Developing a Project-Argumentative Learning Model with Blended Learning Approach for Junior High School Students

Neni Hasnunidah(✉), Dina Maulina, and Ismi Rakhmawati

Biology Education, University of Lampung, Bandar Lampung, Lampung, Indonesia
{neni.hasnunidah,dina.maulina,ismi.rakhmawati}@fkip.unila.ac.id

Abstract. Project-based learning was becoming popular during at the end of school from home since Covid-19 pandemic. Although much research about project-based learning has been published, discussion in the learning process was still limited especially on argumentation. This study aims to integrate model of project-based learning (PjBL) and argument driven inquiry (ADI) with blended learning. This research developed project-argumentative learning model which integrated the syntax with worksheet that can be access online or called e-worksheet. This study used 4D research and development design (Define, Design, Develop, and Disseminate). The trial subjects included eight grade junior high school students in South Lampung, Indonesia. Project-argumentative learning model syntax in e-worksheet is valid and reached 90% of implementation to limited subject of observation. This development is expected to give students learning experience of making science project and having structured discussion of argumentation.

Keywords: argumentation · blended learning · e-worksheet · learning models · project

1 Introduction

One way that can be done in carrying out the policies of the Ministry of Education and Culture of Indonesia in dealing with the situation of the spread of Covid-19 is blended learning. This learning is web-based or commonly called web-based learning because it utilizes a computer connected to the internet as a tool/device that presents information, the content of subject matter, exercises, or both in the form of tutorials, drills, and practices (exercises), simulations, or instructional games presented on a website (internet site). The use of information and communication technology (ICT) in learning is currently developing. Nevertheless, many teachers have difficulty in packaging learning through strategies that can facilitate learning activities to take place properly [1].

The problem found especially in junior high school students in science subjects is that they feel bored with online learning which is often monotonous. Students only listen to the explanation of the material via zoom meeting and get the task of reading the material from the internet. These barriers can cause most students to have difficulty

R. Perdana et al. (Eds.): ULICoSS 2022, ASSEHR 740, pp. 990–1000, 2023.
https://doi.org/10.2991/978-2-38476-046-6_96

in assimilating and elaborating concepts into their thinking, hence their argumentation skill ability is low and has an impact on their learning achievement. Argumentation skills are essential to be empowered in science learning. Argumentation skills improve critical thinking patterns so that they can increase a person' deep understanding of an idea or ideas [2]. Argumentation skills can improve students' thinking and understanding of the material being studied because it improves logical and rational reasoning [3].

The argumentative-project-based learning model through a blended learning approach in junior high school is suspected to be effective in improving students' argumentation skill. However, research on the development of students' argumentation skill through this learning model has never been carried out, so this research needs to be carried out. The PjBL model has revealed advantages in its application, namely being able to provide great opportunities for students to explore their creativity, increase motivation, problem-solving ability, critical thinking skills and improve collaboration skills [4–6]. The PjBL model has enormous potential to provide an engaging learning experience for students in studying science materials. However, student activities to solve problems by applying the skills of researching, analyzing, making, and presenting learning products based on real experiences are not accompanied by statements (theories) that are true or do not refer to the facts and evidence shown. Therefore, this learning model that uses project activities as a means of learning has not contributed to increasing students' understanding of concepts because students will only master one particular topic they are working on while other topics are neglected [7].

Another learning strategy is needed that is expected to be able to overcome the shortcomings of PjBL that effectively improves students' argumentation ability is ADI. In the learning process students can substitute their knowledge about the topics by discussion process through visiting other groups. Discussion used argumentation procedure consist of claim, grounds, warrant, and backing. The integration of PjBL and ADI learning model can complete each deficiencies. Student involvement in argumentation contributes to an increase in the understanding of the concept [8]. Argumentation activities are part of a social process that can develop scientific discourse in learning. Argumentation plays an important role in the construction of knowledge, because by arguing knowledge is communicated to obtain recognition and justification [9, 10]. Argumentation can provide a strong foundation in understanding a concept as a whole and correctly. The object of the thought process in argumentation is the truth regarding the subject being argued [11]. Through argumentation one can show statements (theories) that are put forward to be true or do not refer to the facts and evidence shown.

Science subjects in strategic junior high schools are used to train students' argumentation ability. Through learning innovations with project-based argumentative learning models through a blended learning approach that is in accordance with the characteristics of science, research to improve students' argumentation skills is urgent to be carried out. To produce a project-based argumentative learning model through a blended learning approach that is in accordance with the characteristics of science learning, it is necessary to carry out several tests that include material expert tests, educational expert validation, and learning model effectiveness tests.

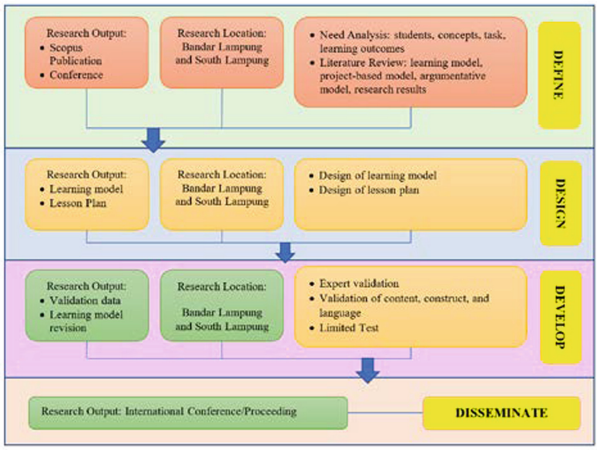

Fig. 1. Research flow chart.

2 Method

This research design uses a 4-D model with modifications that include three research sequences, namely: define stage, design, develop (development and validation), and disseminate [12]. The design of this study is broadly depicted in the research chart (Fig. 1).

A. Define: Need Analysis

Needs analysis is carried out through surveys using a one-time method (Cross-Sectional Survey). The survey is aimed at revealing the needs of 2 teachers in Lampung to obtained data about learning problems and needs. Data mining in survey research through questionnaires, interviews, observations, and document data. The literature study is intended to find references regarding PjBL and ADI learning models, the ability to argue, and include the results of previous research related to science learning. The survey data were analyzed descriptively from questionnaires and interviews that had been conducted. The data from the audio-visual recording were analyzed descriptively qualitatively from the learning transcript.

B. Design: Learning Model

The design stage aims to produce a learning tool design with an argumentative-project-based learning model through a blended learning approach that can improve the argumentation skills of junior high school students. The implementation of this stage consists of 4 steps, namely: preparation of test standards (criterion-test construction), media selection (media selection), format selection (format selection), and initial design (initial design). The preparation of the test standard is the first action that connects between the define stage and the design stage. The benchmark reference test is prepared

based on the results of the formulation of learning objectives. The selection of media is carried out to identify learning media that are in accordance with the characteristics of the science learning material and the characteristics of students. Format selection in the form of lesson plans accordance with the learning model. Format selection is carried out by reviewing existing device formats and adapted to the learning model used. The initial design is a syllabus, lesson plan, and e-worksheet.

C. Develop: Learning Model and Validation

At this stage, the goal is to produce a prototype of a project-argumentative model through a revised blended learning approach based on expert input. The initial stage carried out is the validity test of the syntax, lesson plan, and e-worksheet. Revision I was implemented based on the corrective record of the validator. After the model is declared valid, it is then continued with a limited trial conducted on several students. The validated and revised learning model products are then used in a limited test to 15 students in a junior high school in South Lampung, Indonesia.

D. Data Collection and Analysis

The distribution of questionnaires is used at the stage of preliminary studies and product development. In the preliminary study, the questionnaire used contained written questions that revealed information about the needs of teachers and students in learning, learning problems faced, learning models that have been used, student's response on the worksheets, and the obstacles found in the implementation of learning.

Validation questionnaires are used to determine the quality of learning model developed and to get suggestion. This validation instrument is in the form of a list containing a series of statements regarding pedagogical validity, content validity, and design validation. The validation results are processed in the form of a percentage of the score, then categorized and interpreted.

Lesson plan used curriculum competence: Applying the concept of biotechnology and its role in human life and eco-friendly technology. This instrument refers to Toulmin's argumentation analysis framework (Toulmin's Argument Pattern/TAP). The framework for the analysis of students' scientific argumentation is a kind of argumentation assessment rubric based on the completeness of the argumentation components. Tap argumentation assessment rubric adapted from Hazeltine [13] (Table 1).

Observations are made to uncover project learning, argumentative discussions, and blended learning. In addition, audio-visual recordings are also carried out to support the observational data. Through this observation, it can be known the complexity of the evolving pattern of argumentation discourse. Each group and individual student were observed and recorded during the learning process of 3 meetings. The rubric used to analyze the skills of students participating in oral argumentation in this study was a rubric of assessing the quality of argumentation according to conceptual and epistemic categories using the TAP (Table 1).

Furthermore, using the results of the analysis to understand the research problems. The rationale of this data analysis design is that the shortcomings of one type of data will be complemented by another type of data. In this case quantitative data provides

Table 1. Analysis of the quality of argumentation of contextual and epistemic aspects

	4	**3**	**2**	**1**
Claim	Claims are easy to distinguish and well written	Claim is well written, but could use some clarifications	Claims are not too good and need to be developed	Claims are indistinguishable or non-existent
Grounds	Ground clear, compact, and efficient	Ground is easy to identify, but needs some clarification	Ground is unclear and needs development	Ground is not displayed or is irrelevant
Warrant	Warrants are well written, easy to identify and connect claims and grounds efficiently	Warrants can be clearly identified, but need some clarification	Warrant is unclear, but there is something linking claim and ground	Warrants do not link claims to ground or are not easily identifiable
Backing	Backing supports warrants	Backing supports the warrant, but could use some clarifications to show the relationship as evidence	Backing in favor of the warrant, but the relationship should be clearer	Backing that supports the warrant, but cannot be identified or does not support the warrant

a way to generalize, while qualitative data provides information about contexts and *settings.* Qualitative data (preliminary study data, expert test data, practicality test data, and student response) will be analyzed using a descriptive qualitative approach. Through this analysis, an overview of the needs in the field, the needs of teachers and students in learning, problems faced by lecturers and students in learning, the availability of learning model, components that need to be revised, the level of validity and practicality of learning model in the form of lesson plans, and the level of student satisfaction with project-argumentative learning model.

3 Result

The results of the research on the project-argumentative learning model with *a blended learning* approach are learning model syntax, syllabus, lesson plans, and observation data.

A. Define: Need Analysis

At the define stage, needs analysis is carried out through a survey with a one-time method *(Cross-Sectional Survey)* to reveal about the needs of teachers and learning problems faced. Questionnaires are given to teachers in the form of open questions and checklists to find out the learning that is usually applied in schools which includes the use

Table 2. Syntax of project-based argumentative learning models

No	Learning Model Syntax	Procedure
1	Providing Fundamental References and Questions	Offline
2	Production of Argumentation	Offline
3	Session of Interactive Argumentation	Online
4	Design Project Planning	Offline
5	Creating Schedule	Offline
6	Implementing Project	Offline
7	Writing Project Report	Online
8	Testing Results and Reflection Discussion	Offline

of teaching materials, learning models, and the empowerment of argumentation skills in schools. The results of the recapitulation of survey questionnaire data from 20 public and private junior high schools in Lampung Province showed that as many as 40% of teachers used worksheets as teaching materials in the learning process. However, 55% of the worksheets used by teachers still come from existing textbooks and no teacher has developed worksheets that are oriented towards improving argumentation skills. As many as 80% of teachers already know about the PjBL learning model, but teachers state that it has not been optimal in applying it to learning.

B. Design: Model, Product, and Instrument

At the design stage, researchers make initial designs, media selection, format selection, and preparation of test standards. The results of the needs analysis are used as the basis for creating an initial design syntax of a project-based argumentative learning model with a blended learning approach. The syntax of this model consists of providing references, determining basic questions, producing arguments, argumentation sessions, designing projects, drawing up schedules, implementing projects, compiling reports, testing results, and evaluating experiences. The syntax of the project-based argumentative learning model with a blended learning approach is applied to the lesson plan design of biotechnology materials and environmentally friendly technology consisting of 3 meetings to allocate time for pre-project, project implementation, and post-project.

C. Develop and Validation

The syntax design further became the basis for developing a project-based argumentative learning model with a blended learning approach described in Table 2. The learning model syntax is incorporated into the lesson plan which is then validated by the expert and revised according to the advice of the experts. The quality measured by competent experts so that the results of the product can be accounted [14].

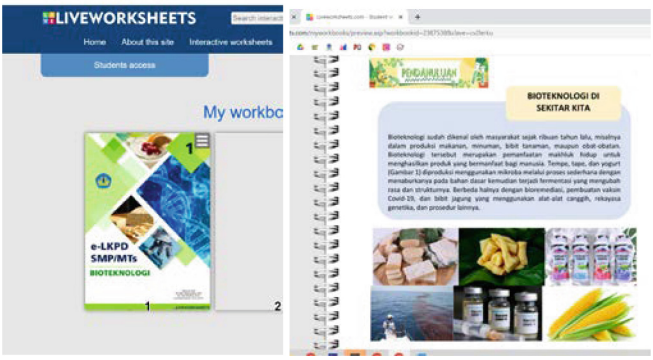

Fig. 2. E-worksheet based on project-argumentative learning model with blended learning approach.

In the development of interactive e-worksheet products, there are 3 parts, namely the introduction, content, and closing which are also adapted to the project-based argumentative learning model with a blended learning approach. The introduction consists of core competencies, basic competencies, and achievement indicators, and learning objectives. The content section contains learning steps, namely providing references, determining basic questions, argument production, argumentation sessions, designing projects, compiling schedules, implementing projects, compiling reports, testing results, and evaluating experiences. The results of the development of e-worksheets can be seen in Fig. 2.

The validation of e-worksheet based on project-argumentative learning model syntax includes material, construction, and language validation by expert validators using the validation sheet instrument (Table 3). Validators are 2 lecturers and 2 science practitioners (teachers) who also provide advice related to e-worksheets. The improvement e-worksheet validation based on expert recommendations is declared feasible to use, so the next stage is to conduct a limited trial stage. The e-worksheet validation results reached an average of 99% with valid categories and worthy of being implemented in learning with improvements for product perfection. Improvements are made in accordance with the suggestions and criticisms of validators. The achievement of content validation if it has fulfilled the relationship between the material and the content and basic competencies as well as the suitability of teaching materials and basic competencies that must be achieved by students [15].

The e-worksheet construct validation gets an average percentage of 98% with categories valid and feasible to implement. The validity of interactive e-worksheet construction is reviewed from the aspects of conformity with the ideal format, appearance, the suitability of the e-worksheet with project-based argumentative syntax with a blended learning approach, and conformity with argumentation skills. The e-worksheet from the development has fulfilled the first aspect with an achievement indicator that already has a cover, foreword, table of contents, bibliography, availability of basic competencies and indicators, and has space to write answers on interactive e-worksheets in *liveworksheets*.

Table 3. Syntax and interactive e-worksheet validation results

No.	Aspect	Percentage (%)		Average	Criteria
		Expert	Teacher		
1	Content	99	98	98	Valid
2	Construct	99	98	98	Valid
3	Language	100	98	99	Valid
All Average				99	Valid

Language validation of interactive e-worksheet languages with project-based argumentative models gained a percentage of 99% with valid and feasible categories with minor improvements. Validators make suggestions requiring sentence improvement, word writing, and proper use of punctuation. Good, precise, and easy-to-understand language for students is very important in the preparation of teaching materials and is the main requirement that must be met in making e-worksheets [16, 17]. Development products can be used after validation by experts who have met valid criteria on aspects of content, construction, and language.

The next stage of this study is a limited trial to find out the practicality given to learners outside the product implementation research sample with 15 respondents. The implementation of interactive e-worksheets on biotechnology materials and environmentally friendly technologies with project-based argumentative models implemented in blended learning was tested using observation instruments. The implementation of observations was carried out by 2 people as observers who are science teachers by filling out observation sheets in the form of questions related to the suitability of achieving learning achievement using e-worksheets. The results of the observation of the implementation of interactive e-worksheets implemented in learning have an average total percentage of 90% (Table 4). Therefore, the achievement of the implementation of the syntax of the project-based argumentative learning model with a blended learning approach is appropriate.

Good implementation is seen in students who have enthusiasm in following the stages of learning in groups such as identifying problems, collecting research data, building tentative arguments, conducting argumentation sessions, compiling reports, holding peer reviews, and revising peer review reports. The learning process of students is carried out with zoom meeting activities and face-to-face activities. Zoom meetings are conducted by teachers in providing assessments, identifying tasks, collecting data, and making tentative arguments with discussions in breakout rooms according to their respective groups. In the task identification activity, obtained an average percentage score of 97%. It can be said that in the activities of students interested and actively participating in learning. Furthermore, at the time of the activity collecting data and the creation of tentative arguments obtaining a very high percentage average. At this stage, it is carried out by grouping students in breakout room discussions and guiding students in managing and analyzing data accompanied by explanations, evidence, and reasons. The learning process carried out using Zoom meetings has obstacles, namely students have difficulty

Table 4. The results of observations on the implementation of learning

Observer	Percentage of Syntax Implementation							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Observer 1	93	96	100	100	75	85	96	70
Observer 2	94	98	100	100	87	81	91	74
Average	93	97	100	100	81	83	94	72
Total	90							

Table 5. Students' responses to e-worksheets

No	Assessment Indicator	Persentase	Kriteria
1	Attractive	90	Very High
2	Usefulness	90	Very High
3	Readability	91	Very High
Average		90	Very High

in accessing the internet. This is due to limited networks for students who live in areas where internet networks are difficult.

The next activity is an argumentation session, students carry out activities directly providing their arguments in groups. In this activity, the percentage yields an average percentage of 92%. Furthermore, on the activity of preparing the report. Furthermore, the stage of preparing the report, at this stage students make a report based on the results of the investigation that has been carried out. The creation of the report is typed in a piece of paper. At this stage it acquires an average value with a percentage of 92%. The sixth stage is the review of the report, which is carried out by collecting the report and then the report is given an assessment by his peers. The process of reviewing the report is carried out with instructions and directions by the teacher. At this stage, the average value with a percentage of 90% is obtained. After the review is carried out, the next stage is the report revision process. In this process, students are asked to correct the report on the results of the investigation that has been made and assessed by their peers. This stage of learning gained a percentage of 72%. Next the last stage, which is the stage of reflective discussion at this stage concludes about what they have learned during the investigation. From several stages of the project-based argumentative learning model that has been implemented using this interactive e-worksheet of biotechnology material, all activities are carried out well with a total average percentage of 90% with a high category.

Students' responses to the e-worksheet are interactive by using a questionnaire that aims to find out the attractiveness, usefulness and readability of the e-worksheet developed by the researcher. The results of the student questionnaire on the e-worksheet are concisely contained in Table 5. Students feel more pleased with learning that used online worksheets hence they are more active in online learning and try better to complete tasks

[18]. In the project-argumentative learning model with a blended learning approach that implemented in e-worksheets on biotechnology and eco-friendly technology topics are interesting and easy to understand by students. In addition, the language used is clear and communicative.

The development produces project-argumentative model with a syntax consisting of providing references, determining basic questions, producing arguments, argumentation sessions, designing projects, compiling schedules, implementing projects, compiling reports, testing results, and evaluating experiences. This model can complete the shortages of PjBL in limited knowledge cause of restricted project topic with sharing discussions through TAP argumentation procedure.

Acknowledgment. We acknowledge the support from schools in South Lampung who have allowed us to research and a deep thank you to the University of Lampung for funding support, facilities, and publication opportunities at the international conference.

References

1. E. Meleisea and T. Siribodhi, ICT in Teacher Education: Case Studies from the ASia-Pasific Region. Bangkok: UNESCO, 2008.
2. P. Deane and Y. Song, "A case study in principled assessment design: Designing assessments to measure and support the development of argumentative reading and writing skills," Psicol. Educ., vol. 20, no. 2, pp. 99–108, 2014.
3. W. S. Ginanjar, S. Utari, and D. Muslim, "Penerapan Model Argument-Driven Inquiry Dalam Pembelajaran Ipa Untuk Meningkatkan Kemampuan Argumentasi Ilmiah Siswa Smp," J. Pengajaran Mat. dan Ilmu Pengetah. Alam, vol. 20, no. 1, p. 32, 2015.
4. M. Wena, "Strategi pembelajaran inovatif kontemporer: Satuan tinjauan konseptual operasional," 2014.
5. M. Shobirin, Konsep dan Implementasi Kurikulum 2013 di Sekolah Dasar. Yogyakarta: Deepublish, 2016.
6. S. Sutirman, Media dan model-model Pembelajaran Inovatif. Yogyakarta: Graha Ilmu, 2013.
7. Y. Abidin, Desain Sistem Pembelajaran Dalam Konteks Kurikulum 2013. Bandung: Refika Aditama, 2013.
8. G. Cakmakci and M. . Tasar, "The Quality of Students' Argumentation and Their Conceptual Understanding: An Exploration Of Their Interrelationship," in Contemporary Science Education Research: Scientific Literacy and Social Aspects of Science, 2010, p. 372.
9. S. Erduran, "Methodological Foundations in the Study of Argumentation in Science Classrooms," in Argumentation in Science Education, Springer, 2008, pp. 47–69.
10. V. Sampson and D. B. Clark, "Assessment of the ways students generate arguments in science education: Current perspectives and recommendations for future directions," Sci. Educ., vol. 92, no. 3, pp. 447–472, 2008.
11. G. Keraf, Argumentasi dan Narasi. Jakarta: Gramedia Pustaka Utama, 2007.
12. S. Thiagarajan, Instructional Development for Training Teachers of Exceptional Children. Minnesota: ERIC, 1974.
13. Hazeltine, "Toulmin Argument Rubric," 2017.
14. E. Widjajanti, "Kualitas Lembar Kerja Siswa," Yogyakarta, 2008.

15. D. Nailah Saidah, Parmin, "Pengembangan LKS IPA Terpadu Berbasis Problem Based Learning Melalui Lesson Study Tema Ekosistem Dan Pelestarian Lingkungan," USEJ - Unnes Sci. Educ. J., vol. 3, no. 2, pp. 549–556, 2014.
16. A. Prastowo, Panduan Kreatif Membuat Bahan Ajar Inovatif: Menciptakan Metode Pembelajaran yang Menarik dan Menyenangkan. Yogyakarta: Diva Press, 2013.
17. I. Sadjati, Pengembangan Bahan Ajar. Jakarta: Universitas Terbuka, 2012.
18. E. Celik, G. Baki, and A. Isik, "The Effect of Cluster Teaching With Worksheets on Students' Academic Achievement in Distance Education," Turkish Online J. Distance Educ., vol. 23, no. 3, pp. 137–153, 2022.