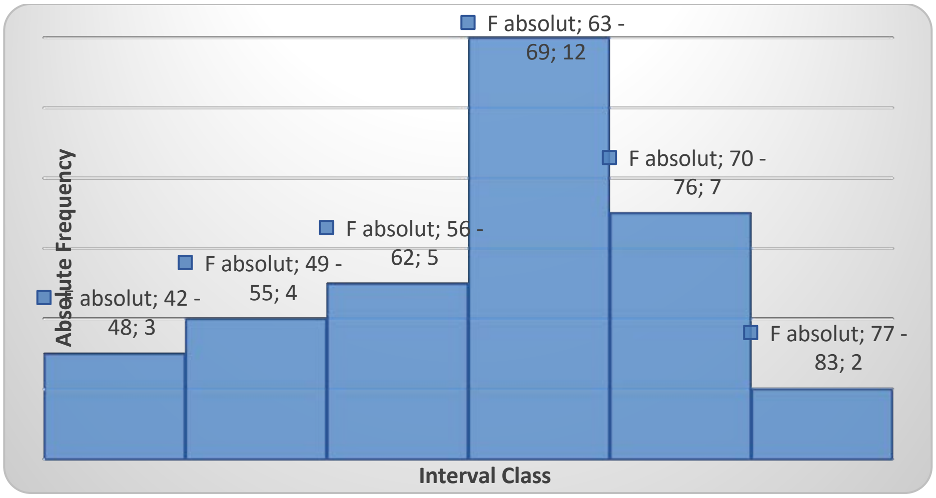

Figure 6. Histogram and polygon of control class's posttest score frequency

There is not much of a gap in the students' capabilities in scientific writing when comparing the class that will act as the control to the other class. This may be demonstrated by the highest possible average score for evaluating the analysis, synthesis, and conclusion was 40.81 points. Figure 7 is where the information regarding the average score obtained for each component of the scientific writing skills test is given.

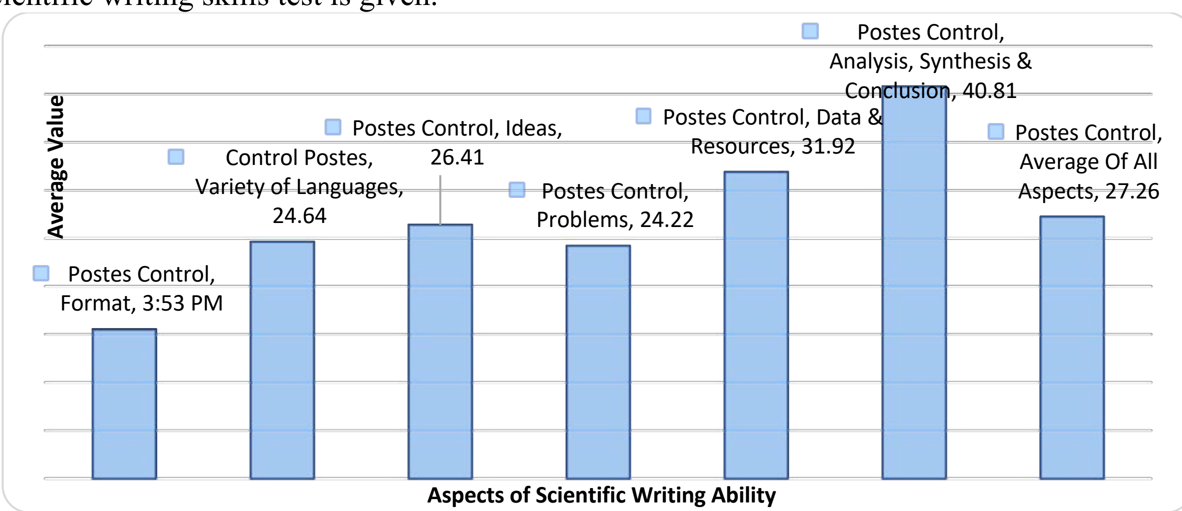

Figure 7. Posttest average score per aspect of scientific writing ability with control class

Experiment class's posttest data

The scientific writing ability test led to the discovery of the following core tendency, which is taken from the test outcomes: The range of available points is from 0 (the worst possible score) to 95. (the greatest possible). Out of a possible 100 points, the aggregate average score is 82.43. The mode, which is just the most frequent score, is currently 82.08. 82.08 is the value that represents the range's arithmetic median. The values range from 0 to 25.00. The data are dispersed across this range. The following characteristics of the distribution tendencies: the variance is 44.82, and the standard deviation is 7.34. The frequency distribution is pictorially in Table 6, which may be seen here.

Table 6. Frequency distribution of experiment class's posttest score

Interval Class	$f_{absolute}$	$f_{relative}$	f
70 – 74	4	12,12	4
75 – 79	8	24,24	12
80 – 84	15	45,45	27
85 -89	5	15,15	32
90 -94	5	15,15	37
95 -99	1	3,03	38
	38	100	

Based on table 6, the results of the scientific writing ability exam, experiment class, with class intervals of 70-74 as many as 4 students, class intervals 75-79 as many as 12 students, class intervals 80-84 as many as 27 students, class intervals 85-89 as many as 32 students, class intervals 90-94 as many as 37 students, and class intervals 95-99 as many as 38 students. Based on these results, it can be seen through the results of students' scientific writing skills in experiment classes their competence has improved significantly. The frequency distribution can be realized in histogram and polygon, as in figure 8.

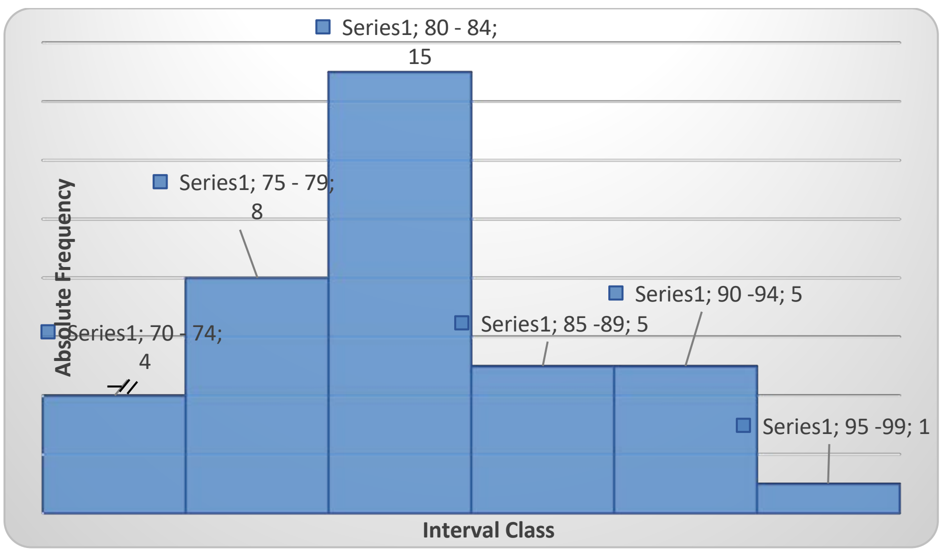

Figure 8. Histogram and polygon of experiment class's posttest score frequency

Based on figure 8, the ability to evaluate, synthesize, and make conclusions is the aspect that receives the highest score of 84.65 out of a possible 100 points when it comes to scientific writing skills. The entire data set about the mean is presented in Figure 9, which was analyzed in terms of one's level of proficiency in scientific writing.

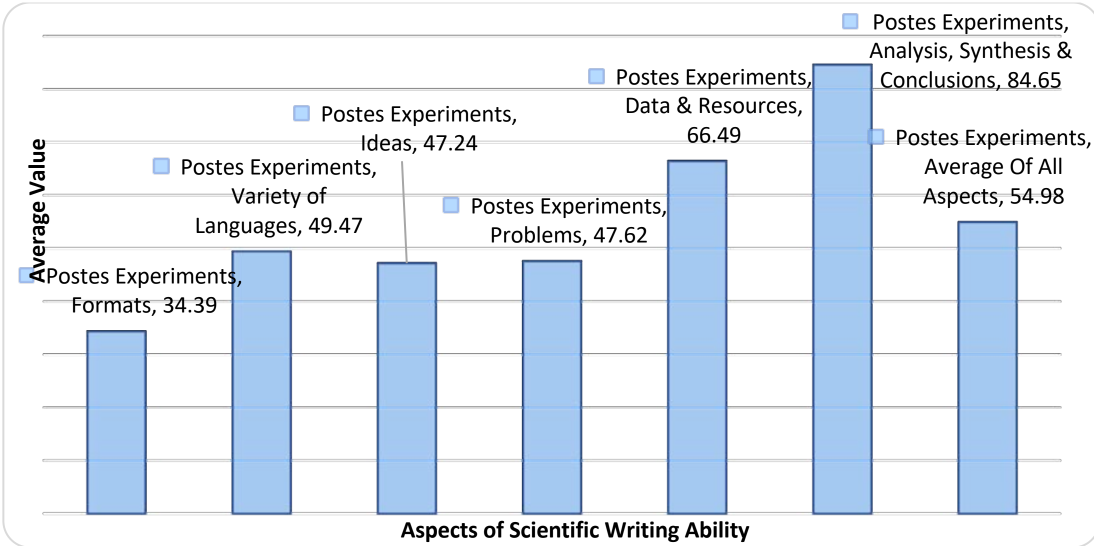

Figure 9. Posttest average score per aspect of scientific writing ability in experiment class

Data of difference between scientific writing ability pretest and posttest results

The following are the pre-test and post-test results, which were determined based on the ability test. The pre-test results are listed first, followed by the post-test results.

The difference in control class

Table 7 compares the control group to the experimental group and presents the scientific writing ability test results taken both before and after the therapy. These findings are shown both before and after the treatment.

Table 7. Score difference of scientific writing ability in control class

Control	N	Min	Max	Mean	Median	Modus	Sd	Varian
Pretest	33	25.83	55.42	39.81	38.33	35.00	7.34	53.93
Posttest	33	42.92	78.33	62.99	63.33	62.50	8.73	76.20
		17.09	22.91	23.18	25	27.50	1.39	22.27

On the test of one's capacity to write scientifically, the lowest possible score was 17.09, and the highest possible score was 22.91. The findings of the test served as the basis for these numerical estimates. The data presented in the table show an increase in the average of 23.18 points. This is because the mode, which is at 27.50, and the range at 5.82, have recently become larger. The information can also be presented as a histogram, as shown in figure 10, which can be seen below.

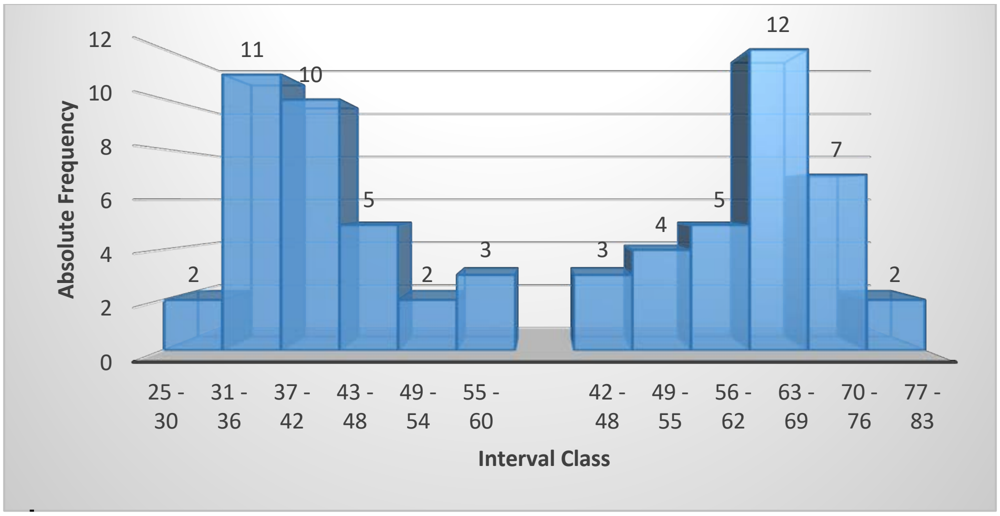

Figure 10. Histogram of frequency of control class's pretest and posttest scores of scientific writing ability

The difference in experiment class

Table 8 indicates the learning outcomes gap between the control and experiment classes before the therapy was carried out.

Tabel 8. Score difference of scientific writing ability in experiment class

Experiment	N	Min	Max	Mean	Median	Modus	Sd	Varian
Pretest	38	25.83	55.42	38.88	36.75	35.00	7.33	53.77
Posttest	38	70.00	95.00	82.43	82.08	82.08	6.69	44.82
		39.58	44.17	43.55	45.33	47.08	-0.64	-8.95

The scientific writing ability test results show that the lowest score is 39.58, and the highest score is 44.17. The table also shows an increase in the average of 43.55. the data can also be observed in figure 11.

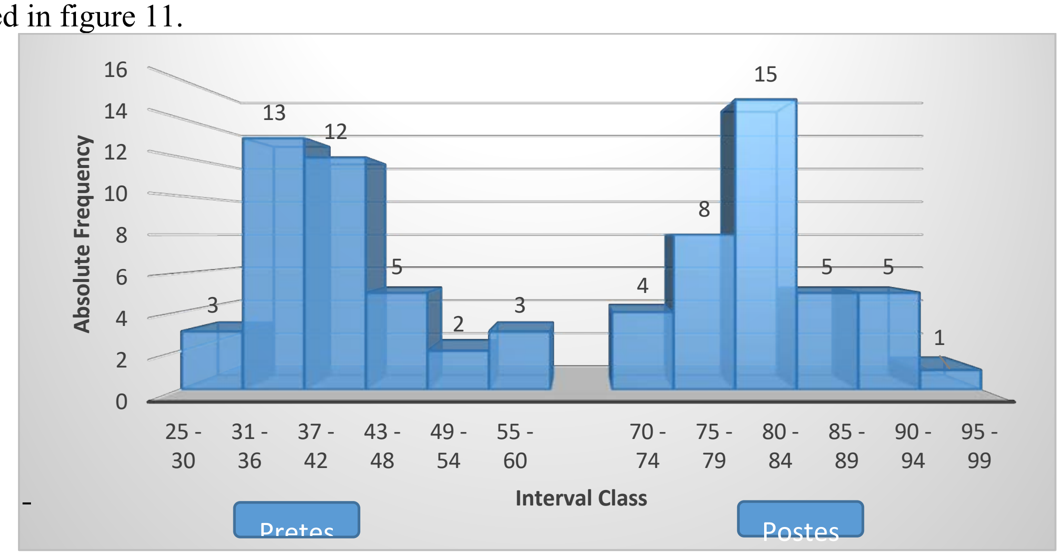

Figure 11. Histogram of frequency of pretest and posttest score of scientific writing ability in experiment class

The descriptions of the post-test data acquired for the control and experiment class are included in Table 9.

Table 9. Description of control class's and experiment class's posttest score

	N	Mean	Std. Deviation	Minimum	Maximum
Control Class's Posttest	33	62.99	8.73	42.92	78.33
Experiment Class's Posttest	38	82.43	6.42	70.00	95.00

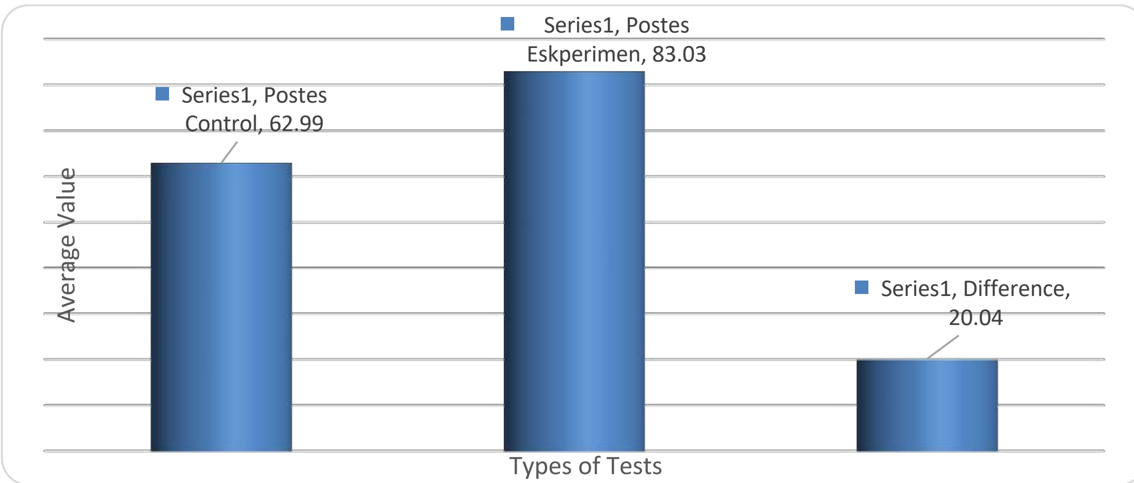

Figure 12. Posttest average score of scientific writing ability in control and experiment classes

Based on figure 12, the difference in average between the control and experiment classes is up to 20.04. This shows a difference in scientific writing ability in class that uses the PARMI-based learning model. The data analysis using independent *t* test results in t_{count} = 10.45 and t_{table} = 1.65. The test criteria used is that H_a is accepted if score t_{count} is higher than t_{table} with significance level $\alpha = 0.05$. The test results show score $t_{count} > t_{table}$ ($10.45 > 1.65$). It is then concluded that H_o is rejected and H_a is accepted. Table 10 shows the difference in scientific writing ability between the control and experiment classes.

Table 10. Independent *t*-test results

Class	Model	N	Average	sd
Experiment	PARMI	38	82.43	6.69
Control	Traditional	33	62.99	8.73

To conduct pretests and posttests in the PARMI learning model, based on scientific papers in General Basic Subjects (MKDU) Indonesian, found that the difference between the control and experimental classes was an average of 20.04 based on the assessment that was carried out in both the control and the experimental classes. This was determined based on the results of the tests that were given in both the control and the experimental classes. This demonstrates that students in classes that employ a PARMI-based learning paradigm have varying proficiency levels in their scientific writing. The data analysis using independent *t* test results in t_{count} = 10.45 and t_{table} = 1.65. The test criteria used is that H_a is accepted if score t_{count} is higher than t_{table} with significance level α = 0.05. The test results show score $t_{count} > t_{table}$ (10.45 > 1.65). It is then concluded that H_o is rejected and H_a is accepted. According to the findings of the many measurement indicators that were carried out, this suggests that the students who produce scientific papers have a significant amount of effect.

Conclusion

Based on the independent t-test data analysis, the test results in score $t_{count} > t_{table}$ (10.45 > 1.65). According to the findings of the many measurement indicators that were carried out, this suggests that the students who produce scientific papers have a significant amount of effect. Therefore, after employing a scientific writing learning model based on PARMI, we can conclude that there is a difference in the student's capacity to write scientifically. This demonstrates that the PARMI learning model is superior to the traditional learning model in terms of effectiveness. Therefore, recommendations for further research, which utilizes a PARMI-based scientific writing learning model, can concentrate their efforts on gaining an understanding of the format structure of scientific paper writing to reduce the number of errors that occur when writing scientific papers, particularly those that occur when adjusting the structure of the writing.

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