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Stimulating Learning Motivation: Application of Inquiry Method in Chemistry Lessons

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ABSTRACT

Purpose of the study: This research aims to describe the improvement in students' learning motivation by applying the inquiry method in chemistry lessons for Class X at State Senior High School 1, XIII Koto Kampar District.

Methodology: In this research, the subjects are the students of Class X at State Senior High School 1, XIII Koto Kampar District, consisting of 41 students. The object of this study is the implementation of the inquiry method in learning. The data obtained in this study are qualitative data, collected through observation and documentation techniques. Data collection tools include tests, observation sheets for teacher and student activities. The research procedure follows an action study framework conducted in two cycles. Each cycle comprises planning, implementation, observation, and reflection stages. The success indicators are measured by achieving predetermined motivation criteria.

Main Findings: In Cycle I, the achievement of the indicators was only 16.67%, while in Cycle II, it reached 100%, meeting the targets set by the researcher. Based on these results, it can be concluded that the use of inquiry strategies effectively increases students' learning motivation in Class X of State Senior High School 1, XIII Koto Kampar District in the chemistry lesson on the fundamental laws of chemistry.

Novelty/Originality of this study: This study provides novelty by showing the effectiveness of the inquiry method in increasing students' learning motivation in chemistry lessons, especially in understanding the basic laws of chemistry, in a high school environment.

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1. INTRODUCTION

Education plays a crucial role in human life as a fundamental necessity for both worldly and spiritual well-being [1]-[3]. It serves as a deliberate effort by individuals to mature according to their needs and abilities while fostering holistic personal development across social, moral, technical, and intellectual aspects [4]-[6]. Therefore, it is essential for all parties, particularly schools as educational institutions, to prioritize the quality of education [7]-[9]. Schools as formal educational institutions systematically plan various environments, namely educational environments that provide various opportunities for students to learn through various learning activities [10]-[12].

One of the educational processes occurs at State Senior High School 1, District XIII Koto Kampar. In this school, various subjects are taught, including chemistry [13], [14]. Where chemistry is set as a main subject

that must be followed by students. However, in this school, especially in class X, the results of learning chemistry are still relatively low. Therefore, the author wants to conduct research at this school.

This research study was conducted because of indications of low student motivation in chemistry subjects. This can be seen from various symptoms found in State Senior High School 1, XIII Koto Kampar District. These symptoms include: some students play around and talk to their friends during the teaching and learning process, some students often go in and out of class while learning is taking place, there are students who are lazy to follow chemistry lessons, and some students show a lack of motivation in studying chemistry subjects.

To overcome this or anticipate the lack of student motivation at State Senior High School 1, District XIII Koto Kampar, the author wants to try to apply the inquiry strategy in the learning process. This is because according to Gulo this strategy can maximize students' abilities [15]-[17]. He stated that the inquiry approach means a series of learning activities that involve maximally, all students' abilities to search and investigate systematically, critically, logically, analytically so that they can formulate their own findings with confidence [18]-[20].

Inquiry learning is designed to invite students directly into the scientific process in a relatively short time [21], [22]. The results of Schlenkes' research, in Joyce and Weil, show that inquiry exercises can improve scientific understanding, productive thinking and students are skilled in obtaining and analyzing information [23]-[25]. The success above in improving understanding is none other than due to the increased motivation of students to learn which encourages them to play an active role because they feel involved in learning [26]-[28].

Previous research conducted by Ferreira et al., [29] highlighted the application of inquiry methods in science learning in general and their effects on students' learning motivation, without giving specific focus on implementation in the context of chemistry learning. The study emphasized more on the holistic impact of inquiry-based approaches on various aspects of learning motivation. Meanwhile, the current study focuses specifically on how inquiry methods are applied in chemistry learning to improve students' learning motivation. This study not only analyzes the application of the method but also explores relevant adaptations and inquiry strategies to address the challenges of chemistry learning, such as the complexity of the material and low initial motivation of students, resulting in a more contextual and targeted approach.

This study has a novelty in its approach that focuses on the application of inquiry methods specifically in chemistry learning to improve students' learning motivation. Unlike previous studies that tend to evaluate inquiry methods in general, this study integrates inquiry strategies with the context of chemistry learning challenges, such as conceptual complexity and low student engagement. In addition, this study also pays attention to the adaptation of inquiry methods to create more interactive, relevant, and in-depth learning experiences, so that it can provide contextual solutions to motivational problems in chemistry learning.

The urgency of this research is based on the urgent need to improve students' learning motivation in chemistry subjects, which are often considered difficult and less interesting by many students. Low learning motivation can have a negative impact on students' learning outcomes and conceptual understanding, especially in the field of science which is the basis for mastering technology in the future. By exploring the application of more relevant and targeted inquiry methods, this research is expected to be able to provide practical and effective solutions for educators in improving student motivation and learning outcomes, so that it can support the improvement of the quality of chemistry education as a whole.

Based on the above symptoms, this study was conducted with the aim of determining whether students' motivation to learn chemistry increases by using the Inquiry Method in class X.D on the subject of Basic Laws of Chemistry at State Senior High School 1 XIII Koto Kampar.

2. RESEARCH METHOD

This classroom action research was conducted in Class X at State Senior High School 1, XIII Koto Kampar District, focusing on the subject of chemistry. The research subjects were 41 students from Class X at State Senior High School 1, XIII Koto Kampar District. This class was selected due to the observed low learning motivation among students in this school, particularly in Class X. The object of this study was the implementation of the inquiry method in the learning process.

The data collected in this study were qualitative in nature. The data collection techniques included observation and documentation [30]-[32]. Through observation, students' learning motivation was assessed based on their improved academic performance and the achievement of predetermined motivation indicators. Learning outcomes were evaluated through tests conducted before and after implementing the inquiry method, using structured questions provided to the students.

Motivation indicators were further assessed through direct observations during the learning process with the inquiry method. These observations were recorded on prepared observation sheets. Additionally, documentation techniques were used to gather data from students' chemistry scores as recorded by their teacher prior to the study. These scores served as baseline data for evaluating the effectiveness of the intervention.

The observation data contained in the student activity observation sheet that has been created, the data is added up and analyzed for the achievement of the motivation indicators that have been set, which is a success in the action or use of the inquiry approach in the class..

$$P = \frac{F}{N} x100\% \qquad ...(1)$$

Description:
P = Percentage
F = frequency obtained
N= Total maximum frequency score

3. RESULTS AND DISCUSSION

3.1. Cycle I

The implementation of Cycle I was not yet optimal, as observed from teacher and student activities during the learning process. Students, in general, showed noticeable improvement in their learning behavior—they were more active, engaged, and enthusiastic. In other words, their learning motivation had increased compared to the previous traditional teaching methods. However, in this cycle, the students' motivation had not yet reached the minimum target set by the researcher.

Out of the six motivation indicators established, only one indicator achieved the target (70%) with a score of 79.49. Three other indicators were categorized as moderate, with scores of 69.23, 65.81, and 67.52. Meanwhile, the remaining two indicators were categorized as low, with scores of 52.99 and 54.70. The overall achievement rate for all students in this cycle was only 16.67%.

Additionally, teachers were observed to infrequently fulfill the indicators outlined in the inquiry strategy plan. This was evident from the reflection on the alignment between the use of inquiry strategies and the lesson plans, with a total score of 28.

3.2. Cycle II

The implementation of Cycle II generally showed significant improvements, as evident from the teacher's and students' activities during the learning process. Students exhibited notable progress in their behavior, becoming more active, engaged, and enthusiastic compared to Cycle I. In this cycle, all six motivation indicators set by the researcher successfully reached or exceeded the minimum target of 70%, with scores of 93.16, 75.21, 76.07, 77.78, 79.49, and 72.67. Individual student achievements ranged from medium to high, and the overall achievement rate for all students reached 100%.

Student motivation in learning chemistry through the inquiry method was assessed based on six indicators: students attentively listening to the teacher’s explanation, enthusiastically completing assignments, actively participating in discussions, feeling happy and calm during the learning process, respecting their peers by not causing disturbances, and recognizing the importance of the lessons.

During the first meeting, observation results revealed varying levels of achievement for each indicator. Indicator I (attentiveness) scored 64%, categorized as moderate/good. Indicator II (enthusiasm for assignments) scored 42%, and Indicator III (active participation) scored 43%, both categorized as low/less good. Indicator IV (happiness and calmness) scored 66%, and Indicator V (peer respect) scored 67%, both categorized as moderate/good. However, Indicator VI (lesson relevance) scored 41%, categorized as low/less good. The overall observation score for the first meeting was 54%, reflecting low motivation or less-than-good performance.

These findings highlight the gradual but significant progress achieved through the implementation of the inquiry method, addressing the issues of low motivation observed in Cycle I.

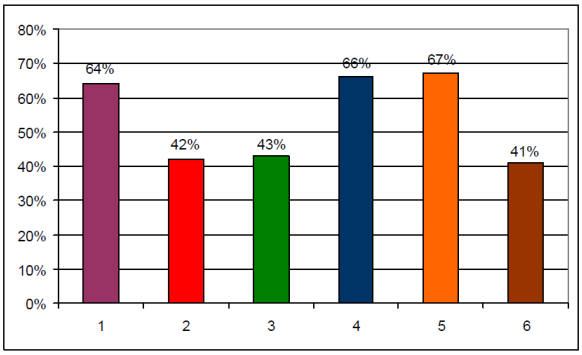

Figure 1. Graph Percentage Indicator Motivation Study Before Action

In Cycle I, the observation data were collected from 39 students. During the third meeting, the results of the observations for each indicator were as follows: Indicator I (attentiveness) was observed in 39 students, with a percentage of 79%, categorized as moderate/good. Indicator II (enthusiasm for assignments) was observed in 39 students, with a percentage of 69%, categorized as low/less good. Indicator III (active participation) showed a percentage of 53%, categorized as low/less good. Indicator IV (happiness and calmness) was observed in 39 students, with a percentage of 66%, categorized as moderate/good. Indicator V (peer respect) showed a percentage of 68%, categorized as moderate/good. Finally, Indicator VI (lesson relevance) had a percentage of 55%, categorized as low/less good. The overall observation score for this cycle was 64.96%, which is categorized as moderate/good but minimal. To further explain these results, Figure 2 below presents a graph showing the percentage of each motivation indicator during Cycle I.

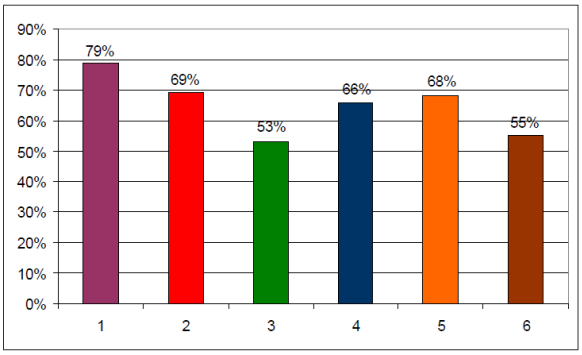

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Figure 2. Graph Percentage Indicator Motivation Learning in Cycle I

In Cycle II, observation data were collected from 39 students. During the first meeting, the results for each indicator were as follows: Indicator I (attentiveness) was observed in 39 students with a percentage of 93%, categorized as high/very good/optimal. Indicator II (enthusiasm for assignments) showed a percentage of 75%, categorized as high/very good/optimal. Indicator III (active participation) had a percentage of 76%, categorized as high/very good/optimal. Indicator IV (happiness and calmness) was observed in 39 students with a percentage of 78%, categorized as high/very good/optimal. Indicator V (peer respect) had a percentage of 79%, categorized as high/very good/optimal. Finally, Indicator VI (lesson relevance) showed a percentage of 73%, categorized as high/very good/optimal. The overall observation score for this cycle was 79%, indicating high/very good/optimal motivation. To further clarify these results, Figure 2 below presents a graph illustrating the percentage of each motivation indicator during Cycle II.

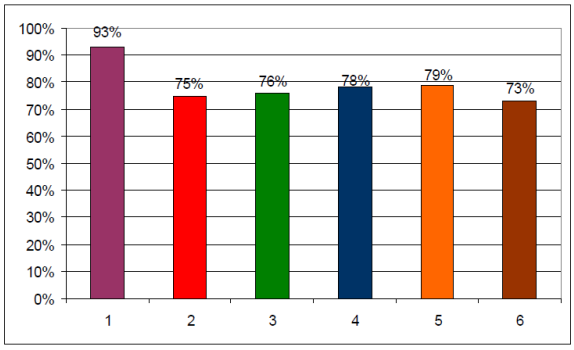

Figure 3. Graph Percentage Indicator Motivation Learning in Cycle II

The observation results regarding the motivation of chemistry students at State Senior High School 1, XIII Koto Kampar District, Kampar Regency in the second academic cycle were categorized as very good/optimal, indicating that the students' motivation had significantly improved. This improvement was evident when comparing the motivation levels before the action, in Cycle I, and in Cycle II. As shown in Figure 4, the data clearly illustrate the progress in student motivation from before the action to Cycle I, and then from Cycle I to Cycle II. Although the improvement was substantial, the teacher will continue to work on further enhancing student motivation.

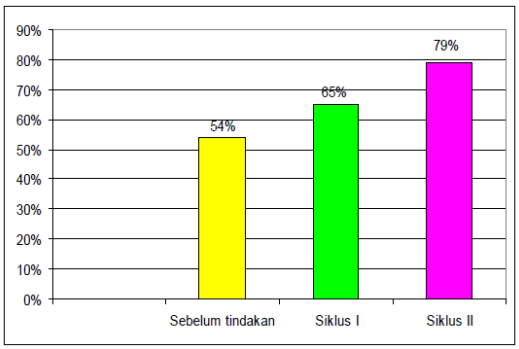

Figure 4. Graph Recapitulation Percentage Motivation Study Student Before Action, Cycle I and Cycle II

Based on the information above, it is clear that the implementation of the inquiry method in chemistry learning to increase student motivation at State Senior High School 1, XIII Koto Kampar District has been very successful, reaching an optimal level. The motivation levels are within the range of 76%–100%, which corresponds to the indicators achieved, all classified as very good. This demonstrates that the use of the inquiry method at State Senior High School 1, XIII Koto Kampar District, Kampar Regency, effectively increased student motivation.

This research is expected to have a significant impact on improving the quality of chemistry learning, especially in terms of motivating students to be more active and involved in the learning process. By implementing a directed inquiry method, teachers can create a more interactive and challenging learning atmosphere, so that students are motivated to explore chemical concepts in depth. In addition, the results of this study can also be a reference for the development of inquiry-based learning strategies in other subjects, as well as contributing to pedagogical innovations that are more relevant to student needs and the challenges of 21st century education.

This study has several limitations that need to be considered. First, this study focuses on the context of chemistry learning in a particular school, so the results may not be fully generalizable to all schools or other subjects. Second, the application of the inquiry method requires teacher skills and readiness that may vary, so the effectiveness of this method can be different in each class. Third, this study emphasizes more on the aspect of learning motivation, so the long-term impact on learning outcomes or in-depth understanding of chemical concepts has not been fully measured.

4. CONCLUSION

Based on the results of the research and the data analysis, it can be concluded that there was a significant improvement in the motivation of chemistry students in class X at State Senior High School 1, XIII Koto Kampar District, particularly in the discussion of basic chemistry laws through the implementation of the inquiry method. This improvement can be observed in the following achievements: Before the action, there was minimal success in the indicators, with only 2 out of 6 indicators approaching the target of 65%, while the others were just above 40%. Only 4 students scored above 60%, while the rest had scores above 45%. The teacher's activity score was 17. In Cycle I, one indicator was fully achieved, 3 indicators approached the target, and 2 others were just above 55%. Overall, student achievement increased by 16.67%, and the teacher's activity score improved to 28. By Cycle II, all assigned indicators were fully achieved, with every student scoring above 70%, resulting in an overall student achievement of 100%. The teacher successfully implemented the plan, with a score of 37 for teacher activities. Further research is suggested to explore the application of inquiry methods in chemistry learning by expanding the scope of students, measuring the long-term impact on learning outcomes, and integrating digital technology as a support in the inquiry process.

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REFERENCES

[1] K. A. A. Gamage, D. M. S. C. P. K. Dehideniya, and S. Y. Ekanayake, "The role of personal values in learning approaches and student achievements," *Behav. Sci. (Basel).*, vol. 11, no. 7, 2021, doi: 10.3390/bs11070102.

[2] A. Szymkowiak, B. Melović, M. Dabić, K. Jeganathan, and G. S. Kundi, "Information technology and Gen Z: The role of teachers, the internet, and technology in the education of young people," *Technol. Soc.*, vol. 65, no. December 2020, 2021, doi: 10.1016/j.techsoc.2021.101565.

[3] N. C. Burbules, G. Fan, and P. Repp, "Five trends of education and technology in a sustainable future," *Geogr. Sustain.*, vol. 1, no. 2, pp. 93–97, 2020, doi: 10.1016/j.geosus.2020.05.001.

[4] A. Ahdar, A. Halik, and M. Musyarif, "Perspective Of Islamic Education To Value Continuity And Culture," *TARBIYA Islam. J. Pendidik. dan Keislam.*, vol. 10, no. 2, pp. 1–10, 2020.
[5] Z. Shana and E. S. Abulibdeh, "Science practical work and its impact on students' science achievement," *J. Technol. Sci. Educ.*, vol. 10, no. 2, pp. 199–215, 2020, doi: 10.3926/JOTSE.888.
[6] A. M. Laleye, "Practical and Technological Skills: An Inevitable Social Engineering Tool for Sustainable Development," *Eur. J. Educ. Pedagog.*, vol. 3, no. 2, pp. 171–177, 2022, doi: 10.24018/ejedu.2022.3.2.318.
[7] A. Alam and A. Mohanty, "Cultural beliefs and equity in educational institutions: exploring the social and philosophical notions of ability groupings in teaching and learning of mathematics," *Int. J. Adolesc. Youth*, vol. 28, no. 1, 2023, doi: 10.1080/02673843.2023.2270662.
[8] M. A. M. Hashim, I. Tlemsani, and R. Matthews, "Higher education strategy in digital transformation," *Educ. Inf. Technol.*, vol. 27, no. September 2021, pp. 3171–3195, 2022, doi: 10.1007/s10639-021-10739-1.
[9] J. Shaturaev, "Financing Public Education in Indonesia," *Curr. Hist.*, vol. 41, no. 240, pp. 82–86, 2022, doi: 10.1525/curh.1961.41.240.82.
[10] K. I. Leonidovych, V. O. Mykolayovych, G. I. Alexandrovna, M. P. Vasyliovych, and K. I. Ivanivna, "Creating the Informational and Educational Environment of the University Based on the Distance Learning Platform LIKAR_NMU," *Arch. Pharm. Pract.*, vol. 12, no. 3, pp. 66–74, 2021, doi: 10.51847/5zzeroabwa.
[11] U. Sahid, I. Wasliman, H. S. Muchtar, and H. S. Insan, "Management of Student Characteristics Through Extracurricular Activities in The School Environment Based on Islamic Boarding Schools," *Munaddhomah J. Manaj. Pendidik. Islam*, vol. 2, no. 2, pp. 116–125, 2021, doi: 10.31538/munaddhomah.v2i2.97.
[12] M. Ali, "Innovative Leadership Management in Early Children Education," *J. Obs. J. Pendidik. Anak Usia Dini*, vol. 6, no. 4, pp. 3007–3012, 2022, doi: 10.31004/obsesi.v6i4.2198.
[13] J. Musengimana, E. Kampire, and P. Ntawiha, "Factors Affecting Secondary Schools Students' Attitudes toward Learning Chemistry: A Review of Literature," *Eurasia J. Math. Sci. Technol. Educ.*, vol. 17, no. 1, pp. 1–12, 2021, doi: 10.29333/ejmste/9379.
[14] B. Nainggolan, W. Hutabarat, M. Situmorang, and M. Sitorus, "Developing innovative chemistry laboratory workbook integrated with project-based learning and character-based chemistry," *Int. J. Instr.*, vol. 13, no. 3, pp. 895–908, 2020, doi: 10.29333/iji.2020.13359a.
[15] H. Husni, "The Effect of Inquiry-based Learning on Religious Subjects Learning Activities: An Experimental Study in High Schools," *J. Penelit. Pendidik. Islam*, vol. 8, no. 1, p. 43, 2020, doi: 10.36667/jppi.v8i1.434.
[16] J. Maknun, "Implementation of Guided Inquiry Learning Model to Improve Understanding Physics Concepts and Critical Thinking Skill of Vocational High School Students," *Int. Educ. Stud.*, vol. 13, no. 6, p. 117, 2020, doi: 10.5539/ies.v13n6p117.
[17] Y. I. Sari, Sumarmi, D. H. Utomo, and I. K. Astina, "The Effect of Problem Based Learning on Problem Solving and Scientific Writing Skills," *Int. J. Instr.*, vol. 14, no. 2, pp. 11–26, 2021, doi: 10.29333/iji.2021.1422a.
[18] B. Asyhar, "Analysis of the Inquiry-Infusion learning model to develop students' critical thinking ability," *J. Focus Action Res. Math. (Factor M)*, vol. 6, no. 1, pp. 1–20, 2023, doi: 10.30762/f_m.v6i1.463.
[19] R. P. Antonio and M. S. Prudente, "Effects of Inquiry-Based Approaches on Students' Higher-Order Thinking Skills in Science: A Meta-Analysis," *Int. J. Educ. Math. Sci. Technol.*, vol. 12, no. 1, pp. 251–281, 2023, doi: 10.46328/ijemst.3216.
[20] I. Royani, "Inquiry Based Learning In Improving Results Student Learning," in *Proceedings of the 1st International Conference on Education, Science Technology And Health (ICONESTH 2023 Universitas Bina Bangsa Getsempena*, 2023, pp. 808–814.
[21] T. T. S. Strat, E. K. Henriksen, and K. M. Jegstad, "Inquiry-based science education in science teacher education: a systematic review," *Stud. Sci. Educ.*, vol. 60, no. 2, pp. 191–249, 2024, doi: 10.1080/03057267.2023.2207148.
[22] K. F. Hew, C. Jia, D. E. Gonda, and S. Bai, "Transitioning to the 'new normal' of learning in unpredictable times: pedagogical practices and learning performance in fully online flipped classrooms," *Int. J. Educ. Technol. High. Educ.*, vol. 17, no. 1, 2020, doi: 10.1186/s41239-020-00234-x.
[23] A. Doyan, S. Susilawati, and H. Hardiyansyah, "Development of Natural Science Learning Tools with Guided Inquiry Model Assisted by Real Media to Improve Students' Scientific Creativity and Science Process Skills," *J. Penelit. Pendidik. IPA*, vol. 7, no. 1, pp. 15–20, 2020, doi: 10.29303/jppipa.v7i1.485.
[24] B. D. Wale and K. S. Bishaw, "Effects of using inquiry-based learning on EFL students' critical thinking skills," *Asian-Pacific J. Second Foreign Lang. Educ.*, vol. 5, no. 1, 2020, doi: 10.1186/s40862-020-00090-2.
[25] C. T. Wen *et al.*, "Students' guided inquiry with simulation and its relation to school science achievement and scientific literacy," *Comput. Educ.*, vol. 149, p. 103830, 2020, doi: 10.1016/j.compedu.2020.103830.
[26] N. R. Moşteanu, "Teaching and learning techniques for the online environment. how to maintain students' attention and achieve learning outcomes in a virtual environment using new technology," *Int. J. Innov. Res. Sci. Stud.*, vol. 4, no. 4, pp. 278–290, 2021.
[27] M. Arini and A. Y. Wahyudin, "Students' Perception on Questionning Technique in Improving Speaking Skill Ability At English Education Study Program," *J. Arts Educ.*, vol. 2, no. 1, pp. 57–67, 2022, doi: 10.33365/jae.v2i1.70.
[28] W. Winarto, A. Syahid, and F. Saguni, "Effectiveness the use of audio visual media in teaching islamic religious education," *Int. J. Contemp. Islam. Educ.*, vol. 2, no. 1, pp. 81–107, 2020.
[29] D. M. Ferreira, F. C. Sentanin, K. N. Parra, V. M. N. Bonini, M. de Castro, and A. C. Kasseboehmer, "Implementation of Inquiry-Based Science in the Classroom and Its Repercussion on the Motivation to Learn Chemistry," *J. Chem. Educ.*, vol. 99, no. 2, pp. 578–591, 2022, doi: 10.1021/acs.jchemed.1c00287.
[30] M. K. Alam, "A systematic qualitative case study: questions, data collection, NVivo analysis and saturation," *Qual. Res. Organ. Manag. An Int. J.*, vol. 16, no. 1, pp. 1–31, 2021, doi: 10.1108/QROM-09-2019-1825.
[31] Ardiansyah, Risnita, and M. S. Jailani, "Teknik Pengumpulan Data Dan Instrumen Penelitian Ilmiah Pendidikan Pada

Pendekatan Kualitatif dan Kuantitatif," *J. IHSAN J. Pendidik. Islam*, vol. 1, no. 2, pp. 1–9, 2023, doi: 10.61104/ihsan.v1i2.57.

[32] L. E. Tomaszewski, J. Zarestky, and E. Gonzalez, "Planning Qualitative Research: Design and Decision Making for New Researchers," *Int. J. Qual. Methods*, vol. 19, pp. 1–7, 2020, doi: 10.1177/1609406920967174.