



The validity of the problem based learning with argumentation– Flipped learning (PBLA-FL) model to improve junior high school students' critical thinking skills during the Covid-19 pandemic season in science material

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Abstract

This study aims to determine the validity of the Problem Based Learning with Argumentation– Flipped Learning (PBLA-FL) model to improve junior high school students' critical thinking skills during the Covid-19 pandemic season. The validity reviewed here is content validity and construct validity as well as the validity of PBLA-FL learning tools. The validity of the PBLA-FL learning tools consists of syllabus, lesson plans, teaching materials, student worksheets, and critical thinking skills test sheets. Data collection was carried out through a Forum Group Discussion (FGD) by presenting science education experts, science assessment experts, and science experts to test the validity of the model and the validity of the PBLA-FL learning tools. In conclusion, the PBLA-FL model was declared valid for improving junior high school students' critical thinking skills during the Covid-19 pandemic season, with the results of the content validity test and construct validity test in very valid and very reliable. criteria with reliability calculation results above 75%, and device validity. PBLA-FL learning criteria are valid and very reliable with reliability calculation results above 75%.

Keywords: Covid-19, PBLA-FL, science

Introduction

After more than a year of the Covid-19 pandemic showing no signs of ending, education is starting to focus less on achieving the educational curriculum, so education practitioners immediately make adjustments to the permanent online learning model with blended learning. Most universities in Indonesia have introduced remote or online classes as a precaution against Covid-19. Several campuses in the country have implemented strategies to carry out lecture activities online such as midterm tests, final semester exams, internships, final assignments, theses, and dissertations until the end of the semester. This decision was taken when the spread of the national level corona virus in Indonesia was getting worse [1]. Likewise, primary and secondary education units have started preparing for online learning for a long time by implementing blended learning. The goal is to be able to focus on achieving instructional goals in learning.

One of the instructional objectives of learning that needs attention and is complained of by many parties is critical thinking skills. The low students' critical thinking skills are caused by several things, including (1) the teacher only imitates the existing teacher's book and the lack of use of learning models, (2) the learning used by the teacher does not involve students so it is not student-centered, (3) students tend to be passive and only listen to the teacher's explanation without daring to ask questions or express ideas, (4) students look bored because there is no media displayed in learning, and (5) students have less opportunity to work in groups [2, 3, 4, 5, 6, 7].

The results of field studies show that science teachers only provide theory and emphasize The results of field studies show that science teachers only provide theory and

emphasize mathematical formulas to be worked on and collected online. It is believed that learning like this will not be able to improve students' critical thinking skills during the Covid-19 pandemic.

One of the blended learning developed to improve the critical thinking skills of junior high school students during the Covid-19 pandemic is Problem Based Learning with Argumentation-Flipped Learning (PBLA-FL). This learning model comes from two learning models, namely Problem Based Learning with Argumentation (PBLA) and Flipped Learning (FL) [8] Covid-19. The PBLA-FL model syntax has five phases like the PBLA model, namely problem identification and motivation, organization and investigation, argument formation, argumentation sessions and evaluation-reflection each sequentially [9], which are delivered with the FL model. PBLA functions to improve students' critical thinking skills in junior high schools. FL is what functions as the implementation of learning during the Covid-19 pandemic season, which allows teachers to apply various methodologies in the classroom by activating different services for each student [10].

This FL model requires the use of technology. Therefore, aspects of technology must be a basic requirement for teachers. Teachers in delivering subject matter are usually assisted by technology such as video, then students are asked to access material through social media such as WhatsApp (WA), YouTube, Instagram, and so on. Then students are asked to engage in active learning while they are in class.

Considering that PBLA has five phases and FL has three phases, it is necessary to incorporate PBLA into FL, with the FL learning framework. Thus, the first stage of FL, namely pre-class, is filled with PBLA stages of 1)

identification and motivation, 2) organization and investigation, and 3) building arguments. The second phase of FL in the classroom is filled with PBLA phases 4) argumentation sessions and 5) evaluation-reflection. The post-class FL phase is the application of learning outcomes from within the classroom.

The science materials used in learning with the PBLA-FL model are (1) How to Use Balance, (2) Determining the Density of Liquids, (3) Building Electric Circuits, (4) Electromagnetism, (5) Experimental Planning, and (6) Understanding Check ^[11].

Research problems

The main problem of this research is how is the validity of the PBLA-FL model to improve students' critical thinking skills during the Covid-19 pandemic season? The PBLA-FL model meets validity if the content validity and construct validity are declared valid and statistical analysis agrees (R) above 75% ^[12]. The PBLA-FL model must also be supported by valid learning tools.

Research focus

The focus of the research is to develop a valid PBLA-FL model to improve students' critical thinking skills during the Covid-19 pandemic season. The research questions that arise are: How is the validity of the PBLA-FL model and the validity of the learning tools?

2. Research Method

Instruments and procedures

Before the PBLA-FL model is used for learning, it is necessary to test the validity of the model and learning tools first. The validity test was carried out by science education experts, science assessment experts, and science experts with model validity instruments and learning tools.

Data analysis

The research data is model validity data. The model validity data consisted of content validity data and construct validity data of the PBLA-FL model, as well as data on the validity of the PBLA-FL model learning tools. The criteria for evaluating the validity of the PBLA-FL model instrument and its learning tools use an ordinal scale, namely: very valid (5), valid (4), quite valid (3), less valid (2), and invalid (1) [9]. Model validity data and learning tools were analyzed using the percentage agreed.

$$(R) = [(AB)/(A+B)] \times 100\%$$

Where A is the highest score of all, and B is the lowest score of all validators ^[12].

Results and analysis

PBLA-FL Model Validity Test Results

The results of the PBLA-FL model validity test are presented in Table 1.

Table 1: The results of the PBLA-FL model validity test.

No	Assessment Aspect	Validation score	Validation Criteria	Reliability coefficient (%)	Reliability
A	Content validity				Reliable
1	PBLA-FL model requirement	5.00	Sangat valid	90.25	Reliable
2	State of the art of knowledge	4.67	Very valid	89.75	Reliable
3	PBLA-FL blended model theory support	4.67	Very valid	92.00	Reliable
4	Implementing PBLA-FL model	4.67	Very valid	87.68	Reliable
5	PBLA-FL model learning environment	5.00	Very valid	88.00	Reliable
6	Use of state-of-the-art evaluation techniques	5.00	Very valid	88.00	Reliable
B	Construct validity				Reliable
1	Theoretical and empirical support of the PBLA-FL model	5.00	Very valid	93.00	Reliable
2	Model syntax	4.67	Very valid	94.00	Reliable
3	Social system	5.00	Very valid	90.25	Reliable
4	Reaction principle	5.00	Very valid	89.89	Reliable
5	Learning environment	5.00	Very valid	88.89	Reliable
6	Implementation of evaluation	4.67	Very valid	90.00	Reliable

The results of the validity test of the PBLA-FL model learning device

Table 2: The results of the validity test of the PBLA-FL model learning device

Number	Material	Validator mean			Average amount	Criteria	Coefficient %	Reliability
		1	2	3				
1	Syllabus	4.33	4.00	4.00	4.00	Valid	86.00	Reliabel
2	Lesson plans (LP)	4.67	4.67	4.33	4.00	Valid	89.89	Reliabel
3	Teching materials	4.00	4.00	4.00	4.00	Valid	87.67	Reliabel
4	Worksheets	4.33	4.00	4.33	4.00	Valid	90.00	Reliabel
5	Critical thinking skills test sheet	4.00	4.00	4.00	4.00	Valid	88.70	Reliabel

Table 2 shows that the average score obtained in the validity test of the PBLA-FL model learning device is above 4 which means it is valid. While the reliability test for the PBLA-FL model learning tool has a reliability coefficient above 75%, which means that the PBLA-FL model learning tool is in the reliable category.

Discussion

The PBLA-FL model is the result of a combination of the PBLA model and the FL model to prepare for learning during the Covid-19 period, so that the learning process for students continues online. This model has been tested for validity by science education experts, science assessment experts, and science experts through Focus Group

Discussions (FGD). Hennink states that testing the validity of the learning model can be done through a review by educational experts ^[10]. From the results of the PBLA-FL model validity test in Table 1 it shows that the results of the model content validity test are all in the very valid category on model requirements, novelty trends, theoretical support, model application, learning environment., and using the latest evaluation techniques. Data needs new models and trends according to critical and responsible basic education content according to 21st century skills, what to do in the Covid-19 pandemic season. As we all know that during the Covid-19 pandemic season, most activities were carried out at home, including teaching and learning activities which were also carried out at home. The goal is to break the Covid-19 outbreak, even though it has an impact on the real disconnection of student and teacher encounters in class, learning can still be carried out online with help of a set of information technology, without neglecting health. and student safety. This is in accordance with the Circular of the Ministry of Education and Culture Number 4 of 2020 concerning Implementation of Education in the Corona Virus Disease Emergency Period (Covid-19) regarding online learning policies, including online learning or distance learning to avoid direct contact. with fellow students or teachers, provide meaningful learning, provide learning experiences without being burdened with the demands of completing all curriculum achievements for grade promotion and graduation, as well as learning activities and assignments that allow it to occur between students according to the interests, talents and conditions of each student ^[13].

Theoretical supporting data explains that the PBLA-FL model is supported by constructivism theory ^[14, 15, 16], cognitive theory ^[17], behavioral learning theory, motivation theory, scaffolding, cooperative learning, and empirical support from recent research is strengthened by model implementation data in limited trials. This PBLA-FL model has strong theoretical and empirical support for carrying out learning to achieve learning objectives, namely to obtain information, ideas, skills, values, and ways of expression ^[18].

Model implementation data describes the role of the PBLA-FL model in relation to: (1) the teacher's role in carrying out the online learning process; (2) the teacher's success in involving students' responsibilities in each phase of the model which has an impact on increasing critical thinking skills for future success ^[19] and directing students to apply science processes and responsibilities in science learning activities ^[20], both acting and thinking ^[20]; and 3) teachers can guide to realize their responsibilities in learning by becoming learning partners, students are involved in building knowledge, and have a positive attitude in learning ^[22]; students can respect other people, work together, participate and express opinions well, enjoy learning and solve problems with a sense of responsibility ^[23, 24, 25].

The learning environment data describes the support systems that set the conditions under which a person can learn best, and support positive human relations. Therefore, this online learning environment is in the form of features that influence learning ^[26]. Furthermore, the learning environment is a structure, tool, community that inspires students or educators to achieve the knowledge demanded by the 21st century. Support for the online learning environment is a virtual laboratory with one of the

laboratory equipment from Physics Environment Technologies (PhET) ^[27, 28].

Data on the use of the latest evaluation techniques illustrate the use of online evaluation media to facilitate evaluation implementation, make it easier for teachers to check evaluation results, and reduce cheating. This is because students are used to learning from various sources, so teachers must adapt to the latest learning and evaluation. Many learning materials can be accessed quickly by opening the Google search site, Bing, YouTube, Wikihow, and so on. Likewise, the latest evaluation can also be done digitally via Google Form, Google Classroom, Elijo, Kahoot, and so on. Evaluation results can be immediately obtained and delivered to students. The enthusiasm for using digital devices by teachers in learning and evaluation will trigger students' enthusiasm to create new things according to their respective potentials. The use of this latest evaluation technique arises because of the situation and demands of the times and technology. Especially with the emergence of the Covid-19 pandemic which should turn learning into a necessity, but the pace is very slow and it is planned to start in 2025, whereas due to Covid-19 inevitably the transformation of education must be carried out. get out soon. In a very short time, changing the pattern of education from face-to-face-based education to online-based education that relies heavily on technology..

For construct validity, the categories are very valid for theoretical and empirical support, model syntax, social systems, reaction principles, learning environment, and evaluation implementation. This is in accordance with the research of Plomp & Nieveen ^[29] and Plomp ^[30] which states that the learning model as a product of educational research is said to be valid if content validity and construct validity meet the validity criteria. The PBLA-FL model syntax with the FL model framework is pre-class, in-class, and post-class, where the pre-class contains the PBLA model syntax for problem identification and motivation, organization and investigation, and argument building, then in class contains argumentation and evaluation sessions. -reflection is an effort to carry out online learning while improving critical thinking skills, and post class is the result of learning in the previous two phases. It is hoped that online learning during the Covid-19 pandemic season is planned and structured with clear goals, one of which is in accordance with the goals of 21st century learning, namely increasing critical thinking skills. The model syntax is implemented with LP, teaching materials, and worksheets ^[31]. This construct validity data also shows the consistency between syntax, social system, support system, instructional impact and accompaniment impact ^[32].

The PBLA-FL model was carried out with the following considerations: 1) During the Covid-19 period, face-to-face learning was not possible ^[33]. Because doing so will accelerate the spread of Covid-19. However, learning in order to prepare learning for the nation's next generation must still be carried out, one of which is by implementing distance learning online. 2) Meeting the learning needs of the 21st century, one of which is learning critical thinking skills. 3) Meet the learning needs mandated in the 2013 curriculum ^[34].

Conclusion

The conclusion of this study is that the PBLA-FL model is declared valid for improving junior high school students' critical thinking skills during the Covid-19 pandemic season with the results of the content validity test and the construct validity test of the model in the very valid category. and the

very reliable category with reliability calculations above 75%, and the results of the validity test of learning devices in the valid and very reliable categories with reliability calculations above 75.

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