Development of Natural Science Learning Models Based on Multiple Inteligences to Improve Higher Order Thinking Skills in Elementary Schools

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Abstract: This research is motivated by the learning of Natural Sciences which have not been integrated with multiple Intelligence and Higher order Thinking Skills (HOTS). The objectives of this study are:. 1) To describe the model of science learning based on multiple intelligences in elementary schools. 2) To describe the learning model of the effectiveness of multiple intelligence-based science in elementary schools. This study uses research or development research and development (R&D) methods, the research methods used to produce certain products, and tests the effectiveness of the products carried out by the research carried out, Design Based Research- Development Planning based on targets from Herington, McKenney, Reeves, Oliver Based on the research results that have been explained, the following conclusions are obtained.The validity of the science, environment, technology and community model based on the validity of the experts meets the valid criteria, the learning kit consisting of lesson plans and worksheets achieves valid. Practicality of science, environment, technology and society models based on practical assessment has reached practical criteria and assessment of students has reached very practical criteria. The effectiveness of the questionnaire appreciation for learning science using the model of science, environment, technology and society from all four aspects

1. Introduction

Education is a process of stimulating all the potential possessed by students in creating a learning environment in accordance with the potential characteristics of students. Education is a creative human endeavor in guiding and helping to develop the potential of students in a planned and continuous manner as a vehicle for forming very basic intellectual skills. , spiritual and emotional towards the realization of a perfect personality.

This potential will be able to emerge and develop effectively through appropriate and integrated learning through balanced learning management by adjusting student development as a whole. One potential that is owned by students is multiple intelligence (Multiple Intelligence). Every intelligence in children will emerge at a certain time in accordance with the stages of its development as stated by Piaget in (Herminati, 2017). Through education also students can interact with the environment to develop the abilities that exist in him. This ability can be in the form of cognitive abilities that hone knowledge, affective abilities to hone the sensitivity of feelings, and psychomotor abilities, namely the

ability to do something. Through these three abilities a student is expected to be able to become an individual who is ready to enter the world outside of school.

One problem that is very troubling in the scope of our education is the problem of the weakness of the learning process. Learning is a process of communication between instructors, students, and teaching materials, in the implementation of teacher learning, many still use conventional learning models that have not used more varied models, so that learning seems monotonous and tedious so that it does not excite students. This is evident from the results of pre-research observations conducted on 15 elementary school teachers in Kuningan District. Regarding teacher understanding of learning models, based on multiple intelligences.

Based on the results of the questionnaire above, it is shown that the implementation of learning in the classroom there are still complaints from students regarding the application of learning methods / models implemented by the teacher so far around 47%. Regarding the teacher's understanding of the term intelligence is 87% teachers do not know the term plural intelligence, teachers have never attended a 100% intelligence-based learning training, in implementing learning 87% of teachers have not implemented plural intelligence-based learning. While 67% of teachers find it difficult to implement learning models. And about 80% of teachers said they would implement learning innovations to improve learning outcomes.

In this regard the teacher is very difficult to apply various variations of the learning model. So that learning is centered on the teacher, the teacher who is effective in carrying out learning is the teacher who is able to be a source of inspiration and motivation for his students. In developing both the cognitive, affective and psychomotor domains, based on the data and problems mentioned above both in terms of the lack of variation in the application of learning models / methods, so that it can affect the low student learning outcomes.

2. Research Methodology

This research uses development or research and development (R&D) research methods, the research methods used to produce certain products, and testing the effectiveness of these products (Sugyono 2012: 407). The research conducted is the research and development of multiple intelligence-based science learning models, Science Materials, Learning Implementation Plans, through expert validation and user trials by students. Development procedures based on targets from (Herington, McKenney, Reeves, Oliver,2015)
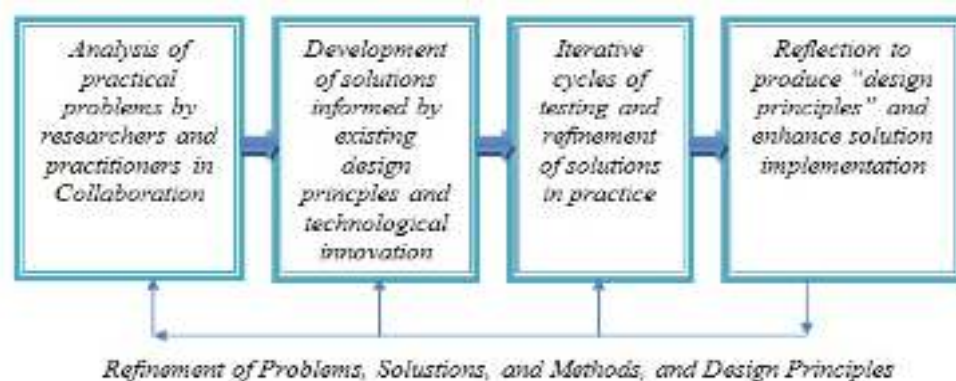

Figure 1. Design Based Research Steps

3. Results and Discussion

3.1 Result

3.1.1 Results of the Validation of the Learning Implementation Plan (RPP)

RPP validation results data are obtained using the validity assessment sheet RPP that has been assessed as feasible to use. In summary the data is presented in table 1 as follows.

Table 1. Scores and Criteria of RPP Validation Assessment Results

No	Validator	Score	Criteria
1	I	58	Valid
2	II	59	Valid
3	III	63	Valid
4	IV	57	Valid
Average		59,25	Valid

Based on the results of the analysis in table 1. it can be seen that the validator score ≥ 56 and the average score of the whole validator> 59.25. It was concluded that according to the assessment of the validator the RPP developed was stated to meet valid criteria. Inputs and suggestions from the validator have been accepted by researchers as revision material to make the lesson plan better.

3.1.2 Student Activity Sheet Validation Result
Data from the worksheet validation results were obtained from the worksheet validation sheets that were assessed as suitable for use. In summary the data can be presented in table 2 as follows.

Tabel 2. Scores and Criteria of Assessment Results of Validation Worksheet

No	Validator	Score	Criteria
1	I	52	Valid
2	II	57	Very Valid
3	III	59	Very Valid
4	IV	57	Very Valid
Average		56,25	Very Valid

Based on Table 2 above, of the four validators scores can be obtained that meet the minimum valid criteria. Thus, as a whole, it can be said that according to the expert, the worksheet developed has met valid criteria.

3.1.3 Practical of Model Sciences, Environment, Technology and Society
The practicality of the learning model is determined by the user ie the teacher and students. Thus, an analysis of the level of practicality is carried out on the data assessment results and responses from students. The results of the analysis of the teacher's questionnaire are presented in table 3 below

Table 3. Scores and Practical Assessment Results Criteria from Teachers

Validator	Score	Criteria
I	40	Practical
II	40	Practical
III	40	Practical
IV	40	Practical

Based on table 3 above, it is said according to the teacher's assessment that all aspects of each validator meet practical criteria. The results of practicality assessment based on student responses are presented in table 4. as follows.

Table 4. Scores and Criteria for Practical Assessment Results of Students

	ASPECT		TOTAL
	Ease of understanding	Ease of completing tasks	
Actual Score	4	3.92	7.92
Criteria	Very practical	Very practical	Very practical

3.1.4 Results of the Effectiveness of Science Learning Models using the Model Sciences, Environment, Technology and Society

Another criterion that shows the quality of the learning model developed in this study is the effectiveness of the learning model and its supporting devices used in learning. The effectiveness of this learning model is seen through the questionnaire of students' appreciation of learning science. Here is presented an analysis of student appreciation data on learning science using the models of Sciences, Environment, Technology and Society.

Table 5. Scores and Criteria Results Questionnaire Student Appreciation of Science Learning Using Models of Sciences, Environment, Technology and Society

Actual Aspect Score				Overall Actual Score
Attention	Attraction	Enjoyment	Participation	
14,0	23,0	17	21,7	75,7
effective	Very effective	Very effective	Very effective	Very effective

Based on table 5 above, it can be concluded that overall or in every aspect, students have appreciated the sciences, environment, technology and society model well. Thus in terms of student appreciation, the model developed is said to be very effective

3.2 Discussion

Validity of Model Sciences, Environment, Technology and Society Based on the results of data analysis of the validity of the research instruments of the sciences, environment, technology and society, LKS and RPP models presented in the previous data analysis, it can be seen that the model developed has met the valid criteria. Based on the evaluation of the four validators, the validity level of the sciences, environment, technology and society models consisting of the invitations, explorations, solutions and application stages reaches valid criteria and is very valid. Furthermore, the level of validity of learning support tools is shown by validity (1) RPP reaches valid criteria and (2) LKS reaches valid criteria.

Practicality of science learning Using the Model Sciences, Environment, Technology and Society Knowing the practicality of the learning model that meets the valid criteria, field trials are conducted. In this study, field trials were carried out by implementing models of sciences, environment, technology and society in schools. Trial models of sciences, environment, technology and society were conducted at SDN 4 Kuningan, SDN 2 Purwawinangun, SDN Awirarangan and SDN Cikupa on grade V.

Based on the results of the practicality assessment questionnaire from the teacher as presented in table 12, it can be seen that the practical, sciences, environment, technology and society models are practical at the practical level. Based on the teacher's overall assessment, the model of sciences, environment, technology and society has reached a practical category.

The effectiveness of science learning Using the Model Sciences, Environment, Technology and Society. The effectiveness of the sciences, environment, technology and society model in this research development is shown by having students appreciate the models of sciences, environment, technology and society. The results of student appreciation questionnaires for learning Natural sciences using the models of sciences, environment, technology and society can be said that students appreciate the models of sciences, environment, technology and society very effectively.

Based on the above study it can be stated that the development of natural science learning using the sciences, environment, technology and society model is a learning that has been tested for its validity, practicality and effectiveness, so it can be considered for use in learning natural science in elementary schools.

In conducting research, researchers face various research limitations that occur in the field. The limitation faced is that the learning developed in this study only covers the basic competencies of the contents of the fifth semester of the natural sciences and the material tested is only material properties and changes in the form of objects. The second limitation is that the researchers only developed learning support device products, namely LKS and RPP. And the third limitation, the researchers only developed a model of sciences, environment, technology and society.

4. Conclusion

Based on the research questions and research results that have been explained, the following conclusions are obtained.

- The validity of the science, environment, technology and community model based on the validity of the experts meets the valid criteria, the learning kit consisting of lesson plans and worksheets achieves valid.
- Practicality of science, environment, technology and society models based on practical assessment has reached practical criteria and assessment of students has reached very practical criteria.
- The effectiveness of the questionnaire appreciation for learning science using the model of science, environment, technology and society from all four aspects

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