



Development of a learning model for writing scientific articles based on blended learning integrated creative problem solving

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Abstract: Learning to write scientific articles necessitates the development of creative ideas and concepts in order to produce high-quality work that is also novel. However, learning to write scientific articles has become uninteresting among students due to a lack of interest in reading, ineffective use of digital literacy services to obtain references, and difficulties in creatively expressing ideas in scientific writing. The research goal is to create a learning model for writing scientific articles based on blended learning and creative problem solving. The Plomp model is used in the research method, which has three stages: preliminary, prototype, and assessment. The research yielded a trilogy of models: model books, lecturer books, and student books. The trilogy of models is designed based on the results of needs and context analysis, analysis of learning model characteristics to write scientific articles in universities, and prototypes by designing model books, lecturer books, student books, and assessments. The assessment results show that: (a) the model book is 89,44%, the lecturer's book is 94,44%, and the student book is 91,67% very valid. (b) A practicality test revealed that 85% of model books, 85,71% of lecturer books, and 87,27% of student books were very practical. (c) The practical 87,602% very effective. The characteristics of the blended learning integrated creative problem-solving learning model for writing scientific articles are very interesting and creative when combined with two lecture methods between online and offline (hybrid) using blended learning to improve students' creative thinking skills. The learning process incorporates technology and blended learning components to help students understand and gain new experiences in creative writing of scientific papers.

Keywords Blended learning, Creative problem solving, Learning model, Scientific article writing

How to Cite

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INTRODUCTION

Writing scientific articles is an important skill for college students to learn. Writing scientific articles also aids in the implementation of the Independent Learning Campus (MBKM) curriculum. According to the observations, students are afraid of writing scientific articles. Students have difficulty developing ideas for scientific articles because they have difficulty finding creative ideas. Students are expected to come up with creative ideas and ideas based on scientific articles (Oktavia & Zaim, 2022). Furthermore, students have creative ideas and can discuss them (Mendieta & Barkhuizen, 2019), but they struggle to explain them in scientific writing.

The process of learning scientific article writing skills was carried out online during COVID-19 (Atmazaki et al., 2021). Students must have innovation, creative thinking skills, and insight while learning to write scientific articles in order to produce quality and substantive scientific articles (Kurniawan, 2012; Ortinau, 2011). Furthermore, students must have the 4Cs, which are communication, collaboration, critical thinking and problem solving, creativity, and innovation, in order to meet the demands of 21st century learning competencies. According to Yanti et al. (2018), writing scientific articles necessitates a complex and systematic thought process, and students must

consider the scientific structure of each section of scientific articles (De Sordi et al., 2017). Students must have the ability and experience to write creative scientific articles (De Oliveira & Lan, 2014).

Observations were made in the Indonesian general compulsory subjects during the 2021–2022 odd semester learning process. The issue is that students rely on and wait for lecturers to present lecture material without having the ability to think creatively in order to understand the material independently and comprehensively. An interview format was used for students taking Indonesian language classes. According to the interview transcription results, "students admit that the factor of studying while working allows them to focus on studying and reading lecture material during the lecture schedule." Reading, on the other hand, is extremely beneficial for producing relevant scientific articles (Ayomi et al., 2022).

This research is very important and should be carried out in relation to this phenomenon. When the learning process occurs, it attempts to direct students toward becoming proficient in writing scientific articles. Furthermore, it has the potential to solve the problems that students have encountered thus far. Furthermore, learning to write scientific articles is intended to improve creative thinking skills, which can be used to actualize students' ideas when writing scientific articles (Rhosalia, 2016). The ability to write scientific articles is the first step for students in producing works in the form of scientific articles that require creative thinking skills and can prove the truth. According to (Sahmini & Rostikawati, 2015; Sb, 2015), scientific articles should be written completely, logically, and systematically so that they can prove the truth and are integrated with creative thinking skills such as fluency, flexibility, and novelty (Haylock, 1997).

As a result, a learning model that can pique students' interests is required so that they can develop the ideas and concepts outlined in scientific articles (Can et al., 2010; Bliuc et al., 2007). The blended learning and integrated creative problem-solving learning model for writing scientific articles seeks to be a solution to the problems encountered during the learning process.

So far, the learning process for writing scientific articles that has been implemented through the use of e-learning and Microsoft Office365 with the Microsoft Teams feature needs to be supported using the blended learning method in order for lecturers to adopt new technology during the classroom learning process (Schechter et al., 2017; Rasheed et al., 2020). Furthermore, lecturers must design learning in a creative, innovative, and student-centered manner (Tomlinson, 2018). Learning is carried out not by replacing face-to-face or traditional learning, but by providing a new vehicle for students by utilizing technology to support the learning process (Hubackova, 2015). The transition of learning models into blends of the two is promising (Dziuban et al., 2014). Teachers, lecturers, and practitioners have widely used blended learning because it has been shown to have a positive impact on the development of the world of technology-assisted education (Tomlinson, Brian, 2015). As a result, lecturers must continue to strive to master technology in order to avoid missing information when appropriately integrating approaches, models, strategies, techniques, and language learning methods. According to (Cerna, 2018), lecturers can create new things and learning materials based on their face-to-face interactions with students.

With the assistance of blended learning, creative problem solving supports students' creative thinking power, particularly in the skills of writing scientific articles (Kashefi et al., 2012). According to Fogleman et al., (2013), the process of learning to write, particularly scientific articles, can make use of information and communication through blended learning. Furthermore, according to Bueno-Alastuey & Pérez, (2014; Persadha (2016), lecturers must integrate the use of technology that can improve student productivity skills into the skills of writing scientific articles in terms of grammar and vocabulary. Students must actively participate in academic writing and strive to improve the quality of their writing; this necessitates evaluation (Can et al., 2010). Students are frequently asked to practice writing scientific articles and must understand the ethics of scientific writing.

It is pertinent to the research that the researcher's learning model has novel value in developing a learning model for writing scientific articles based on blended learning and integrated creative problem solving. This research yielded three models: model books, lecturer books, and student books. legitimately, practically, and effectively. Furthermore, to keep up with technological developments by

incorporating face-to-face lectures online, because online lectures are not a replacement (substitute) but rather a supplement during the lecture process to write scientific articles.

METHODS

The Plomp development model is used in this study. Plomp & Nieveen (2013) explain that developing learning models necessitates research design. In order to solve research problems, research designs are created in a systematic manner. Academics can benefit from innovative products developed through research and development. A learning model for writing scientific articles based on blended learning and creative problem solving will be developed and tested with the help of this research.

Plomp & Nieveen (2013) outline the model development steps as follows. First, there is the preliminary stage (preliminary research). The preliminary development steps are as follows: (a) collecting information and phenomena in the field, (b) identifying problems, and (c) reducing and selecting research data so that they can be formulated in the formulation of problems and research objectives. Second, create prototyping stage. The third stage is the evaluation (assessment phase). In this study, descriptive statistics were used in data analysis techniques such as (a) product validity test analysis, which involved calculating the total average score of the validator's assessment of the product developed using a Likert scale (Purwanto, 2011). Validity data analysis in the form of product validation sheets, content validation sheets, linguistic validation sheets, and graphic validation on model books, lecturer books, and student books. (b) The questionnaire filled out by lecturers and students reveals a practicality test analysis in the form of a product feasibility analysis. Practicality tests were carried out on model books, lecturer books, and student books. (c) Evaluation of the product trilogy in the form of model books, lecturer books, and student books. Analysis of the effectiveness test data was also carried out on scientific article writing skills data analysis, data analysis on student knowledge aspects, data analysis on aspects of students' creative thinking abilities, conducting normality tests, homogeneity tests, and hypothesis testing from the results of the experimental class and control class tests.

The research subjects were 26 students from Universitas Putera Batam State Administration study program during the odd semester of the 2021-2022 academic year. The research resulted in the creation of a trilogy of model books, lecturer books, and student books. Needs and context analysis, as well as a validity, practicability, and effectiveness test of model books, lecturer books, and student books, were used to collect data.

RESULT AND DISCUSSION

The research is divided into three stages, which will be described below: preliminary, prototype, and assessment.

Preliminary

The preliminary stage serves as the starting point and foundation for research and development implementation. This research's preliminary stages include a needs and context analysis, a literature review, and a student analysis. The following will be thoroughly explained.

Need Analysis and Context

Analyzing the characteristics of the learning model for writing scientific articles in universities, analyzing the material for writing scientific articles, analyzing the characteristics of students, and analyzing the curriculum are all part of the needs and context analysis.

1) Analysis of the Characteristics of the Learning Model for Writing Scientific Articles in Higher Education

Students in higher education must learn to produce scientific articles because they are output-based. Students' scientific articles are based on observations, research, and literature reviews, and they

must adhere to Indonesian language rules. In reality, students admit that it is difficult to find topics for scientific articles, to synchronize the main ideas with the topic, and to develop the practice of adapting quotes and opinions of others.

Writing scientific articles during learning in the era of society 5.0 uses the latest technology to help students understand learning materials. Technology effectively supports the learning process, resulting in effective and comprehensive learning. Students are also keeping up with technological advancements so that they can access journals, proceedings, e-books, book chapters, and other reference sources online as needed. This technology aids in the learning process of writing scientific articles, allowing students to become more proficient in writing scientific articles in accordance with their systematic writing style. Students can write scientific articles based on their observations, experiences, literature studies, and mini-research based on research methodology (Bliuc et al., 2007).

It is also consistent with the optimization of campus infrastructure to facilitate the adoption of blended learning to write scientific publications, the provision of a 24-hour wi-fi network, the use of Microsoft Teams 365 accounts, the existence of e-learning at <http://elearning.upbatam.ac.id>, and a repository at <http://repository.upbatam.ac.id>, which can be accessed freely by students. These facilities are used during the learning process to write scientific articles that combine in-person and online learning (Marie, 2021).

Students are encouraged to become more technologically savvy as a forum for students to find topics and express ideas practically and creatively, and learning to write scientific articles is done in an engaging manner (Oktavia et al., 2021). Writing scientific articles has grown in popularity among students and can provide benefits to students (Widyartono, 2014) because it aligns with the Merdeka Learning Campus Merdeka (MBKM) curriculum. Students create published journals, seminar proceedings, and book chapters from scientific articles. As a result, learning to write scientific articles in general courses in universities based on blended learning becomes the basic foundation for students to implement in their field of science. Blended learning also creatively connects technology and can meet pedagogical needs during learning (Bruggeman et al., 2021). This blended learning method can help students understand the material (Klentien & Wannasawade, 2016).

Campus facilities are very technologically supportive, as are students' technological skills. This is consistent with the use of the blended learning method, which allows students to have flexible time during the learning process (Müller & Mildenerger, 2021; Jen & Hoogeveen, 2022). However, students admitted that it was difficult to find scientific article topics while learning to write scientific articles. Lecturers have directed students to be able to find and contextually analyze the topic of scientific articles. In fact, students are constrained by the difficulty of locating the topic of the scientific article. Students' topics will also be developed into titles and scientific articles that will be published in journals with OJS or e-proceedings.

Furthermore, once students have identified an appropriate topic and title, they must align the main idea with the topic. The title and the scientific article must match in order to be consistent with the systematics of writing scientific articles. Students admit to writing quality scientific articles paragraph by paragraph in order to publish them in SINTA-accredited journals and other online journals.

Furthermore, students have a habit of practically committing plagiarism by adapting quotes and opinions from others. In contrast, students are only allowed a maximum of 20% plagiarism in the systematic assignment of scientific article writing. In essence, paraphrasing can be done so that plagiarism is not detected. Using the blended learning method can help students overcome these issues and become proficient in writing scientific articles. Based on this analysis, it is necessary to create a blended learning model for writing scientific articles that is integrated with creative problem solving in order to improve students' creative thinking skills.

2) Curriculum Analysis

Curriculum analysis is performed so that the learning model developed is consistent with and based on the Indonesian MKWU curriculum at universities. Indonesian Books for Higher Education

from the Ministry of Research, Technology, and Higher Education's Director General of Learning and Student Affairs in 2016. Learning must be capable of directing students' critical, creative, and innovative thinking. Students can study independently or in groups, with the facilitator and mediator being the lecturer. To achieve learning outcomes, learning is also based on the learning outcomes of the study program (CPP) and CPMK. Language courses in Indonesian are used as a foundation for writing scientific works in the form of scientific articles, theses, and journals as a required academic activity and are implied in everyday life. Students must understand the correct and appropriate procedure for writing scientific papers in accordance with the Indonesian language rules in *Ejaan Bahasa Indonesia yang Disempurnakan (EYD)* and *Kamus Besar Bahasa Indonesia (KBBI)* edition V. Bahasa lectures instruct students on how to minimize previous language errors and conform to Indonesian language rules. The position and function of the Indonesian language, exploring academic texts in the macro genre, exploring the world of libraries, designing research proposals and activity proposals, reporting research results and activity results, and self-actualizing by writing scientific articles are all covered in this fourteen-week course.

The material from the book was adapted to an Rencana Pembelajaran Semester (RPS), and it was determined that learning to write scientific articles was carried out at the 12th and 13th meetings. The findings from the interviews show that students are eager to learn how to write scientific publications from an outcomes-based perspective. Therefore, it needs to be supported by producing a product to minimize and find solutions to the challenges that students have while learning to write scientific articles. The resulting learning model is seen as effective, practical, and valid.

Prototype

Prototype Stage

The prototype stage in the research includes (a) designing a prototype, (b) summative evaluation, (c) revision, and (d) a focused discussion forum. The following will be described in detail.

1) Designing Prototypes

The products to be designed in the form of model books, lecturer books, and student books are described as follows.

a) Model Book

The learning model's design aims to solve problems based on needs, which are then tested to obtain results from the effectiveness test (Sanjaya, 2008). The learning model serves as a conceptual, management, and communication tool for analyzing, designing, developing, and evaluating learning and training programs. The resulting learning model is distinct from the procedures used (Pribadi, 2010). The specifications of the resulting model book are described below.

The created learning model will be a creative problem-solving-based blended learning model. Blended learning is a learning method that integrates or combines two or more methods to achieve the learning process's objectives (Rusman, 2012). The blended learning method combines online learning with face-to-face instruction to achieve the learning process's objectives (Graham, 2006). This method combines face-to-face learning with online access, which is done concurrently during the learning process. "Blended learning" is also referred to as "hybrid learning" and "mixed learning" (Rusman, 2012).

According to Picciano (2009), the goal of developing blended learning is to combine classroom learning (face-to-face) with online learning to encourage more active and independent learning among students while also reducing the amount of time spent in traditional classroom settings. The curriculum is rethought by educators with the assistance of computer-based technology, which results in the introduction of new online activities for students to engage in, such as case studies, tutorials, individual exercises, simulations, and online group collaboration. According to Husamah (2014), the goal of blended learning is to help students develop better in the learning process based on their learning styles and preferences, as well as to provide practical-realistic opportunities for teachers and

students to learn independently, usefully, and continuously. By combining face-to-face lectures with online learning, schedules can be made more flexible.

The model book's components are designed in accordance with model development Joyce et al., (2016), which is based on (1) the rationale and nature of the model; (2) the learning theory supporting the model; (3) the syntax and components of the model; (4) social system; (5) reaction principle; support system; instructional impact and accompaniment; and (6) implementation instructions for learning the model to write scientific articles.

b) Lecturer Book

The lecturer's book includes work guidelines that lecturers can use to direct themselves during the lecture process, making it easier for lecturers to apply the designed learning model. The curriculum and lesson plans for general Indonesian language courses in universities serve as the foundation for the learning model for writing scientific articles to improve students' creative thinking skills. Learner books include assessment tools to help students meet learning objectives and improve their creative thinking skills.

This lecturer's book is presented for university lecturers to get ideas for writing scientific articles in general Indonesian subjects when giving lectures. This book contains the following sections: (1) working guidelines for lecturers in implementing the blended learning model; (2) guidelines for preparing semester learning plans; (3) sub-achievements of learning and learning materials; and (4) assessment to write scientific articles.

The following factors contribute to the importance of this lecturer's book: (1) It is critical for lecturers to comprehend the learning model in terms of teaching students to write scientific articles in the presence of a social system, reaction principle, support system (student books, student worksheets, and assessment instruments), instructional impact, and accompaniment impact. (2) organizing students to learn and understand the material for writing scientific articles by performing syntax, formulating problems, reviewing literature, developing hypotheses, planning and carrying out research, analyzing and interpreting data, and presenting and publishing scientific article writing results. During the learning process of writing scientific articles, lecturers serve as motivators, facilitators, mediators, and evaluators. (3) To achieve effective and innovative learning objectives, lecturers select models, techniques, media, strategies, and approaches. (5) Lecturers provide information on learning resources, literature reviews, student access to national and international journals for literature studies, and the submission and publication of scientific articles in online journals. (6) Assessment of learning instructions in the blended learning model incorporates creative problem solving into learning to write scientific articles.

This lecturer's book contains instructions and guidelines for implementing the blended learning and integrated creative problem-solving learning process model in order to increase students' capabilities of imaginative and original thought through the writing of scientific papers. The lecturer's book includes work guidelines that lecturers can use to direct themselves during the lecture process, making it easier for lecturers to apply the designed learning model. A model for learning how to write scientific articles. The result is a strategy for fostering students' capacity for original thought that draws inspiration from the structure and content of regular Bahasa courses at the college level. Learner books include assessment tools to help students meet learning objectives and improve their creative thinking skills.

c) Student Book

Student books serve as textbooks and reference books for students as they learn how to write scientific articles. Improve students' capacity for original thought through the implementation of a learning model based on the conventions of scientific article writing in the development of course textbooks. The designed student books can also generate student learning motivation because they are equipped with material presentation, examples, and illustrations that aid students' understanding in mastering lecture material and writing scientific articles.

Understanding lecture material, formulating problems, reviewing literature, formulating hypotheses, planning and carrying out research, analyzing and interpreting data, and presenting the results of scientific article writing are all components of the student book. The following syntax is included in the student book:

1. Comprehending Course Materials

The first step in this learning model to help students improve their ability to think creatively is to understand what is being taught. The information is in the form of the nature of writing scientific articles, the qualities of scientific articles, the requirements for writing scientific articles, and things that need to be thought about when writing scientific articles.

2. Formulating the Problem

The second phase of this learning model to improve students' creative thinking skills is to formulate problems. As an initial stage in formulating problems, a creative problem-solving strategy is needed. [Sanjaya \(2010\)](#) affirms that CPS can be used to enhance learning. The first is when the instructor wants the class to not merely memorize material but truly comprehend it. Second, if the goal of the classroom is to foster students' rational thinking skills, such as critical analysis, the ability to distinguish between truth and opinion, and impartial judgment, then teachers should emphasize these traits. Third, when the instructor intends for the class to demonstrate their problem-solving skills and intellectual prowess by posing difficult questions to the pupils, Fourth, if the educator seeks to foster a culture of increased student accountability for their own academic development, As a fifth point, if a professor wants his or her students to make connections between classroom material and real-world situations (the relationship between theory and reality).

3. Literature Review

The third step in the learning process to foster original thought in students is to examine existing research in the field. Students are instructed to obtain literature in the form of required references and adapt it to the topic of the scientific article they write. The literature obtained can come from books with ISBNs, accredited national journals, proceedings of national and international seminars, and international journals that are indexed or not. Students can find national journals at <https://scholar.google.co.id/schhp?hl=id> and indexed international journals at <https://www.sciencedirect.com>.

Students can find themselves and the literature resources they require. A review of the literature must be planned. [Gilek et al., \(2021\)](#) because it can serve as a resource and foundation for students to obtain the necessary references ([Simatupang & Yuhertiana, 2021](#)). The literature review also tries to gather literature studies that students have done ([Kurniawan et al., 2021](#)).

4. Formulating Hypotheses

Formulating hypotheses is the fourth phase in this model for improving students' creative thinking skills. Writing scientific articles requires the formulation of hypotheses. The lecturer directs students to find temporary solutions to problems they have encountered in order to use them as a foundation for writing articles. When asked to develop hypotheses, students might demonstrate their understanding by drawing on personal experience ([Andri et al., 2013](#); [Van Den Akker, 2013](#)).

5. Planning and Conducting Research

The fifth phase of this model for improving students' creative thinking skills is research planning and execution. To obtain accurate data, conduct research in accordance with scientific research procedures and steps. Students plan research by preparing literature studies, instruments, and data collection techniques all the way to the data analysis stage. Students complete all of these stages in a systematic manner.

6. Performing Data Analysis and Interpretation

Step six of this methodology for nurturing original thought lets pupils analyze and interpret relevant data. The goal of data analysis is to obtain accurate and valid data after conducting research. The data analysis results will provide a conclusion and verification (Rijali, 2018). Miles & Huberman (1994) state the following:

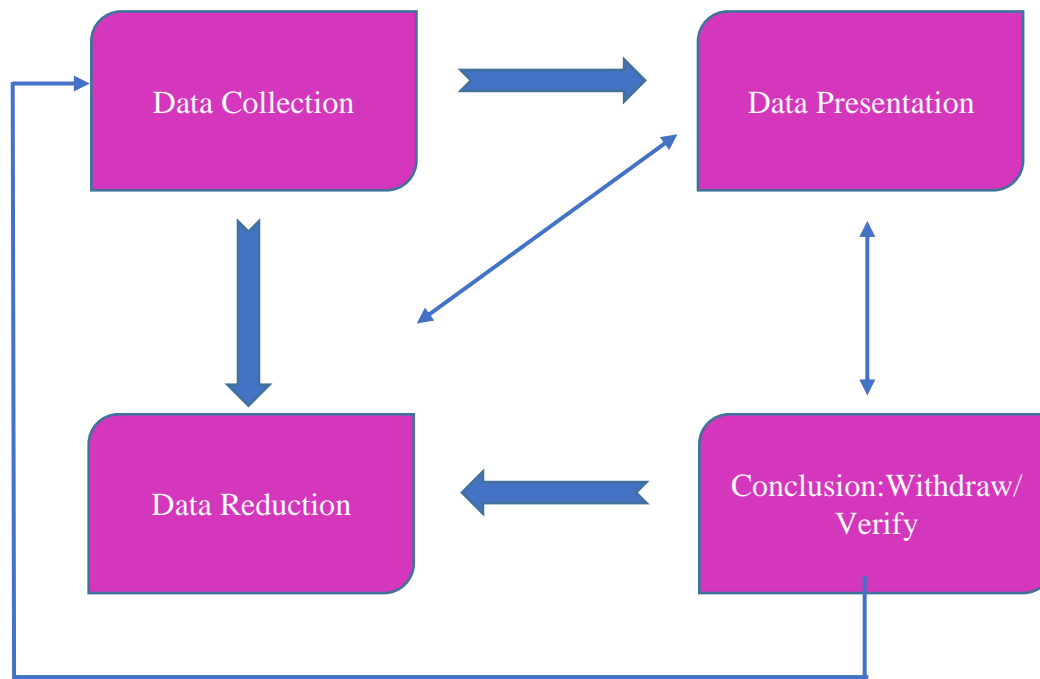


Figure 1. Qualitative Data Analysis Techniques

7. Presenting the Results of Scientific Article Writing

The presentation of the results of students' attempts to write scientific articles is the seventh and final element of this strategy for enhancing students' capabilities of creative thinking. The presentation of the results of student scientific articles is done alternately. The students can then do both and provide feedback on the findings of the scientific articles presented. Students can revise their respective scientific articles after receiving feedback and suggestions from their classmates before they are published in online journals. This presentation activity was carried out in order to improve student learning outcomes (Oktavia & Hulu, 2017).

2. Assessment

Assessment activities are carried out to test the validity, practicality, and effectiveness of the resulting trilogy of models in Table 1.

Table 1
Validation of Model Book, Lecturer Book, and Student Book

No	Product	Research Result Quantitative	Research Result Qualitative
1	Model Book	89,44 %	Very Valid
2	Lecturer Book	94,44 %	Very Valid
3	Student Book	91,67 %	Very Valid

Based on the results of the validity test of the 89,44% model books, 94,44% lecturer books, and 91,67% student books with very valid categories.

Table 2
Practicality of Model Book, Lecturer Book, Student Book

No	Product	Research Result Quantitative	Research Result Qualitative
1	Model Book	85%	Very Practical
2	Lecturer Book	85,71%	Very Practical
3	Student Book	87,27%	Very Practical

The results of the practicality test showed that 85% of model books, 85,71% of lecturer books, and 87,27% of student books had very practical categories.

Table 3
The Effectiveness

No	Product	Research Result Quantitative	Research Result Qualitative
1	Test	$L_{hit} < L_{tabel}$ 0,171 < 0,173	Normal distribution & Very effective
2	Creative thinking skills	87,602 %	Very effective

The results of the effectiveness test for model books were 89.09%, 88.89% for lecturers' books, and 90% for student books in the very effective category.

Based on the results of this study, there is a comparison with the results of previous research showing that the development of a learning model for writing scientific articles uses the Plomp Model by carrying out the preliminary stages, designing prototypes in the form of model books, lecturer books, and student books, up to the summative evaluation stage. Evaluation activities were carried out in the control class and experimental class by carrying out normality tests, homogeneity tests, and hypothesis testing using learning models to write scientific articles based on blended learning integrated with creative problem solving.

CONCLUSION

When I was first learning how to write scientific articles, I came across a phenomenon that served as the basis for this study. The students' capacity to create articles on particular subjects and to creatively express themselves through writing is severely restricted. Students' scientific articles do not follow the systematics of writing and are written in accordance with the rules of the Indonesian language. In relation to these issues, a learning model for writing scientific articles based on blended learning and creative problem solving was designed and developed. Before creating the trilogy of models, three stages were completed: the preliminary stage, which consisted of conducting a needs analysis in the form of an analysis of the characteristics of the learning model for writing scientific articles in universities and a curriculum analysis; the prototype stage, which consisted of designing a prototype; and the assessment stage. Validity tests, practicality tests, and effectiveness tests were performed on the resulting learning models in the form of model books, lecturer books, and student books. The model book is 89,44%, the lecturer's book is 94,44%, and the student book is 91,67%, which is very valid. (b) A practicality test revealed that 85% of model books, 85.71 percent of lecturer books, and 87.27% of student books were very practical. (c) The practical 87,602% is very effective. The use of research results on learning Bahasa based on blended learning and creative problem solving is very helpful and gives students new ways to write scientific papers. Students can easily get to the learning process; they can see how they are being graded; and they save time because lectures can be given both online and in person. The learning process is carried out using the blended learning method based on the needs of the students [Carbonell et al. \(2013\)](#) to make the lecture material easier to understand.

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Batam, 26 Juni 2023
Dekan,



Universitas Putera Batam

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