

karya ilmiah 16

by Santi Oktarina

Submission date: 30-Aug-2024 07:57PM (UTC+0700)

Submission ID: 2441207362

File name: 16._SCOPUS_Q2_santi.pdf (1.19M)

Word count: 8724

Character count: 48982

The Development of Blended Learning Model Combined With Project-Based Learning Model in Indonesian Students' Scientific Writing

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Abstract—This research aims to describe the practicality of the blended learning model combined with the project-based learning model when Indonesian students write scientific papers. This research employs the research and development method but focuses only on the small group testing stage. The subjects of this research are students taking scientific writing courses in the study program of Indonesian Language and Literature Education, Indonesia. The data were collected through tests, a questionnaire, and an interview and analyzed by means of qualitative and quantitative techniques. The research results show that in general, this learning model is practical to be used in learning scientific writing. Furthermore, the post-test results show significantly higher scores than those of the pre-test results in students' scientific writing (34.59). Additionally, based on the results of the questionnaire distributed to students, all components of the blended learning model combined with the project-based learning model that have been developed, namely the learning structure, reaction principles, social systems, and support systems are considered by students to be appropriate and very appropriate. However, the results of the interview reveal that there are weaknesses in the learning model being developed. These weaknesses will be addressed so that its effectiveness is well tested in the next stage, namely the large group test.

Index Terms—Development, learning model, blended learning, project-based learning, scientific writing

I. INTRODUCTION

The positive impact of the COVID-19 pandemic era is the development of technology-based learning. This development in this era is the initial milestone in the rapid use of technology in instructions. Many technology learning applications have emerged and become popular. After the Covid-19 pandemic era, a learning system that prioritizes technology has become permanent because of a plethora of benefits (Dhawan, 2020; Oktarina et al., 2023). Technology-enabled learning has become imperative for students and lecturers in this contemporary world. Technology can be defined as a foundational cornerstone within the realm of education (Jeanjaroonsri, 2023). The embrace of technology-enabled learning is especially salient for the millennial generations, given their pervasive immersion in technology-infused lifestyles. They seek innovative writing instruction that fosters an elevation in learning motivation (Arta et al., 2019). Therefore, educators must have technological skills so that learning can take place optimally. Many studies report that technology can improve the quality of learning, especially in writing (AIRouji, 2020; Belda-Medina, 2021; Mohammad, 2018; Oktarina, 2021; Rama et al., 2023).

Learning to write scientifically requires technology in the learning process. However, not all lecturers are able to design learning that uses technology optimally, especially for learning to write. In fact, one of the competencies that educators must master in this era is technological proficiency (Belda-Medina, 2021; Guillén-Gámez et al., 2019). Apart from that, many educators neglect the principles of writing that must be included in the teaching and learning process. Based on preliminary studies, lecturers did not use optimal technology in teaching scientific writing and learning models enabling students skillful and productive in writing (Oktarina et al., 2023). In fact, students need a learning model integrating technology and facilitating students' writing skills as these skills are a crucial necessity for students so that their academic pursuits are uninterrupted. Therefore, a learning model accommodating the diverse needs of students is needed.

The blended learning model combined with the project-based learning model is one solution that can overcome such problems. These two models are integrated as a means to address prevalent challenges for several discernible reasons. Firstly, the selection of these two learning models stems from student and lecturer needs discovered through a need analysis, which is a preliminary study conducted as one of several phases in the research and development method. Another reason is that the blended learning model is a technological learning model that suits the characteristics of students in this era. It is widely acknowledged that the youth of this era is very close to technology, such that one might metaphorically describe technology as their breath (Adedoyin & Soykan, 2020; Cilliers, 2017; Firmadani, 2020). Moreover, the blended learning model synergistically integrates the inherent benefits of both offline and online learning

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modalities (Dakhi et al., 2020). Multiple studies corroborate the effectiveness of blended learning models in addressing challenges encountered within writing instruction (Arta et al., 2019; Hosseinpour et al., 2019; Turmudi, 2020). Lastly, the project-based learning model is an innovative learning model that is product-oriented with clear and systematic steps. These characteristics are in accordance with the characteristics and principles of writing. Various studies also report the reliability of this model in improving students' writing skills (Argawati & Suryani, 2020; Maros et al., 2021; Soleh, 2021).

The novelty of the learning model developed in this research is attributed to several factors, such as combining the reliability of two innovative learning models, namely blended learning and project-based learning; using various multimedia, such as e-learning, learning videos, online workshops, flipbooks, and other media; and complying with learning standards, blended learning principles, and writing principles. Because this research is a part of research and development, the researcher has designed a blended learning model combined with a project-based learning model for scientific writing. This model prototype has been validated by media, material, and language experts. Then, the practicality of this model prototype is determined in the stage of a small group test. Therefore, the research problem in this study is "How is the practicality of the developed learning model that integrates blended learning and project-based learning models in Indonesian Students' Scientific Writing?"

II. LITERATURE REVIEW

A. Learning Model

Joyce, Weil, and Calhoun state that learning models are educational products that are used to help students acquire information, ideas, skills, values, ways of thinking, and ways of expressing themselves and teach them how to learn (Joyce et al., 2009). Arrends highlights that the term learning model refers to a particular approach including its objectives, syntax, environment, and management system (Arrends, 1997). A learning model is needed to ensure the attainment of the learning objectives for successful learning. As something conceptual and used as a guideline in carrying out learning activities, it contains everything that is complex in the sense that it is based on scientific thoughts and actions, student success in learning, learning environments, and an effective and efficient learning management system.

Furthermore, Joyce, Weil, and Calhoun put forward several keywords that we need to understand as components of a learning model, namely learning structure, reaction principle, social system, and support system (Joyce et al., 2009). The learning structure is a phasing model that details the phases of the model activities. It basically contains a number of activities that students must carry out during the learning process. The reaction principle is the relationship that must exist between teachers and students. The relationship in question is the appropriate reaction given by the teachers to the activities carried out by the students and the various norms (principles) that must be adhered to and developed for the benefits of the learning model. Additionally, the social system includes three main definitions, namely: (1) a description of the various roles of teachers and students; (2) a description of the hierarchical/authority relationship between teachers and students; and (3) a description of various rules to encourage students. Finally, the supporting system means elements that must be conditioned accurately and appropriately to support the implementation of the teaching model. The model support system starts from the questions of what support is needed by a model to create a special environment.

B. Scientific Writing

Writing is an important part of language learning (Eryilmaza & Yesilyurt, 2022). Writing is a complex process involving a variety of skills. Because of the complexity of these skills, extra time is needed to complete compositions in writing (Jeanjaroonsri, 2023). During the writing process, a series of activities are carried out through certain stages to produce a piece of writing (Oktarina et al., 2017; Oktarina, 2021; Oshima, 2007). Therefore, writing cannot be done just on a single try. There is a process that writers must go through to produce their writing at its best.

One type of writing is scientific writing which must be distinguished from writing in general. The difference lies within the flow of thought. Writing scientific papers needs a linear line of thought; that is, the writer will think and reason scientifically and use various scientific languages in accordance with applicable scientific requirements (Akhadiyah, 2015).

Students in higher education are required to possess proficient scientific writing skills, thereby fostering an expectation for their mastery of such skills. We all know that writing activities are an inseparable part of the entire learning process experienced by students while studying in higher education. Good scientific writing skills greatly influence a student's academic excellence. In other words, writing is one of the keys for students to be successful in the academic field (Piamsai, 2020).

Enhancing proficiency in scientific paper writing requires three important aspects. Firstly, training, acclimatization, and motivation are essential for achieving optimal results (Darmuki et al., 2021; Burhanuddin, 2021). Secondly, the use of various learning models is paramount (Alston et al., 2021; Burhanuddin, 2021; Oktarina et al., 2018). Lastly, technology integration in instructions also plays a vital role (Oktarina et al., 2022; Balqis et al., 2021; Zhang & Chen, 2022). This current trend in writing adapts to the advancements in science and technology.

C. Blended Learning

Blended learning represents an instructional approach that seamlessly integrates the benefits of traditional face-to-face (offline) instruction with those of online learning methodologies (Aminah, 2021; So & Lee, 2013). In this learning model, students are facilitated to be able to study and review learning materials independently for one part of the session through online learning materials and resources, and another part of the session is carried out face-to-face in the classroom. Blended learning is not only about integrating technology into classroom learning but also about facilitating students in exploring learning materials as well as gaining independent and enjoyable learning experiences so that they can learn anytime and anywhere (Alipour, 2020; Alebaikan & Troudi, 2010). Various studies report that the application of blended learning for writing has a positive impact (AlRouji, 2020; Burhanuddin, 2021; So & Lee, 2013). However, in its implementation, there are three challenges, namely unsupportive culture and environment, poor learning design, and unsuitable time planning (Alebaikan & Troudi, 2010).

D. Project-Based Learning (PBL)

Project-based learning (PBL) is a learning model that is based on constructivist learning theory (Yuliansyah & Mutiara, 2021). PBL encourages full involvement and is based on authentic experiences that can be applied to various scientific disciplines. In this case, we will together develop a project-based learning design. The characteristic of project-based learning is a product as a form of learning outcome (Miller et al., 2021). The project-based learning model is reported to be able to train 21st century skills in the era of globalization, especially in Indonesian language learning. Project-based learning has the potential to improve higher-level thinking skills – analysis, synthesis, and evaluation (Sakran, 2021). Various studies have reported the success of this model, especially in learning scientific writing (Hidayati et al., 2023; Sari & Angreni, 2018; Soleh, 2021).

III. METHODOLOGY

A. Research Methods

The method used in this research is the research and development method which combines qualitative and quantitative approaches (Gall et al., 2007). This research is part of research and development based on Borg and Gall's theory at the product design development and initial operational testing stages. More details are presented in Figure 1.

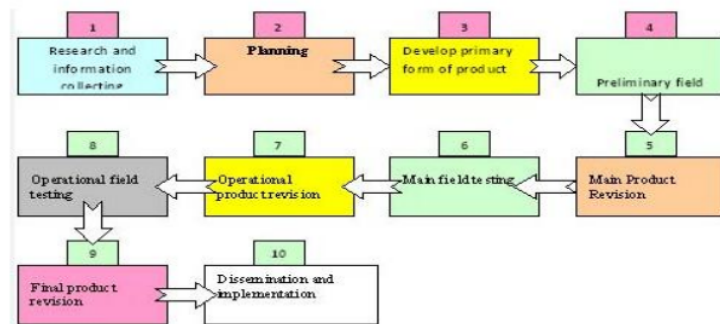


Figure 1. Research and Development Stages

B. Subjects of Research

The research subjects in this study are 12 students (8 female and 4 male) of the Indonesian Language and Literature Education Study Program. They were involved in the practicality test stage or small group test.

C. Data Collection Technique

The data collection was carried out through tests, a questionnaire, and an interview. Firstly, 12 students participated in a pre-test and post-test on the learning material of writing a research proposal. Then, they complete a questionnaire through a Google Form. The questionnaire consists of 5 components, namely learning structure, reaction principle, social system, and support system. The learning structure, reaction principle, social system, and support system consist of 18, 2, 7, and 18 statement items, respectively, as shown in Table 1.

TABLE 1
THE QUESTIONNAIRE SPECIFICATION

Aspects	Indicators	Item Numbers
Learning Structure	1. Standards of the learning process	4,5,6,8,10,11
	2. The learning process in accordance with the principles of writing	1,2,3,9,12,13,
	3. Blended learning process	14,19,20,21,22,23,24,25
Reaction Principles	1. Lecturers as facilitators in the learning process	26
	2. Lecturers as motivators in the learning process	27
Social Systems	1. Patterns of interaction between lecturers and students	28,29
	2. Atmosphere in the learning process	30,31,32,33,34
Support System	1. Lesson plan	35,36,37,38,39,40,41,42
	2. Teaching materials	43,45, 46
	3. E-Learning	

Additionally, an interview was carried out with three students to obtain in-depth information regarding student perceptions on the development of the blended learning model combined with the project-based learning model. The interview question specification is presented in Table 2.

TABLE 2
THE INTERVIEW SPECIFICATION

No	Components of the developed model	Question
1.	Learning Structure	Strengths
2.	Reaction Principles	Weaknesses
3.	Social Systems	Suggestions for improvement
4.	Support System	

D. Data Analysis Technique

In this research, the data were analyzed using quantitative and qualitative techniques. The data obtained from the tests and questionnaire were analyzed quantitatively. To analyze the data from the tests in the research proposal writing, an assessment rubric was used as displayed in Table 3.

TABLE 3
SCIENTIFIC WRITING ASSESSMENT RUBRIC (RESEARCH PROPOSAL)

No	Component	Weight (W)	Score (S)
1.	The quality of the introduction, literature review, methodology	3	
2.	The originality of the research topic	1	
3.	The consistency and appropriateness of the use of methods and the research problems	2	
4.	The contribution to the application and development of science	1	
5.	The conformity to the in-house style and use of written language	1	
Final Score = S x W			

Furthermore, the quantitative data from the questionnaire was analyzed using a Likert scale ranging from very inappropriate, inappropriate, appropriate, and very appropriate. Meanwhile, the interview data was analyzed qualitatively by organizing the data; reading, describing, classifying, and interpreting the data into codes and themes; interpreting the data; and presenting the data.

IV. RESEARCH RESULTS

To find out the practicality of the developed learning model by integrating blended learning and project-based learning models to increase students' creativity and productivity the learning of scientific paper writing, a small group test was done. This stage was carried out by involving 12 students within 6 meetings of instructions through writing a scientific research proposal as the learning material. The data in the small group test phase were obtained from the tests, the questionnaire, and the interview.

A. Pretest and Posttest Data

To find out the practicality of the developed learning model, a small group test was carried out by conducting tests on 12 students taking scientific writing courses. The tests included a pretest and posttest on writing a research proposal. The results of the pretest and posttest are available in Figure 2.

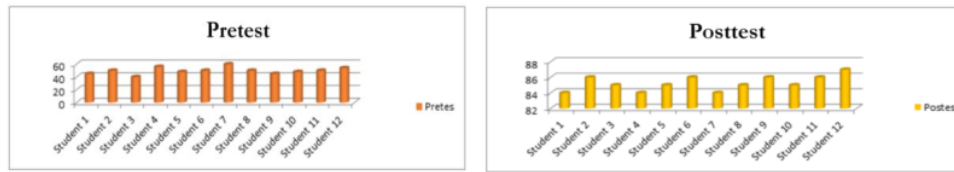


Figure 2. Pretest Dan Posttest Scores

As depicted in Figure 2, the pretest scores within the small group test yield results below 60. Following an assessment conducted in adherence to the research writing assessment rubric, the average score is 49.66. It implies the persistent challenge among students in grasping foundational concepts encompassing introduction, literature review, and research method. Furthermore, the findings reveal that the research topics are not original, and their papers lack consistency between research methods and research problems, contribution to the development of science, and understanding of in-house style.

In addition to the pretest outcomes, students' posttest scores range from 84 to 87, with a mean score of 85.25. Comparative analysis reveals a significant improvement in the average score by 34.59 points when compared to the pretest results. Concerning this, it can be inferred that a significant difference exist in students' performance before and after the implementation of the project-based learning model integrated with blended learning.

B. Questionnaire Data

After implementing this learning model, ⁷ researcher distributed a questionnaire to 12 students consisting of 52 statements in term ¹ of learning structure, reaction principles, social systems, and support systems to assess the practicality of the blended learning model combined with project-based learning model to learn how to write scientific papers through writing a research proposal. The findings derived from the questionnaire are delineated as follows.

(a). Learning Structure

The first component in the learning model is the learning structure. In this model, there are 7 stages of learning structure, namely the project orientation and determination, project exploration, interpretation, analysis and brainstorming, project planning, project implementation, project presentation and discussion, project revision and assessment, and project publication phases. Following the tests, the students' evaluations regarding the practicality of the model structure under development are presented in Table 4.

TABLE 1
STUDENTS' PERCEPTIONS OF THE PRACTICALITY OF THE MODEL STRUCTURE OF BLENDED LEARNING COMBINED WITH PROJECT-BASED LEARNING

No.	Statement	Likert Scale			
		Very Inappropriate	Inappropriate	Appropriate	Very appropriate
1	The learning structure of this learning model includes writing stages (prewriting, writing, and postwriting).	0(0%)	0(0%)	7(58.3%)	5(41.7%)
2	The learning structure of this learning model combines all language skills.	0(0%)	0(0%)	6(50%)	6(50%)
3	The learning structure of this learning model is authentic.	0(0%)	0(0%)	4(33.3%)	8(66.7%)
4	The structure of this learning model encourages a comprehensive and broad mindset.	0(0%)	0(0%)	5(41.7%)	7(58.3%)
5	The structure of this learning model is integrated.	0(0%)	0(0%)	8(66.7%)	4(33.3%)
6	The structure of the learning model is contextual.	0(0%)	0(0%)	11(91.7%)	1(8.3%)
7	The structure of this learning model prioritizes a scientific approach.	0(0%)	0(0%)	6(50%)	6(50%)
8	The structure of the learning model is student-centered.	0(0%)	0(0%)	6(50%)	6(50%)
9	The structure of the learning model creates group interaction patterns and an atmosphere that is in accordance with the characteristics of scientific writing.	0(0%)	0(0%)	5(41.7%)	7(58.3%)
10	The learning model structure provided optimizes the roles of lecturers and students.	0(0%)	0(0%)	4(33.3%)	8(66.7%)
11	The learning model structure is designed by considering the characteristics, time, and study materials.	0(0%)	0(0%)	9(75%)	3(25%)
12	The structure of this learning model makes students work collaboratively.	0(0%)	0(0%)	6(50%)	6(50%)
13	The structure of this learning model is able to produce maximum projects (products).	0(0%)	0(0%)	7(58.7%)	5(41.3%)
14	The structure of this learning model combines online and offline learning to its maximum level.	0(0%)	0(0%)	8(66.7%)	4(33.3%)
15	The structure of this learning model makes it easier for students to produce scientific writing.	0(0%)	0(0%)	7(58.7%)	5(41.7%)
16	The structure of this learning model is able to make students work in solid groups.	0(0%)	0(0%)	8(66.7%)	4(33.3%)
17	The structure of this learning model prioritizes the development of students' creativity, capacity, personality, and needs and develops independence in seeking and discovering knowledge.	0(0%)	0(0%)	5(41.3%)	7(58.7%)
18	The structure of this learning model prioritizes efficient writing practice.	0(0%)	0(0%)	7(58.7%)	5(45.5%)
19	The structure of this learning model provides opportunities for interaction between students and lecturers via the website.	0(0%)	0(0%)	6(50%)	6(50%)
20	This learning model structure provides opportunities for discussion between lecturers and all students via the website.	0(0%)	0(0%)	7(58.7%)	5(45.3%)
21	The structure of this learning model makes students independent in learning.	0(0%)	0(0%)	9(75%)	3(25%)
22	The structure of the learning model makes the learning process flexible because this learning is not limited by time, place, teacher, and learning materials.	0(0%)	0(0%)	3(25%)	9(75%)
23	The structure of this learning model presents materials by displaying texts, audio, and video teaching objects in the Moodle E-Learning system.	0(0%)	0(0%)	3(25%)	9(75%)
24	The learning model structure allows students to learn at a pace according to their individual needs and abilities.	0(0%)	0(0%)	7(58.7%)	5(41.3%)
25	This learning model structure gives students opportunities to access learning material through a non-linear manner on a website.	0(0%)	0(0%)	6(50%)	6(50%)
	Average	0%	0(0%)	6,4(53.4%)	5,6(46.6%)

As shown in Table 4, the findings indicate that the structure of the developed learning model is deemed appropriate (53.3%) and very appropriate (46.6%) by the students, in alignment with established standards of the learning process, principles of writing, and principles of blended learning with the following details. First, students rate the structure of this model as appropriate (58.3%) and very appropriate (41.7%) with the stages of the writing process. Second, the structure of this model is appropriate (50%) and very appropriate (50%) because it combines all language skills. Next, the authentic structure of this model is rated as appropriate (33.3%) and very appropriate (66.7%). Furthermore, the students rate it as appropriate (41.7%) and very appropriate (58.3%) for the structure of this model that encourages a comprehensive way of thinking. Then, they also rate it as appropriate (66.7%) and very appropriate (33.3%) that the structure of this model is integrated. They also deem it appropriate (91.7%) and very appropriate (8.3%) that this learning structure is contextual. Moreover, the structure of this model prioritizes a scientific approach that is rated as appropriate (50%) and very appropriate (50%). Then, this learning structure is designed to be student-centered and is rated as appropriate (50%) and very appropriate (50%). These students also deem it appropriate (41.7%) and very appropriate (58.3%) that the structure of this model is able to create group interaction patterns and an atmosphere that is in accordance with the characteristics of scientific writing. Additionally, it is deemed appropriate (33.3%) and very

appropriate (66.7%) that the structure of the learning model optimizes the roles of lecturers and students.

Furthermore, for the eleventh statement, they also rate it as appropriate (75%) and very appropriate (25%) that the structure of this model is designed by considering characteristics, time, and learning materials. Twelfth, these students deem it appropriate (50%) and very appropriate (50%) that the structure of this learning model makes them more collaborative. Next, it is deemed appropriate (58.7%) and very appropriate (45.5%) that this model structure results in products. The students also deem it appropriate (66.7%) and very appropriate (33.3%) that the structure of this learning model combines online and offline learning. They also rate it as appropriate (58.7%) and very appropriate (45.5%) that the structure of this model produces scientific writing that is easy. Additionally, that the structure of this model is able to make students work in solid groups is deemed appropriate (66.%) and very appropriate (33.3%). Then, they perceive that the structure of this learning model is appropriate (45.5%) because it prioritizes developing creativity, capacity, personality, needs, and independence in seeking and exploring knowledge. Moreover, they believe that the structure of this model is appropriate (58.7%) and very appropriate (45.5%) because it prioritizes efficient writing practices.

Next, for the nineteenth statement, according to students, the structure of this model provides an opportunity for interaction between students and lecturers carried out via a website, which is rated as appropriate (50%) and very appropriate (50%). They also rate it as appropriate (58%) and very appropriate (45.5%) that this model structure provides opportunities for discussion between lecturers and all students via a website. Furthermore, that the structure of this learning model makes students independent in learning is rated as appropriate (75%) and very appropriate (25%). Then, students perceive that the structure of the learning model made the learning process flexible with scores of 25% for appropriate and 75% for very appropriate. Students also agree and rate appropriate (25%) and very appropriate (75%) that this model presents materials by displaying text, audio, and video teaching objects in the Moodle E-Learning system. Additionally, the structure of the learning model allows students to learn at a pace according to their individual needs and abilities which students rate it as appropriate (58.7%) and very appropriate (45.5%). Finally, students believe that it is appropriate (50%) and very appropriate (50%) that the structure of this learning model gives them opportunities to be able to access learning material in a non-linear manner on a website.

(b) Reaction Principle

The second component of the learning model is the reaction principle. The reaction principle developed in this model is related to the role of lecturers in learning, in this case, as a facilitator and motivator. The following results are students' perceptions of the reaction principles developed in this model.

TABLE 5
STUDENTS' PERCEPTIONS OF THE PRACTICALITY OF THE REACTION PRINCIPLE IN THE BLENDED LEARNING MODEL COMBINED WITH THE PROJECT-BASED LEARNING MODEL.

No.	Statement	Likert Scale			
		Very Inappropriate	Inappropriate	Appropriate	Very appropriate
1	This learning model optimizes the role of lecturers as facilitators in learning.	0(0%)	0(0%)	7(58.3%)	5(41.7%)
2	This learning model optimizes the role of lecturers as motivators in learning.	0(0%)	0(0%)	6(50%)	6(50%)
	Average	0(0%)	0(0%)	6.5(54.15%)	5.5(45.85)

Table 5 shows that the reaction principle is deemed appropriate (54.15%) and very appropriate (45.85%), which means that this model optimizes the role of lecturers as facilitators and motivators.

(c). Social System

The third component of the learning model is the social system. Table 6 presents students' perceptions of the social system developed in this model.

TABLE 6
STUDENTS' PERCEPTIONS OF THE PRACTICALITY OF THE SOCIAL SYSTEM IN THE BLENDED LEARNING MODEL COMBINED WITH THE PROJECT-BASED LEARNING MODEL.

No.	Statement	Likert Scale			
		Very Inappropriate	Inappropriate	Appropriate	Very appropriate
1	This learning model creates interaction between lecturers and students.	0 (0%)	0 (0%)	3(25%)	9(75%)
2	This learning model creates interaction among students.	0 (0%)	0 (0%)	4 (33.3%)	8(66.7%)
3	This learning model is able to build an interactive atmosphere indicated by group learning in discussions as well as giving each other input/criticism on each other's writing.	0 (0%)	0 (0%)	7(58.3%)	5(41.7%)
4	This learning model is able to build a democratic and open atmosphere.	0 (0%)	0 (0%)	8(66.7%)	4(33.3%)
5	This learning model is able to build a conducive atmosphere.	0 (0%)	0 (0%)	10(83.3)	2(16.7%)
6	This learning model is able to build a collaborative atmosphere.	0 (0%)	1(8.3%)	6(50%)	5(41.7%)
7	This learning model is able to build active and creative learning.	0 (0%)	0 (0%)	7(58.3%)	5(41.7%)
	Average	0(0%)	0(0%)	6.4(53.5%)	5.6(71.5%)

Table 6 indicates that the students consider it appropriate (25%) and very appropriate (75%) that this learning model creates good interactions between lecturers and students. Additionally, they rate it as appropriate (33.7%) and very appropriate (66.3%) that this learning model creates interactions among them. Also, they deem it appropriate (58.3%) and very appropriate (41.3%) that this learning model is able to build an interactive atmosphere indicated by the students being in groups throughout discussions and giving input/criticism to each other's writing. Furthermore, they rate that this learning model is able to build a democratic and open atmosphere with a percentage of 66.7% (appropriate) and 33.3% (very appropriate). Next, that this learning model is able to build a conducive atmosphere is rated as appropriate (83.3%) and very appropriate (16.7%). For the statement that this learning model is able to build a collaborative atmosphere, 50% of the students deem it appropriate, 4.7% of them believe that it is very appropriate, and 8.3% of them rate it as inappropriate. Lastly, that this learning model able to build active and creative learning is believed to be appropriate (58.3%) and very appropriate (41.7%).

(d). *Support System*

The final component in the learning model is the support system which is a pivotal element to design for achieving an optimal learning model. Within this study, a comprehensive semester plan has been devised, encompassing a lesson plan, instructional resources, a Moodle E-Learning system, and learning tools, all constituting integral components of the support system of this model. Table 7 presents the results of students' evaluations.

TABLE 7
STUDENTS' PERCEPTIONS OF THE PRACTICALITY OF THE SUPPORT SYSTEM IN THE BLENDED LEARNING MODEL COMBINED WITH THE PROJECT-BASED LEARNING MODEL

No.	Statement	Likert Scale			
		Very Inappropriate	Inappropriate	Appropriate	Very appropriate
Lesson Plan					
1	The lesson plan is made systematically.	0 (0%)	0 (0%)	7 (58.7%)	5(4.7%)
2	Course descriptions are formulated clearly and completely.				
3	Course learning objectives include aspects of knowledge, skills, and attitudes.	0 (0%)	0 (0%)	3 (25%)	9(75%)
4	Course learning objectives are formulated clearly and accurately.	0 (0%)	0 (0%)	8(66.7%)	4 (33.3%)
5	Final learning objectives are formulated based on course learning objectives, using verbs that are operational, short, concise, and clear.	0 (0%)	0 (0%)	10(83.3)	2(16.7%)
6	Instructional materials contain the main materials that are relevant to the abilities that will be achieved.	0 (0%)	0 (0%)	8(66.7%)	4(33.3%)
7	The learning experience creates interaction patterns and an atmosphere that is in accordance with the characteristics of scientific writing.	0 (0%)	0(0%)	6(50 %)	6(50%)
8	Assessment refers to the course learning objectives and per-meeting objectives.	0 (0%)	0 (0%)	8(66.7%)	4 (33.3%)
	Average	0(0%)	0(0%)	6.25(52.1%)	4.75(47.9 %)
Instructional Resources					
9	The instructional resources are in line with the student's final achievements and abilities.	0(0%)	0(0%)	7(58.7%)	5(4.7%)
10	The instructional resources have accurate and up-to-date information.	0(0%)	0(0%)	6(50 %)	6(50%)
11	The language used in the instructional resources is easy to understand.	0(0%)	0(0%)	3(25%)	9(75%)
12	The instructional resources make students active and interested in learning.	0(0%)	0(0%)	8(66.7%)	4(33.3%)
	Average	0(0%)	0(0%)	6(50%)	6(50%)
E-learning Moodle System					
14	The features presented in this course make students interested and involved in learning	0 (0%)	0 (0%)	6 (50%)	6(50%)
15	The facilitated materials and student activities on Moodle are easy for lecturers and students to use.	0 (0%)	0(0%)	8(66.7%)	4(33.3%)
16	This e-learning Moodle course provides many opportunities for students to engage in new learning experiences.	0 (0%)	0(0%)	7(58.7%)	5(41.3%)
	Average	0 (0%)	0(0%)	7(58.7%)	5(41.3%)
Learning Tools					
17	The learning tools can support the successful implementation of this learning model.	0 (0%)	0 (0%)	3 (25%)	9(75%)
18	The use of learning tools can make students interested and involved in learning.	0(0%)	0 (0%)	7(58.7%)	5(45.5%)
19	The use of learning tools can stimulate student creativity.	0(0%)	0(0%)	8(66.7%)	4(33.3%)
	Average	0 (0%)	0(0%)	6(50 %)	6(50%)

Table 7 shows that students believe that the support system in the model developed is appropriate (50%) and very appropriate (50%). In terms of the lesson plan, students rate it as appropriate (52.08%) and very appropriate (47.92%). Also, instructional resources are deemed appropriate (50%) and very appropriate (50%). Furthermore, students rate the other two components as appropriate (58.7%) and very appropriate (41.3%) for the E-Learning Moodle System and appropriate (50%) and very appropriate (50%) for learning tools.

C. Interview Data

To find out more about the practicality of the blended learning model combined with the project-based learning model in scientific writing courses, an interview was conducted with three students who had received treatment using this model. The interview focuses on strengths, weaknesses, and suggestions for future improvements to the components of the developed learning model. The results of the interview indicate that the advantages of this learning model are that it enables students to produce scientific work collaboratively, students find variations in learning, the availability of all materials in E-Learning makes it easier for students to write, and the coherent learning stages make the writing process easier for students. In addition to the strengths, the weaknesses of this learning model are also identified, such as the unstable internet connection, inactive team members, and lack of interaction during online learning. Suggestions are also discerned for the improvement of this model which include the use of the language laboratory for stable internet connection and clear role descriptions among group members.

V. DISCUSSION

The integration of blended learning and project-based learning models constitutes a novel pedagogical synthesis aimed at enhancing effectiveness in scientific writing instruction. The blended learning model is a form of technological advancement in the field of education that combines conventional and online learning. This learning model is an effort to overcome the diversity of demands for student success and to improve the quality of learning (Alipour, 2020). Moreover, this learning ensures that students participate actively in the learning process by integrating technological advancements. Additionally, this model adeptly circumvents constraints about spatial and temporal limitations inherent in conventional learning frameworks. However, teaching staff are required to be technologically literate. In implementing this model, technological skills are required (Zhang & Chen, 2022). Meanwhile, the project-based learning model is also an innovative learning model that is product-oriented. This model is used because it suits the characteristics of writing which must produce written products. The reliability of this model has been proven to be able to improve scientific writing skills as proven by many studies (Soleh, 2021; Mohammad, 2018). The reliability of these two models is the reason for combining these models. This has also been proven for learning academic writing (Miller et al., 2021; Maros et al., 2021; Sakran, 2021). Apart from that, the learning model in this research is developed based on an analysis of student needs (Oktarina et al., 2023).

The small group test carried out in this research aims to determine the practicality of this learning model from the perspectives of students. In this research, the data were collected using tests, a questionnaire, and an interview. These three data collection techniques were used to obtain in-depth information about the practicality of the model being developed. If weaknesses are identified in this phase, the learning model will be revised to obtain better result in the next test phase.

The results from the tests indicate that the post-test results show significantly higher scores than those of the pre-test results in students' scientific writing, in this case writing a research proposal. The average posttest score is 85.25, while the average pretest score is 49.66. This indicates that there is a significant improvement in the average score by 34.59. It implies that there is a difference in the students' scores before and after implementing the project-based learning model combined with blended learning. This is because the learning model consists of important components starting from the learning structure, reaction principles, social systems, and supporting system data, combining the reliability of the two innovative learning models. Project-based learning is a learning model that uses projects/activities as a learning process to achieve competency in attitude, knowledge, and skills. The emphasis on learning lies in students' activities to produce products by applying the skills of researching, analyzing, creating, and even presenting learning products based on real-time experience. Implementing project-based learning allow students to think critically and enable them to develop their own creativity through developing initiatives in producing a product (Sakran, 2021; Argawati & Suryani, 2020). Meanwhile, the technology-based blended learning model is very suitable for the current millennial generation (Cilliers, 2017; Oktarina, 2023). The existence of technology is more focused on facilitating students in exploring instructional resources and gaining independent and enjoyable learning experiences so that they can learn anytime and anywhere (Alipour, 2020; Alebaikan & Troudi, 2010). Various studies report that the application of blended learning for writing has a positive impact (AlRouji, 2020; Burhanuddin, 2021; So & Lee, 2013). When combined, these two models can improve students' abilities in scientific writing. This has been proven by the results of this small-group test.

The results of the questionnaire also show positive results regarding students' perceptions on this learning model. In terms of the learning structure, students rate the learning structure of this model as appropriate (53.4%) and very appropriate (46.6%). They agree that the model structure complies with learning standards, writing principles, and blended learning principles. For the reaction principle, it is perceived by students as appropriate (54.15%) and very appropriate (48.85%) that this model optimizes the role of lecturers as facilitators and motivators, characteristics sought after by students. This has an impact on achieving the learning objectives (Arfandi & Samsudin, 2021). Regarding the aspect of the social system, the interactions developed in this model are deemed appropriate (53.5%) and very appropriate (71.5%). A good engagement during learning between lecturers and students will create a pleasant learning atmosphere so that students are motivated to learn. Interaction in learning is a pivotal aspect that lecturers need to know (Dakhi et al., 2020). Moreover, concerning the support system, students believe the lesson plan, materials, e-learning, and learning tools designed in this model are appropriate (52.69%) and very appropriate (47.31%). This favorable

perception persists due to the tailored alignment of this design with the specific needs of the students. Should a learning design be predicated upon the needs of students, instructional activities are anticipated to be interactive, thereby fostering student motivation toward learning (Evans et al., 2020).

However, based on the results of the interview with three students, there are weaknesses in this learning model, namely unstable internet connection, inactive team members, and lack of interaction during online learning. Some technical issues with new features on the website at the beginning of the lesson are also the problems. Various studies also reported similar weaknesses of the blended learning model (Burhanuddin, 2021; Chen et al., 2010; Dakhi et al., 2020; So & Lee, 2013). Lecturers are expected to mitigate these shortcomings to ensure they do not impede the attainment of learning objectives. In the field test, which is the final phase of this study, efforts will be made to refine this learning model through the utilization of a language laboratory, redesigning the reaction system particularly within online lectures, and delineating roles within group assignments. It is anticipated that following these enhancements, the effectiveness of this instructional model can be empirically evaluated.

VI. CONCLUSION

The findings of the research indicate that in general, this learning model is practical in facilitating the acquisition of scientific writing skills. Specifically, the finding reveals a significant improvement in the posttest average score compared to the pretest average score (34.59) in scientific writing. Furthermore, insights derived from student surveys highlight that all components of the blended learning model combined with the project-based learning model that have been developed, namely the learning structure, reaction principles, social systems, and support systems, are considered by students to be appropriate and very appropriate. For the learning structure, students rate the learning structure of this model as appropriate (53.4%) and very appropriate (46.6%). Regarding the reaction principle, it is perceived by students as appropriate (54.15%) and very appropriate (48.85%) that this model optimizes the role of lecturers as facilitators and motivators. Concerning the aspect of the social system, the interactions developed in this model are deemed appropriate (53.5%) and very appropriate (71.5%). About the support system, students agree that the lesson plan, materials, e-learning, and learning tools designed in this model are appropriate (52.69%) and very appropriate (47.31%). However, the results of the interview reveal that there are weaknesses in the learning model, such as unstable internet connection, inactive team members, lack of interaction during online learning, and some technical issues with new features on the website at the beginning of the lesson. Therefore, it can be concluded that this learning model is practical to be used by Indonesian students in learning scientific writing despite its weaknesses. These weaknesses will be addressed to enhance the developed learning model in the next test phase, specifically the field test, allowing for the evaluation of its effectiveness.

ACKNOWLEDGEMENTS

The author would like to thank the Research and Community Service Institute of Sriwijaya University for funding this research and all students participating in this research.

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