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Efforts to Enhance Learning Activity and Conceptual Understanding among Grade XI Students at SMA IT Al Fityah Using the ICARE Model on the Topic of Salt Hydrolysis

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Abstract

Salt hydrolysis instruction presents persistent challenges in promoting active participation and conceptual understanding among chemistry students. This study aimed to improve the learning activity and conceptual understanding of 26 Grade XI science students at SMA IT Al Fityah Pekanbaru through the ICARE learning model. A collaborative classroom action research design was implemented across two cycles, each comprising two meetings and the stages of planning, action, observation, and reflection. Data were collected through observation sheets assessing teacher and student activities, documentation, evaluations conducted after each meeting, and conceptual understanding tests administered at the end of each cycle. The data were analyzed descriptively using activity percentages, individual scores, class mastery rates, and achievement across seven indicators of conceptual understanding. The numbers of students who did not meet the mastery criterion and the lowest scores in each cycle were also examined to assess the distribution of learning outcomes. Instructional improvements emphasized participation, group discussion, reflection, and independent application of concepts. Student learning activity increased from

64.47% in Cycle I to 76.68% in Cycle II, representing an increase of 12.21 percentage points. The mean conceptual understanding score rose from 76.35 to 88.08, while the mean class score increased from 76.34 to 88.27. Class mastery improved from 69.22% to 88.46%. By Cycle II, all seven conceptual understanding indicators had reached at least 84.62%, with the ability to restate concepts reaching 100%. These findings demonstrate that ICARE can improve students' engagement and conceptual understanding of salt hydrolysis. The model therefore offers a viable student-centered approach to chemistry instruction, provided that teachers ensure effective time management, reinforce prerequisite concepts, and distribute participation equitably.

Keywords: Chemistry Education; Conceptual Understanding; ICARE Learning Model; Learning Activity; Salt Hydrolysis

INTRODUCTION

Chemistry education plays a vital role in equipping students with scientific literacy, encompassing the ability to understand concepts, apply knowledge to daily life, think critically, and make science-based decisions (Purnawati & Yakin, 2025). However, chemistry is still perceived as a difficult and abstract subject. While many students can solve problems procedurally, they often struggle to explain the underlying concepts or apply them in different contexts (Yatri et al., 2025).

These difficulties are particularly evident in abstract and interconnected topics such as chemical equilibrium, acids and bases, and salt hydrolysis. Chemical equilibrium requires an understanding of dynamic equilibrium, factors influencing equilibrium shifts, and constant calculations areas prone to fostering misconceptions (Basyiroh et al., 2022). Regarding acids and bases, difficulties stem from both internal and external factors that impact conceptual understanding and the ability to calculate pH (Anelka & Fitri, 2025). Salt hydrolysis also frequently gives rise to misconceptions, as it integrates concepts from both acid-base chemistry and chemical equilibrium (Amin et al., 2023).

A similar issue was identified in the Grade XI MIPA class at SMA IT Al Fityah Pekanbaru. Observations and interviews revealed that some students were not actively paying attention during lessons and showed limited engagement in multi-directional communication. Conceptual understanding was also low, as evidenced by the results of a daily test on chemical equilibrium: only 11 out of 26 students (42.30%) met the minimum mastery criterion (KKTP) of 80, while 15 students (57.70%) failed to meet the standard, achieving an average score of 62. These conditions highlight the need for instructional improvements that foster not only physical activity but also cognitive engagement.

Various innovative learning models such as Discovery Learning, Problem-Based Learning, Project-Based Learning, and guided inquiry had previously been implemented. Although these models theoretically encourage active participation and knowledge construction, student engagement in the studied classroom remained uneven, and understanding tended to be merely procedural. A lack of mastery over basic concepts can hinder advanced chemistry learning (Seliwati, 2017), whereas conceptual understanding serves as a foundation for students to solve learning-related problems (Subagiyo, 2019).

To address these issues, the ICARE model was selected because it offers a systematic sequence of stages: Introduction, Connection, Application, Reflection, and Extension (Mahdian et al., 2019). This model provides opportunities for students to activate prior knowledge, connect concepts, apply knowledge through activities and discussions, reflect, and expand their understanding (Purba et al., 2024). Theoretically, the ICARE structure aligns with constructivist learning, which positions the student as an active participant. Previous research has demonstrated the effectiveness of ICARE in enhancing conceptual understanding, chemistry learning outcomes, science process skills, and learning engagement (Adnyani et al., 2023).

Prior studies have also yielded positive results across various chemistry contexts. (Nisa et al., 2024) reported that a problem-solving-based ICARE approach improved knowledge-based learning outcomes from 68.09 to 84.54. Elazasmira et al., (2025) obtained an n-gain of 0.92 for the topic of buffer solutions, whereas Syafira, Susilawati, & Haryati (2025) reported an improvement in conceptual understanding regarding atomic structure and the periodic table of elements, with an n-gain of 0.76. Nevertheless, there remains a need for classroom-based evidence regarding the topic of salt hydrolysis that specifically observes changes in both learning activity and conceptual understanding within a cyclical improvement process.

The novelty of this study lies in the application of the ICARE model as an intervention to improve instruction on salt hydrolysis through two cycles of Classroom Action Research (CAR), involving the observation of student and teacher activities, learning mastery, and seven indicators of conceptual understanding. Grounded in constructivist theory and prior research findings, this study addresses whether the ICARE model can improve learning activities and enhance the conceptual understanding of Grade XI MIPA students at SMA IT Al Fityah Pekanbaru regarding the topic of salt hydrolysis. The objective is to describe the improvements in learning activities and the gains in conceptual understanding following the ICARE intervention.

METHODS

The study employed a collaborative Classroom Action Research (CAR) design involving the researcher and the chemistry teacher. The teacher acted as an observer/collaborator, while the researcher implemented the instructional interventions. The CAR process was conducted cyclically through stages of planning, action implementation, observation, and reflection, with the reflection results serving as the basis for improvements in the subsequent cycle (Prihantoro & Hidayat, 2019).

The research was conducted at SMA IT Al Fityah Pekanbaru (located on Jalan Swakarya Ujung, Tuah Madani District) with a Grade XI MIPA class during the even semester of the 2025/2026 academic year. Data collection took place from April 23 to May 19, 2026, spanning a total of approximately 27 calendar days. The intervention consisted of two cycles each comprising two sessions culminating in a Cycle II final test on May 19, 2026. Each session incorporated the five stages of the ICARE model: Introduction, Connection, Application, Reflection, and Extension.

The research participants comprised the entire Grade XI MIPA class, totaling 26 students. Data sources also included the researcher (as the implementer of the intervention) and the chemistry teacher (as the observer/collaborator). Although the source text does not specify a formal sampling technique, the study utilized all students within the designated research class. In each cycle, students worked in six groups, consisting of three male groups and three female groups.

Instructional instruments included the Learning Objective Flow, In-depth Lesson Plan (RPM), Student Worksheet (LKM), and teaching material textbooks. Data collection instruments included student activity observation sheets, teacher activity observation sheets, evaluation questions for each session, and cycle-end test questions. Observations were used to gather data on activities, while written tests measured conceptual understanding based on established indicators. Each cycle-end test consisted of 20 objective questions.

The procedural steps for each cycle comprised planning, implementation, observation, and reflection. During the implementation phase, the Introduction stage was used for activating prior knowledge and building motivation; Connection linked existing knowledge to new concepts; Application involved discussions, exercises, or practical work; Reflection focused on summarizing and evaluating the learning process; and Extension aimed to broaden the application of concepts. In Cycle II, improvements focused on more targeted activation of prior knowledge, posing random questions to less active students, providing more intensive group guidance, offering additional exercises, acknowledging student activities, and managing time more effectively.

Observational data analysis was conducted by calculating activity percentages comparing obtained scores against maximum scores and multiplying the result by 100%. Activity categories were defined as follows: 81–100% (excellent), 61–80.9% (good), 41–60.9% (fair), 21–40.9% (poor), and 0–20.9% (very poor). Individual conceptual understanding was calculated by comparing obtained scores to maximum scores, while class mastery was determined by the ratio of students achieving mastery to the total number of students. Success criteria were set at a minimum score of 80 (KKTP), a class mastery rate of at least 75%, and a minimum student activity level of 61% for each cycle.

RESULTS

The research began with a pre-cycle phase to identify the issues. Prior to the intervention, 15 out of 26 students (57.70%) had not yet met the minimum mastery criterion (KKTP) of 80. Following the implementation of the ICARE model, student learning activities, teacher activities, and conceptual understanding improved from Cycle I to Cycle II. A summary of the key findings is presented in Table 1.

Table 1. Summary of Key Research Findings

Indicator	Cycle I	Cycle II	Increase	Category/Status
Student learning activity	64.47%	76.68%	+12.21 points	Good
Average conceptual understanding	76.35	88.08	+11.73	Improved
Average class score	76.34	88.27	+11.93	Exceeded KKTP
Class mastery	69.22%	88.46%	+19.24 points	75% target achieved
Teacher activity	84.72%	95.83%	+11.11 points	Excellent

Source: Processed Data (2026)

Based on Table 1 Summary of Key Research Results, the implementation of the ICARE learning model demonstrated improvements across all research indicators from

Cycle I to Cycle II. Student learning activity increased from 64.47% in Cycle I to 76.68% in Cycle II, representing a rise of 12.21 percentage points. This increase indicates that student engagement in the learning process improved following the action refinements made in Cycle II. Regarding conceptual understanding, the average indicator score rose from 76.35 in Cycle I to 88.08 in Cycle II, an increase of 11.73 points. This improvement demonstrates that students became increasingly capable of understanding and applying the concept of salt hydrolysis through the stages of the ICARE model. This aligns with research findings showing that, by Cycle II, all indicators of conceptual understanding had met the established criteria.

Furthermore, the class average score increased from 76.34 in Cycle I to 88.27 in Cycle II, a rise of 11.93 points. In Cycle I, the class average remained below the Minimum Learning Mastery Criterion (KKTP) of 80, whereas in Cycle II, the average exceeded this benchmark. Improvements were also observed in classical mastery. The mastery percentage rose from 69.22% in Cycle I to 88.46% in Cycle II, an increase of 19.24 percentage points. While eight students had not achieved mastery in Cycle I, only three remained below the mastery level in Cycle II. Consequently, the classical mastery rate in Cycle II surpassed the research success indicator of 75%.

Meanwhile, teacher activity also increased from 84.72% in Cycle I to 95.83% in Cycle II, representing a rise of 11.11 points. This achievement indicates that the implementation of instruction using the ICARE model improved. In Cycle II, teacher activity fell into the "very good" category, demonstrating an increased ability to execute each stage of the ICARE model systematically. Overall, Table 1 Summary of Key Research Results shows that the instructional improvements in Cycle II had a positive impact on student learning activity, conceptual understanding, class average scores, class mastery rates, and teacher activity. Improvements across all these indicators demonstrate that the application of the ICARE model supports a more active learning process while enhancing students' mastery of concepts regarding salt hydrolysis.

Table 2. Conceptual Understanding Across Seven Indicators

Indicator	Cycle I (%)	Cycle II (%)	Change
Restating a concept	76.92	100.00	+23.08
Classifying objects according to a concept	75.64	84.62	+8.98
Providing examples and non-examples	78.85	97.44	+18.59
Presenting a concept in various representations	73.07	84.62	+11.55
Developing necessary/sufficient conditions	78.85	96.00	+17.15

Indicator	Cycle I (%)	Cycle II (%)	Change
Selecting specific procedures/operations	76.92	88.46	+11.54
Applying concepts/algorithms	78.85	98.08	+19.23

Source: Processed data (2026)

Based on Table 2 Conceptual Understanding across Seven Indicators, all indicators of conceptual understanding showed improvement from Cycle I to Cycle II. The largest increase occurred in the indicator for restating a concept, rising by 23.08 points from 76.92% to 100.00%. This was followed by the indicator for applying concepts/algorithms, which increased by 19.23 points, and the indicator for providing examples and non-examples, which increased by 18.59 points. Meanwhile, the smallest increase was observed in the indicator for classifying objects according to concepts, rising by 8.98 points. Overall, the improvements across these seven indicators demonstrate that the implementation of the ICARE model successfully enhanced students' conceptual understanding of the topic of salt hydrolysis. These results also indicate that, by Cycle II, students had become increasingly capable of understanding, explaining, classifying, representing, and applying the concepts they had learned.

Table 3. Classical Mastery At Each Meeting

Meeting	Completed	Not completed	Class mastery
1	14	12	53.8%
2	23	3	88.5%
3	25	1	96.2%
4	26	0	100%

Source: Processed data, 2026

Based on Table 3, "Class Mastery at Each Meeting," a consistent increase in student learning mastery is evident from the first to the fourth meeting. At the first meeting, 14 students (53.8%) achieved mastery, while 12 did not. By the second meeting, the number of students achieving mastery rose to 23 (88.5%), leaving only 3 students who had not yet achieved it. Subsequently, at the third meeting, 25 students (96.2%) achieved mastery, with only 1 student failing to do so. By the fourth meeting, all 26 students (100%) had achieved mastery. Thus, Table 3 demonstrates a 46.2 percentage-point increase in class mastery from the first to the fourth meeting, indicating excellent progress in student learning outcomes during the implementation of the ICARE model.

Figure 1. Progression of Class Mastery Across Four Sessions

Based on Figure 1 Progression of Class Mastery Across Four Sessions, it is evident that student class mastery consistently improved from the first session to the fourth. Mastery levels rose from 53.8% in Session 1 to 88.5% in Session 2, then to 96.2% in Session 3, finally reaching 100% in Session 4. This increase indicates that a growing number of students achieved mastery as the learning process unfolded. Overall, there was an increase of 46.2 percentage points from Session 1 to Session 4. These results demonstrate positive progress in learning mastery during the implementation of the ICARE model.

DISCUSSION

The increase in learning activity from 64.47% to 76.68% indicates that the modified actions in Cycle II successfully improved student engagement. During Cycle I, students were still adapting to the ICARE framework; discussions were uneven, and some students tended to rely on peers who had a better grasp of the material. This reflection led to subsequent adjustments, including more focused initial engagement (apperception), random questioning directed at less active students, more intensive group guidance, and structured time management. This approach aligns with the nature of Classroom Action Research (CAR), which utilizes reflection to determine necessary improvements for subsequent actions (Nurhayati et al., 2024).

Conceptually, this increase in activity can be understood through the function of each ICARE phase (Sefriani, et al. 2024). The Connection phase helps students link prior knowledge with new concepts, while Application provides opportunities to apply these concepts through discussions and practical activities (Mahdian et al., 2019). Reflection assists students in evaluating their learning outcomes, whereas Extension encourages the transfer of concepts to broader contexts (Nikmah et al., 2024). Field findings demonstrate that in Cycle II, students were more active in asking questions, participating in discussions, expressing opinions, and completing tasks independently.

The improvement in conceptual understanding also strengthens the link between learning engagement and cognitive outcomes. The average score for conceptual understanding indicators rose by 11.73 points, while the class mastery rate increased by 19.24 percentage points. The most notable improvements were observed in the abilities to restate concepts, provide examples and non-examples, define conceptual criteria, and apply concepts or algorithms. These results align with findings by Jannah et al., (2020), who observed high N-gain scores in the topic of buffer solutions, and Kamilatunnisa et al., (2025), who reported high N-gain scores regarding atomic structure and the periodic table. The findings are also consistent with those of Qosim et al., (2026) regarding the enhancement of conceptual understanding through the ICARE model supported by PhET simulations.

The study's results also align with research positioning ICARE as a model for improving learning outcomes and process skills. Hanifah et al., (2023) reported ICARE's effectiveness in teaching acid-base chemistry and Rihandoko et al., (2024) showed gains in learning outcomes and problem-solving abilities through ICARE-based instruction. Thus, the results regarding salt hydrolysis extend the consistency of these findings to a topic that integrates acid-base and equilibrium concepts.

The findings have practical implications for chemistry instruction. ICARE can be used to design lessons that go beyond mere conceptual explanation, creating space for students to connect prior knowledge, apply concepts, reflect on difficulties, and deepen their understanding. However, results from Cycle I indicate that the Application and Extension stages require more intensive guidance, and time management must be carefully planned to ensure the Reflection and Extension stages are not curtailed. Therefore, the implementation of ICARE should be accompanied by the reinforcement of prerequisite concepts, clear role allocation within groups, the use of guiding questions, and exercises involving conceptual representations.

Limitations of the study must be considered when interpreting the results. The research employed a single class of 26 students and a two-cycle Classroom Action Research (CAR) design; consequently, the findings primarily reflect improvements within the specific classroom context studied and were not intended to compare the ICARE approach against a control group. Furthermore, success was measured over a relatively short implementation period using observations and tests directly linked to the intervention. These limitations highlight the need for further research involving a comparison group, a larger sample size, and the monitoring of conceptual retention.

CONCLUSION

Implementing the ICARE learning model for the topic of salt hydrolysis improved learning activities and enhanced conceptual understanding among Grade XI MIPA students at SMA IT Al Fityah Pekanbaru. Learning activity levels rose from 64.47% in Cycle I to 76.68% in Cycle II. The average conceptual understanding score increased from 76.35 to 88.08, while the class mastery rate improved from 69.22% to 88.46%. By Cycle II, all indicators of conceptual understanding had surpassed the established criteria. Improvements were also observed in the implementation of teacher activities, which rose from 84.72% to 95.83%.

The study contributes to the body of knowledge by providing empirical evidence based on Classroom Action Research (CAR) that the ICARE syntax can serve as a constructivist learning framework for integrating learning activities with the development of conceptual understanding in complex chemistry topics. From a practical standpoint, the findings indicate that improved outcomes depend not only on the model itself but also on the quality of reflection and the refinement of actions between cycles. Future research is encouraged to evaluate the ICARE model using experimental or quasi-experimental designs that incorporate control groups, larger participant samples, and extended follow-up periods. Subsequent studies could also focus interventions on students who have not yet achieved mastery and on indicators of conceptual representation that show lower performance, thereby fostering more equitable improvements in understanding.

REFERENCES

Adnyani, D. A. A. R. S., Rumondor, D. A. S., & Anom, I. D. K. (2023). Efektivitas Implementasi Model Pembelajaran ICARE terhadap Hasil Belajar Kimia Siswa pada Materi Asam Basa di SMA Budi Luhur Kembang Mertha. *Oxygenius: Journal of Chemistry Education, 5*(2), 120–126. https://doi.org/10.37033/ojce.v5i2.596

Amin, M. A. H., Asworo, Y. D., & Rahmawati, Y. (2023). Analisis Miskonsepsi pada Materi Kesetimbangan dalam Asam Basa dan Hidrolisis Garam. *Jurnal Riset Pendidikan Kimia (JRPK), 13*(2), 118–126. https://doi.org/10.21009/JRPK.132.05

Anelka, V. P., & Fitri, B. Y. (2025). Deskripsi Kesulitan Belajar Kimia pada Materi Asam Basa dalam Pembelajaran Interaktif. *SECONDARY: Jurnal Inovasi Pendidikan Menengah, 5*(3), 328–338. https://doi.org/10.51878/secondary.v5i3.6225

Basyiroh, U., Mulyani, B., & Ariani, S. R. D. (2022). Analisis Kesulitan Belajar pada Materi Kesetimbangan Kimia dengan Tes Diagnostik Three-Tier Multiple Choice pada Siswa Kelas XI SMA Negeri 1 Surakarta Tahun Pelajaran 2020/2021. *Jurnal Pendidikan Kimia, 11*(1), 51–59. https://doi.org/10.20961/jpkim.v11i1.49899

Eka Yatri, A., Suradi, & Danial. (2025). Kajian Literatur: Faktor Penyebab Kesulitan dalam Pemahaman Konsep Matematis pada Siswa. *Lattice Journal: Journal of Mathematics Education and Applied, 5*(2), 146–159. https://doi.org/10.30983/lattice.v5i2.10469

Elazasmira, E., Herdini, H., & Susilawati, S. (2025). Meningkatkan Pemahaman Konsep Larutan Penyangga dengan Model Pembelajaran ICARE. *Jurnal Pendidikan Matematika dan Sains, 13*(Special issue), 81–91. https://doi.org/10.21831/jpms.v13iSpecial_issue.88509

Hanifah, N., Putri, N. A. S. M., & Cipta, E. S. (2023). Efektivitas Model ICARE terhadap Kemampuan Pemahaman Peserta Didik pada Pembelajaran Matematika Kelas 5 tentang Konsep Bangun Ruang. *JIIP: Jurnal Ilmiah Ilmu Pendidikan, 6*(12), 10090–10095. https://doi.org/10.54371/jiip.v6i12.3325

Jannah, R., Mahsul, A., & Mubarak, S. (2020). Pengaruh Penerapan Model Pembelajaran Problem Based Learning terhadap Peningkatan Keterampilan Berpikir Kritis dan Pemahaman Konsep Siswa. *SPIN Jurnal Kimia dan Pendidikan Kimia, 2*(2), 116–131. https://doi.org/10.20414/spin.v2i2.2697

Kamilatunnisa, L., Andayani, Y., & Hakim, A. (2025). Penerapan Modul Ajar Kimia Berbasis Etnosains pada Materi Struktur Atom dan Sistem Periodik Unsur untuk Meningkatkan Kemandirian Belajar Peserta Didik. *Chemistry Education Practice, 8*(2), 461–465. https://doi.org/10.29303/cep.v8i2.9564

Mahdian, M., Almubarak, A., & Hikmah, N. (2019). Implementasi Model Pembelajaran ICARE (Introduction–Connect–Apply–Reflect–Extend) terhadap Keterampilan Proses Sains pada Materi Larutan Elektrolit dan Nonelektrolit. *Jurnal Penelitian Pendidikan IPA, 5*(1), 92–97. https://doi.org/10.29303/jppipa.v5i1.184

Nikmah, F. K., Singgih, S., & Muhlisin, A. (2025). The effectiveness of the Introduction, Connection, Application, Reflection, Extension (ICARE) learning model in improving higher order thinking skills (HOTS) of junior high school students. *Paedagogia: Jurnal Pendidikan, 14*(2), 223–240. https://doi.org/10.24239/pdg.Vol14.Iss2.982

Nisa, S. I., Syahmani, S., & Hamid, A. (2024). Meningkatkan Kemampuan Pemecahan Masalah dan Hasil Belajar Peserta Didik dengan Model Pembelajaran Problem Solving Berbasis ICARE pada Materi Larutan Elektrolit dan Nonelektrolit. *JCAE*

(Journal of Chemistry and Education), 7(3), 149–160. https://doi.org/10.20527/jcae.v7i3.2582

Nurhayati, S. S., Savitri, R. A., & Ucup. (2024). Penelitian Tindakan Kelas (Classroom Action Research) PAUD, Apa dan Bagaimana? *EduSpirit: Jurnal Pendidikan Kolaboratif, 1*(1), 22–27. https://doi.org/10.57255/eduspirit.v1i1.17

Prihantoro, A., & Hidayat, F. (2019). Melakukan Penelitian Tindakan Kelas. *Ulumuddin: Jurnal Ilmu-Ilmu Keislaman, 9*(1), 49–60. https://doi.org/10.47200/ulumuddin.v9i1.283

Purba, C. G., Islami, N., & Ernidawati. (2024). Penerapan Model Pembelajaran ICARE Berbantuan PhET Simulation untuk Meningkatkan Pemahaman Konsep Siswa Kelas VIII SMP Taruna Pekanbaru. *Silampari Jurnal Pendidikan Ilmu Fisika, 6*(2), 209–222. https://doi.org/10.31540/sjpif.v6i2.2848

Purnawati, A., & Yakin, N. (2025). Implementasi Kemampuan Literasi Sains dalam Pembelajaran IPA Terintegrasi di Sekolah Dasar. *Action Research Journal (ARJ), 2*(2), 107–120. https://doi.org/10.63987/arj.v2i2.204

Qosim, A., Mahmud, & Rusmanto. (2026). Implementasi Model ICARE dalam Meningkatkan Pemahaman Konsep Matematika di MI Ziyadatul Iman. *QOSIM: Jurnal Pendidikan, Sosial & Humaniora, 4*(4), 4128–4137. https://doi.org/10.61104/jq.v4i4.9802

Rihandoko, Andrini, V. S., & Patmaningrum, A. (2024). Penerapan Model Pembelajaran ICARE (Introduction, Connect, Apply, Reflect, Extend) Berbantu Aplikasi Desmos terhadap Kemampuan Pemahaman Konsep Matematis Siswa pada Materi Fungsi Kuadrat Kelas X SMK NU Pace. *Dharma Pendidikan, 19*(1), 28–36. https://doi.org/10.69866/dp.v20i1.507

Sefriani, R., Jalinus, N., Abdullah, R., & Ridwan, R. (2024). Penerapan Model Pembelajaran Introduction, Connect, Apply, Reflection and Extend (ICARE) dalam Pembelajaran Teknologi Informasi dan Komunikasi. *At-Tajdid: Jurnal Pendidikan dan Pemikiran Islam, 8*(1), 255–260. https://doi.org/10.24127/att.v8i1.3343

Seliwati, S. (2017). Kesulitan Memahami Konseptual dan Prosedural Kesetimbangan Kimia pada Siswa SMA di Kota Palangka Raya. *Jurnal Ilmiah Kanderang Tingang, 8*(2), 130–139. https://doi.org/10.37304/jikt.v8i2.65

Subagiyo, S. (2019). Penerapan Model Blended Learning untuk Meningkatkan Pemahaman Konsep Termokimia Siswa. *Journal of Educational Chemistry (JEC), 1*(1), 1–8. https://doi.org/10.21580/jec.2019.1.1.3830

Syafira, N. F., Susilawati, S., & Haryati, S. (2025). Penerapan Model Pembelajaran ICARE untuk Meningkatkan Pemahaman Konsep Peserta Didik pada Materi Struktur Atom dan SPU. *Jurnal Riset dan Praktik Pendidikan Kimia, 13*(2), 188–197. https://doi.org/10.17509/jrppk.v13i2.90931