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The Implementation of a Differentiated Approach to Improve Collaboration Skills in Physics Material

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Abstract: Students often face difficulties in socializing with their peers during the learning process. Therefore, a learning approach that can enhance collaborative skills is needed—one such approach is differentiated instruction. This study aims to describe students' collaboration skills through the implementation of a differentiated approach in learning physics at Grade X of SMA B in West Seram Regency. The subjects of this study were 26 students from class X-2 at SMA B. The research employed a descriptive quantitative and qualitative method. The experimental design used was a one-shot case study. The instrument used in the study was non-test-based, namely an observation sheet designed to measure collaboration skills. Data analysis was conducted using quantitative descriptive analysis to present the data in percentage form, as well as qualitative descriptive analysis to explain the findings through narrative descriptions. The data analysis techniques included both qualitative and quantitative descriptive analysis, which involved observing students' collaboration skills using the differentiated approach. The observation sheet results showed that students' collaborative skills reached a percentage of 72.43%, which falls under the high category. This high category was attributed to the fact that learning through a differentiated approach enabled students to demonstrate improved collaboration skills—such as active participation, responsibility, flexibility and compromise, and mutual respect.

Keywords: Collaboration Skills; Differentiated Approach; Physics Learning.

Introduction

In this challenging era of globalization, education has become one of the most essential strategies for developing and strengthening human resources. Through education, it is expected that individuals will be equipped with the knowledge and skills necessary for success. Education must be carried out in a planned and systematic manner to ensure that learning objectives are achieved through effective and efficient instruction (Kaban et al., 2023). The field of education has experienced a major transformation due to the rapid evolution of information technology. To meet the challenges of the 21st century, education must be grounded in scientific principles, and raising educational standards is of utmost importance. Teachers must have a collaborative understanding of the subject matter, student characteristics, and learning strategies (Hajar et al., 2024).

Students possess diverse characteristics—some understand the material quickly, while others require repetition for comprehension (Karmila, 2024). Today's teachers must be able to prepare the foundation for their students' academic and professional success, so they can grow into competent and adaptive individuals in this globalized era. The four pillars of 21st-century skills—critical thinking, communication, creativity, and collaboration— are essential competencies students must master (Sholikah et al., 2023).

Collaboration skills refer to an individual's ability to work effectively with others to achieve shared goals. Collaboration involves cooperation among multiple parties or inter-organizational relationships where all participants agree and engage in achieving a common objective (J. F. Maria et al., 2023). Collaboration among

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students—whether within the same group or across different groups—is believed to improve academic performance. This ability is a critical asset in the global era, where individuals are expected to work with people from diverse backgrounds and characteristics.

Based on classroom observations in Grade X-2 of SMA B in West Seram Regency, along with teacher interviews, it was found that students' collaboration skills remain low. This is due to some students struggling to socialize with their peers, resulting in only a few actively participating during group discussions. Moreover, students were grouped heterogeneously, and only a portion of them contributed actively to group tasks. One of the instructional approaches promoted by the Merdeka Curriculum to enhance students' collaborative abilities is differentiated instruction (Herrera & Murry, 2017). Differentiated instruction can foster a supportive learning environment that encourages student collaboration. At the same time, collaboration itself can serve as an effective tool for implementing differentiated instruction tailored to students' needs (Marlina, 2019).

Differentiated instruction is an approach that enables teachers to accommodate individual differences in the classroom by providing materials, strategies, and assessments that are adapted to students' needs, interests, and abilities. The goal of this approach is to ensure that all students are actively engaged in the learning process and achieve deep understanding based on their unique profiles (Purnawanto, 2023). It is essential because it allows teachers to meet the diverse learning needs of each student (Faiz et al., 2022). Through differentiation, students can learn according to their own learning styles, thus increasing engagement and comprehension. This approach also helps narrow learning gaps by offering appropriate challenges for every student. Differentiation enables teachers to create an inclusive environment that promotes optimal academic growth and achievement for all learners (Miller, 2019). Previous studies have shown that differentiated instruction can address classroom learning challenges by meeting students' needs in terms of readiness, learning profiles, and interests (Yunita et al., 2023).

Tailoring instructional approaches to students' learning styles and levels of understanding can naturally stimulate more productive collaboration among them. Students who feel understood and supported by their teachers are generally more motivated to collaborate with peers in completing group tasks and projects (Mastropieri et al., 2022). Based on this background, the objective of this study is to describe students' collaboration skills through the implementation of a differentiated instructional approach in physics learning for Grade X students at SMA B in West Seram Regency.

Method

This research is a descriptive quantitative and qualitative study, aimed at describing the improvement of students' collaboration skills during the learning process. The study will be conducted in two stages: before and after the implementation of differentiated instruction. This study adopts a collaborative research approach, involving cooperation with the subject teacher (Nirmalasi. N, et al., 2024). In this research, the researcher will act as the instructor, while the subject teacher will serve as the observer, assisting in and monitoring the learning process to ensure its effective implementation (Suganda, L. et al., 2024). The study uses a descriptive quantitative and qualitative method with a one-shot case study design. A simplified flow of the research process is illustrated in the figure below:

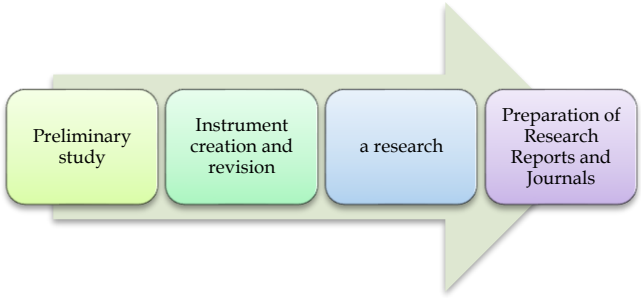

Figure 1. Research Flowchart

Participants

The population in this study consists of Grade X students at SMA A in West Seram Regency, totaling 109 students. The research sample comprises 26 students from Class X-2, selected randomly as all classes were considered homogeneous in characteristics.

Instrument

The research instrument used is a non-test instrument, specifically an observation sheet for collaboration skills. The indicators for observing students' collaboration skills during the learning process are adapted from Dhitasarifa et al. (2023) and include: 1) Active Participation, 2) Responsibility, (3) Flexibility and Compromise, and 4) Mutual Respect.

Data Analysis Techniques

The data in this study is analyzed using descriptive quantitative analysis, which presents data as-is in percentage form, and qualitative descriptive analysis, which provides narrative explanations of the observed phenomena. The main technique used is qualitative descriptive analysis, aimed at describing the improvement in collaboration skills resulting from the implementation of the differentiated instructional approach.

Results and Discussion

Based on the research conducted with 26 students from Class X-2, as observed by the Physics teacher, the results of the initial observation before the intervention are presented in Figure 2.

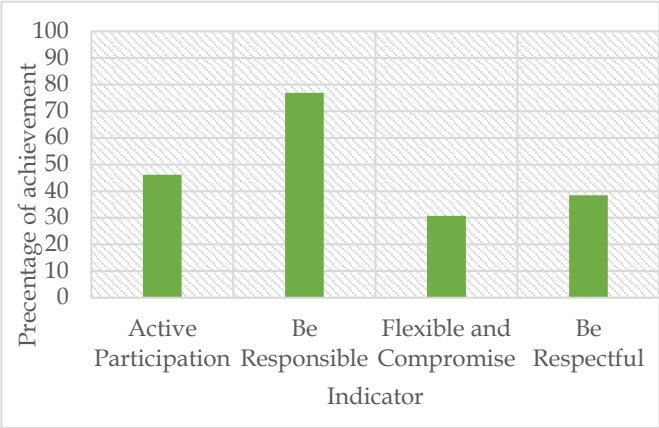

Figure 2. Collaboration Skills Data Before Intervention

Based on Figure 2, it was found that three indicators—active participation, flexibility and compromise, and mutual respect—showed percentages below 50%, while only one indicator, responsibility, exceeded 50%. This suggests that most students had not yet demonstrated strong collaboration skills. The first indicator, active participation, received a score of 46.15% (12 students), categorized as moderate (Riduwan, 2013). The second indicator, responsibility, had a percentage of 76.92% (20 students), also in the moderate category. The third indicator, flexibility and compromise, scored 30.77% (8 students), categorized as low. The fourth indicator, mutual respect, received 38.46% (10 students), also categorized as low. These results indicate the need to improve students' collaboration skills. This can be achieved by implementing differentiated instruction, which adapts teaching approaches to students' interests and learning profiles (Herwina, 2021). The results of observations on collaboration skills over the course of three meetings are presented in Figure 3.

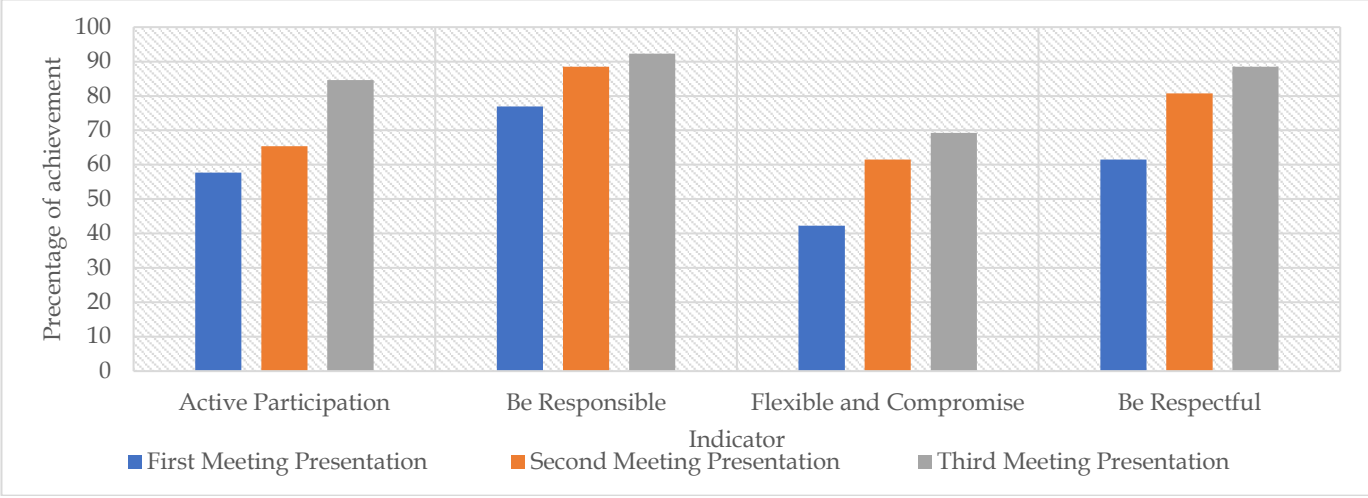

Figure 3. Collaboration Skills Data Across Three Learning Sessions

Based on Figure 3, there was a continuous improvement in all four indicators of collaboration skills across the three sessions: For the first indicator, active participation, the percentages were: 57.59% in the first meeting, 65.38% in the second meeting and 84.61% in the third meeting. This yields an average of 69.23%, which falls into the highest category (Riduwan, 2013). This increase indicates that students gradually began to participate more actively from the first session, with continuous improvement by the third session. This progress is attributed to the use of the differentiated approach, which encouraged students to collaborate within groups based on their learning styles or learning profiles. The students were grouped into three categories: auditory, visual, and kinesthetic. These groups were highly engaged because students enjoyed learning in environments that aligned with their preferred learning styles. It is essential to teach students how to collaborate with others, as humans are social beings who require interaction with others (I. E. Indriyani et al., 2021; Mercer, 2013; Tomasello & Gonzalez-Cabrera, 2017). Differentiated instruction contributes to student engagement and their ability to work collaboratively during the learning process (Boelens et al., 2018). Furthermore, the researcher conducted mapping of student readiness, interests, and learning profiles, which revealed that students were highly enthusiastic. This enthusiasm positively impacted their active participation within their respective groups.

Indicator 2: Responsibility. The responsibility indicator showed a percentage of 76.92% in the first

meeting, 88.46% in the second, and 92.31% in the third meeting, with an average of 85.90%, categorized as very high (Riduwan, 2013). Even before the implementation of the differentiated approach, students had already demonstrated a sense of responsibility. However, when the differentiated approach was applied, their sense of responsibility increased further. This is because students worked in groups based on their learning profiles, which encouraged greater ownership of their roles—particularly in developing group projects aligned with their learning styles and presenting them. Not only did representatives present, but every group member was required to present the project to the class. Although students learned collaboratively, each individual had a personal responsibility to complete their assigned tasks and support their group members. This individual responsibility fostered a sense of care and accountability toward fellow members and the success of the group, ultimately reinforcing a strong sense of responsibility (Haris, 2017).

Indicator 3: Flexibility and Compromise. The flexibility and compromise indicator showed percentages of 42.31% in the first meeting, 61.54% in the second, and 69.23% in the third, with an average of 57.69%, categorized as moderate (Riduwan, 2013). From the beginning of group formation, students demonstrated flexibility by not insisting on being grouped with close friends. They complied with instructions to form groups based on learning styles. Previous studies (Andini, 2022; Angyanur et al., 2022; Husni, 2013; Wahyuningsari et al., 2022) indicate that students in a single classroom often have diverse characteristics, including varying levels of readiness, interests, talents, and learning styles. Therefore, each student should receive instruction tailored to their needs in order to achieve optimal learning outcomes. During learning, students demonstrated the ability to compromise with peers' opinions to complete projects. They communicated openly when offering answers or suggestions. In cases of disagreement, students sought resolution by listening to differing opinions first, then reaching a middle ground that was fair to all parties (Zammi et al., 2021). Additionally, project timelines were flexible across groups, acknowledging the different paces of work based on individual learning styles, which affected the complexity and timing of project completion. However, students did not find this burdensome because their learning was aligned with their personal profiles and interests.

Indicator 4: Mutual Respect. The mutual respect indicator recorded 61.54% in the first meeting, 80.77% in the second, and 88.46% in the third, with an average of 76.92%, categorized as high (Riduwan, 2013). Like the other collaboration indicators, this one showed steady improvement across meetings. Students respected their peers' ideas during group work and project development. Throughout the project and presentations, students remained focused on academic activities, showing respectful behavior by avoiding unrelated distractions. When giving opinions, they were constructive and supportive rather than critical. This finding aligns with Junita (2021), who reported that students scored 100% on respecting group members' contributions—indicating they were polite, listened attentively, and acknowledged others' work.

Based on the four indicators, overall collaboration skills reached 72.43%, categorized as high (Riduwan, 2013). It can thus be concluded that differentiated instruction improves students' collaboration skills. This finding is supported by Cahya et al. (2023); Devi et al. (2023); Jumiarti & Kurniawati (2023), who assert that differentiated learning enhances students' collaboration abilities. Further, research by Chiou et al. (2017); Damrongpanit & Reungtragul (2013); Fan & Xiao (2015) confirms that learning styles significantly influence students' academic performance and outcomes.

Conclusion

Based on the research findings, the implementation of differentiated instruction led to an overall collaboration skills score of 72.43%, categorized as high (Riduwan, 2013). This high score reflects improvements in active participation, responsibility, flexibility and compromise, and mutual respect across learning sessions. The differentiated approach encourages students to become more accountable, active, flexible, and respectful, as it focuses on meeting each student's individual needs. This study still requires further exploration. Therefore, it is recommended that future research continues to develop this area and work toward ensuring all students at SMA B acquire strong collaboration skills.

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The authors declare no conflict of interest

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