

# Analysis of Changes in the Level of Difficulty of Elementary School Students in Learning the RADEC Model on the Concept of Energy Transformation Using the Rasch Model

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**Abstract:** Utilizing the RADEC learning paradigm (Read, Answer, Discuss, Explain, Create) to help students comprehend the concept of energy transformation through Rasch model analysis is the goal of this study. From the get-go in 2023, 32 students filled in as the example for this quantitative spellbinding exploration project. The Pre-Test and Post-Test data were examined with the help of the Rasch Stacking Analysis model. The results showed that when the RADEC learning approach (Read, Reply, Talk about, Make sense of, Make) was utilized, the two understudies with low and high capacity levels worked on in their ability to figure out subjects. RADEC represents Read, Reply, Examine, Make sense of, and Make. trains understudies for autonomous and bunch learning. Students are expected to solve problems on their own after reading and responding. Then, at that point, understudies work as dynamo fans following the idea of energy change material. The group then presents an explanation of their work or discussion to the other groups. In the wake of following the punctuations as seen from the aftereffects of the pretest and posttest, which are handled utilizing the Rasch stacking examination model in the RADEC learning model, understudies can deliver logit values that are generally excellent at 37.5% and great at 62.5%.

**Keywords:** Energy Transformation; Level of Difficulty; RADEC; Rasch

## Introduction

The ability of students to not only comprehend but Concept mastery is the ability to apply the concepts offered to solve problems and even to comprehend new concepts (Astuti et al., 2017). Understanding science scientifically, both conceptually and in its practical applications, demonstrates a student's conceptual mastery (Nura & Hartati, 2022). Schema is related to how knowledge is related to one another (Sukmawati et al., 2022). Natural Sciences is one of the subjects taught in the Elementary School education unit. Science is a subject that is expected to be an accurate source of facts for students to learn about nature and its relation to students' lives through a scientific attitude (Bukit, 2022).

The purpose of learning science is not only to improve learning outcomes or knowledge but also to show the demand for students to master science concepts and critical thinking skills in order to create long-term concepts in students' memory things are practical and applicable in daily life (Wahyuni et al., 2020). Along with the times, the education system in Indonesia has a very important role in educating the next generation of this nation. The education system certainly has the competence to carry out learning. There are at least four competencies that students must possess to be able to play an active and competitive role. The four capabilities are high perusing understanding abilities, great composing abilities to build and communicate meaning, the capacity to talk mindfully, and the capacity

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to dominate different compelling computerized media. We comprehend that society in the twenty-first century requires individuals (Suryana et al., 2021). Looking at the cases in the field, elementary school student's mastery of the concept of energy transformation material is still low.

This can be seen from the students who find it difficult to carry out group discussions so that only a few students have an opinion (Fitriani & Indonesia, 2023; Nurliana & Sukmawati, 2023a; Sukmawati & Wahjusaputri, 2018; Wahjusaputri et al., 2022). In addition, the skills of students to explain the results of group discussions are still very low, as well as the lack of creativity of students to make a project to achieve the goals of current learning (Aisyah et al., 2023; Novianti et al., 2023; Sukmawati, 2023). According to Aldeya (2019), students can present an idea in another form that is not the same as in the textbook provided they have the capacity to describe concepts (Bohori et al., 2022), identify them, and provide instances or non-examples of them. Therefore, in order to assist students in learning for particular objectives, we need a learning model that can offer a systematic explanation of how to execute learning (Maryana & Sukmawati, 2021; Sukmawati, 2018; Sukmawati et al., 2021b). The RADEC learning model as an option is supposed to be appropriate for assisting understudies with grasping ideas, particularly in energy change material (Sukmawati, 2017; Sukmawati et al., n.d., 2021a; Wati Sukmawati, Asep Kadarohman, Omay Sumarna, 2021). The Read, Reply, Examine, Make sense of, and Make (RADEC) learning model is a procedure for discovering that utilizes stages as its name, in particular Read, Reply, Examine, Make sense of, and Make (Pratama et al., 2020).

The RADEC learning model as an answer unquestionably enjoys benefits. The upsides of the RADEC learning model are as per the following: 1) Gives open doors to educators to configuration fascinating learning models. 2) Further developing understudies' decisive reasoning abilities. 3) Enhancing students' comprehension and analysis skills 4) Increment participation in gatherings.

The Read, Answer, Discuss, Explain, and Create phases of the RADEC learning model must be completed in order, necessitating highly skilled human resources. The implementation process for RADEC, a learning model, is broken down into steps (syntax): (1) Read. Students use textbooks, print media, and the internet to complete reading activities the day before learning takes place, also known as "Pre-Learning." These activities help students prepare for the "Discuss, Explain, and Create" phases of the learning process; (2) After receiving an answer, students can work on the questions in the pre-

learning activities to determine the reading activity's outcomes; (3) Examine this movement did during learning, and each gathering talks about energy change material; (4) Define. In this activity, group members present the discussion's outcomes to other groups. After that, they participate in discussions and ask questions about what they heard; (5) Produce. In the final activity, students perform independent work using a dynamo fan in accordance with the topic under study, energy transformation (Fauziah & Sukmawati, 2023; Sukmawati, 2019, 2020; Sukmawati et al., 2022). The use of the RADEC learning model improves students' literacy skills, increases their motivation to read, and fosters high-level thinking in them.

The RADEC model was developed taking many factors into account, some of which are as follows: First, this model is based on the goal of national education, which is to help students become good, healthy, knowledgeable, competent, creative, independent, and God-believing citizens (Fauziah & Sukmawati, 2023). Thusly, the teacher should more wise in conclude the learning model with the objective that the developing experience can develop student creative mind. To get this rolling, teachers can take advantage of the RADEC learning model offered by experts as a response.

Implying the results of a composing overview from a couple of past examinations which express that legitimate training requires learning considering student dynamic learning, the researcher endeavors to recommend an inventive learning model that can be used to beat this issue, explicitly using the Read, Answer, Discuss, get a handle on, learning model. Besides, make, or what is known by the truncation RADEC. This study focuses on the issue of how changes in the degree of difficulty of the RADEC model on the idea of energy transformation are reflected in student learning.

## Method

A descriptive research approach was combined with a quantitative approach for this study. The Rasch stacking analysis model is used in data analysis techniques to compare and contrast the outcomes of mastering the concept prior to and following participation in the RADEC learning model. Understudies in a school in East Jakarta's 4th grade filled in as the review's subjects. The Rasch model is examined utilizing an immersed test of up to 32 understudies (Faisal et al., 2023).

Problem-based learning was the research instrument used in this study to help students better understand the energy transformation material's concepts. The talk text contained in the things

incorporates kinds of energy, changes in energy structures, and attributes of energy changes. Each question has four response decisions that should be picked by the right response. Students are expected to be able to identify the material and its content from the developed text.

Distinguishing features of energy transformation, knowing the types of energy, knowing the meaning of energy and energy transformation. Each of the 15 questions from the current conversation is worth 20 points, and the total score will be 100 if there are three correct responses. Expressive investigation and quantitative information examination using the Winstep 3.73 program are two techniques for dissecting research information (Palimbong et al., 2019).

Utilizing the RADEC learning worldview, quantitative information were procured from understudy test results (pretest and posttest), explicitly when learning. To decide how significant changes in the rising dominance of thoughts are surveyed from the pretest and posttest scores, the test information were dissected utilizing the Rasch dichotomous model, otherwise called the stacking approach (Nurliana & Sukmawati, 2023b). A technique for looking at changes at the singular level is stacking investigation. Eight steps can be used to do the analysis using stacking methods (Laliyo, 2021).

The Rasch model ranking analysis method serves as the foundation for this phase. Here are the means: Understudy reactions are assessed, with the level of comprehension of the thought changed to guarantee that the information got is polytomous information; arranging polytomous information into Succeed and information created freely by the pretest and posttest; information transformation into stretch information with a similar estimation scale utilizing the WINSTEP program 3.73; assessing the instrument's viability considering the reliability and legitimacy of people and things; utilizing the test framework details oddball request, characterize approval things; scrutinizing the hypothesis by looking at members' grades from the pretest and posttest; assessing how well every understudy has dominated the subjects; furthermore, analyzing how well students comprehended subjects deductively when treatment.

## Result and Discussion

To achieve an objective, scientists applied the RADEC Learning model (Read, Reply, Disk, Make sense of, and Make) in this review to understudies' significant

level reasoning skills. In SD, students are required to implement the RADEC Learning Model by doing the following: peruse, answer, examine, and make sense of.



Figure 1. Learning activity Read - Answer - Discuss - Explain - Create

The results of the students' pre- and post-tests demonstrate how improving concept comprehension affects primary school students. In view of the results of the understudies' Pre-and Post-Tests, which were then examined with the Rasch model. The unfortunate class of people have a constancy rating of 0.62 and a split worth of 1.29. As per the insights, understudies reliably answer requests, and all understudy gatherings might be estimated utilizing delicate inquiries (Sukmawati, 2022). Generally excellent inquiries have a dependability esteem classification of 0.73 and a different worth of 1.65. The data show that the responses to the questions by the respondents varied.

With low unwavering quality of individuals, this can happen in light of the fact that the example utilized is little, in particular 32 individuals, in the event that you investigate the thing's reliability number, which is brilliant, you might be sure that the apparatus being utilized can precisely assess significant level abilities to reason. This information served as the foundation for the pre- and post-test questions. The understudies' pretest and posttest results were gathered, examined, and afterward an exhibit investigation utilizing the Rasch model was done. Students' higher-order thinking abilities have changed as a result of participating in cooperative learning under the RADEC paradigm, as shown by the changes in logit/measure values in Table 2.

**Table 2.** Items and Reliability Value

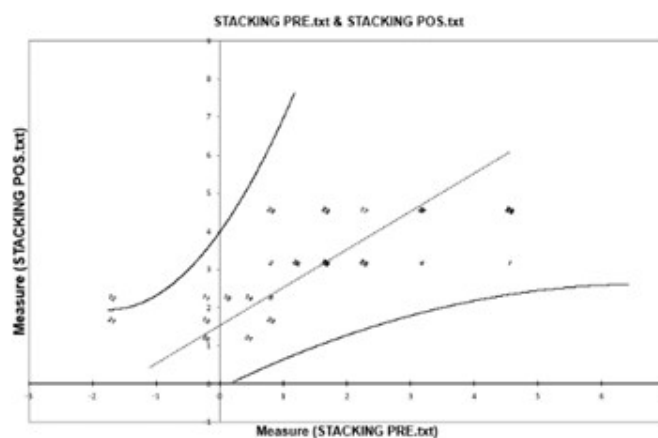
Person	32 Input		32 Measured			Infit		Outfit
	Total	Count	Measure	Realse	Imnsq	Zstd	Omnsq	
Mean	11.2	15.0	1.70	0.95	0.98	0.1	0.94	0.1
S.D.	3.2	0.0	1.70	0.44	0.32	0.8	0.48	0.8
Real Rmse	1.05	True Sd	1.35	Separation	0.00	Person Reliability		0.62
Item	15 Input		10 Measured			Infit		Outfit
	Total	Count	Measure	Realse	Imnsq	Zstd	Omnsq	
Mean	23.8	32.0	0.00	0.54	0.99	0.1	0.94	0.0
S.D	4.4	0.0	1.05	0.08	0.19	0.7	0.31	0.6
Real Rmse	0.55	True Sd	0.90	Separation	1.65	Item Reliability		0.73

**Table 2.** Changes in the understudy's deliberate worth from the aftereffects of the pretest posttest

Pretest Log Value	Posttest Log Value	Log Value Changes	Category
4.56	3.18	1.38	Good
0.81	3.18	2.37	Very Good
1.67	3.18	1.51	Good
3.18	3.18	0	Good
1.21	3.18	1.97	Very Good
1.67	3.18	1.51	Good
3.18	4.56	1.38	Good
0.81	2.27	1.46	Good
3.18	4.56	1.38	Good
2.27	3.18	0.91	Good
-0.21	2.27	2.48	Very Good
-1.69	2.27	3.96	Very Good
1.67	4.56	2.89	Very Good
0.46	2.27	1.81	Very Good
-0.21	1.67	1.88	Very Good
4.56	4.56	0	Good
2.27	4.56	2.29	Very Good
0.12	2.27	2.15	Very Good
1.67	3.18	1.51	Good
0.81	1.67	0.86	Good
-1.69	1.67	3.36	Very Good
1.67	4.56	2.89	Very Good
4.56	4.56	0	Good
1.21	3.18	1.97	Good
2.27	3.18	0.91	Good
1.67	3.18	1.51	Good
3.18	4.56	1.38	Good
0.81	4.56	3.75	Very Good
4.56	4.56	0	Good
-0.21	1.21	1.42	Good
0.46	1.21	0.75	Good
4.56	4.56	0	Good

Based on the data in Table 2, it can be seen that using the RADEC model for instruction helped all students understand concepts better. Students' levels of gaining conceptual mastery fluctuate equally between moderate and high. With 12 understudies, changes in higher-request figuring capacities can enormously expand the quantity of understudies (2, 5, 11, 12, 13, 14, 15, 17, 18, 21, 22, 28). Students who experience increased mastery of concepts by good category occurred in the number of 20 students (1, 3, 4, 6,

7, 8, 9, 10, 16, 19, 24, 25, 26, 27, 29, 30, 31, 32). Figure 3 shows more specifics. 0, 23.



**Figure 2.** Concept Mastery Improvement Graph

The RADEC learning paradigm has a positive effect on students' high-level thinking abilities because it teaches students to use their knowledge to solve real-world problems in the field and throughout the learning process. It also teaches students to be autonomous and cooperative so that direct learning is student-centered. The RADEC learning method benefits all students, though the benefits range from very good to good.

The utilization of the linguistic structure of the RADEC learning model as per the attributes of understudies and learning in Indonesia underlies the improvement in understudies' reasonable authority in the wake of taking part in getting the hang of utilizing the RADEC model. Perusing is the first syntactic, which trains understudies to concentrate freely so they are taught to peruse and foster reasonable information all alone. The additional perusing materials kids consume, the better their undeniable level reasoning skills become.

The punctuation as per the RADEC learning worldview, understudies total the principal learning stage by perusing, which can be perused different sources like course books or sources from the web. To coordinate understudies in perusing, Understudies are given logical based papers to prepare

understudies high-request thinking abilities, and afterward understudies answer autonomously. Identifying materials and their qualities, categorizing materials, examining changes in materials, and knowing how to separate materials are some of the questions that students are asked based on learning objectives and indicators. Prior to taking part in the growing experience, understudies should finish perusing and answering tasks. When this is done, the learning process may then concentrate on concepts that students do not comprehend, which is known as effective learning.2019; Hartati, Setiawan, and Sopandi.

Each understudy is ready to learn in class and is ready for the accompanying stage, which is the conversation and clarification of the stages. Students actively participate in the discussion phase in pre-established groups. In order to select the most appropriate response, students are required to exchange ideas and perspectives. Understudies partake in the gathering conversation stage, then, at that point, happen to the clarification step. which teaches students to better understand concepts in response to other group discussions' outcomes.



**Figure 3.** Making Dynamo Fan Works

Then the last stage is the stage of making, It teaches pupils how to use their understanding of scientific principles to solve issues or produce art (Ramadini et al., 2021). With the help of this exercise, kids learn how to generate original concepts, create a piece of art, or offer answers to difficulties that arise. For the RADEC model, understudies effectively and imaginatively gather or build answers for issues that arise independently utilizing the reasonable information that understudies have, as opposed to other learning models where understudies focus on understanding the subject or collecting answers for issues that have been given. These findings provided direction for the selection of instrument questions for the

pre- and post-tests. The results of the understudies' pre- and post-test data were analyzed, and a cluster analysis using the Rasch model was carried out.

All students benefit from the RADEC learning paradigm, but the degree to which they do so can be categorized as either very good, good, or moderate. The development in understudies' ability for more significant level idea following support in examples in view of the RADEC model is the main impetus behind the use of the RADEC learning model's sentence structure as per the qualities of understudies and learning in Indonesia. Reading is the first syntax that teaches students how to learn on their own by guiding them to read and understand concepts on their own. That is, the development of a student's higher-request thinking abilities is correlated with the student's increased exposure to various reading materials. Lestari et.al., (2022).

Everybody in the class is ready for the subsequent stage, which is to examine and make sense of the means, and approaches the assets they expect to learn. Understudies take an interest very effectively in enthusiastic little gathering conversations during the conversation stage. To foster an answer that is basically as complete as could be expected, understudies are urged to speak with each other and share their thoughts. (Handayani, et.al., 2019).

## Conclusion

Following participation in learning utilizing the RADEC learning model with very excellent categories of 37.5% and good categories of 62.5%, it can be inferred on the basis of the research and discussion that has been put out that students' conceptual competence grew. The pre-test and post-test logit values consider estimation of this addition. The estimation esteem or logit esteem shows the way that well understudies can answer them. Rasch handling is utilized to change over the understudies' crude scores into estimating or logit scores. This development occurred in groups of students with low or high beginning ability. In reality, it was also discovered that a large number of students with weak starting skills took part in learning activities in classes with kids whose performance increased in the very good category.

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## Author Contributions

Nurrika Febriyanti Kusnadi and Wati Sukmawati conceptualized the exploration thought, planned of philosophy, investigated information, the board, and coordination obligation. We likewise led an examination and examination process, writing survey, and gave basic

input on the original copy. All writers read and supported the last form of the original copy.

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### Conflicts of Interest

The authors declare that they have no competing interests. The study's design was influenced by the funders; in the process of data collection, analysis, or interpretation; in the composition of original copies; or in deciding whether or not to publish the results.

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