Development of an Advanced Organizer Model Based on Open-Ended to Increase Student Punishment in Elementary Schools

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Abstract— This study aims to develop an advanced organizer learning model based on an open-ended approach to improve student reasoning in elementary schools. The focus of this research is the needs analysis phase of learning that takes place in primary schools to improve student reasoning and the stage of developing advanced models based on an open-ended approach to improving student reasoning. This study uses a research and development (RnD) approach. The research procedure was divided into preliminary study stages, development stages, and testing stages. In the preliminary study stage, the data was obtained through a questionnaire with the subject of 45 teachers and observation with the subject of 28 teachers in the city of Semarang. The development phase is carried out by preparing a prototype model, validation is carried out by 5 experts, and limited testing is carried out in 5 Semarang city schools with 6 subject teachers. From the preliminary study data, it can be concluded that it is necessary to develop a learning model that is oriented to the aspects of student reasoning in elementary schools. From the results of the expert validation assessment shows that the development of an advanced organizer model based on the open-ended approach meets the following criteria: (1) the development of an advanced organizer model based on needs, (2) the development of an advanced organizer model based on an open-ended approach based on current knowledge, (3) the development of the model advance organizer based on open-ended approach fulfills construct validity, (4) development of advance organizer model based on open-ended approach gets adequate theoretical support, and (5) development of advance organizer model based on open-ended approach fulfills practical validity in its use in learning activities.

Keywords: advance organizer based on open-ended, reasoning, elementary schools

I. INTRODUCTION

21st Century skills and skills cover three main categories, namely: (1) learning skills, innovation skills, including critical thinking, problem-solving in communication, collaborative creativity, innovative, (2) digital literacy skills, including new media literacy and ICT literacy, (3) life and career skills, including the ability of flexible and adaptive initiatives, social skills in inter-cultural interaction, productive leadership skills, accountable, and responsible. The 21st century demands the characteristics of students who have learning and innovation skills, namely those related to Ariyana's critical thinking skills [1].

The ability to think critically requires freedom of thought in a learning process, which is obtained by developing an advanced organizer model based on an open-ended approach. This model provides broad opportunities for students in freedom of thought through presentations. This model is supported by the characteristics of the open-ended approach that is the problem formulated has the correct multi-answer. An open-ended approach is called an incomplete problem or an open-ended problem or an open problem [18]. Learning with an open-ended approach usually begins by giving students open problems. This is in line with the first stage of learning with an advanced organizer model oriented to how knowledge is managed, how the mind works in processing new information, and how teachers can apply these ideas to learning. [9].

A student-centered learning approach is a must. Students are seen as active subjects who have the power of selection and interpretation, as well as highly creative power to what topics are discussed in a learning process. This approach is not based on the principle of right or wrong, but how to develop the ability to reason and reason students. To answer the student-centered learning approach, it is necessary to develop

a student-centered learning model. The advanced organizer model based on the open-ended approach provides many opportunities for students to be actively involved and do a lot in the learning process.

Advance Organizer is a model to help students organize information connecting it to a larger cognitive structure that reflects the organization of knowledge itself. Advance Organizer models do not have the stages or procedures specified [4]. The advance organizer model is oriented to how knowledge is managed, how the mind works in processing new information, and how the teacher can apply these ideas to learning [9].

Development of an advanced organizer learning model with an open-ended approach oriented to the principle of developing students' reasoning and reasoning abilities. This is in line with research conducted [12] which states that the achievement and improvement of students' mathematical creative thinking and creative abilities using the Advance Organizer model are better than students who get ordinary learning. To get critical thinking skills need to be supported by good reasoning abilities as stated [13] that Inquiry learning and using Advance Organizer learning are effective for students' mathematical reasoning, but Advance Organizer learning is more effective than Inquiry learning.

The development of an advanced organizer model based on an open-ended approach was designed using the stages of an advanced organizer model combined with an open-ended approach so that students' mathematical reasoning is expected to increase. If the reasoning of students increases, then students can have the characteristics of 21st-century skills such as critical thinking and problem-solving. The learning process that is held interactively, fun, challenging, inspiring, motivating students to actively participate makes reasoning very important for students to increase creativity, independence, develop problem-solving skills and think critically.

The reasoning is an activity of thinking in developing arguments to convince others of certain statements or in solving problems or to integrate ideas in problem-solving [2]. The reasoning is the process of thinking logically and systematically on empirical facts that can be observed to obtain conclusions in the form of knowledge [10]. The reasoning is a way of drawing conclusions and evaluating a valid or invalid conclusion, a thought process that connects known facts to a conclusion [20].

[15] states that reasoning refers to the mental processes involved in making and evaluating logical arguments. [6] Reasoning is arguments to support a view by presenting reasons. [17] states that reasoning is an activity, a process or an activity of thinking to draw conclusions or make a new statement that is true based on several statements whose truth has been proven or assumed beforehand. in this research, the reasoning is the activity of connecting facts or thought processes in developing arguments to draw conclusions or provide answers in problem-solving. The reasoning is the basis of a wide variety of topics in the school curriculum [23]. Reasoning produces conclusions from the mind, clarity, and assertiveness and involves solving problems to explain why something happened or what will happen

Research conducted by [11] shows that reasoning abilities can improve students' mathematical literacy skills by giving assignments, so students use reasoning abilities to solve these tasks and then cause mathematical literacy abilities to increase. In solving problems, a reasoning process is needed, or in making a decision or conclusion or in giving argumentation, an adequate reasoning ability is needed, reasoning is an activity of thinking in linking the knowledge possessed with a new problem situation so that related to the facts, the knowledge possessed can be used to make argumentation or making conclusions. [14] states that reasoning skills include: understanding, thinking logically, understanding negative examples, thinking deduction, thinking systematically, thinking consistently, drawing conclusions, determining methods, making reasons and determining strategies.

The development of an advanced organizer model based on an open-ended approach is expected to improve students' reasoning abilities because the developed model is oriented to how knowledge is managed, how the mind works in processing new information, providing opportunities for students to investigate various strategies and ways they believe by their abilities elaborating problems. Thus it has the potential to improve students' reasoning abilities in elementary school.

II. METHODS

This study uses a research and development approach. Research and development is a process or steps to develop a new product or improve existing products, which can be accounted for [21]. Development research is a process used to develop and validate educational products [16]. Research and development is a process or steps to develop a new product or improve existing products, which can be accounted for [21] [8].

The research procedure that will be used includes three stages, namely stage 1: preliminary study, stage II: development stage, development stage includes: (a) development of product design, (b) manufacture of product prototypes, and (c) product trials, stage III: product testing stage [22].

In studying the implementation of learning activities researchers distributed observation sheets to 28 elementary school teachers in Semarang, distributing questionnaires to 45 teachers and principals in Semarang.

Observation sheets are used to get an overview of how the implementation of learning in schools and how the ability of student reasoning is carried out observation activities to schools by distributing observation sheets to class teachers to assess or describe the description of the implementation of student learning in schools and students' reasoning abilities.

Questionnaires were distributed to teachers and principals to get a picture of how the implementation of learning in schools by applying student-centered learning models, asking about the importance of reasoning abilities, describing how learning should be carried out. The dam provides recommendations on developing a model to be carried out.

The development phase includes: (a) developing the design of the product, (b) making the prototype of the product,

(c) Product testing. At the development stage, it refers to the system approach model designed by [5].

Design validation is a process to assess whether a product design is more effective or not. At this stage product validation was carried out using 5 expert lecturers in the fields of educational evaluation, education, psychology, and mathematics education. Field trials were conducted in 5 schools with 6 trial subjects (teachers). During the trial observations, interviews and distribution of questionnaires were held. Data is collected by distributing valuation validation sheets. Analysis of the data used in this study is an interactive descriptive analysis technique and takes place continuously until complete. Activities in data analysis are data reduction, data display, and conclusion drawing/verification [19].

III. RESULTS AND DISCUSSION

A. *Preliminary studies*

In the needs analysis, the researchers distributed observation sheets to 28 elementary school teachers in Semarang, distributing questionnaires to 45 teachers and principals in Semarang.

Based on the results of the study obtained from a questionnaire distributed to 45 teacher respondents gave the following picture: regarding the implementation of the 2013 curriculum all schools had implemented the 2013 curriculum and the conceptual understanding of the curriculum implementation of some respondents was already good.

One of the respondents' answers about how the implementation of learning in the 2013 curriculum is as follows: The 10th respondent answered the concept of implementing the 2013 curriculum is that students in the learning process are expected to be able to complete basic concepts not only to be able to do the problems correctly but must be able to reason so that they understand, following the results of a randomized questionnaire about the understanding of the implementation of the 2013 curriculum. Seeing the responses and answers of teachers, in the implementation of the 2013 curriculum teachers already have sufficient knowledge about learning that is appropriate or expected in the 2013 curriculum.

Related to how the implementation of learning that is currently taking place some respondents gave diverse responses, for example, R2 stated Scientific Thematic Learning, authentic assessment of the learning process and outcomes, Application of learning models to support KBM. And the responses from other respondents can be seen in the table above. Related to the implementation of the learning model introduced in the 2013 curriculum, namely the discovery learning model, problem-solving, and project-based learning respondents agreed to answer that the model has helped present student-centered learning, allowing students to think and express opinions, but in its implementation, it has not been maximized, one of the respondents' answers that the model introduced is very helpful, but to improve the quality of learning it is necessary to develop good learning models, learning resources and media. The results of the preliminary study activities can be seen in the following Table I:

TABLE I.   DATA DESCRIPTION OF STUDY RESULTS INTRODUCTION

Aspect observed	Yes / Yes / Important / Need	Not yet
The learning model (problem-based learning, discovery learning, project-based learning) introduced in the 2013 curriculum has helped.	45(100%)	0
The learning model introduced in the 2013 curriculum helps to improve aspects of student reasoning.	44(97,78%)	1(2.22%)
The aspect of student reasoning is an important ability that needs to be improved in the 2013 curriculum.	45(100%)	0
The development of learning models is needed to improve student reasoning in elementary schools.	44(97,78%)	1(2.22%)
In learning, it is necessary to explain the definition of a concept of learning material.	42(93.33%)	3(6.67%)
In learning students need to be allowed to give examples and not examples of concepts of learning materials.	44(97,78%)	1(2.22%)
Ability in mathematical modeling and problem solving is important for students.	45(100%)	0
Need to provide opportunities for students to provide arguments or ideas in problem-solving.	45(100%)	0
The ability of students to solve problems according to procedures is very important	42(93.33%)	3(6.67%)
The ability of students to draw conclusions and provide logical reasons is very important.	43(95.56%)	2(4.44%)
Do you agree if the development of a learning model can improve student reasoning?	45(100%)	0
Are existing learning models sufficient to improve student reasoning?	25(55.56%)	20(44.44%)
What if the learning model developed provides an opportunity for students to convey ideas/ideas about learning material?	42(93.33)	3(6.67%)
What if the model developed by learning activities must accommodate students' opportunities to do things freely?	35(77.78%)	10(22.22)
What is your opinion if the model developed allows students to convey a variety of answers in answering a question?	44(97,78%)	1(2.22%)
What is your opinion if the developed learning model allows students to interact with their social environment?	45(100%)	0
Recommendations: It is necessary to develop a learning model that is oriented to the aspects of student reasoning in elementary schools.	45(100%)	0

From Table, I. Obtained a learning profile that is currently taking place, the learning model introduced in the 2013 curriculum has helped many teachers in implementing learning, 100% of respondents agreed that the learning model introduced in the 2013 curriculum was very helpful in implementing learning. Related to the aspect of increasing student reasoning 97.78% of respondents answered that the model introduced in the 2013 curriculum had helped improve the student reasoning aspect. Then relating to the ability of student reasoning is an important ability that must be increased 100% of respondents answered importantly, this will help students in critical thinking if the student's reasoning ability is good.

Of 45 respondents 97.78% of respondents agreed to do the development of learning models to improve students' reasoning abilities, then related to construction how should learning be done 93.33%) respondents agreed if the learning needs to explain the definition of a concept, 97.78% of respondents agreed if in student learning needs to be allowed to give examples and not examples of concepts of learning material, 100% of respondents think that the ability in mathematical modeling and problem-solving is important for students, 100% of respondents agree if in the learning process provides opportunities for students to give arguments or ideas in problem-solving, 93.33 % of respondents think that the ability of students to solve problems according to procedures is very important, 95.56 respondents view that the ability of students to draw conclusions and provide logical reasons is very important, 100% of respondents agree if development of a learning model is carried out able to improve student reasoning.

From the results of a preliminary study using observational instruments related to learning in the aspects of learning implementation, the implementation of scientific approaches, open-ended approaches, and aspects of student reasoning obtained data such as the following Table II:

TABLE II.　　RESEARCH DATA

	Learning Aspects	Learning Aspects	Learning Aspects	Learning Aspects
Average Score	99,035	26,428	29,714	47,821
Max score	125	35	40	70
Percentage	79,228%	75,510%	74,285%	68,316%
Criteria	Well	Well	Well	Well

Table II. above shows that the reasoning aspect still needs to be improved by implementing the development of an advanced organizer model based on the open-ended approach. With the development of an advanced organizer model based on the open-ended approach, it is hoped that it can improve students' reasoning abilities because the model developed is oriented to how knowledge is managed, how the mind works in processing new information, allowing students to investigate various strategies and ways they believe by their abilities elaborating problems. Thus it has the potential to improve students' reasoning abilities in elementary school.

B. Expert Rating

The validation of the advanced organizer model based on the open-ended approach was carried out by inviting 5 experts. The results of the model validation can be seen in Table III below:

TABLE III.　　NEEDS FOR DEVELOPMENT OF ADVANCE ORGANIZER MODEL BASED ON OPEN-ENDED APPROACH

Assessment Aspects	Respondents				
	R1	R2	R3	R4	R5
Score obtained	15	17	15	17	16
Maximum Score	20	20	20	20	20
Value	75	85	75	85	80
Criteria (k)	V	SV	V	SV	V
Average (ẋ)	80			Valid	

Table III. is the result of validation from 5 experts with an average value of 80 with valid criteria in the content validation assessment of the need for the development of an advanced organizer model based on the open-ended approach.

TABLE IV.　　ADVANCE ORGANIZER MODEL BASED ON OPEN-ENDED APPROACH DESIGN BASED ON EXCELLENT KNOWLEDGE

Assessment Aspects	Respondents				
	R1	R2	R3	R4	R5
Score obtained	18	23	21	24	24
Maximum Score	28	28	28	28	28
Value (score obtained / maximum score) * Maximum value (100)	64	82	75	86	86
Criteria (k)	V	SV	V	SV	SV
Average (ẋ)	78,57			Valid	

From Table IV. shows that the advanced organizer learning model based on the open-ended approach is valid with a value of 78.57 with valid criteria, meaning that the development of the model is based on cutting-edge knowledge.

TABLE V.　　SUMMARY OF ADVANCE ORGANIZER MODEL BASED ON OPEN-ENDED APPROACH

Assessment Aspects	Respondents			
	R1	R2	R3	R4
Score obtained	12	12	15	12
Maximum Score	16	16	16	16
Value (score obtained / maximum score) * Maximum value (100)	75	75	94	75
Criteria (k)	V	V	SV	V
Average (ẋ)	79,69		Valid	

Table V. It shows that the construct validity assessment on the development of an advanced organizer model based on the open-ended approach with a value of 79.69 with valid criteria.

TABLE VI.   THEORETICAL SUPPORT OF OPEN-ENDED ADVANCE ORGANIZER MODELS

Assessment Aspects	Respondents			
	R1	R2	R3	R4
Score obtained	12	12	15	12
Maximum Score	16	16	16	16
Value (score obtained / maximum score) * Maximum value (100)	75	75	94	75
Criteria (k)	V	V	SV	V
Average (ẋ)	79,69		Valid	

From Table VI. Shows that the development of an advanced organizer model based on an open-ended approach is valid with a value of 79.69. This means that the development of an advanced organizer model based on an open-ended approach is based on adequate theoretical studies.

TABLE VII.   IMPLEMENTATION OF ADVANCE ORGANIZER MODEL BASED ON OPEN-ENDED APPROACH

Assessment Aspects	Respondents			
	R1	R2	R3	R4
Score obtained	17	15	17	16
Maximum Score	20	20	20	20
Value (score obtained / maximum score) * Maximum value (100)	85	75	85	80
Criteria (k)	SV	V	SV	V
Average (ẋ)	81,25		Very Valid	

From Table VII. Shows that the development of an advanced organizer learning model based on the open-ended approach is very valid used in the implementation of learning with a value of 81.25 with very valid criteria.

TABLE VIII.   PRACTICE OF ADVANCE ORGANIZER BASED ON OPEN-ENDED APPROACH

Assessment Aspects	Respondents			
	R1	R2	R3	R4
Score obtained	30	23	30	27
Maximum Score	32	32	32	32
Value (score obtained / maximum score) * Maximum value (100)	94	72	94	84
Criteria (k)	SV	V	SV	SV
Average (ẋ)	85,94		Very Valid	

From Table VIII. Shows that the development of an advanced organizer model based on the open-ended approach fulfills practical aspects for its use in learning with a value of 85.95 with the criteria of Very Valid.

C. Limited Trial

The results of the initial field trials conducted in 5 elementary schools in the city of Semarang with 6 subject teachers can be seen in the following Table IX:

TABLE IX.   PRACTICE OF ADVANCE ORGANIZER BASED ON OPEN-ENDED APPROACH

Assessment Aspects	Respondents					
	R1	R2	R3	R4	R5	R6
Score obtained	27	28	29	32	32	30
Maximum Score	32	32	32	32	32	32
Value	84,375	87,5	90,625	100	100	93,75
Criteria (k)	SV	SV	SV	SV	SV	SV
Average (ẋ)	92,70833333			Very Valid		

From Table IX. Demonstrate that the development of an advanced organizer model based on an open-ended approach is practical or easy to use in implementing learning. With a value of 92.70 with very valid criteria.

D. Product Prototype

Advance Organizer is a model to help students organize information connecting it to a larger cognitive structure that reflects the organization of knowledge itself. Advance Organizer models do not have the stages or procedures specified [4]. The advance organizer model is oriented to how knowledge is managed, how the mind works in processing new information, and how the teacher can apply these ideas to learning [9].

Open-ended approach oriented to problems that are formulated to have multiple answers that are properly called incomplete problems are also called open-ended problems or open problems [18]. Learning with an open-ended approach usually begins by giving students open problems. Learning activities must bring students in answering problems in many ways and perhaps also many answers (right) to invite the intellectual potential and experience of students in the process of discovering something new.

The main objective of the advanced organizer model is to help teachers manage and transfer diverse information as useful and efficient as possible. Obtaining information is a valid educational goal and that certain theories can guide teachers in transmitting a variety of information to students. The teacher acts as a manager of learning material and presents information through lectures, readings and providing assignments to the learner in integrating what has been learned. Thus the main objective of the advanced organizer model is in line with the objectives of open-ended learning, which is to help develop creative activities and mathematical mindsets of students through simultaneous problem-solving.

Research conducted [13] which states that Advance Organizer learning is more effective for students' mathematical reasoning than Inquiry learning so that advanced organizer learning can help develop creative activities and mathematical mindsets of students through simultaneous problem-solving.

The advanced organizer model based on the open-ended approach has the following teaching structure: The first stage

of the initial arrangement: consists of two activities namely: directing students to the material to be studied, recalling related information. Directing students to the material to be studied provides an opportunity for students to prepare themselves well to follow the lesson, convey learning references related to the subject matter to be learned and convey learning activities to be carried out. Remind related information that can be used to help instill new knowledge.

The initial arrangement can be considered a kind of mental help and is presented before new material. Many studies have shown that initial organizers increase students' understanding of various subject matter [3].

The second stage of the advance organizer presentation: consists of three activities: clarifying the objectives of the lesson, presenting the advance organizer, and encouraging awareness of relevant knowledge. Clarifying learning goals is one way to get students' attention and direct them to learning goals, both of which are important to facilitate meaningful learning. Constructivism is a psychological and philosophical perspective that views each form or builds most of what is learned and understood [15].

The third stage is the presentation of assignments or subject matter, presented in the form of lectures, discussions, films, experimentation, or reading. During the presentation of processing, learning materials need to be made clear to students so that they have all the senses of instruction and can see the logical sequence of the material and how the processing relates to the advance organizer. Vygotsky considers that the social environment is very important for learning and thinks that social interactions change or transform learning experiences.

The fourth stage of strengthening cognitive processing is anchoring new learning material into the existing cognitive structure of students, which is strengthening the cognitive processing of students. To strengthen Ausubel's cognitive processing, it suggests the principle of integrative adjustment by showing how new concepts are linked to concepts that are already possessed. Bruner assumes that the acquisition of knowledge is an interactive process and the second assumption that people construct knowledge by linking incoming information with stored information that has been obtained previously.

The advanced organizer model social system based on open-ended teachers must maintain control on the intellectual structure, it is important to link learning material with the organizer and help students distinguish new material from material that has been previously learned. in the third stage however the learning situation, the idea must be more interactive, students need to be stimulated to ask questions and provide responses. Teachers' assignments to students are directed to clarify the meaning of new learning material, distinguishing that meaning from and reconciling it with existing knowledge, making it relevant to students personally, and helping them improve critical approaches to knowledge.

The development of an advanced organizer model based on an open-ended approach is expected to improve students' reasoning abilities because the developed model is oriented to how knowledge is managed, how the mind works in processing new information, providing opportunities for students to investigate various strategies and ways they believe by their abilities elaborating problems. Thus it has the potential to improve students' reasoning abilities in elementary school

IV. CONCLUSION

Based on the results of the preliminary study data analysis, it can be concluded that it is necessary to develop a learning model that is oriented to the aspects of student reasoning in elementary schools. From the results of the expert validation assessment shows that the development of an advanced organizer model based on the open-ended approach meets the following criteria: (1) the development of an advanced organizer model based on needs, (2) the development of an advanced organizer model based on an open-ended approach based on current knowledge, (3) the development of the model advance organizer based on open-ended approach meets construct validity, (4) development of advance organizer model based on open-ended approach gets adequate theoretical support, and (5) development of advance organizer model based on open-ended approach meets practical validity in its use in learning activities.

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