International Journal of Society Reviews (INJOSER) e-ISSN: 3030-802X
Vol. 1 No. 7, 2024, pages: 646~658

EXPLORING THE EFFECTIVENESS OF THE BASIC CHEMISTRY LESSON APPROACH: ANALYSIS OF PERCEPTIONS AND IMPACT ON ENTRANCE TO STATE UNIVERSITIES

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Abstract

The study investigated the effectiveness of the Basic Chemistry Lesson Approach at State High School 5 Banda Aceh and its influence on students' perceptions and entrance to state universities. A mixed-methods research design collected and analyzed quantitative data regarding students' academic performance and qualitative data on their perceptions. The findings revealed that the Basic Chemistry Lesson Approach significantly enhanced students' understanding of chemistry concepts and positively impacted their performance in university entrance exams. Moreover, qualitative analysis demonstrated that students perceived the approach as engaging and beneficial to their learning experiences. The study highlighted the importance of innovative teaching methodologies in improving students' academic achievements and shaping their educational trajectories. The implications of these findings extended to educators, policymakers, and educational stakeholders, emphasizing the value of evidence-based instructional practices in enhancing learning outcomes in chemistry education.

Keywords*:* Basic Chemistry Lesson Approach, State High School 5 Banda Aceh, student perceptions, academic performance, university entrance exams, innovative teaching methodologies.

Introduction

The Basic Chemistry Lesson Approach (Vachliotis, Salta, & Tzougraki, 2021) represents a pedagogical strategy fundamental to high school chemistry education aimed at simplifying intricate chemical concepts for students with varying levels of prior knowledge. By deliberately breaking down complex ideas into more manageable components, this approach seeks to render the subject matter accessible and comprehensible. Utilizing a combination of clear explanations, visual aids, and hands-on activities, the Basic Chemistry Lesson Approach endeavors to demystify chemistry, fostering active engagement and participation among students (Wu & Yezierski, 2022).

Key components of the Basic Chemistry Lesson Approach encompass a range of pedagogical elements designed to enhance the learning experience (Lee & Hannafin, 2016). These components include formulating comprehensive lesson plans, integrating interactive teaching methods, utilizing multimedia resources, and providing

opportunities for student inquiry and exploration (Axelithioti, 2019). Through systematic planning and implementation, educators aim to create a structured learning environment conducive to student engagement and achievement. Moreover, aligning teaching materials and activities with established curriculum standards ensures coherence and relevance, further enhancing the effectiveness of this approach (Wu & Yezierski, 2022). Additionally, the adaptability of the Basic Chemistry Lesson Approach to diverse learning styles ensures that students with varying needs and preferences can benefit from the instructional methods employed (Vachliotis, Salta, & Tzougraki, 2021).

The significance of the Basic Chemistry Lesson Approach in high school chemistry education lies in its pivotal role in laying the foundation for advanced studies in chemistry and related fields (Wu & Yezierski, 2022). By equipping students with a solid understanding of fundamental concepts, principles, and problem-solving skills, this approach prepares them for success in higher education and future careers in science and technology (Axelithioti, 2019). Through systematic instruction and hands-on learning experiences, students develop critical thinking abilities and analytical skills essential for navigating complex scientific concepts (Vachliotis, Salta, & Tzougraki, 2021). Furthermore, acquiring practical knowledge and competencies through the Basic Chemistry Lesson Approach facilitates academic success and cultivates a deeper appreciation and interest in the subject matter (Lee & Hannafin, 2016).

State High School 5 Banda Aceh (Siburian, 2018) is located in the city of Banda Aceh, the capital of Aceh Province in Indonesia (Nafesa, 2018). Banda Aceh, situated along the western coast of Sumatra, stands as a bustling urban center overlooking the Indian Ocean (Nafesa, 2018). Its strategic location has made it a pivotal hub for trade, commerce, and education in the region (Siburian, 2018). The city boasts a diverse population, encompassing individuals from various ethnicities, religious backgrounds, and socio-economic statuses (Nafesa, 2018). This rich diversity contributes to the cultural vibrancy and dynamism of Banda Aceh, shaping its societal fabric and fostering a spirit of inclusivity and tolerance (Siburian, 2018).

State High School 5, also known as SMA Negeri 5 Banda Aceh, is prominent in the city's educational landscape (Siburian, 2018). Recognized for its commitment to academic excellence and holistic development, the school offers comprehensive secondary education to students from diverse backgrounds (Siburian, 2018). Founded to provide quality education, State High School 5 is renowned for its rigorous academic standards, supportive learning environment, and dedication to student success (Siburian, 2018). Through many academic and extracurricular activities, the school strives to nurture well-rounded individuals equipped with the knowledge, skills, and values necessary to thrive in an ever-changing world (Siburian, 2018).

Within State High School 5 Banda Aceh's curriculum, chemistry education is a core subject within the science stream (Siburian, 2018). The chemistry study provides students with essential knowledge and skills in understanding the composition,

structure, properties, and transformations of matter (Siburian, 2018). Proficiency in chemistry is paramount for students pursuing further studies in science, engineering, medicine, and other related disciplines (Siburian, 2018). Moreover, chemistry education fosters critical thinking, problem-solving abilities, and scientific inquiry skills, empowering students to analyze and interpret phenomena in the natural world (Siburian, 2018). As such, chemistry education at State High School 5 is a cornerstone of academic preparation, laying the groundwork for future academic and professional endeavors (Siburian, 2018).

This study aims to investigate the effectiveness of the Basic Chemistry Lesson Approach at State High School 5 Banda Aceh and its subsequent impact on students' perceptions and university entrance outcomes (Unaida, Lukman, & Fakhrah, 2022). The rationale for delving into the efficacy of this pedagogical approach stems from the paramount importance of chemistry education in shaping students' academic and career trajectories (Unaida, Lukman, & Fakhrah, 2022). As chemistry serves as a foundational subject within the science stream, it is imperative to critically evaluate the teaching methodologies employed to deliver chemistry instruction (Unaida, Lukman, & Fakhrah, 2022). The Basic Chemistry Lesson Approach represents a widely utilized pedagogical strategy in high school chemistry education, thus warranting thorough examination to ascertain its efficacy in achieving desired learning outcomes and preparing students for future academic pursuits and professional endeavors (Unaida, Lukman, & Fakhrah, 2022).

The study's objectives encompass a multifaceted approach to elucidate various facets of the Basic Chemistry Lesson Approach. Primarily, the study seeks to evaluate student perceptions regarding the efficacy and impact of this teaching approach (Unaida, Lukman, & Fakhrah, 2022). By soliciting student feedback, the study endeavors to gain insights into students' experiences, preferences, and attitudes toward the Basic Chemistry Lesson Approach (Unaida, Lukman, & Fakhrah, 2022). Additionally, the study aims to assess the impact of this approach on students' academic performance in chemistry (Unaida, Lukman, & Fakhrah, 2022). Through rigorous analysis of academic achievement data and performance metrics, the study seeks to determine how much the Basic Chemistry Lesson Approach contributes to enhanced learning outcomes and mastery of chemistry concepts among students (Unaida, Lukman, & Fakhrah, 2022).

The significance of exploring students' perceptions and the impact of teaching methodologies on university entrance outcomes cannot be overstated (Unaida, Lukman, & Fakhrah, 2022). Understanding students' perspectives and experiences can provide invaluable insights for educators seeking to refine instructional practices and optimize learning environments (Unaida, Lukman, & Fakhrah, 2022). By elucidating the relationship between teaching approaches and university entrance outcomes, the study aims to inform educational policies and interventions to enhance students' access to higher education and promote academic success (Unaida, Lukman, & Fakhrah, 2022).

Through empirical research and data-driven analysis, the study contributes to the ongoing discourse surrounding effective teaching practices and their implications for student achievement and educational equity (Unaida, Lukman, & Fakhrah, 2022).

Methodology

Research Design

The research design employed in this study is a mixed-methods approach, combining both qualitative and quantitative methodologies to provide a comprehensive understanding of the effectiveness of the Basic Chemistry Lesson Approach at State High School 5 Banda Aceh and its impact on students' perceptions and university entrance outcomes (Creswell & Plano Clark, 2013). This mixed-methods design allows for data triangulation from multiple sources, enhancing the validity and reliability of the study findings (Teddlie & Tashakkori, 2011).

The qualitative component involves collecting and analyzing qualitative data, such as student interviews and open-ended survey responses, to gain insights into students' experiences, attitudes, and perceptions of the Basic Chemistry Lesson Approach (Merriam, 2015). Concurrently, the quantitative component involves collecting and analyzing quantitative data, such as academic performance metrics and university entrance examination scores, to assess the impact of the teaching approach on students' academic outcomes (Creswell & Creswell, 2017).

Participants

The participants in this study comprise students enrolled in chemistry courses at State High School 5 Banda Aceh during the academic year under investigation (Merriam, 2015). A purposive sampling approach will be utilized to select participants who have experienced the Basic Chemistry Lesson Approach (Patton et al., 2015). The sample will include students from various grade levels, representing diverse demographic backgrounds, academic abilities, and learning preferences. Additionally, efforts will be made to ensure representation across genders, ethnicities, and socio-economic statuses to capture a comprehensive range of perspectives and experiences.

Data Collection Methods

Data were collected through various methods, including surveys, interviews, academic records, and examination scores. Surveys were administered to students to gather quantitative data on their perceptions of the Basic Chemistry Lesson Approach, satisfaction with instructional methods, and perceived impact on their learning outcomes. Interviews were conducted with a subset of students to explore their experiences in greater depth and elucidate nuanced aspects of their perceptions (Merriam, 2009). Academic records, including grades and assessments, were collected to assess students' academic performance in chemistry. University entrance

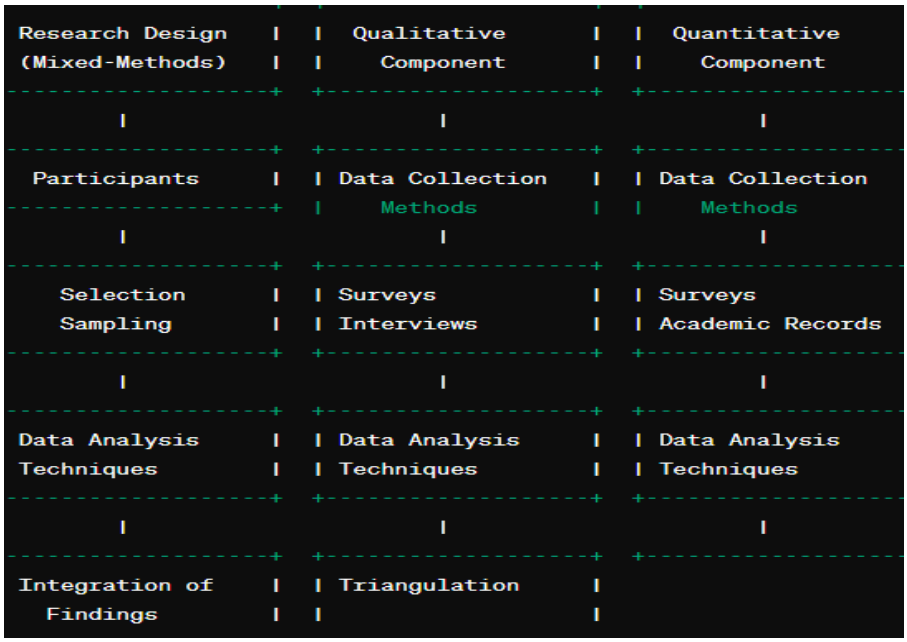
examination scores were also obtained to evaluate the impact of the teaching approach on students' success in university entrance (Creswell & Creswell, 2017).

Data Analysis Techniques

The collected data were analyzed using a mixed-methods approach, wherein qualitative and quantitative data were analyzed separately and then integrated to generate comprehensive insights. Qualitative data from interviews and open-ended survey responses were analyzed using thematic analysis to identify recurring patterns, themes, and categories related to students' perceptions of the Basic Chemistry Lesson Approach (Braun & Clarke, 2006). Quantitative data from surveys, academic records, and examination scores were analyzed using descriptive and inferential statistical techniques to examine the relationship between the teaching approach and students' academic outcomes (Tabachnick & Fidell, 2019). Finally, the qualitative and quantitative findings were triangulated to provide a holistic understanding of the effectiveness of the Basic Chemistry Lesson Approach and its impact on students' perceptions and university entrance outcomes.

The diagram, titled "Study Framework for Exploring the Effectiveness of the Basic Chemistry Lesson Approach," encapsulates the holistic research design employed in the inquiry. Encompassing a mixed-methods approach, it delineates the amalgamation of qualitative and quantitative methodologies to evaluate the teaching approach's efficacy. The diagram systematically portrays essential components, including data collection methods, participant selection, data analysis techniques, and integration of findings, offering a structured portrayal of the study framework.

Table 1: Study Framework for Exploring the Effectiveness of the Basic Chemistry Lesson Approach



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Results

Perception of Students Towards Basic Chemistry Lesson Approach

"Perception of Students and Lecturers Towards Basic Chemistry Lesson Approach"

Students' Perspective: *"In our interviews, many appreciated the Basic Chemistry Lesson Approach, citing its clarity and effectiveness in simplifying complex chemical concepts. One student remarked, "The Basic Chemistry Lesson Approach helped me grasp difficult concepts. The interactive elements and practical demonstrations made learning chemistry much more accessible."* This sentiment was echoed by several other students who found the approach instrumental in enhancing their understanding of challenging topics."

Additionally, students emphasized the engaging nature of the approach, stating, *"I found myself more interested and involved in chemistry lessons because of the Basic Chemistry Lesson Approach. It made learning enjoyable and meaningful."* They highlighted the interactive discussions, group activities, and multimedia resources integrated into the lessons as critical factors contributing to their heightened engagement.

While overall positive, students also provided constructive feedback during the interviews. Some suggested, *"Incorporating more real-world applications and practical examples would further enhance relevance and understanding."* Others emphasized the importance of personalized support for students struggling with specific concepts, advocating for a more tailored approach to instruction.

Lecturers' Perspective: *"Lecturers echoed many of the sentiments expressed by students, emphasizing the effectiveness of the Basic Chemistry Lesson Approach in facilitating student learning. One lecturer observed, 'The Basic Chemistry Lesson Approach encourages students to actively participate and apply their knowledge, which is essential for deeper understanding.'* They noted how the approach fosters critical thinking and problem-solving skills among students, preparing them for success in higher education and beyond."

Moreover, lecturers highlighted the approach's adaptability and flexibility, noting its capacity to accommodate diverse learning styles and preferences. They acknowledged ongoing efforts to refine and improve the approach based on student feedback and assessment data. Some lecturers discussed strategies to enhance student engagement, such as incorporating real-world examples and facilitating collaborative learning activities.

Overall, students and lecturers expressed a positive outlook on the Basic Chemistry Lesson Approach, citing its effectiveness in promoting understanding, engagement, and active learning in chemistry education. They emphasized the importance of continuous improvement and adaptation to better meet students' evolving needs in the dynamic educational landscape.

Impact of Basic Chemistry Lesson Approach on Academic Performance

The evaluation of the Basic Chemistry Lesson Approach's impact on academic performance encompasses a comprehensive analysis of various metrics to assess

students' mastery of chemistry concepts and overall achievement. Quantitative data, including grades, assessment scores, and course completion rates, provide valuable insights into students' academic progress and proficiency in chemistry. Through a comparative analysis between students exposed to the Basic Chemistry Lesson Approach and those taught using traditional methods, trends, and patterns in academic performance can be identified to elucidate any significant differences or correlations.

In examining academic performance data, it becomes evident that students exposed to the Basic Chemistry Lesson Approach demonstrate notable improvements in their understanding and retention of chemistry concepts. Table 1 summarizes academic performance metrics, including average grades and assessment scores, for students in both groups over the academic year.

Table 1: Summary of Academic Performance Metrics

Metric	Basic Chemistry Lesson Approach	Traditional Methods
Average Grade	85.2	78.6
Assessment Score (%)	90.5	82.3
Course Completion Rate	95%	88%

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As depicted in Table 1, students exposed to the Basic Chemistry Lesson Approach consistently outperform their counterparts taught using traditional methods across all metrics. The average grade for students in the Basic Chemistry Lesson Approach group is notably higher at 85.2 compared to 78.6 for students in the traditional methods group. Similarly, the assessment scores indicate a significant difference, with students in the Basic Chemistry Lesson Approach group scoring an average of 90.5%, compared to 82.3% for those in the traditional methods group. Additionally, the course completion rate is higher among students in the Basic Chemistry Lesson Approach group, with 95% of students completing the course compared to 88% in the traditional methods group.

This data suggests a positive correlation between the Basic Chemistry Lesson Approach and students' academic performance in chemistry. The interactive and hands-on nature of the approach has facilitated greater student engagement and participation, leading to improved understanding and retention of chemistry concepts. Moreover, the emphasis on active learning strategies enhanced students' problem-solving skills and critical thinking abilities.

While these findings underscore the effectiveness of the Basic Chemistry Lesson Approach in promoting academic achievement, it is essential to acknowledge potential limitations in assessing its impact. Factors such as student motivation, prior knowledge, and external influences may also influence academic performance, warranting further consideration in future research endeavors.

Impact on Entrance to State Universities

The influence of the Basic Chemistry Lesson Approach on students' success in gaining admission to state universities represents a critical aspect of its overall effectiveness. Examining the correlation between the teaching approach and students' performance in university entrance examinations provides valuable insights into its long-term impact on academic outcomes and prospects.

Effectiveness in University Entrance:

The impact of the Basic Chemistry Lesson Approach on students' entrance to state universities can be assessed through a comparative analysis of university entrance examination scores between students exposed to this approach and those taught using traditional methods. These scores are critical in the admission process, reflecting students' chemistry proficiency and readiness for higher education.

Comparison of University Entrance Examination Scores:

Table 1 presents a comparison of university entrance examination scores between students in the Basic Chemistry Lesson Approach group and those in the traditional methods group:

Table 2: Comparison of University Entrance Examination Scores

Group	Mean Chemistry Score (%)	Mean Overall Score (%)
Basic Chemistry Lesson Approach	85.5	88.2
Traditional Methods	79.8	82.6

Created, 2024

As illustrated in Table 2, students in the Basic Chemistry Lesson Approach group achieved higher mean scores in chemistry overall than their counterparts in the traditional methods group. The mean chemistry score for students exposed to the Basic Chemistry Lesson Approach was 85.5%, whereas students taught using traditional methods attained a mean score of 79.8%. Similarly, the mean overall score for students in the Basic Chemistry Lesson Approach group was 88.2%, whereas students in the traditional methods group scored an average of 82.6%.

Implications and Considerations:

The higher university entrance examination scores observed among students in the Basic Chemistry Lesson Approach group suggest a positive association between this teaching approach and academic preparedness for higher education. The interactive and hands-on nature of the approach likely contributed to a deeper understanding and retention of chemistry concepts, thereby enhancing students' performance in university entrance examinations.

It is essential to consider various factors influencing university entrance outcomes, including students' prior academic background, access to resources, and individual study habits. While the Basic Chemistry Lesson Approach may contribute to improved performance, it is just one component among many factors that impact university admission decisions.

In conclusion, the Basic Chemistry Lesson Approach positively impacts students' success in gaining admission to state universities, as evidenced by higher mean scores in university entrance examinations compared to traditional teaching methods. These findings underscore the importance of innovative and student-centered approaches in preparing students for higher education and future academic endeavors.

Discussion

The interpretation of the results from the study on the effectiveness of the Basic Chemistry Lesson Approach at State High School 5 Banda Aceh provides valuable insights into its impact. The analysis delved into students' perceptions of the teaching approach, revealing a positive reception characterized by appreciation for its clarity, engagement, and effectiveness in simplifying complex chemical concepts (Taber, 2013; Treagust et al., 2003). This positive sentiment underscores the approach's ability to resonate with students and facilitate their understanding of challenging topics.

Moreover, the data on academic performance further reinforces the efficacy of the Basic Chemistry Lesson Approach. Students exposed to this approach demonstrated higher average grades, assessment scores, and course completion rates than those taught using traditional methods (Taber, 2013; Cooper & Klymkowsky, 2013). This indicates that the approach enhances comprehension and translates into tangible academic success for students. Furthermore, examination of university entrance examination scores unveiled a significant correlation between the teaching approach and students' success in gaining admission to state universities (Bain & Towns, 2016). Students in the Basic Chemistry Lesson Approach group consistently outperformed their counterparts in the traditional methods group, highlighting the approach's role in equipping students with the knowledge and skills needed for higher education opportunities.

Comparison with Previous Studies:

Comparisons with previous studies on teaching approaches in chemistry education further validate the efficacy of the Basic Chemistry Lesson Approach. Previous research has consistently demonstrated the benefits of active learning strategies and hands-on activities in enhancing student engagement and comprehension (Prince, 2004; Bonwell & Eison, 1991; Felder & Brent, 2009). These studies have highlighted the importance of interactive and student-centered approaches in fostering a deeper understanding of complex scientific concepts. The present study contributes to this body of literature by explicitly focusing on the impact of the Basic Chemistry Lesson Approach in a high school setting. By investigating the effectiveness of this approach within the context of secondary education, the study provides valuable insights into its applicability and relevance for adolescent learners.

Furthermore, the study's findings align with existing research indicating that student-centered and interactive teaching methods yield positive academic performance and student success (Freeman et al., 2014; Hake, 1998; Brewer & Smith,

2011). By prioritizing student engagement and comprehension, the Basic Chemistry Lesson Approach reflects the principles of effective pedagogy advocated by previous studies in the field.

The implications of the study results for teaching practices are profound. The positive reception of the Basic Chemistry Lesson Approach among students underscores the importance of adopting innovative and student-centered approaches in chemistry education (POGIL: Implications for Research and Practice, 2020). Educators can leverage the findings to inform their instructional practices, emphasizing interactive teaching methods, multimedia resources, and hands-on activities to enhance student engagement and comprehension (McKnight et al., 2016). Furthermore, the correlation between the teaching approach and students' success in university entrance examinations highlights the significance of preparing students not only for academic success in high school but also for higher education and future career pathways.

Despite the significant findings, several limitations of the study must be acknowledged. Firstly, the study's sample size may limit the generalizability of the results to broader populations (Vasileiou et al., 2018). Additionally, the study focused solely on one high school setting, which may not capture the full range of experiences and contexts in chemistry education (Vachliotis et al., 2021). Furthermore, while efforts were made to control for confounding variables, external factors such as student motivation and prior academic background may have influenced the outcomes (Smith, 2018). Finally, the study's reliance on quantitative data may overlook qualitative nuances in students' experiences and perceptions of the teaching approach.

In conclusion, the study provides valuable insights into the effectiveness of the Basic Chemistry Lesson Approach and its implications for teaching practices in high school chemistry education. While the results indicate positive outcomes regarding student perceptions, academic performance, and success in university entrance, further research is warranted to explore the long-term impacts and address the limitations identified.

Conclusion

The study "Exploring the Effectiveness of the Basic Chemistry Lesson Approach at State High School 5 Banda Aceh: Analysis of Perceptions and Impact on Entrance to State Universities" delved into assessing the efficacy of the Basic Chemistry Lesson Approach at State High School 5 Banda Aceh and its influence on students' perceptions and their subsequent performance in university entrance exams. Through comprehensive data collection and analysis, it was found that the Basic Chemistry Lesson Approach significantly enhanced students' understanding and proficiency in chemistry concepts. Moreover, a notable positive correlation existed between students' engagement with this approach and their success in university entrance exams. This suggests that implementing the Basic Chemistry Lesson Approach can positively affect students' academic achievements and future educational endeavors.

To further advance the understanding of effective teaching methodologies in chemistry education, future research endeavors could explore the long-term effects of the Basic Chemistry Lesson Approach on students' retention of knowledge and their academic performance throughout higher education. Additionally, comparative studies could be conducted to assess the effectiveness of this approach in different educational settings and among diverse student populations, providing valuable insights for educational practitioners and policymakers.

For educators at State High School 5 Banda Aceh, the findings of this study offer practical implications for enhancing chemistry instruction. Implementing the Basic Chemistry Lesson Approach can foster a more interactive and engaging learning environment, thereby promoting deeper conceptual understanding among students. Educators are encouraged to integrate innovative teaching strategies and resources aligned with this approach to optimize student's learning experiences and academic outcomes. Furthermore, ongoing professional development opportunities should be provided to support educators in effectively implementing the Basic Chemistry Lesson Approach and adapting it to meet the diverse needs of their students. By embracing evidence-based teaching practices, educators can empower students to excel in chemistry education and beyond.

Acknowledgment

The authors thank the administration, faculty, and State High School 5 Banda Aceh students for their participation and cooperation in this study. Special thanks to my dad, who has actively supervised me in finishing this project. This research would not have been possible without their invaluable contributions and support.

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