

Stacking Analysis of Higher Thinking Skills of Class V Elementary School Students on the Material of Movement Organs Using the RADEC Model

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Abstract: The purpose of this research is to use a Rasch model analysis to determine how integrating RADEC (Read, Answer, Discuss, Explain, and Create) learning in schools influences students' ability to think critically about the topic of locomotion. This descriptive research is a quantitative study conducted in early 2023 with a sample size of 29 students. The results of the pretest and the posttest were collected, and the Rasch Stacking Analysis method was used to examine them. The implementation of the RADEC learning paradigm (Read, Answer, Discuss, Explain, and Create) improved the critical thinking skills of students of all ability levels, according to the findings. Reading, Analyzing, Discussing, Explaining, and Creating (RADEC) trains students for independent and group learning. Starting from reading to the last stage, namely making free work through problem-solving activities carried out so that students are trained in high-order thinking skills. Students' high-level thinking skills have improved to the very excellent, good, and enough categories after participating in learning utilizing the RADEC paradigm. The difference between the logit readings before and after the test demonstrates this improvement. Applying the RADEC learning model to students' higher-order thinking skills shows that students experience improvement, as seen from the results of the pretest and posttest, which are processed using the Rasch stacking analysis model. Students are trained in high-order thinking skills students with high level.

Keywords: Higher Order Thinking; Organs of Motion; RADEC; Stacking

Introduction

Learning is a conscious and planned effort carried out by educators to condition or stimulate someone to be able to learn well so that there is a change in the attitude and behavior of students in the long term, and the achievement of the expected learning objectives (Rahayu et al., 2020). Effective learning is learning that provides opportunities for self-study or carries out the widest possible activities for students to learn (Rohmawati 2015). Movement organs are material that is considered to have abstract concepts for students. Organ is a collection of various tissues that performs one or more functions (Khairunnisa and Tanaya 2016). Between the function and structure of the animal body has a very

close relationship, both have a unity that cannot be separated (Isnaeni 2019). The locomotor system is an organ system in humans that plays a role in body movement consisting of active and passive locomotion devices (Mercuningsari 2019). Basically learning is a communication process to convey messages from the sender to the recipient, but from the facts found in the field, students Higher Level Thinking abilities are very low, especially for elementary school students (Sartono 2017). Teachers need to be more accurate about innovative learning models so they only feel they are carrying out innovative learning when they are not (Tulljanah & Amini, 2021; Sukmawati 2017; Sukmawati et al. 2021b). In addition to syntax that is challenging to remember, innovative learning models also require

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quite a lot of time to learn. Students are actively involved in the learning process by solving problems so as to foster creativity according to the potential and tendencies that differ from one another (Istiq'faroh and Aliyah 2022). The tendency of teachers to make more use of learning through the lecture method, which is considered practical and fast, so that class activities are dominated by assignments and memorization, indicating the low involvement of students thinking skills in learning. The application of inappropriate learning models or strategies can have an impact on students' learning abilities and achievement. Alternative solutions in other learning models that are more concise in describing all innovative learning models, namely by using a learning model whose syntax is easy to memorize, namely the RADEC learning model (Read, Answer, Discuss, Explain, and Create) which was first introduced by Sopandi (Tulljanah & Amin, 2021; Sukmawati et al. 2021; Wati Sukmawati et al., 2020). The basic principle of the model This RADEC is that all students have the capacity to learn independently and learn more about knowledge and Skills (Setiawan et al., 2019). The research is focused on the implementation of RADEC (Read-Answer-Discuss-Explain-Create) learning model which is assumed to be able to overcome some of these problems because it has characteristics that are in accordance with philosophical knowledge acquisition (perceptual, memorial, introspective, and a priori) (Nugraha and Prabawanto 2021). The RADEC learning approach (Read, Answer, Discuss, Explain, and Create) consists of five stages: reading, answering, talking about what was read, explaining what was explained, and coming up with something new. The RADEC development model (Read, Answer, Discuss, Explain, and Create) was developed to address the problem of the low quality of student learning processes and outcomes in improving students' high-order thinking skills This is supported by research (Tulljanah & Amini, 2021). With this model it is hoped that it can provide an increase in the quality of learning and be able to motivate students to be able to master competencies and skills (Kusumaningpuri and Fauziati 2021). One Step Above Students need to develop not just their memorization and comprehension skills, but also their capacity to think critically and creatively if they are to succeed in the modern world, namely, to analyze, evaluate, and create) (Tulljanah & Amini, 2021). The RADEC model was developed on the basis of several things, namely as follows. First, This model is based on the goal of national education, which is to develop students have all the potential to become human beings who believe in God, noble, healthy, knowledgeable, capable, creative, independent, and a citizen democratic and responsible (Maspiroh and Eddy Sartono 2022).

Higher order thinking skills actually important for students to master education for academic success as a provision in society (Simanjuntak & Sitohang, 2022). Higher Order Thinking is a fairly complex skill that involves logic and reasoning, judgment, analysis, creativity, problem-solving and decision-making. One of the impacts of implementing Higher Order Thinking Ability is to maximize performance and reduce weaknesses. This can be termed students who are trained to think at a higher level which will affect their ability, speed, and efficiency in making a decision (Tulljanah & Amini, 2021; Aisyah et al., 2023; Wahjusaputri et al., 2022). By increasing students' Higher Order Thinking Abilities and describing changes in students' Higher Order Thinking Abilities related to the application of the an alternate approach to teaching elementary students Higher-Order Thinking Skills using the RADEC (Read, Discuss, Explain, and Create) learning paradigm (Handayani et al., 2019). 1) Read, students carry out reading activities the day before learning takes place, or what is commonly called Pre-Learning, using flipbooks of movement organ material that researchers have prepared. Flipbook can be interpreted as a software that has benefits or roles in terms of editing where some of the advantages are being able to insert hyperlinks, media images, video and sound as a complement to multimedia objects on available pages that can be flipped back and forth like a printed book in general (Ramadhina and Pranata 2022) 2) Answer; students are then able to work on the questions in the pre-learning activities. The goal is to discover the results they read in the flipbook reading activity. This is done to hone students' high-order thinking skills. 3). Discuss; this activity is carried out when learning takes place, and each group discusses the material for the organs of movement. 4) Explain; in this activity, group representatives present the results of the discussion in front of other groups, then they hold discussions and ask questions with other groups about what was being presented. 5) Create; in the last activity, students make free works according to the material being studied, namely the organs of movement according to the wishes of the students. The application of the RADEC learning model (Read, Answer, Discuss, Explain, and Create) supports the growth of students' reading motivation, trains students' reading comprehension, and encourages high-level thinking in students. This study also prepared a companion book to support the learning process, as shown in Figures 1 and 2. This study investigates the connection between the RADEC (Read, Discuss, Explain, and Create) learning paradigm and the findings from an investigation of students' higher-order thinking skills. As part of the Motion Organs Learning Material?



Figure 1. Pre-Learning Book Cover



Figure 2. Pre-Learning Books

Method

Descriptive statistics were used for this study's research design. The RADEC methodology of data analysis compares pre- and post-learning outcomes on higher-order thinking skills using the Rasch stacking analysis model. Students from one of the elementary schools in East Jakarta participated in the research. Methodologically, 29 students were selected at random using the Rasch model (Sumintono, 2018). In this study, questions testing students' abstract reasoning skills were employed as the research instrument. There are 10 multiple-choice questions on the instrument. The text of the discourse contained in the items includes vertebrate and invertebrate animal groups, animal locomotion, characteristics of animal locomotion organs, human skeleton, human locomotion, disorders of human organs and disorders of human organs. There are four multiple-choice questions in each text. Students are required to have a working knowledge of the subject matter and the contents of the text. They are distinguishing the organs

of movement in vertebrates and invertebrates, knowing the organs of movement in humans, knowing the characteristics of the organs of movement in animals, and knowing abnormalities in the human locomotion system. With a total of 10 possible questions based on the current conversation, the highest possible score is 100.

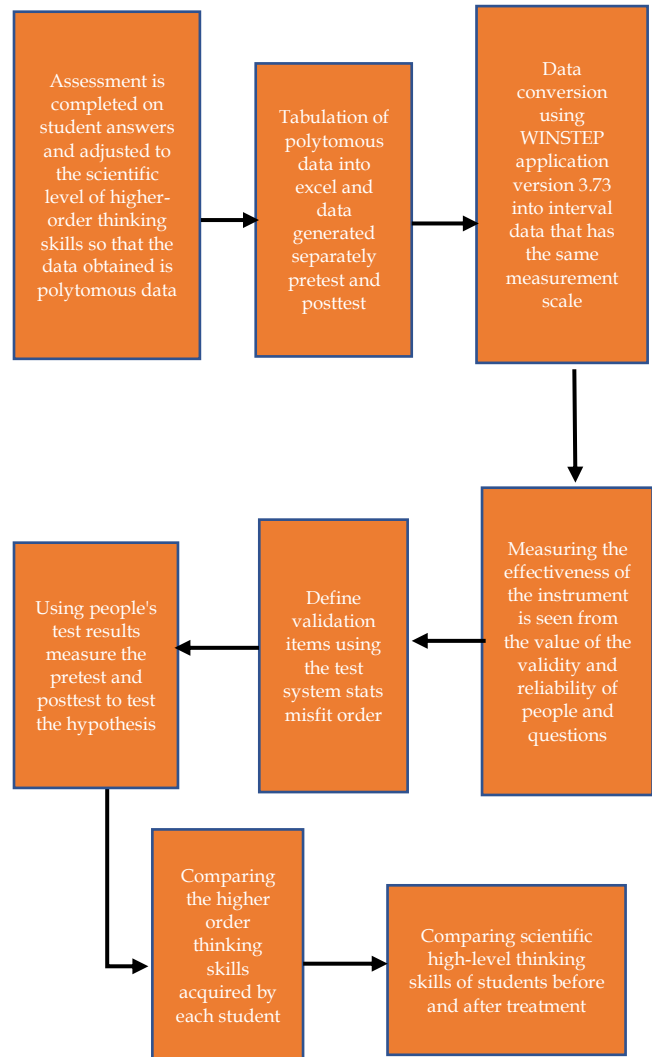


Figure 3. These stages are based on the Rasch model ranking analysis approach

Data analysis (Palimbong et al., 2019; Novianti et al., 2023; Sukmawati, 2020) methods include descriptive and quantitative data analysis utilizing the Winstep 3.73 program. Student test scores both before and after the study were analyzed to provide quantitative data. Higher-order thinking improvement was evaluated by comparing pre- and post-test scores using the Rasch dichotomous model and stacking technique (Sukmawati & Zulherman, 2023). Individual-level change can be examined using the stacking analysis method (Laliyo, 2021). The stacking method allows for eight distinct steps in the analytical process (Laliyo, 2021). At this

point, we employ a ranking analysis technique based on the Rasch model. Here's how it's done: At this point, we employ a ranking analysis technique based on the Rasch model. Here's how it's done: At this point, we employ a ranking analysis technique based on the Rasch model. This is how it's done: 1) Assessment is completed based on student responses and modified for the advanced degree of scientific reasoning required data obtained is polytomous; 2) Tabulation of polytomous data into Excel and data generated separately from pretest and posttest; 3) Third, converting the data into interval data with the same measurement scale using the WINSTEP program version 3.73; 4) Quantifying the instrument's usefulness in terms of the benefits accrued to individuals and businesses; 5) Misfit order statistics from the testing system should be used to define validation items. 6) Using people's test results measuring the pretest and posttest to test the hypothesis; 7) Comparing the higher-order thinking skills acquired by each student; 8) You are comparing students' scientific high-level thinking skills before and after treatment.

Result and Discussion

In this study, the application of the RADEC Learning model (Read, Answer, Discus, Explain and

Create) in students' high-level thinking skills was carried out so that researchers were able to achieve a goal. By The stages below outline how students in SD may put the RADEC Learning Model into practice in their own classrooms. Steps: 1) Read, 2) Respond, 3) Converse, and 4) Define Make 5).



Figure 4. Read - Answer - Discuss - Explain - Create

Elementary school kids' pre- and post-test scores provide insight into the impact of their high-order thinking skills. Students' pre- and post-test scores suggest the following, then processed using the Rasch model. The reliability value of the low category of people is 0.25, with a split value of 0.57. Data shows that students consistently answer questions, and the caliber of questions is sensitive to gauging all types of students (Sukmawati, 2022). Excellent questions have a dependability score of 0.90, and their split value is 2.95. There was some variation in how people answered the questions. Table 1 provides further explanation.

Table 1. Person and Reliability Value

Person	60 Input		60 Measured			Infit		Outfit	
	Total	Count	Measure	Realse	Imnsq	Zstd	Omnsq	Zstd	
Mean	7.3	10.0	1.42	1.00	1.02	.1	.91	.1	
S.D.	1.6	.0	1.21	.32	.37	.7	.50	.7	
Real Rmse	1.05	True Sd	.60			Separation .57	Person Reliability	.25	
Item	10 Input		10 Measured			Infit		Outfit	
	Total	Count	Measure	Realse	Imnsq	Zstd	Omnsq	Zstd	
Mean	43.6	60.0	.00	.38	1.00	.0	.91	-.1	
S.D.	11.0	.0	1.19	.06	.21	1.5	.32	1.4	
Real Rmse	.38	True Sd	1.12			Separation 2.95	Person Reliability	.90	

With low reliability of people, this can happen because the sample used is small, namely 29 people, but if you look at the item's strong reliability value suggests that it accurately assesses higher-order thinking abilities (Sumintono, 2018). These findings informed the selection of questions for both the pre- and post-test instruments. The data from the students' pre- and post-tests were analyzed, and an array analysis based on the Rasch model was carried out. Table 2 displays the outcomes of the RADEC model joint learning in terms of changes in students' higher-order thinking abilities as measured by shifts in logit/measure values.

Table 2 shows that the use of the RADEC model in the classroom led to an increase in students' use of

higher-order thinking abilities. High school, middle school, and elementary school children all experience similar shifts in their ability to think critically. Alterations to one's capacity for higher-level thought the number of students very well with a total of 16 students (1, 2, 3, 4, 5, 9, 10, 11, 13, 14, 19, 20, 22, 23, 27, 29), students who experienced an increase in high-level thinking skills with good categories occurred in a number of 10 students (8, 12, 15, 16, 18, 21, 24, 25, 26, 28), students who experienced increased high-order thinking skills with sufficient categories occurred in the number of 3 students (6, 7, 17). For more details, can be seen in Figure 5.

Table 2. Changes in the student's measured value from the results of the pretest posttest

Person	Pre-Test Logit Value	Post-Test Logit Value	Logit Value Changes	Category
1	0.48	4.49	4.01	Very good
2	0.48	4.49	4.01	Very good
3	0.48	4.49	4.01	Very good
4	-0.11	4.49	4.6	Very good
5	0.48	4.49	4.01	Very good
6	3.03	4.49	1.46	Enough
7	3.03	4.49	1.46	Enough
8	1.15	4.49	3.34	Good
9	0.48	4.49	4.01	Very good
10	-0.11	4.49	4.6	Very good
11	-0.66	4.49	5.15	Very good
12	1.15	4.49	3.34	Good
13	0.48	4.49	4.01	Very good
14	0.48	4.49	4.01	Very good
15	0.48	3.03	2.55	Good
16	-0.11	3.03	3.14	Good
17	3.03	3.03	0	Enough
18	-0.11	1.15	1.26	Good
19	-0.66	4.49	5.15	Very good
20	0.48	4.49	4.01	Very good
21	1.95	4.49	2.54	Good
22	0.48	4.49	4.01	Very good
23	-0.11	4.49	4.6	Very good
24	1.95	3.03	1.08	Good
25	3.03	4.49	1.46	Good
26	-0.11	3.03	3.14	Good
27	0.48	4.49	4.01	Very good
28	1.15	4.49	3.34	Good
29	-0.66	4.49	5.15	Very good

Mean : 3.36 SD : 0.318

Very Good: 55% Good: 34% Fair: 11%

The increase in students' ability to think critically is attributable to the RADEC approach, which teaches them to apply what they've learned to real-world challenges while also learning to work together effectively on group projects. Research shows that the RADEC learning approach improves students' higher-level thinking skills (Pratama et al., 2020).

All students benefit from the RADEC learning paradigm, albeit the extent to which they benefit can be categorized as either very good, good, or moderate. The usage of the RADEC learning model's syntax in accordance with the characteristics of students and learning in Indonesia is the driving force behind the growth in students' capacity for higher-level thought following participation in lessons based on the RADEC model. Reading is the first syntax, and it's the one that trains pupils to learn independently by guiding them to read and figure out topics on their own. That is, the

greater a student's exposure to diverse reading materials, the greater the development of the student's higher-order thinking abilities (Lestari et al., 2022). In addition, the instructor uses pre-reading questions to guide students' reading.

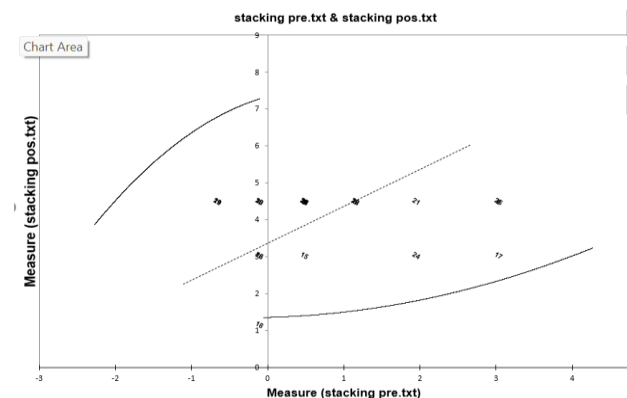


Figure 5. Graph of Changes in Critical Thinking Ability

Students are given contextual-based essays to train students high-order thinking skills, then have them reply on their own accord. Students are asked questions that align with learning objectives and indicators, such as identifying and categorizing items, assessing changes in materials, and determining how to separate materials. Effective learning occurs when students undertake pre-learning tasks like reading and answering questions so that teachers may spend class time on topics that students still don't grasp (Sopandi, 2019).

Everyone in the class has the resources they need to learn and is prepared for the next step, which is to discuss and explain the steps. Students participate very actively in lively small-group discussions during the discussion stage. Students are encouraged to talk to one another and share their thoughts in order to come up with the most comprehensive solution possible. Discussion activities not only help students hone their communication abilities, but also their ability to think critically (Handayani et al., 2019). Students practice developing higher-order thinking abilities in reaction to the findings of other group conversations during the explanation stage, which comes after the discussion stage in which they participate in small groups.



Figure 6. Create free works

Students are then prepared to apply their understanding of material principles to the solution of issues or the production of original works in the last step of the process, which is known as "creation" (Sukmawati & Zulherman, 2023). Students are educated to be perceptive by engaging in this activity, in which they generate ideas, create a work, or propose answers to challenges they meet. For the RADEC model, students actively and creatively compile or create solutions to existing problems that arise independently with the conceptual knowledge they have acquired, whereas in other learning models, students focus on mastering the material or compiling solutions to problems that have been prepared.

Conclusion

Based on the Based on the presented evidence and discussion, it can be stated that the RADEC learning approach leads to significant improvements in students' higher-order thinking skills (55% improved to very good, 34% to good, and 11% to sufficient). The difference between the logit readings before and after the experiment demonstrates this improvement. The logit value, or measurement value, reveals how well pupils do on problems of varying degrees of difficulty. Students' raw scores are processed by Rasch to get measurement or logit scores. Both groups of students with low and high starting talents saw this improvement. Many students with extremely poor beginning skills were also found to actively participate in the learning process of groups of students who had an improvement in the very good category. Students' higher-order thinking abilities are developed throughout the learning process utilizing the RADEC model, which guides them from individual study to guided instruction based on the syntax they experience. This includes reading, replying, debating, explaining, and producing.

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Author Contributions

The study, data gathering, processing, and publication writing are all Nur Fauziah's contributions. Research proposal writing, instrument validation, teaching data processing using Rasch, and article writing are all areas in which Wati Sukmawati has made significant contributions.

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Conflicts of Interest

The author confirms that he or she has no competing interests to disclose in the research up to the writing of this article. The authors also certify any circumstances or personal interests that could be considered to have influenced the representation or interpretation of research results reported inaccurately.

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