



Enhancing Students' Oral and Written Communication Skills through Discovery Learning Model: A Study on Reduction-Oxidation Reactions

Qurratun Mardhatillah*, Jimmi Copriady, Dedi Futra

Chemistry Education Study Program, FKIP, Universitas Riau, Jl. Kampus Bina Widya Km 12,5 Simpang Baru Pekanbaru 2829

* Corresponding Author e-mail: qurratunmardha1999@gmail.com

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Abstract

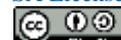
The lack of communication skills in the learning of chemistry can negatively impact students' understanding of reduction-oxidation (redox) reactions. This study aimed to investigate the effect of the implementation of the discovery learning model on students' communication skills related to redox reactions. A quasi-experimental research design with a Non-Equivalent Control Group Design was employed. The research participants were students of class X MIPA 1 (experimental class) and class X MIPA 2 (control class) from SMA Negeri 1 Teluk Kuantan. The instrument used was a communication skills test sheet comprising five descriptive questions. The results indicated that 1) the implementation of the discovery learning model was rated as very good for each stage; 2) the writing communication skills of the experimental class were superior to those of the control class. In conclusion, the discovery learning model is an effective approach in enhancing students' communication skills on the subject of redox reactions in class X MIPA at SMA Negeri 1 Teluk Kuantan.

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INTRODUCTION

In the 21st century, students require the development of key supporting skills such as communication, critical thinking, creativity, and collaboration, collectively referred to as the "4C" skills (Van Laar et al., 2020). Communication is a vital aspect of human life, serving as a process for exchanging ideas, messages, and social interaction (Melawati et al., 2014). Communication skills can be demonstrated through the presentation of observations or knowledge, both orally and in writing (Melawati et al., 2014).

Communication can be further divided into oral and written forms. Oral communication encompasses the ability to argue, ask questions, respond appropriately, and clearly convey ideas (Arends, 2012). Meanwhile, written communication involves the ability to present ideas through written findings, utilizing graphs, tables, or symbols to convey information, selecting relevant information, and effectively presenting the findings (Harlen, 2006). Communication and the learning process are intertwined, with the ability to communicate facilitating students in expressing their ideas and exchanging information with teachers and peers (Marfuah, 2017).

Observations conducted at SMA Negeri 1 Teluk Kuantan indicate a lack of student interaction and verbal communication during chemistry lessons. Additionally, students demonstrate insufficient writing communication skills in the form of presenting findings and

participate minimally in discussions. The study of chemical phenomena requires the ability to explain and convey information at macroscopic, symbolic, and sub-microscopic levels. This can result in students encountering misconceptions, particularly in abstract and sub-microscopic materials such as reduction-oxidation (redox) reactions (Andrianie et al., 2018). These misconceptions can stem from both internal factors, such as student abilities and motivation, and external factors, such as the teaching method used (Yuniarti et al., 2020).

To address these issues, a learning model that encourages oral and written communication is necessary. Findings from Rahayu and Hardini (2019) suggest that student engagement in the learning process can be stimulated through the discovery learning model. This model fosters active student involvement through stimulation, problem statements, data collection, data processing, verification, and generalization (Santika et al., 2016). The discovery learning model encourages students to work on activities such as observation, investigation, experimentation, and the sharing of information and concepts learned (Qadariyah and Hendriana, 2015).

The objective of this study is to improve the communication skills of students in the study of redox reactions in class X MIPA at SMA Negeri 1 Teluk Kuantan by implementing the discovery learning model.

METHOD

This study was conducted as a quasi-experiment with a Non-Equivalent Control Group Design, consisting of control and experimental groups. The design is outlined in Table 1. The study was carried out at SMA Negeri 1 Teluk Kuantan in Kuantan Singingi Regency from November to April 2022. A total of 34 students were selected as participants in each group (experimental and control). The research instruments consisted of pre- and post-test questions on the topic of reduction-oxidation reactions. Data analysis was performed using SPSS statistical software version 20.

Table 1. Research design (Sugiyono, 2019)

Group	Pretest	Treatment	Posttest
Experiment	O ₁	X	O ₃
Control	O ₂	-	O ₄

Description: (O1) Pretest in experimental class, (O2) Pretest in control class, (O3) Posttest in experimental class, (O4) Posttest in control class, (X) Treatment of experimental class with the application of discovery learning model.

RESULTS AND DISCUSSION

Implementation of Learning

The results of the learning implementation are presented in the form of observation and worksheet results from students. The data collected shows the results of the implementation of the discovery learning model in teaching reduction-oxidation reaction materials. The results are displayed in Table 2.

Table 2 demonstrates the results of the discovery learning model on reduction-oxidation reaction materials, which are categorized as excellent in each phase. The results indicate a very significant increase in performance from the first to the third meeting. The stimulation and problem statement phases showed a 100% improvement in the second and third meetings. Meanwhile, the data collection phase achieved 100% improvement in the third

meeting. Although the data processing, verification, and generalization phases did not reach 100%, they were still in the very good category.

The results suggest that the discovery learning model can enhance the students' understanding of the material and increase their motivation to learn. As reported by Khodijah (2014), motivation is a key factor in converting a person's energy into actual activities that lead to the achievement of a goal. Students who are motivated to learn will demonstrate their skills during the learning process, thereby increasing their chances of achieving good communication skills.

Table 2. Recapitulation of discovery learning model implementation

Activities	Meeting 1		Meeting 2		Meeting 3	
	%	Category	%	Category	%	Category
Phase 1 : <i>Stimulation</i>	78	Good	100	Very good	100	Very good
Phase 2: <i>Problem Statement</i>	80	Very good	100	Very good	100	Very good
Phase 3: <i>Data Collection</i>	80	Very good	90	Very good	100	Very good
Phase 4: <i>Data Processing</i>	78,60	Good	88,20	Very good	93,60	Very good
Phase 5: <i>Verification</i>	60	Good	90	Very good	90	Very good
Phase 6 : <i>Generalization</i>	77,00	Good	93	Very good	96	Very good

Writing Communication Skill

The written communication skills were evaluated based on four indicators: writing down information, explaining and representing ideas through illustrations, analyzing and providing solutions, and concluding explanations. The results of the pretest and posttest for writing communication skills are presented in Figure 1.

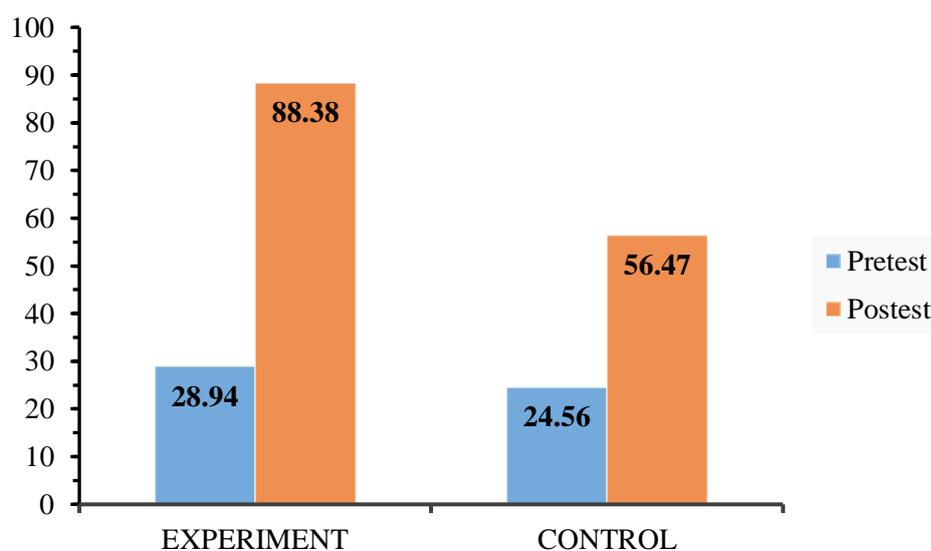


Figure 1. Average score of writing communication skills

Figure 1 indicates that the average score for writing communication skills in the experimental class experienced a marked improvement from 28.94 in the pretest to 88.38 in the posttest. While the improvement was not as significant, the control class still showed an increase in their average score from 24.56 in the pretest to 56.47 in the posttest. These results

demonstrate the positive impact of the discovery learning model on students' writing communication skills. This aligns with the findings of Azhari and Nurita (2021) who concluded that activities within the stages of discovery learning, such as documenting results, can enhance students' abilities to analyze problems and effectively communicate abstract concepts. It can be concluded that the implementation of the discovery learning model leads to better writing communication skills compared to traditional learning methods.

Oral Communication Skill

The data on students' oral communication skills in the experimental and control classes is presented in Figure 2. According to Figure 2, a significant improvement in the average score of oral communication skills is observed in the experimental class. The average scores of the oral skills of the experimental class at the first, second, and third meetings were 50.88% (sufficient category), 79.12% (good category), and 81.03% (excellent category), respectively. On the other hand, the average scores of oral skills in the control class at the first, second, and third meetings were 33.15% (less good category), 38.09% (less good category), and 38.09% (less good category), respectively.

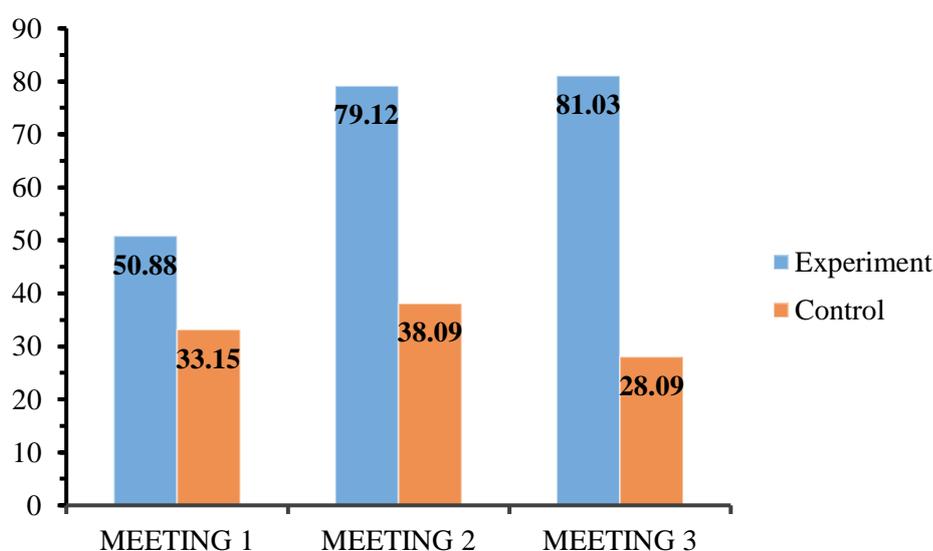


Figure 2. Average Score of Oral Skills

Five indicators were used to measure oral communication skills, namely the ability to argue, ask questions effectively, express ideas, convey material clearly, and respond appropriately to others. The results of each indicator are presented in Table 3. According to Table 3, the average score of oral communication was generally higher in the experimental class than in the control class. For example, the indicator of the ability to argue increased from 45.59% (fairly good category) in the experimental class to 75% (good category) at the second and third meetings. Meanwhile, the average result of the ability to argue in the control class increased from 32.35% (good category) at the first meeting to 33.82% (quite good category) at the second and third meetings. This is consistent with Yusefni's (2015) research that the ability to express opinions and respond to others' opinions (arguing) is a prominent aspect of learning.

Table 3. Average score of oral communication skills indicator

No	Indicator	Experiment			Control		
		Meeting			1	2	3
		1	2	3			
1	Ability to argue	45,59	75	75	32,35	33,82	33,82
2	Can Ask questions well	44,85	75,74	76,47	31,62	33,09	33,09
3	Provide ideas	46,32	75,74	75,74	32,35	33,09	33,09
4	Convey the material clearly	71,32	89,71	89,71	42,65	52,94	52,94
5	Respond others appropriately	46,32	79,41	88,24	36,76	37,5	37,5
Average		50,88	79,12	81,03	35,15	38,09	38,09

Discovery learning models can effectively train and improve learners' oral communication skills. This improvement is supported by the results of research by Nurmala and Priantari (2017) and Meikasari et al (2020) that showed an increase in communication skills after the implementation of the discovery learning model. In other chemistry learning activities, such as the aliphatic compound substitution practicum, students are encouraged to explore more deeply and present scientific conclusions (Curran et al., 2016). Small group learning and discussions that require interaction with other group members facilitate students in discovering concepts together (Kulevich et al., 2014).

CONCLUSION

In conclusion, the results of this study have shown that the implementation of the discovery learning model has a positive effect on students' writing and oral communication skills. The average score of writing communication skills in the experimental class increased significantly from 28.94 at pre-test to 88.38 at post-test, while in the control class, it only increased from 24.56 to 56.47. Meanwhile, oral communication skills in the experimental class showed a significant improvement from 50.88% to 81.03%, while in the control class, the average score remained in the poor category (33.15% to 38.09%). The discovery learning model can be an effective way to foster students' communication skills as it provides opportunities for students to write down information, analyze, explain and communicate their findings, which ultimately enhances their skills in communicating abstract ideas effectively. These results are in line with previous research, emphasizing the importance of discovery learning in improving students' communication skills.

BIBLIOGRAPHY

- Andrianie, D, Sudarmin, & Wardan, S. (2018). Representasi kimia untuk mereduksi miskonsepsi siswa pada materi redoks melalui penerapan model pembelajaran inkuiri terbimbing berbantuan LKS. *Chemistry in Education*, 7(2): 69-76.
- Arends, R. (2012). *Learning to teach*. New York : McGrawHill
- Azhari, R. P., & Nurita, T. (2021). Penerapan model pembelajaran discovery learning untuk meningkatkan keterampilan komunikasi siswa. *Pensa E-Jurnal: Pendidikan Sains*, 9(3). pp. 385-393.
- Curran, Timothy P.; Mostovoy, Amelia J.; Curran, Margaret E.; Berger, Clara (2016). Introducing Aliphatic Substitution with a Discovery Experiment Using Competing Electrophiles. *Journal of Chemical Education*, 93(4):757-761. <https://doi.org/10.1021/acs.jchemed.5b00394>
- Ertikanto, C., Rosidin, U., Distrik, I., Yuberti, Y., & Rahayu, T. (2018). Comparison of Mathematical Representation Skill and Science Learning Result in Classes with

- Problem-Based and Discovery Learning Model. *Jurnal Pendidikan IPA Indonesia*, 7(1), 106-113. doi:<https://doi.org/10.15294/jpii.v6i2.9512>
- Harlen, W. (2006). *Teaching, learning and assessing science 5-12*, London : SAGE Publications.
- Kristini, E. (2021). Penerapan metode discovery learning dengan pendekatan adiksimba untuk meningkatkan ketrampilan bertanya dan hasil belajar pendidikan kewarganegaraan. *Journal of Education Action Research*, 5(3), 309–317. <https://doi.org/10.23887/jear.v5i3.33109>
- Kulevich, Suzanne E.; Herrick, Richard S.; Mills, Kenneth V. (2014). A Discovery Chemistry Experiment on Buffers. *Journal of Chemical Education*, 91(8), 1207–1211. doi:10.1021/ed400377a
- Larson, L.C & Miller, T.N. (2011). 21st Century Skills: Prepare Students for the Future. *Kappa Delta Pi Record*, 47(3), 121–123. doi:10.1080/00228958.2011.10516575
- Marfuah. (2017). Meningkatkan Keterampilan Komunikasi Peserta Didik melalui Model Pembelajaran Kooperatif Tipe Jigsaw. *Jurnal Pendidikan Ilmu Sosial*. 26(2): 148-160.
- Meikasari, D. Rosilawati, I. dan Tania, L. 2020. Efektifitas Model Pembelajaran Guided Discovery pada Materi Kesetimbangan Kimia dalam Meningkatkan Keterampilan Komunikasi Siswa. *Jurnal Pendidikan dan Pembelajaran Kimia*, 9(2). Hal 60-80
- Melawati, C., Paristiowati, M., & Suhartono, S. (2014). Analisis kemampuan komunikasi dan kerja sama siswa pada pembelajaran kimia melalui model pembelajaran kooperatif tipe TAI (Team Assisted Individualization). *Jurnal Riset Pendidikan Kimia (JRPK)*, 4(1), 251 - 259. <https://doi.org/10.21009/JRPK.041.04>
- Nurmala, R.S & Priantari, S. (2017). Meningkatkan keterampilan komunikasi dan hasil belajar kognitif melalui penerapan discovery learning improving communication skills and cognitive study result through discovery learning. *Bioma : Jurnal Biologi dan Pembelajaran Biologi*, 2(1). doi:<https://doi.org/10.32528/bioma.v2i1.586>
- Qadaryah, L dan Hendriana, H., 2015 Mengembangkan Kemampuan Komunikasi dan Disposisi Matematik Siswa SMP Melalui *Discovery*. *Edusentris Jurnal Ilmu Pendidikan dan Pengajaran*, 2(3): 241-252. <https://doi.org/10.17509/edusentris.v2i3.177>
- Rahayu, I. P., & Asri Hardini, A. T. (2019). Penerapan Model Discovery Learning untuk Meningkatkan Keaktifan dan Hasil Belajar Tematik. *Journal of Education Action Research*, 3(3), 193–200. <https://doi.org/10.23887/jear.v3i3.17369>
- Ramadani, A., & Linda, R. (2022). Kesulitan belajar pada materi pelajaran reaksi reduksi dan oksidasi siswa SMA. *Prosiding Seminar Nasional Pendidikan Kimia*, 1(1), 61–65. Retrieved from <http://proceedings.radenfatah.ac.id/index.php/snpk/article/view/54>
- Santika, A.D., Rudibyani, R.B., & Efkar, T. (2016). Penerapan *discovery learning* dalam meningkatkan kemampuan berpikir luwes materi elektrolit/nonelektrolit. *Jurnal Pendidikan dan Pembelajaran Kimia*. 5(3):143-155.
- Slavin, R. E. (2010). *Cooperative Learning Teori, Riset dan Praktik* (Terjemahan). Bandung : Nusa Media
- Sugiyono. (2019). *Statistik untuk Penelitian*. Bandung: Alfabeta.
- Sumendra, M. Y. (2021). Aktivitas dan hasil belajar peserta didik pada implementasi online discovery learning. *Journal of Education Action Research*, 5(1), 48–56. <https://doi.org/10.23887/jear.v5i1.31019>
- Van Laar, E., van Deursen, A. J. A. M., van Dijk, J. A. G. M., & de Haan, J. (2020). Determinants of 21st-Century Skills and 21st-Century Digital Skills for Workers: A Systematic Literature Review. *SAGE Open*, 10(1). <https://doi.org/10.1177/2158244019900176>
- Yuniarti, E., Bahar, A., & Elvinawati, E. (2020). Analisis miskonsepsi siswa pada materi konsep redoks menggunakan Certainty of Response Index (CRI) di SMA Negeri 9 Kota Bengkulu. *ALOTROP*, 4(1). <https://doi.org/10.33369/atp.v4i1.13714>

Yusefni, W. (2015). *Implementasi Pembelajaran IPA Terpadu menggunakan Pendekatan Science Writing Heuristic (SWH) untuk Meningkatkan Penguasaan Konsep dan Kemampuan Berkomunikasi Siswa SMP*. Tesis S2. Sekolah Pascasarjana, Universitas Pendidikan Indonesia.