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Comparison of Children Learning in Science Model with Direct Instruction in Developing Critical Thinking Skills in Terms of Learning Motivation in Science Learning

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ABSTRACT: Comparison of Children Learning in Science model with Direct Instruction in the development of critical thinking skills in learning science in elementary school. The purpose of this study was to determine the comparison of children Learning in Science with Direct Instruction in the development of critical thinking skills in terms of learning motivation in learning science in elementary school district Kedawung-Sragen, this study is a quasi-experimental research, using quantitative data analysis and sampling using cluster random sampling. Data collection is by test. The research Data were analyzed by stages: prerequisite analysis test, variance analysis test of two unequal cell paths, and further analysis of variance test. The results of the test calculation of variance analysis of two unequal cell paths obtained data that Fcount (75.61) > Ftable (3.89), and in further tests Anava, obtained data that the marginal mean of Children Learning in Science model is 89.78 greater than the Direct Instruction model which has an average of 77.66. The conclusion of the study is that the model of children Learning in Science is more effective than the model of Direct Instruction in the development of critical thinking skills.

KEYWORDS: CLIS learning, Critical thinking skills, Direct Instruction.

INTRODUCTION

Learning at this time requires the selection and determination of a wise learning model so that learning achievement can be more optimal. Learning is the main goal in the learning process. One of the learning objectives is the development of critical thinking skills. Understanding critical thinking skills, namely: critical thinking skills are analyzing arguments through aspects of finding similarities and basic differences in the material or learning topics studied (Erlistiani, et al., 2020). Critical thinking skills are one of the high-level thinking abilities that a person has in responding or responding to certain topics (Manurung, et al., 2023). Critical thinking skills are the ability to correctly conclude a problem, review and thoroughly research the decisions taken (Larasati & Syamsurizal, 2022). Based on some of these opinions, it can be synthesized that critical thinking skills are an ability that everyone has to analyze ideas or ideas in a more specific direction to pursue relevant knowledge about the world by involving the evaluation of evidence.

Critical thinking skills are the focus of learning that prepares the younger generation to be able to keep pace with the development of Science and technology. Sudiarta, et al., (2021) explains some considerations about the importance of critical thinking skills, namely: developing critical thinking in education means that we give appreciation to learners as a person (respect a person). This will provide an opportunity for the full personal development of students because they feel given the opportunity and will be respected for their rights in personal development; critical thinking is an ideal goal in education because it prepares students for their adult lives; and the development of critical thinking in the educational process is a traditional ideal as what is desired to master science and technology. Ariadila, et al., (2023), critical thinking becomes very important to be implemented in everyday life, namely so that: a person can make the right and better management; can avoid fraud and manipulation of information; can develop higher academic skills; sharpen analytical thinking skills.

Critical thinking skills do not arise randomly or without effort; it requires structured, deliberate, and repetitive exposure and practice, in order for learners to develop insightful thinking. Changwong, et al, (2018) explained that the key steps to build critical thinking skills, namely: Describing - by clearly defining what you are talking about, what specifically was involved, where it took place and under what circumstances; Reflecting – considering a topic by taking into account new information or a new experience, or considering other viewpoints; Analyzing – examining and then explaining how something is, including comparing and contrasting

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different elements and understanding relationships to your subject/topic; Critiquing-identifying and examining weaknesses in arguments, as well as acknowledging its strengths. It's important to think of critiquing as 'neutral' and not negative; Reasoning-using methods such as cause and effect to demonstrate logical thinking, as well as presenting evidence that either refutes or proves an argument.; Evaluating-can include commenting on the degrees of success and failure of something, or the value of something.

Learners who have critical thinking skills can be noticed from the indicators. Some indicators of critical thinking skills in this study according to Sudirman, et al., (2019), among others: provide basic explanations; build basic skills; conclude; make further explanations; organize strategies and tactics. Meanwhile, critical thinking can be considered also from aspects that can also be the basis of indicators. Facione (2011: 137) explains that: a module which is containing critical thinking components, those are interpretation, understanding and expressing the meaning or significance of various experiences, situations, data, events, judgments, conventions, beliefs, rules, and procedures; analysis, an attempt to decompose a material into its constituent parts and determine relationships, identify inferential relationships, questions, concepts, descriptions, or other forms of representation; conclusions, to draw conclusions based on relevant information that flows from data, statements, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation; evaluation, to assess the credibility of statements or other representations that are records or descriptions of perceptions of experiences, situations, judgments, beliefs or opinions; and to assess the logical strength of inferential relationships between statements, descriptions of statements, or; explanation, to provide an explanation that reasoning in terms of from evidence, conceptual, methodological, and contextual considerations; self-regulation are called as critical thinking skills based module; awareness to monitor one's cognitive activities and the elements used in such activities; and the results educaced, especially by applying skills in analysis and evaluation to one's own inferential judgments.

The development of thinking skills in SD Kecamatan Kedawung Sragen became the focus of research. This is because students experience weaknesses in connecting science material with other materials and connections with problems in the community. These weaknesses have an impact on the implementation and learning outcomes of IPAS. The impact is that the learning carried out by teachers is dominated by learning with lecture methods and utilizing print media, such as: student handbook and student worksheets (LKPD). Meanwhile, the learning media used are photos inserted in Powerpoint slides. Learning by using the lecture method and followed by a reinforcement method that is doing exercises, providing a level of cognitive development at the stages: remember (C1), understand (C2), and apply (C3). As for the stage of analyzing (C4), synthesizing (C5), and evaluating (C6) is less supported when learning science.

Not optimal development of critical thinking skills in the learning of natural and Social Sciences (IPAS), there is a need for an understanding of the characteristics of Science Learning. The characteristics of Science in this case is divided into 2 things, namely Natural Science (IPA) and Social Science (IPS) (Suhelayanti, et al., 2023). Some characteristics of science learning according to Suhelayanti, et al., (2023), namely: the science learning process involves almost all sense organs, the entire thinking process, and various muscle movements; Learning science is done using a variety of ways (techniques); observation, exploration, and experimentation; learning science requires a variety of tools, especially to assist observation. This is done because the ability of the human senses is very limited. In addition, there are certain things when the data obtained based only on sensory observation, will give less objective results, while IPA prioritizes objectivity; Learning science often involves scientific activities (seminars, conferences or symposia), literature studies, visiting an object, preparing hypotheses, and more; learning science is an active learning process.

Taking into account the characteristics of science learning, there needs to be a learning model that can accommodate science learning to develop critical thinking skills. The learning Model is described by Abdul Majid (2015: 28) as a conceptual framework and systematic procedure in classifying learning experiences so that learning goals are achieved and serve as guidelines for teaching designers by teachers. Trianto (2015: 52) explained that the learning model is a planning or pattern that can be used to design learning patterns by teachers. Meanwhile, Irvy (2020) explained that the learning model is a pattern that is used as a benchmark in planning learning in the classroom.Understanding the learning model described above, researchers can conclude that the learning model is the patterns in designing a systematic learning program so that the achievement of goals can be done effectively and easily implemented.

Taking into account the characteristics of Science Learning and to realize the development of critical thinking skills, researchers examined the influence of two models of learning, namely: Model Children Learning in Science (CLIS) and direct instruction model. Sari, et al, (2015) explained that the CLIS learning model emphasizes students ' activities to perfect the

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achievement process in getting ideas, adjusting to existing knowledge, solving and discussing emerging problems, so that students can express their own opinions. According to Budiarto (2015), explained that the CLIS model is a learning model that seeks to develop students ' ideas or ideas about a particular problem in learning and reconstructing ideas or ideas based on observations or experiments. Meanwhile, according to Samatowa, (2006: 70) the CLIS learning model is a framework for creating an environment that allows teaching and learning activities that involve students in observation and experimental activities using student worksheets (LKS). Based on some of the opinions above, it can be synthesized that the CLIS learning model is a learning model that focuses on creating a learning environment that involves students to perfect the achievement process in getting ideas, adjusting to existing science, solving and discussing problems that arise, and can express ideas or ideas based on the results of observations or experiments.

Direct Instruction is one model that is often used by teachers. Yanti (2019) explained that the Direct Instruction model is specifically designed to develop student learning about procedural knowledge and declarative knowledge that is well structured and can be learned step by step. Supartini (2021) explains that Direct Instruction is a learning model in which teachers transform information or skills directly to learners, learning is goal-oriented and structured by teachers. Syahrastani (2022) explained that the Direct Instruction model is a good learning model to teach about rules, procedures, basic skills, especially young learners, so the Direct Instruction model is very suitable to be applied in teaching Platting and Garnish techniques. Meanwhile, Arends (Rahmayanti, Alimuddin, Suradi, 2021) says that direct instruction or direct teaching can be interpreted as a learning model that aims to help students learn basic skills and acquire knowledge that can be taught gradually step by step. Based on the description above, researchers can conclude that the Direct Instruction model is a learning that transforms the concept of learning and knowledge procedures to learners who do not have much understanding of the material being studied.

CLIS learning Model and direct instruction in comparison in terms of learning motivation. The definition of learning motivation is explained by Muhibbin Shah (2003:158) which asserts that learning motivation is the overall driving force that is in the student that gives rise to learning activities and ensures the continuity of learning activities, so that the desired goals by learning subjects can be achieved. Winkel (2004: 526) learning motivation is the overall driving force within the student that gives rise to learning. Thus, the sample of this study needs to be considered the ownership of learning motivation. Yulianto, Sisworo, and Hidayanto (2022) explain that the function of motivation, namely: encouraging humans to do; determining the direction of action, namely towards the goal to be achieved; selecting actions, namely determining what actions must be done that are compatible in order to achieve the goal, by filling in actions that are not useful for the goal.

Based on the above description, The purpose of this study was to determine the comparison of children Learning in Science with Direct Instruction in the development of critical thinking skills in learning science in elementary school district Kedawung-Sragen. So the title of this study is a comparison of the model of children Learning in Science with Direct Instruction in developing critical thinking skills in learning science.

RESEARCH METHODS

This type of research is quantitative with Pretest-Posttest Control Group Design. The characteristic of the research is that all groups were pretested before being given treatment / treatment and then observed the results. This experimental study to investigate the effect of two independent variables simultaneously, namely the CLIS model and direct instruction model on one dependent variable, namely critical thinking skills. The study population was all fourth grade elementary school students in Kedawung-Sragen district. Sampling technique using cluster randam sampling.

Data collection techniques using tests. Data in variant analysis (Anava) two roads with unequal cells, using the formula:

$X_{ijk} = \mu + \alpha_i + \beta_i + (\alpha\beta)_{ij} + \varepsilon_{ijk}$ (Budiyono, 2016)

and further test the analysis of two-way variance, using the Scheffe method, which is formulated:

$F_{i;j} = \frac{(\overline{X_i} - \overline{X_j})^2}{RKG\left(\frac{1}{n_i} + \frac{1}{n_j}\right)}$ (budiyono, 2016)

Description:

$F_{i;j}$ = value of F_obs in comparison of i-th row and j-th row

$\overline{X_i}$ = average on line to i

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$\bar{X}_j$ = average on line to j
RKG = mean squared error obtained from the calculation of variance analysis
n_i = i-th sample size
n_j = j-th sample size

RESULTS AND DISCUSSION

The results of data processing have met the test prerequisites, namely: normality test, homogeneity test, and balance test, followed by variant analysis test. The results of the analysis of variance test (Anava) are arranged as follows:

Table 1. Analysis of The Variance of Two Dissimilar Cell Paths

	JK	dk	RK	F_{acount}	F_{Table}	Results
Learning Model (B)	8.037,96	1	8.037,96	75,61	3.89	Decline H_{OB}
Motivation To Learn (A)	624,57	2	312,29	2,937	3.04	Accept H_{OA}
Interaction (BA)	1.516.981,94	2	758490,97	7.134,59	3.04	Decline H_{OBA}
Error	22.431,78	211	106,31	--	--	--
Total	1.548.076,25	216		--	--	--

Anava summary table of two different cell paths above, can be interpreted as follows: There are differences in the achievement of critical thinking skills development in science learning that is taught with the learning model of Children Learning in Science (CLIS) and Direct Instruction (DI); there is no difference in the achievement of critical thinking skills development in science learning that has learning motivation skills; there is an interaction between the learning model of Children Learning in Science (CLIS) with learning motivation and Direct Instruction (DI) with learning motivation in achieving the development of critical thinking skills in science learning.

Anava test results, data followed by Anava follow-up test. The stages for the Anava follow-up Test, starting from the preparation of a summary of the marginal mean calculation, which is arranged in the following table:

Table 2. Average Each Cell

	Motivation To Learn (A)			Average Marginal
Learning Model (B)	Height (A1)	Medium (A2)	Lowh (A3)	
Model CLIS (B1)	91,13	89,88	88,33	89,78
Direct Instructin (B2)	80,98	74,88	77,14	77,66
Average Marginal	86,05	82,38	82,74	

Based on the table above, the marginal mean on line B1 (89.78) > the marginal mean of line B2 (77.66). The comparison can be interpreted that the students who are given the children Learning in Science (CLIS) learning model influence in the achievement of critical thinking skills development is better than the students who are given learning with Direct Instruction (DI) learning model.

The above analysis needs to be sharpened by taking into account the double comparative test between cells, due to the interaction. The summary of the double comparison between cells is arranged in the table as follows:

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Table 3. Summary of Intercellular Double Comparisons

H_0	F_{acount}	$(pg-1)F_{Table}$	P
$\mu_{11} = \mu_{12}$	2,441406	(5)(2.26)=11.30	Accept H_0
$\mu_{12} = \mu_{13}$	5,648875	(5)(2.26)=11.30	Accept H_0
$\mu_{11} = \mu_{13}$	5,648875	(5)(2.26)=11.30	Accept H_0
$\mu_{21} = \mu_{22}$	1385,138	(5)(2.26)=11.30	Decline H_0
$\mu_{22} = \mu_{23}$	5,648875	(5)(2.26)=11.30	Accept H_0
$\mu_{21} = \mu_{23}$	26,45226	(5)(2.26)=11.30	Decline H_0
$\mu_{11} = \mu_{21}$	10611,09	(2)(3.04)=6.20	Decline H_0
$\mu_{12} = \mu_{22}$	50625	(2)(3.04)=6.20	Decline H_0
$\mu_{13} = \mu_{23}$	15681,74	(2)(3.04)=6.20	Decline H_0

The table above can be described as follows: students who are given the children Learning in Science (CLIS) learning model and have learning motivation with high, medium, and low criteria, have the same influence on the achievement of critical thinking skills in science learning. This is because, each learner is able to actively practice the development of the concept of science through the stages of learning Children Learning in Science (CLIS) and is able to develop interaction between learners; Learners who are given a Direct Instruction (DI) learning model and learning motivation with high, medium, and low criteria, provide different influences in the development of critical thinking skills. The Direct Instruction (DI) learning Model and learning motivation with moderate criteria are not optimal in the development of critical thinking skills. This is different from the Direct Instruction (DI) learning model and learning motivation with high and low criteria that are able to influence the development of critical thinking skills. Less optimal students who enter the criteria are in the development of critical thinking skills because, teachers dominate too much learning, questions and answers are held focused on active learners only, and the provision of tasks less in response by the teacher, and interaction between learners less space; Students who are given learning model Children Learning in Science (CLIS) different results with learning model Direct Instruction learning model (DI) in the achievement of developing critical thinking skills in learning science with learning motivation that has high, medium, and low criteria. Taking into account the average of each, it can be concluded that the children Learning in Science (CLIS) learning model is more effective than the Direct Instruction (DI) learning model, which is based on learning motivation for all criteria.

DISCUSSION

Summary table Anava two cell paths are not the same in the decision column obtained data that H0B rejected means that learning science with learning model Children Learning in Science (CLIS) with learning motivation and Direct Instruction (DI) PJBL-STEM influence on the achievement of critical thinking skills development. H0A accepted means that learning motivation has not been able to affect the learning of Science in the achievement of critical thinking skills. While h0ba rejected means learning model Children Learning in Science (CLIS) with motivation to learn and Direct Instruction (DI) with motivation to learn to influence or there is interaction in the achievement of critical thinking skills development in science learning

Based on the table above, it can be concluded, namely: students who are given the children Learning in Science (CLIS) learning model and have learning motivation for all criteria, get relatively almost the same average in achieving the development of critical thinking skills. Considering the average, students with motivation to learn with high, medium, and low criteria, have an average difference, namely: 1.25 and 1.55, so it can be concluded that the children Learning in Science (CLIS) learning model has an effect on the development of critical thinking in Science Learning; students who are given Direct Instruction (DI) learning models and have motivation with high and low criteria, have an effect on the achievement of critical thinking skills. While the control group whose learning motivation criteria were moderate, had less influence on the development of critical thinking skills. This is because teachers are more dominant in learning, questions and answers are held focused on active learners only, and the provision of tasks is less in response by teachers, and interaction between learners is less space; The learning model approach of Children Learning in Science (CLIS) and Direct Instruction (DI) learning models provide different influences on the achievement of critical thinking skills development in science learning in terms of learning motivation for each criterion, namely: high, medium, and low. It can be concluded that the learning model of Children Learning in Science (CLIS) is more effective than the learning model of

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Direct Instruction (DI), because the learning stages of Children Learning in Science (CLIS) can be performed by students well and there is room for interaction between students.

Better CLIS model in learning science in Class IV in the development of critical thinking skills. Learning that is carried out using the CLIS model has stages that can support students to develop critical thinking skills, such as: students can focus their attention and find problems in the subject matter that has been known by students, develop problem solution ideas from the results of interacting, describing and compiling better ideas, applying and compiling ideas into the definition of a science concept. This stage is in line with the concept of learning using the CLIS model described by Sari, et al, (2015), namely: orientation, is an attempt by teachers to focus the attention of learners by providing concept phenomena that occur in society to be observed; delivery of ideas, is an attempt to bring up the initial ideas of learners; rearrangement of ideas, is an attempt; implementation of ideas, is an effort made by teachers to implement new ideas that have been obtained by students through activities working on practice questions; stabilization of ideas, is an effort made by teachers to strengthen scientific concepts obtained by students by feedback.

Stages of building the concept of science through the CLIS model stages, seen from the stages of delivering ideas, validating ideas scientifically by paying attention to facts in the field, applying ideas, and solidifying ideas to become a concept or theory of science, are stages that build critical thinking skills. This is in line with the definition of critical skills described by Manurung, et al., (2023), namely critical thinking skills are one of the high-level thinking abilities that a person has in responding or responding to certain topics. Critical thinking skills are the ability to correctly conclude a problem, review and thoroughly research the decisions taken (Larasati & Syamsurizal, 2022).

In contrast to the direct Instruction model, which is the development of the IPAS concept, teachers provide guidance to practice, evaluate, and provide opportunities to practice again after it is felt enough. This condition indicates that the teacher's direct Instruction model still dominates in learning, so that the critical thinking skills of learners can not be optimal. The dominance of teachers in learning can be seen from the stages of direct Instruction model described by Kardi & Nur (2000:57-59), namely: explaining the purpose of learning and preparing students; demonstrate or explain the material to be learned by students; provide practical guidance; check students ' understanding and give feedback; provide opportunities for students to practice on their own and apply learning outcomes. Assessment of learning outcomes emphasizes the practice of developing and applying appropriate basic knowledge, carefully measuring simple and complex skills, and providing feedback.

Stages of direct Instruction model in the development of critical thinking skills can occur after the stages provide opportunities for learners to practice on their own and apply learning outcomes. this is because the assessment of learning outcomes is emphasized on the practice of developing and applying appropriate basic knowledge. This condition is less in line with the concept of Al Fanny & Roesdiana (2020) which explains that critical thinking skills are needed to analyze a problem until the search for solutions to solve the problem.

The CLIS Model starting from the stages of observing, formulating ideas, testing and practicing ideas and ideas to become IPAS concepts, is a stage in the formation of critical thinking skills development. This is because critical thinking skills do not arise randomly or without effort; it takes structured, deliberate, and repetitive exposure and practice for learners to develop insightful thinking. The stages of the CLIS model are in line with the theory of Changwong, et al, (2018) which explains that the stages of developing critical thinking skills, namely: Describing – by clearly defining what you are talking about, what specifically was involved, where it took place and under what circumstances; Reflecting – reconsidering a topic by taking into account new information or a new experience, or considering, including comparing and contrasting different elements and understanding relationships to your subject/topic; Critiquing-identifying and examining weaknesses in arguments, as well as acknowledging its strengths. It's important to think of critiquing as ‘neutral’ and not negative; Reasoning – using methods such as cause and effect to demonstrate logical thinking, as well as as presenting evidence that either refutes or proves an argument; finally Evaluating – can include commenting on the degrees of success and failure of something, or the value of something.

Based on the above description, it can be concluded that the CLIS model is better than the direct Instruction model in the development of critical thinking skills, because the CLIS learning stages provide learners to be able to carry out, namely: explain, explain as clearly as possible about what is being talked about, what is specifically involved, where it is happening and under what circumstances; ; analyze, examine and then explain something, including comparing and contrasting different elements and understanding the relationship with the topic; criticize, identify and examine the weaknesses of an argument, as well as recognize

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its strengths; reasoning, using methods such as cause and effect to demonstrate logical thinking, as well as presenting evidence that refutes or proves an argument; and evaluate, being able to comment on its degree of success and failure.

CONCLUSION

The Children Learning in Science Model is more effective than the Direct Instruction model in the development of critical thinking skills. This is because the CLIs learning stage provides space for learners to be able to carry out the development of critical thinking skills, namely: explaining, reflecting, analyzing, criticizing, reasoning, and evaluating.

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