IJOELA: International Journal of Education and Learning Assessment
Vol. 01, No. 04, Year 2025, pp. 144-151

# Implementation of Teaching at the Right Level (TaRL) Approach to Improve Learning Outcomes in Thermochemistry at SMAN 7 Palu

**Moh. Rais Perdana Putra[1], Alfiyah Dwi Kasari[2], Kasmudin Mustapa[3], Nur Baeti[4]**
[1,2,3]Teacher Professional Program , Tadulako University, Indonesia
[4]SMA Negeri 7 Palu, Indonesia
E-mail: mohraisperdanaputrachemistry17@gmail.com

**Article Info**

***Article history:***

Received December 03, 2025
Revised December 15, 2025
Accepted December 25, 2025

***Keywords:***

Teaching At The Right Level, Learning Outcomes, Thermochemistry, Adaptive Learning

**ABSTRACT**

This study aims to improve the learning outcomes and conceptual understanding of grade XI-2 students at SMA Negeri 7 Palu in thermochemistry through the application of the Teaching at the Right Level (TaRL) approach. The type of research used was Classroom Action Research (CAR), which was carried out in two cycles, each cycle consisting of the planning, implementation, observation, and reflection stages. There were 25 students with heterogeneous initial abilities as research subjects. Data were obtained through learning achievement tests, activity observation sheets, student response questionnaires, and documentation, which were then analyzed descriptively, quantitatively, and qualitatively. The results showed an increase in learning outcomes from an average of 71.25 in cycle I to 83.90 in cycle II, with classical mastery increasing from 65% to 92% and an N-Gain value of 0.52 (medium-high category). Student activity and response also increased from medium to good. The application of the TaRL approach helped students learn according to their level of mastery, creating adaptive, collaborative, and meaningful learning.



***Corresponding Author:***

Moh. Rais Perdana Putra
Tadulako University
Email: mohraisperdanaputrachemistry17@gmail.com

## INTRODUCTION

Education is the main foundation in nation building because it plays a role in preparing human resources who are qualified, characterful, and able to face global challenges (Khairiyah & Dewinda, 2022). Through education, students are expected not only to master knowledge, but also to have critical, creative, and collaborative thinking skills in accordance with the demands of the 21st century (Arnyana, 2019). Therefore, improving the quality of learning in schools is a top priority in achieving national education goals.

However, the reality on the ground shows that the world of education in Indonesia is still facing various problems. One of the problems that is often encountered is the low achievement of student learning outcomes. Low learning outcomes are often not solely due to limited facilities and infrastructure, but also due to learning strategies that have not been able to accommodate the diversity of students' abilities (Sari & Suci, 2024). In practice, teachers often use a uniform approach for all students, even though the classroom conditions are very

heterogeneous. This results in some students finding learning too difficult, while others feel too easy and less challenged (Sari & Suci, 2024).

The diversity of the level of mastery of the material is also found at SMAN 7 Palu, especially in the Chemistry class XI subject. Based on the results of observations and daily test score data, it can be seen that there is a significant gap between students who are able to understand concepts quickly and students who still have difficulty mastering the basics of the material (Ijirana & Wahyuni, 2019). This is exacerbated by the characteristics of Chemistry subjects that require conceptual understanding, numeracy skills, and the ability to connect macroscopic, microscopic, and symbolic phenomena simultaneously (Sunyono, et al., 2013).

One of the most challenging materials for students is Thermochemistry. This material discusses energy in chemical reactions, the law of energy conservation, enthalpy changes, and calculations involving calorimeter data. These concepts are abstract so they are not easy to understand if they are only taught theoretically. The difficulty of students in understanding Thermochemistry has an impact on their low involvement in the learning process as well as low evaluation results. For example, there are still many students who make mistakes in interpreting positive and negative signs in enthalpy changes, or are less able to relate the phenomena of daily life to the concept of reaction heat

A number of previous studies have tried to overcome low student learning outcomes by applying various active learning models. For example, research by Fitriani (2020) shows that the application of *problem-based learning* can improve students' understanding of concepts in chemistry materials (Laulaleng, et al., 2025), while Martir (2024) found that *inquiry-based learning* can improve critical thinking skills (Martir, et al., 2024). However, the two studies have not fully touched the root of the problem of student learning ability heterogeneity in the classroom.

On the other hand, the Teaching at the Right Level (TaRL) approach introduced by the Pratham Education Foundation in India has been shown to be effective in addressing learning lag, particularly in basic literacy and numeracy (Setyawati & Indriani, 2025). Further research by Fathikhin, et al. (2024) shows that TaRL is able to improve learning outcomes through grouping students based on the level of material mastery, not based on age or grade level. The main principle of TaRL is to adapt the learning strategy to the level of students' learning readiness, so that each group gets a learning experience that suits their needs.

Several studies in Indonesia have begun to adapt the principle of TaRL in elementary and junior high school subjects, especially in the context of literacy and numeracy (Indartiningsih, et al., 2023). However, the results of the literature review show that the research gap is still clearly visible, namely: (1) the application of TaRL in Chemistry learning at the high school level has not been widely done, (2) abstract Thermochemistry material is rarely studied in relation to the TaRL approach, and (3) previous studies have emphasized more on literacy and basic numeracy, so that the contribution of the application of TaRL in exact subjects has not been adequately revealed.

Based on these conditions, this study has novelty in two aspects. First, this study examines the implementation of TaRL in Chemistry learning at the high school level, which is still rarely done. Second, this study specifically emphasizes Thermochemistry material, which requires conceptual as well as numerical skills, so that it can show the extent to which TaRL is able to overcome the heterogeneity of learning abilities in the context of complex material. Thus, the results of this study are not only useful practically for Chemistry teachers in improving student learning outcomes, but also make an academic contribution to the development of adaptive learning strategies in the exact field.

## RESEARCH METHODS

This study uses the Classroom Action Research (PTK) approach with the model of Kemmis and McTaggart (1988) which is carried out in two cycles. Each cycle includes four stages, namely planning, implementation of actions, observation, and reflection. This model was chosen because it provides an opportunity for teachers to make continuous improvements to learning practices through a systematic reflection process. The design of this study is also in accordance with the characteristics of the *Teaching at the Right Level* (TaRL) approach which emphasizes the adjustment of learning strategies to the actual abilities of students (Gan, et al., 2025).

This research was carried out at SMA Negeri 7 Palu in the even semester of the 2024/2025 academic year, with the subject of the study being 25 students in class XI-2. This class was chosen based on the results of initial observations that showed the heterogeneity of learning ability and low learning outcomes in Thermochemistry material. The research was conducted over eight weeks which included a preparatory stage, two action cycles, and evaluation of learning outcomes.

The focus of this research is the application of *the Teaching at the Right Level* (TaRL) approach in Chemistry learning, especially in Thermochemistry material. The variables studied included students' cognitive learning outcomes, learning activities during the learning process, and students' responses to the application of the TaRL approach (Sholihi, et al., 2025). This approach is adapted to tailor learning to the level of students' ability, so that each group obtains a learning experience that is in accordance with their level of mastery of thermochemical concepts.

The research stage consists of two cycles that are carried out repeatedly and reflectively. In the planning stage, the researcher prepared a learning tool based on *Teaching at the Right Level* in the form of a Learning Implementation Plan (RPP) in the form of learning modules, evaluation instruments, observation sheets, and student response questionnaires. In addition, a diagnostic test was also carried out to map the level of students' initial mastery of Thermochemistry material. Based on the results of this test, students are grouped into three levels of ability, namely basic, intermediate, and advanced. The stage of implementing actions is carried out by applying differentiated learning. The basic group students are focused on understanding the concept of energy and the law of conservation of energy, the intermediate group studies the changes of enthalpy, while the advanced group practices in calorimetry calculations and the application of concepts in the context of everyday life. This approach is designed so that students are able to relate abstract concepts of chemistry to concrete phenomena around them (Tomasoa & Mustapa, 2025).

Observation is carried out collaboratively by partner teachers who assess student activities and involvement during the learning process using observation sheets that have been prepared. After the action is completed, reflection is carried out on the results of observation and evaluation of student learning. The results of the reflection in the first cycle were used to refine the actions in the second cycle. Improvements were made, especially in the aspect of discussion time between levels and providing *peer tutoring opportunities* for students who are more proficient in order to help their groupmates. The second cycle is focused on the application of more complex material such as Hess's law and bonding energy, with more adaptive and contextual learning patterns.

The research instruments consisted of learning outcome tests, observation sheets of student and teacher activities, student response questionnaires, and field notes. Learning outcome tests are administered at the beginning and end of each cycle to see an improvement in students' cognitive achievement. Observation sheets were used to assess the activeness and implementation of learning activities, while questionnaires were used to find out students'

responses to the application of *the Teaching at the Right Level approach*. All instruments have been validated by subject matter experts and tested for reliability using the Cronbach Alpha formula for consistent and reliable measurement results (Bueno & Rodas, 2024).

The data collection technique is carried out through written tests, direct observations, filling out questionnaires by students, and documentation in the form of photos of activities, student scores, and the results of teacher reflections. Data were analyzed descriptively, quantitatively, and qualitatively. The analysis of learning outcomes was carried out by calculating the average increase in scores between cycles using the *N-Gain Score* formula to determine the effectiveness of the action. Activity observation data and student responses are calculated in the form of a percentage of implementation and a positive response rate. An action is considered successful if classical learning completeness reaches at least 85% of students above the Minimum Completeness Criteria (KKM), learning activities show good categories, and at least 75% of students respond positively to *Teaching at the Right* Level-based learning (Sholihi et al., 2025; Tomasoa & Mustapa, 2025).

Based on these designs and procedures, this study is expected to be able to make an empirical contribution to the application of the TaRL approach in the context of chemistry learning at the high school level, as well as become an effective adaptive learning model to improve learning outcomes in conceptual materials such as Thermochemistry.

## RESULTS AND DISCUSSION

This classroom action research was carried out in two cycles with the aim of improving the learning outcomes and activities of students in grades XI -2 of SMA Negeri 7 Palu on Thermochemistry material through the application of *the Teaching at the Right Level (TaRL) approach*. The research subjects amounted to 25 students with heterogeneous initial abilities. Each cycle consists of four stages, namely planning, implementation of actions, observation, and reflection.

### Cycle I

Cycle I is focused on the initial implementation *of Teaching at the Right Level* by dividing students into three groups of abilities based on the results of *the diagnostic test*: 10 elementary level students, 9 intermediate level students, and 6 advanced level students. Learning emphasizes understanding the concept of energy, the law of energy conservation, and enthalpy changes using a differentiation approach.

The results of the evaluation showed that **16 out of 25 students (65%)** had achieved the Minimum Completeness Criteria (KKM = 70). The average grade of the class in the first cycle was **71.25**, indicating an increase compared to the pre-cycle value of 59.10. The calculation *of N-Gain* of **0.35** is in the medium category.

**Table 1.** Student Learning Outcomes in Cycle I (n = 25)

| Indicators | Grade Point Average | Number of Students Completed | Classical Completeness % | N - Gain | Category |
|---|---|---|---|---|---|
| Pretest | 59,10 | 10 | 40 | - | - |
| Post test | 71,25 | 16 | 65 | 0,35 | Keep |

The results of the observation of student learning activities in the first cycle showed that the involvement was still relatively moderate with an average **of 68%.** The highest activity was found in the aspect of group cooperation (72%), while the lowest was in the

courage to ask questions (64%). This shows that students are still adapting to new learning models that demand active participation. These findings are in line with (Sholihi, et al., 2025) who report that students need time to adjust to TaRL-based adaptive learning before their activities increase significantly.

The reflection at the end of cycle I showed several obstacles, such as the difference in learning speed between levels, inefficient discussion time management, and limited interaction between groups. To improve this, the researcher added a *peer tutoring* strategy and expanded the discussion time in cycle II.

**Cycle II**

In cycle II, learning is focused on the application of Hess's law and bond energy, with strategy improvement through *peer tutoring* and rotation between skill levels. Each group was given a contextual task to relate the concept of Thermochemistry to everyday life phenomena, such as the analysis of fuel combustion energy.

The results of the evaluation showed a significant increase. A total **of 23 out of 25 students (92%)** achieved KKM, with an average score **of 83.90** and *an N-Gain* of **0.52** (medium to high category).

**Table 2.** Student Learning Outcomes in Cycle II (n = 25)

| Indicators | Grade Point Average | Number of Students Completed | Classical Completeness % | N - Gain | Category |
|---|---|---|---|---|---|
| Pretest | 70,20 | 15 | 60 | - | - |
| Post test | 83,90 | 23 | 92 | 0,52 | Medium-High |

The increase in scores of 12.65 points from cycles I to II shows that *the Teaching at the Right Level approach* is effective in improving learning outcomes and narrowing the ability gap between students. These results reinforce the research *of Tomasoa and Mustapa (2025)* which affirms that ability-based adaptive learning is able to improve students' cognitive achievement and collaboration.

**Student Learning Activities**

Student learning activities have also increased from cycle to cycle. Aspects observed included involvement in group discussions, participation in simple experiments, and the ability to ask and answer questions during learning. The results of the observation of activities are presented in Table 3.

**Table 3.** Student Learning Activities in Cycles I and II

| Observed Aspects | Cycle I (%) | Cycle II (%) | Category |
|---|---|---|---|
| Involvement in group discussions | 70 | 88 | Excellent |
| Activeness in answering questions | 64 | 82 | Good |
| Cooperation between students | 72 | 86 | Excellent |
| Average overall activity | 68 | 85 | Good–Very Good |

The average student activity increased from 68% in the first cycle to 85% in the second cycle. This increase shows that the TaRL approach is able to increase students' active involvement in the learning process. Students feel more motivated because learning activities are tailored to their abilities and provide opportunities to move to the next level after mastering certain material. This is in line with the findings of *Setyawati and Indriani (2025)* who stated that TaRL-based adaptive learning creates a learning experience that fosters students' confidence and active involvement.

**Student Response to Learning**

The results of the questionnaire showed that the majority of students responded positively to TaRL-based learning. The details of the questionnaire results are shown in Table 4.

**Table 4.** Student Response to the Application of the TaRL Approach

| Response Criteria | Percentage (%) | Category |
|---|---|---|
| Easy to understand learning | 90 | Very positive |
| Engaging and fun learning | 84 | Positive |
| Boosts confidence | 86 | Positive |
| Helps understand chemical concepts | 88 | Very positive |
| Overall average | 87 | Very positive |

As many as 87% of students responded positively to the application of the TaRL approach. Students feel that learning becomes easier to understand, engaging, and in accordance with their abilities. This approach not only helps them understand abstract concepts such as enthalpy and reaction energy, but also increases confidence in solving problems and discussing with peers. These findings are consistent with the results of *research by Fathikhin, et al., (2024)* who stated that the TaRL approach is able to create an inclusive learning environment and foster intrinsic learning motivation.

**Comparison Between Cycles**

A comparison of learning outcomes, activities, and student responses between cycles is presented in Table 5 below.

**Table 5.** Comparison of Learning Outcomes and Student Activities Between Cycles (n = 25)

| Observed Aspects | Cycle I | Cycle II | Increased |
|---|---|---|---|
| Average Learning Outcomes | 71,25 | 83,9 | 12,65 |
| Completed Students (people) | 16 | 23 | 7 |
| Classical completeness (%) | 65 | 92 | 27 |
| N-Gain | 0,35 | 0,52 | 0,17 |
| Learning Activities (%) | 68 | 85 | 17 |

| | | | |
|---|---|---|---|
| Positive Student Response (%) | 75 | 87 | 12 |

The table above shows consistent improvement across all aspects. The most significant improvement occurred in classical completeness (from 65% to 92%), indicating that most students have a good understanding of the Thermochemistry material after the implementation of *Teaching at the Right Level*. This proves that teaching strategies that focus on students' actual abilities are able to improve learning outcomes while building their confidence (Fathikhin, et al., 2024).

Overall, the application of *Teaching at the Right Level* in Thermochemistry learning has proven to be effective in improving learning outcomes, activities, and motivation of students in grades XI -2 of SMA Negeri 7 Palu. This adaptive learning provides space for students to learn according to their level of mastery, as well as allowing them to rise to a higher level after demonstrating sufficient understanding. This approach creates a collaborative learning atmosphere and is oriented towards individual progress, in accordance with the characteristics of the Independent Curriculum which emphasizes learning differentiation (Indartiningsih, et al., 2023).

## CONCLUSION

Based on the classroom action research that has been carried out, it can be concluded that the learning outcomes and conceptual understanding of students in grades XI-2 of SMA Negeri 7 Palu in Thermochemistry material have increased significantly. This increase is influenced by the application *of the Teaching at the Right Level (TaRL)* approach which groups students according to their ability level and provides an adaptive learning experience. Through differentiated learning activities, *peer tutoring*, and the presentation of materials that are adjusted to students' mastery levels, there is an increase in learning completeness, activities, and learning motivation.

## BIBLIOGRAPHY

Arnyana, I. B. P. (2019). Learning to improve the competencies of the 4cs (communication, collaboration, critical thinking and creative thinking) to welcome the 21st century era. *Proceedings: National Conference on Mathematics and Science of PGRI University of Banyuwangi*, *1*(1), i-xiii.

Bueno, P. M., & Rodas, R. S. (2024). Assessment Of Level Of Application Of Critical Thinking Skills In The Context Of A General Chemistry Course. In *Iceri2024 Proceedings* (pp. 5518-5523). Iated.

Fathikhin, N., Apriandi, D., & Purwaningtijas, P. (2024). Learning with the TARL approach to increase students' interest and learning outcomes in mathematics. In *National Seminar on Social, Science, Education, Humanities (Senassdra)* (Vol. 3, No. 1, pp. 586-591).

Gan, F. C., Jamali, A. H., Sabil, A., & Mansor, U. K. (2025). *SN2 5E Model 2.0: Improving Conceptual Understanding in Chemistry through Adaptive Teaching Strategies.* **UiTM Institutional Repository**

Ijirana, I., & Wahyuni, S. (2019). The Chemistry Competency Achievement of SMA Negeri 7 Palu Students Using Predict, Observe, and Explain (POE) Learning Model. *Indonesian Journal on Learning and Advanced Education (IJOLAE)*, 9-14.

Indartiningsih, D., Mariana, N., & Subrata, H. (2023). Perspektıf glokal in implementası teachıng at the rıght level (tarl) on learning berdıfrensıası on the independent curriculum. *Journal of Elementary Education*, *6*(4), 1984-1994.

Khairiyah, U., & Dewinda, H. R. (2022). The role of character education in preparing quality human resources. *Psyche 165 Journal*, 119-124.

Laulaleng, S. O., Tukan, M. B., & Boelan, E. G. (2025). Design of Problem Based Learning (PBL) Based Worksheets to Improve Understanding of Chemical Concepts: Cases of Collective Properties of Solutions. *Indonesian Journal of Education: Theory, Research, and Innovation*, *5*(5).

Martyr, L., Love, Y. V., & Frozen, V. Y. (2024). The application of the discovery learning model in improving the critical thinking skills of elementary school students in science learning. *Journal of Mathematics and Natural Sciences Education*, *14*(3), 757-766.

Sari, Y. M., & Suci, D. K. (2024). Differentiated Learning Solutions in Learning in Diversity of Student Learning. In *Proceedings of the National Seminar on Research, Science, and Technology (Senarasi).*

Setyawati, M., & Indriani, N. (2025). TaRL (Teaching at the Right Level) Approach in Developing Literacy Programs in the Reading Community. *Journal of Research Innovation and Community Service*, *5*(1), 77-93.

Sholihi, M. M., Rahmawati, S., & Albar, Z. (2025). Improving student learning outcomes in chemistry lessons through the tarl approach with the discovery learning model. *Edu Research*, *6*(3), 190-197.

Sunyono, S., Leny, Y., & Muslimin, I. (2013). The effectiveness of multiple representation-based learning models in building students' mental models of reaction stoichiometry topics. *Journal of Progressive Education*, *3*(1), 65-79.

Tomasoa, Y. L. C., & Mustapa, K. (2025). Application of TaRL and CRT Approaches to Improve Conceptual Understanding of Basic Laws of Chemistry. *JOURNAL OF THE AMERICAN PRESS*, *5*(1), 47-53.