The Validity of the Pro-Based Caturalis Learning Model to Improve Elementary School Students' Scientific Literacy

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Abstract. This study aims to describe the level of validity of the Pro-Based Caturalis learning model to increase elementary school students' scientific literacy. This type of research is development research by focusing on the limited scale trial phase. The development was carried out by involving 3 experts to assess the feasibility level of the Pro-Based Caturalis learning model with an average expert rating of 83. Experts rated the developed model in the valid category. The Pro-Based Caturalis Learning Model was tested on 2 elementary schools with a number of 40 students. The average scientific literacy ability of the trial students was in the good category with an average pretest score of 68.5 and a posttest score of 74.25. The increase in scientific literacy scores is influenced by the systematic and innovative syntax of the Pro-Based Caturalist learning model. Besides that, the use of technology-based learning media makes elementary school students' thinking patterns more complex to increase scientific literacy.

Keywords: Pro-Based Caturalis, Scientific Literacy, Learning Model

1 Introduction

The inevitable progress of the times indirectly demands adjustments in various areas of life, one of which is the field of education. Education is one of the main vehicles for intellectual and professional development for human beings and is playing an increasingly important role in supporting globalization in a competitive Indonesia. Indonesia was ranked 57th out of 115 countries in 2015. In the latest 2015 UN development program report, Indonesia was ranked 110th out of 187 countries in the Human Development Index (IPM) with a score of 0.684. With that figure, Indonesia is still lagging behind its two ASEAN neighbors, namely Malaysia (ranked 62nd) and Singapore (ranked 11th).

Improving education for Indonesian people will spur achievement of other goals and objectives in the 17 points of the Sustainable Development Goals, especially to increase Indonesia's human development index. Education is expected to play a role in increasing Indonesia's competitiveness in supporting the 2030 SDGs. These changes and adjustments are expected to be able to create an active, creative and innovative

Z. B. Pambuko et al. (eds.), *Proceedings of the 4th Borobudur International Symposium on Humanities and Social Science 2022 (BIS-HSS 2022)*, Advances in Social Science, Education and Humanities Research 778,
https://doi.org/10.2991/978-2-38476-118-0_9

learning process in an effort to produce graduates who are competent according to the times. The student's scientific achievement is very closely related to scientific literacy. Scientific literacy is a person's ability to understand, communicate, orally or in writing [1]. One of the factors that influence students' scientific literacy skills is critical thinking skills [2]. The obstacles faced in implementing scientific literacy in elementary schools are because scientific literacy requires students to think critically, while critical thinking is a challenge for students.

The application of scientific literacy in schools does not only require students' abilities but also requires the teacher's ability to teach literacy-based science and teach students to have scientific literacy skills is not easy. Teachers have an important role in fostering students' scientific literacy skills [3]. Scientific literacy has great potential for the development of children's education, especially elementary school age. Therefore, scientific literacy is something that gets great attention for education in Indonesia. The government's efforts to improve education in Indonesia lie in the strategic target program in the 2020-2024 Ministry of Education and Culture Strategic Plan which focuses on strengthening the quality and relevance of education centered on the development of students, namely increasing the quality of learning and the relevance of education at all levels [4]. Additional efforts made by the Indonesian government to meet the demands of the times are the application of the 2013 Curriculum which is very thick with the use of a scientific approach which is the foundation for training students to think critically.

One learning model that adheres to this approach is Problem Based Learning. Through Problem Based Learning students are trained to solve problems both individually and in groups this will encourage the development of critical thinking skills and social attitudes [5]. Furthermore, that learning based on the problem is the interaction between stimulus and response, is a relationship between two directions of learning and the environment [6]. The environment provides input in the form of help and problems while the nerves of the brain will interpret the aid effectively so that the problems encountered can be observed, investigated, assessed and analyzed so that problems can be solved properly. Problem Based Learning in science learning is one of the interesting lessons because 1). Problem Based Learning invites students to solve cases or problems related to science; 2). increase interest in discussion among students and encourage learning activities; 3). help students construct their knowledge about the world around them and help lay the foundation of their initial knowledge before moving on to more complex knowledge [7]. Problem Based Learning in its implementation requires the interest and intelligence of students to optimize problem-based learning.

Based on this, it can be concluded that in theory and scientific novelty, the potential for scientific literacy can be influenced by the application of the Problem Based Learning model. Besides that, teachers also need a very effective learning model to improve student competence in addition to learning outcomes. For this reason, it is necessary to conduct research to prove whether the Problem Based Learning Model is Based on Naturalist Intelligence to Increase Scientific Literacy.

2 Method

This type of research is development research, in this study testing a new learning model resulting from the development of the Pro-Based Caturalist learning model to increase elementary school students' scientific literacy. Small-scale testing of this research was carried out at the Muntilan Elementary School and Mertoyudan Innovative Muhammadiyah Elementary School. The subjects of this limited scale research were 40 students in class IV. The research design used refers to the Borg & Gall development research model. The data analysis technique used is descriptive, namely analyzing the scores on the validation sheet on the characteristics of the Pro-Based Caturalist learning model in the guidebook which is still hypothetical and taking into account written input from the validators for materials for improvement in model development. The learning model is declared valid if the three validation elements have been declared valid. The three validation elements consist of: 1) validation by experts from three expert lecturers in the field of learning; 2) user validation by three practitioners (professional teachers); 3) audience validation by students by giving a score to the student response questionnaire as displayed in Table 1 [8].

Table 1. Criteria for the validity of the Pro Based Caturalis learning model

Score	Criteria	Information
40–48	Very Valid	Very Good to use
31-39	Valid	Usable with minor revisions
22-30	Valid Enough	Can be used with major revisions
12-21	Invalid	Cannot be used

3 Result and Discussion

The validation of the Pro-Based Caturalis learning model begins with the development stage, namely designing the Pro-Based Caturalis learning model in the form of a draft guide containing the background, concepts and characteristics of the learning model consisting of syntax, social systems, reaction principles, support systems, instructional impact, and companion effect. Model development was carried out by examining the analysis of various learning theories relevant to the needs of the Pro-Based Caturalis learning model, which was then logically validated by 3 expert lecturers and 3 professional teachers as assessors of user validation and audience validation based on student response questionnaires.

Since the beginning of the development of the Pro-Based Caturalis learning model, a lot of input has been received so that it continues to be improved, starting from the name of the learning model to the characteristic elements of the learning model. The results of the logical validator experts can be presented in Table 2.

The results of the scores in Table 2 by each validator were given a decision that the Pro-Based Caturalis learning model could be used in learning with small revisions. The revision, especially in the statement items explaining the purpose of developing a learning model, is considered less valid because an average of 3.0 is obtained from

the three validators. In addition to the background development goals that are not very specific, there are aspects of the description of the model and aspects of the syntax or learning steps that are less specific. The purpose of developing a learning model is also more specific with instructional impact. Input from the validator is used as the basis for revising for the feasibility of the learning model. In addition to the results of validation by experts, an assessment was also carried out on the draft Pro-Based Caturalis learning model by users (Table 3).

Table 2. The results of the expert logical validation of the Pro-Based Caturalis learning model

Assessment Indicator	Validators			Average
	I	II	III	
Supporting theory of learning models	4	4	3	3.7
Background on the development of learning models	3	3	4	3.3
The purpose of developing a learning model	3	3	3	3.0
Description of the learning model	3	3	3	3.0
Learning model syntax	3	3	3	3.0
The social system of learning models	3	4	3	3.3
Learning model support system	4	3	3	3.3
Use of a learning approach	3	4	3	3.3
Learning steps	3	3	3	3.0
Evaluation and assessment	3	3	4	3.3
Desired Learning Outcomes	4	3	3	3.3
Amount	36	36	35	35.7
All Valid Items	Valid	Valid	Valid	
Average		35.5		
Percentage		88.75		

Table 3. User Validation Test Results of the Pro-Based Caturalis learning model

Assessment Indicator	Validators			Average
	I	II	III	
Supporting theory of learning models	3	3	3	3.0
Background on the development of learning models	3	3	3	3.0
The purpose of developing a learning model	3	3	3	3.0
Description of the learning model	3	3	3	3.0
Learning model syntax	3	3	3	3.0
The social system of learning models	3	3	3	3.0
Learning model support system	3	3	3	3.0
Use of a learning approach	3	4	3	3.3
Learning steps	3	3	3	3.0
Evaluation and assessment	3	3	4	3.3
Desired Learning Outcomes	3	3	3	3.0
Amount	33	34	34	33.7
All Valid Items	Valid	Valid	Valid	
Average		33.5		Valid
Percentage		83.75		

In this aspect, the assessment was carried out by 3 professional teachers in class IV of Elementary School who were used as research subjects. The majority of teachers

rated it with a score of 3.0, which means that the distribution of predetermined indicators met the valid criteria. At this validation stage, the teacher emphasizes aspects of the learning steps to simplify them further, considering that meeting time in elementary schools is very limited, so an effective and efficient learning step is needed. On the other hand, the teacher also provided input for the purpose of model development to be further expanded, bearing in mind that elementary school children have complexity in thinking and learning. After going through the expert and user validity testing phase. The Pro-Based Caturalis learning model was then applied in a limited-scale trial at Muntilan State Elementary School and Muhammadiyah Innovative Mertoyudan Elementary School with a total of 40 students. The treatment was given 4 times according to the Basic Competency of Energy Change in Class IV. Furthermore, to measure continued validity, students' responses to the implementation of the Pro-Based Caturalis learning model are needed to find out from the student's aspect. The following table 4 is a recapitulation of student responses to the implementation of the Pro-Based Caturalis learning model on a limited scale.

Table 4. Student Response Questionnaire Results (Audience Validation)

No	Assessment Aspects	Score
1	Are you happy with the Problem Based Learning that you just joined?	36
2	Through the Problem-Based Learning-based learning model, it makes me feel more enthusiastic about participating in learning.	37
3	The Problem Based Learning learning model based on naturalist intelligence makes me excited and motivated.	35
4	Through the Problem Based Learning learning model, it makes me lazy to discuss and do experiments with friends.	38
5	Problem-Based Learning-based learning makes it easy for me to conclude the results of experiments that have been carried out with friends.	32
6	By using Rulisca's media "House of Electricity from Light" I enjoy and understand the material that absorbs sunlight through solar panels which turns into heat energy and generates electricity.	35
7	By using Bio Briquette media, I am happy and understand the material for managing coconut shells into briquettes and can be used as an alternative energy to replace fossils.	34
8	By using Geni Rika's media "Mini Generator From a Fan" I am happy and understand about alternative energy material in the form of wind energy which can generate electricity.	32
9	By using the Jump Stater media, I am happy and understand the potential energy material. Using a battery can produce a source of electrical energy that can be used in everyday life.	35
10	I like learning science using the Problem Based Learning model based on natural intelligence because learning is fun and not boring.	38
11	Through the Problem Based Learning learning model based on naturalist intelligence, it makes me learn new things.	33
12	I enjoy doing experiments outside the classroom with friends and teachers.	32
13	I am happy when presenting trial results, because it trains courage and self-confidence.	36
14	Learning to use the Problem Based learning model based on naturalist	32

No	Assessment Aspects	Score
	intelligence makes me more skilled and able to explain material related to changing energy forms.	
15	Learning to use the Problem Based learning model based on naturalist intelligence makes me bored and sleepy so I can't explain material related to changing energy forms.	31
16	Learning to use the Problem Based learning model based on naturalist intelligence makes me understand science subject matter.	30
17	I can find a lot of information related to alternative energy from various sources of information and the environment around me.	32
18	I can apply the concept of designing alternative energy that I have learned in my daily life.	31
19	I am able to compile experimental results and work on evaluation questions independently and honestly according to my knowledge.	35
20	I am able to compile experimental results and work on evaluation questions independently and honestly according to my knowledge.	33
	Amount	677
	Average	33.85
	Rating Percentage	85 %

In general, students with a total of 40 respondents gave good results where the average result was worth 33.8 or the equivalent of 85% giving a good response. The majority of students consider that the Pro-Based Caturalis learning model provides new and meaningful experiences in learning science because they interact outside the room. This activity provides a new atmosphere for students to be closer to nature and optimize the senses in carrying out the learning process. Problems faced by students at the beginning of learning make students enthusiastic about finding alternative solutions by associating problems with technology. This is supported by the provision of positive responses to student questionnaires related to the learning media used.

4 Conclusion

Development the Pro-Based Caturalis learning model has been carried out in stages that are in accordance with theoretical and empirical studies. The developed Pro-Based Caturalis learning model has met the valid criteria of 3 important components, so that this learning model can be used for more complex wide-scale trials. The results of the complete validation can be seen in table 5.

Table 5. Expert, User and Audience Validation Results.

Validation	Percentage	Information
Logical / Expert	88.7%	Valid
User / Teacher	83.75%	Valid
Audience / Students	85%	Valid

Acknowledgment. Acknowledgments are addressed to the Ministry of Research, Technology and Higher Education which has provided a Doctoral Dissertation Re-

search grant in 2022 for the funding that has been provided. Next, thanks are addressed to the research members of PGSD Unimma students who have assisted in the data collection process in this study,

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