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Implementation and Effectiveness of Chemistry Instruction for Students in Special Sports Programs at Senior High Schools

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ABSTRACT

Chemistry learning in Special Sports Classes (KKO) faces challenges because students engage in intensive physical activities that influence their academic focus. This study aims to describe the implementation of chemistry learning and analyze the effectiveness of the learning process and outcomes for Grade X senior high school. A descriptive qualitative method was used through observation, structured interviews, and documentation. The results showed that learning followed the planning, implementation, and evaluation stages of the Merdeka Curriculum; however, its effectiveness remained suboptimal because students' physical fatigue reduced their concentration, participation, and motivation. Learning activities were also less conducive, limiting the quality of learning interactions. The average student score was below the minimum competency standard, with a completion rate of only 22%. The findings indicate that chemistry instruction in KKO classes has not been effective, highlighting the need for more adaptive strategies to meet the learning needs of students with high physical demands.

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1. INTRODUCTION

Chemistry at the high school level plays an important role in equipping students with relevant and in-depth scientific knowledge (Kurniawati *et al*., 2023). However, in reality, the majority of students have a negative perception of chemistry. Students consider chemistry to be difficult, uninteresting, and even potentially fatal (Okmarisa *et al*., 2025). This condition has an impact on the loss of interest and motivation of students to study chemistry in depth (Hakim *et al*., 2024). His pedagogical challenge becomes even more complex when applied to groups of students with special characteristics, such as in special sports classes (KKO), which have different learning needs and self-development focuses than regular classes (Khodari, 2016).

KKO is the program designed to accommodate students with exceptional potential in sports in regular educational units at the primary and secondary education levels. (Kusumawati, 2017). Students in this program follow an intensive training schedule, resulting in a different division of time between academic and non-academic activities compared to regular classes (Khodari, 2016). KKO students have unique characteristics influenced by the demands of physical training, competition schedules, and a high orientation towards athletic achievement (Hasan *et al*., 2025).

Psychologically, they tend to have strong motivation to excel in sports, while academic motivation is not always at the same level, resulting in variations in learning commitment. Physical fatigue resulting from training can also impact information processing abilities and perseverance in learning. Annifa'ari and Noor (2025), These differences in activity rhythms have the potential to affect students' readiness to learn, focus, and cognitive stamina, especially in subjects that require conceptual reasoning, such as chemistry (Nabilah et al., 2020). In addition, the learning process in KKO classes requires more adaptive strategies to ensure that learning objectives are still achieved optimally.

Learning in KKO faces various challenges in terms of intelligence, as KKO students tend to have lower academic abilities than their peers in regular classes (Annifa'ari & Noor, 2025). Some reports indicated that this condition hurts suboptimal learning, as evidenced by the relatively lower learning achievements of KKO students compared to those in regular classes. In addition, the busy sports training schedule, which consumes a significant amount of time, leaves KKO students with less time for learning. This situation poses a unique challenge for teachers, especially as noted by Khodari (2016).

This condition is also seen in students of the KKO in grade X at a senior high school. In addition to being required to optimize their potential in sports, students are also required to take chemistry classes, just like their regular class counterparts. However, the implementation of chemistry classes in KKO classes has its own dynamics. The high intensity of sports training and a busy schedule often affect the physical condition of students, thereby impacting their level of active involvement during the learning process. Therefore, this study aims to describe the implementation of chemistry learning for students in the KKO and analyze its effectiveness in the chemistry learning process for 10th-grade students.

2. METHODS

This study used a qualitative descriptive research design. The research was conducted in the 2025/2026 academic year, in October 2025. The location of this research was a senior high school, specifically SMA Muhammadiyah 7, Yogyakarta. The subjects or informants in

this study included chemistry teachers and 10th-grade students. The data collection techniques used in this study were as follows:

2.1. Observation

The observations in this study were conducted by observing the learning process that took place in KKO, which included planning, organizing, implementing, and evaluating learning. The type of observation conducted was non-participatory, in which the researcher did not participate in the study and acted solely as an observer. The data obtained from these observations was the effectiveness of chemistry learning among KKO students with chemistry teachers in the classroom.

2.2 Interviews

The interview technique involved collecting data in the form of direct questions and answers from the sources. This study used a structured interview technique. Interviews with informants were conducted to discuss the planning, organization, implementation, and evaluation of chemistry learning in KKO.

2.3 Documentation

Documentation analysis was conducted on the general description of the school, the curriculum used for KKO students, and images of the learning implementation. The documentation technique was able to provide more credible evidence and data on the chemistry learning process in KKO because it used documentary evidence.

The data analysis technique used in this study examined all available data from various sources, namely observations and interviews. The data analysis included reduction, data presentation, and conclusion drawing/verification.

3. RESULTS AND DISCUSSION

3.1. Implementation of Chemistry Learning for Grade X Students in the Special Sports Class at the Senior High School

3.1.1. Background of chemistry learning

Chemistry is one of the subjects that plays a crucial role in enhancing students' science literacy and critical thinking skills. Chemistry plays a significant role in developing an understanding of scientific concepts essential for everyday life and the advancement of modern technology (Apriliani *et al.,* 2019). Therefore, chemistry is designated as a compulsory subject at the secondary education level, including for students in the KKO.

Based on preliminary interviews with 10th-grade chemistry teachers at Muhammadiyah 7 High School in Yogyakarta, teaching chemistry in the KKO class has its own challenges compared to regular classes. Teachers stated that the learning plans outlined in the Lesson Plans could not always be implemented optimally due to the physical condition of students who were tired after sports training and the absence of some students participating in certain sports activities.

Grade X KKO students, in addition to focusing on developing their potential in sports, also have the obligation to take chemistry classes like regular students. However, there is a difference in academic achievement between KKO students and regular students, with regular students tending to perform better. This difference is influenced by the high intensity of sports training, which limits the learning opportunities and academic readiness of KKO students. Physical fatigue after training and absences due to competitions also affects students' focus, participation, and involvement in chemistry lessons.

3.1.2. Stages of chemistry learning implementation

The learning provided to students in the KKO in grade X, is now based on the independent curriculum. While regular class students receive three hours of physical education or sports lessons per week, KKO students receive six hours of lessons per week. Meanwhile, the content of other subjects taught in KKO and regular classes remains the same. Chemistry also uses an independent curriculum, as do various other subjects.

The learning process consists of three phases, namely the planning phase, the implementation phase, and the evaluation phase. The stages of chemistry learning are as follows:

(i) Planning. The planning of chemistry learning in grade X KKO is compiled through the preparation of a syllabus and lesson plans that refer to the Merdeka Curriculum Content Standards. The syllabus contains the subject identity, objectives, scope of material, and Pancasila Student Profile values, with the main material covering atomic theory, atomic structure, the periodic table, electron configuration, and green chemistry concepts. The lesson plans are developed as an elaboration of the syllabus, containing activity steps, learning media, assessments, and learning syntax. The learning experience is designed through activities such as reading materials, discussions, simple observations, working on worksheets, and connecting chemistry concepts with environmental phenomena. The learning media used include PowerPoint, whiteboards, worksheets, and textbooks. Assessment is conducted through observation, question-and-answer sessions, discussions, exercises, quizzes, and summative evaluations, taking into account students' perceptions, motivation, and engagement during the learning process.

(ii) Implementation. The implementation of chemistry learning in class X KKO took place in accordance with the preliminary, core, and closing stages. In the initial stage, the teacher opened the lesson with a greeting, prayer, and class readiness check, then provided an introduction, motivation, and conveyed the learning objectives and indicators relevant to the material on atoms, electron configuration, and the periodic table. In the core activity, the teacher applied the Discovery Learning model through group discussions, gathering information, and presenting the students' findings. The teacher also reinforced key concepts, corrected misconceptions, and utilized various learning media to support student understanding. However, learning was often hampered by students' disruptive behaviour, such as not paying attention, talking among themselves, or using cell phones to play online games. The teacher overcomes this by employing a persuasive approach and offering quizzes with prizes as a strategy to increase motivation. In the closing stage, the teacher provides an opportunity for questions and answers, asks students to summarise the material, and provides an overview of the next lesson before ending the lesson.

(iii) Stage of learning Outcome Assessment. Assessment is the process of collecting and processing information to measure student learning outcomes. The assessment of learning outcomes aims to monitor and evaluate the learning process and progress of students (Asmara, 2015). The evaluation process plays a crucial role in every learning process, enabling the determination of the effectiveness of chemistry learning among KKO students.

Based on field research findings, chemistry lessons for KKO classes have been scheduled for the first period in the morning. This schedule is an effort by teachers and the school to create a more conducive learning atmosphere, with the hope of increasing students' comfort, focus, and motivation in participating in chemistry lessons. However, this schedule has not had a significant impact on KKO students. The results of the study indicate that the chemistry

learning outcomes of KKO students remain significantly below the standard. This is due to the students' low interest and focus on academics, as their main attention is more focused on sports activities. As a result, students' interest in chemistry tends to be low. These findings confirm that even with a good learning schedule, it still needs to be balanced with more adaptive learning strategies to suit the characteristics of KKO students.

3.2. Effectiveness of the chemistry learning process for 10th-grade students in the special sports class

3.2.1. Effectiveness in terms of process

3.2.1.1. Good Organisation of Material

The organization of material in chemistry learning for 10th-grade KKO students is carried out systematically following the Merdeka Curriculum structure. The material is arranged in stages, progressing from simple to complex concepts, to facilitate understanding, in line with research (Kurniawati *et al*., 2023) that suggests a coherent material structure improves students' conceptual understanding. This effort is important, considering that KKO students often experience physical fatigue after intensive training, which can cause learning to be condensed and focused on core concepts. Some reports (Nur & Supriyanto, 2023) also stated that KKO students have different learning needs due to the demands of intense sports activities.

3.2.1.2. Effective Communication

Clear and interactive communication is an important factor in delivering chemistry material in KKO classes. The selection of concrete examples, visualization of abstract concepts, and active interaction between teachers and students are necessary to maintain learning engagement, especially when students' physical conditions reduce their concentration. Adaptive communication can increase students' interest and motivation in learning science subjects (Setiawan, 2020).

3.2.1.3. Flexibility in Learning Approaches

Flexibility in learning approaches is applied through adjustments to methods, learning time, and remedial opportunities for students who are constrained by training or competitions. An adaptive approach is needed to adjust the learning rhythm to the demands of sports activities. The unique characteristics of KKO students necessitate a distinct academic coaching approach from that of regular students (Annifa'ari, A., & Noor, 2025).

3.2.1.4. Mastery and Enthusiasm for Learning Materials

Mastery of materials and teacher enthusiasm play a major role in increasing the effectiveness of chemistry learning in KKO classes. Presenting materials in an applicable and contextual manner can increase the interest and participation in learning among students who are more oriented towards athletic achievement. This is reinforced by previous research that suggests appropriate learning strategies can enhance the academic achievement of KKO students, which tends to be lower without an adequate learning approach.

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3.2.2. Effectiveness in Terms of Learning Outcomes

Student learning outcomes can be effective if they achieve optimal learning outcomes. The assessments given by chemistry teachers to KKO students are basically the same as those given to regular students. However, teachers lower the level of difficulty of the assessments to suit the abilities and understanding of KKO students. KKO students still receive the same material and assignments as regular students, but these are adjusted to suit the characteristics of the KKO class. This adjustment is made. Thus, the understanding between regular students and KKO students remains balanced. Even though the teacher has reduced the depth of the material and lowered the level of difficulty of the assessment, the learning process is still considered quite difficult for KKO students. This condition is influenced by various factors, one of which is the level of fatigue resulting from high-intensity sports training, which affects students' focus and involvement during learning.

Based on the assessment of KKO students' learning outcomes in chemistry, their learning achievements have not met the Minimum Passing Criteria set by the school, which is 75. The evaluation results show that the average score of KKO students in the odd semester only reached 58. This condition was also influenced by several students who did not take the exam, which had an impact on the low overall class mastery percentage. In addition, only 22% of KKO students were declared to have mastered chemistry, while the remaining 78% were declared not to have mastered it because they had not reached the minimum assessment standards set by the school.

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4. CONCLUSION

Based on the results of the analysis of the implementation and effectiveness of chemistry learning in the KKO, the implementation of learning has followed the stages of planning, introduction, core activities, conclusion, and assessment in accordance with the teaching module and independent curriculum. Teachers opened the lesson with an introduction, motivation, and presentation of objectives, then proceeded with core activities that utilized the discovery learning model, group discussions, presentations, and concept reinforcement. Various learning media, including worksheets, textbooks, and presentations, were also used to support student understanding. However, the effectiveness of the learning process was not fully optimal. This condition was influenced by physical fatigue due to the high intensity of sports training, making it difficult for students to maintain focus and motivation to learn. The impact was also seen in the learning outcomes, where most students did not achieve the learning outcomes and mastery criteria set. Thus, chemistry learning in KKO classes can be said to be ineffective in terms of both process and results, requiring learning strategies that are more adaptive to the characteristics of students who have high physical demands and relatively low academic interest.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

6. REFERENCES

Alifa, V. N. (2023). Manajemen Kelas Khusus Atlet Di SMP Labschool UNESA 3. *Inspirasi Manajemen Pendidikan*, *11*(5), 1206-1222.

Annifa'ari, A. A. N., and Noor, T. R. (2025). Sistem Manajemen Program Kelas Khusus Olahraga di Sekolah Menengah Pertama. *Dirasah: Jurnal Studi Ilmu dan Manajemen Pendidikan Islam*, *8*(2), 459-469.

Apriliani, P. N., Sudiana, I. K., & Wiratini, N. M. (2019). Pelaksanaan pembelajaran remedial mata pelajaran kimia. *Jurnal Pendidikan Kimia Undiksha*, *3*(2), 43-51.

Asmara, A. P. (2017). Penilaian Hasil Belajar Siswa dalam Pembelajaran Kimia Materi Kimia Unsur Menggunakan Mind Map di Kelas XII IPA Semester 1 SMA Negeri 1 Wonosari. *Lantanida Journal*, *3*(1), 34-54.

Hakim, E., Astafani, A., & Resmawati, R. F. (2024). Systematic Review Faktor-Faktor Kesulitan Belajar Materi Kimia. *Jurnal Inovasi Pendidikan Kimia*, *18*(2), 81-88.

Hasan, C. R., Muhibbi, M., & Fuad, M. N. (2025). Survei Kemampuan Motorik Terhadap Siswa Kelas Khusus Olahraga (KKO). *Jurnal Ilmu Keolahragaan Undiksha*, *13*(1), 1–11.

Khodari, R. (2017). Evaluasi Program Pendidikan Kelas Khusus Olahraga Sekolah Menengah Atas Negeri 1 Sewon Bantul Yogyakarta. *Multilateral: Jurnal Pendidikan Jasmani dan Olahraga*, *15*(2), 124-132.

Kurniawati, Y., Mayshinta, I., & Yenti, E. (2023). Identifikasi Kesulitan Materi Kimia Bagi Siswa SMA: Kajian literatur. In *Prosiding Seminar Nasional Hasil Penelitian dan Pengabdian Kepada Masyarakat*, *1*(1), 23-27).

Kusumawati, E. D. (2017). Pengaruh Adversity Quotient terhadap Regulasi Diri Siswa Kelas Khusus Olahraga (KKO) SMP Negeri 13 Yogyakarta. *Jurnal Pendidikan Madrasah*, *2*(1), 121-141.

Nabila, A. S., Okmarisa, H., & Humaira, T. Isu Sosiosaintifik dalam Pembelajaran Kimia: Systematic Literature Review. *Konfigurasi: Jurnal Pendidikan Kimia dan Terapan*, *9*(2), 36-45.

Nabilah, M., Sitompul, S. S., & Hamdani, H. (2020). Analisis Kemampuan Kognitif Peserta Didik Dalam Menyelesaikan Soal Momentum dan Impuls. *Jurnal Inovasi Penelitian Dan Pembelajaran Fisika*, *1*(1), 1-7.

Setiawan, A. R. (2020). Motivasi dan Hasil Belajar dalam Pembelajaran Adaptif Fisika menggunakan Naḍom Mabādī ‘Asyroh. *WaPFi (Wahana Pendidikan Fisika)*, *5*(2), 132-146.