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Principal management in improving student discipline to support science learning effectiveness at SMPN 1 Jatinangor and SMPN 12 Bandung City

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ABSTRACT

This study aims to examine the role of principal management in improving student discipline to support the effectiveness of science learning at SMP Negeri 1 Jatinangor, Sumedang, and SMP Negeri 12 Bandung City. A qualitative approach with a comparative case study design was employed; data were collected through observation, in-depth interviews, and document analysis involving school principals, vice principals, and science teachers. The findings reveal that principals at both schools have implemented discipline management systematically, encompassing the planning, organizing, activating, and evaluating discipline development programs. The improvements in student discipline achieved through these efforts contributed directly to the enhanced effectiveness of science learning in both schools.

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1. INTRODUCTION

Science education (Ilmu Pengetahuan Alam/IPA) constitutes an active process of knowledge construction through inquiry, observation, experimentation, and problem-solving — rather than the passive reception of scientific facts. An inquiry-based approach in science learning has been empirically demonstrated to significantly enhance students' higher-order thinking skills, scientific creativity, and science literacy (Antonio & Prudente, 2024; Morris, 2025). Moreover, successful science learning requires students to develop 21st-century competencies, including scientific communication, collaborative engagement in laboratory activities, and the responsible use of technology in scientific processes (Dah et al., 2024).

The quality of the learning environment profoundly shapes the success of inquiry-based science learning. Laboratory practical work demands a high degree of discipline to ensure occupational safety, procedural accuracy during experiments, and the integrity of scientific data. Recent empirical research indicates that student discipline is directly correlated with the quality of academic engagement and learning outcomes; conversely, indisciplined behavior generates a negative cycle that progressively undermines learning achievement (Anderson et al., 2019). The effectiveness of classroom management, as an integral dimension of discipline development, has been shown to positively influence student performance across diverse educational levels and contexts (Putra & Yanto, 2025).

Within the framework of School-Based Management (SBM), student management plays a strategically important role, as all educational services — including the administration of science laboratory facilities and student affairs programs — are directed toward ensuring that students receive optimal educational support. As an educational leader, the school principal bears central responsibility for planning, organizing, and evaluating student discipline programs as part of broader efforts to improve school quality (Lumban Gaol, 2023). The principal's role in cultivating a culture of discipline has been shown to significantly contribute to a school climate conducive to effective learning (Pisriwati et al., 2024).

Student discipline is defined as a state of order and regularity maintained by students within the school environment, free from violations that cause harm — directly or indirectly — to the students themselves or to the institution as a whole (Imron, 2012). This condition of order and regularity constitutes a fundamental prerequisite for science teachers seeking to implement inquiry-based instruction; in its absence, instructional time intended for scientific exploration is instead consumed by behavioral management (Welsh, 2024).

Discipline serves several functions that are specifically relevant to science education: (1) establishing a safe and conducive laboratory environment for practical activities; (2) fostering scientific attitudes (scientific attitude) such as data integrity, accountability, and precision; (3) improving students' academic achievement in science subjects; and (4) preparing students to meet the challenges of science and technology in the future. Educative and positive discipline strategies are more effective than purely punitive approaches in promoting student self-regulation (Ijaz et al., 2024). School-family partnerships also play an important role in ensuring the consistency of discipline development and its consequent impact on learning quality (Rodriguez & Welsh, 2024).

SMP Negeri 1 Jatinangor in Sumedang and SMP Negeri 12 in Bandung face tangible challenges, including low national examination scores in science, compounded by a high frequency of disciplinary violations such as truancy, physical altercations, smoking, and non-compliance with school regulations. These undisciplined behaviors directly undermine the quality of science learning: instructional time is lost, laboratory activities are disrupted, and the science learning environment becomes non-conducive. Studies conducted within the

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Indonesian context indicate that internal factors — such as self-awareness and motivation — alongside external factors including the school environment and parental involvement, are the primary determinants of discipline levels among junior high school students (Alam & Fitriatin, 2024).

Student discipline development refers to the school's systematic efforts to shape student behavior in accordance with prevailing norms, thereby ensuring the continuity of an effective educational process. In the context of science learning, these norms encompass not only general school regulations but also the ethical standards and scientific procedures that must be adhered to throughout all science-related activities. Against this backdrop, the present study aims to empirically analyze how student discipline management is implemented at SMPN 1 Jatinangor, Sumedang, and SMPN 12 Bandung, and to examine its contribution to enhancing the effectiveness of science learning. The conceptual framework of this study is presented in Figure 1.

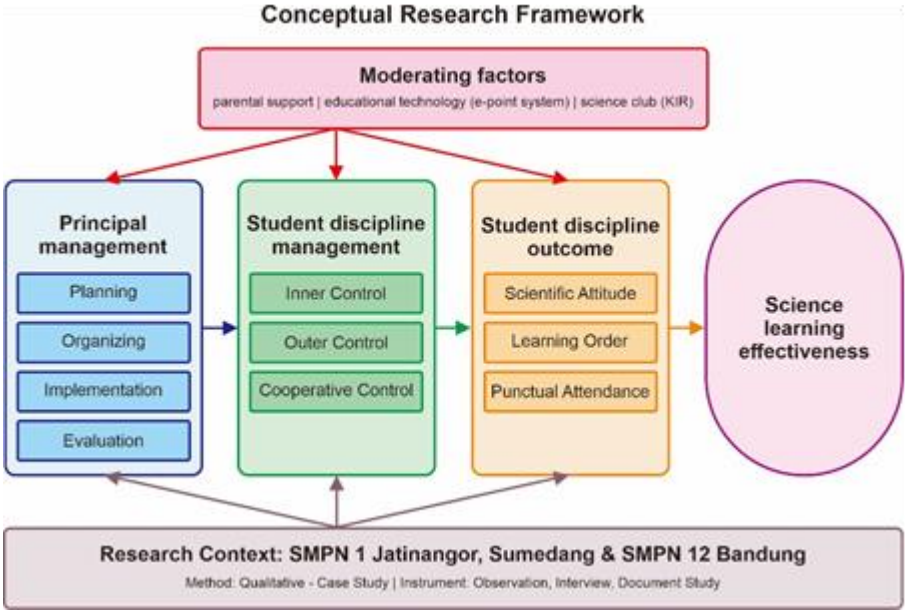

Figure 1. Conceptual framework of the relationship between principal discipline management and science learning effectiveness.

2. METHODS

2.1. Research approach and design

This study employs a qualitative, comparative case study design. This approach was selected to enable an in-depth understanding of student discipline management in its natural context, encompassing planning, organizing, activating, supervising, challenges, and solutions, as well as their implications for science learning quality. The comparative case study design was adopted to intensively explore the phenomenon across two distinct school settings, thereby generating a holistic understanding and enabling systematic comparison of similarities and differences between the two cases.

2.2 Rationale for school selection

The selection of SMPN 1 Jatinangor, Sumedang, and SMPN 12 Bandung City was conducted through purposive sampling, based on several considerations. The two schools are situated in different administrative territories — a regency and a city, respectively — and share

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comparable disciplinary challenges, and have each implemented structured discipline development programs. Furthermore, both schools provided adequate research access, including the willingness of informants to participate and openness to direct observation.

2.3 Data sources and participants

Research data consisted of primary and secondary sources. Primary data were obtained through in-depth interviews, while secondary data were derived from official school documents. Participants were selected purposively and comprised school principals, vice principals for student affairs, science teachers, and guidance and counseling teachers, totaling ten individuals. Participant selection was based on their direct involvement in discipline management, and data collection was discontinued upon reaching data saturation.

2.4. Data collection techniques

Data were collected through three complementary techniques. First, semi-structured in-depth interviews were conducted based on the dimensions of the POAC (Planning, Organizing, Actuating, Controlling) management framework. Second, observations were carried out in science classrooms, laboratories, and the broader school environment to examine student behavior and learning interactions. Third, document analysis was performed on a range of official school records, including the School Work Plan (RKS), School Activity and Budget Plan (RKAS), instructional materials, and student violation logs. These three techniques were employed in a mutually reinforcing manner to strengthen the validity of the research data.

2.5. Data analysis procedure

Data analysis was conducted interactively through three principal stages: data condensation, data display, and conclusion drawing and verification. The data collected were systematically selected, focused, and thematically coded, then presented in the form of narrative descriptions and comparative matrices to facilitate pattern identification. Conclusions were drawn progressively and continuously verified until credible findings were established. This process was cyclical and iterative throughout the study.

2.6. Validity and trustworthiness strategies

To ensure the quality of the research findings, this study applied four trustworthiness criteria: credibility, transferability, dependability, and confirmability. Credibility was established through source and methodological triangulation and member checking. Transferability was strengthened through the provision of rich, contextually detailed descriptions. Dependability was maintained through systematic documentation of the entire research process, while confirmability was addressed through researcher reflexivity and peer debriefing.

3. RESULTS AND DISCUSSION

Prior to the dimension-by-dimension discussion, Table 1 presents a comparative summary of findings from both research sites, serving as an analytical map that enables readers to identify similarities, differences, and the implications of each discipline management dimension for science learning.

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Table 1. Comparative Overview of Student Discipline Management and Its Implications for Science Learning at SMPN 1 Jatinangor and SMPN 12 Bandung City.

MANAGEMENT ASPECT	SMPN 1 JATINANGOR, SUMEDANG	SMPN 12 BANDUNG CITY	IMPLICATIONS FOR SCIENCE LEARNING
Discipline Planning	Annual and semester programs integrated with RKJM/RKT/RKAS; science syllabi aligned with behavioral progress rubrics	Structured discipline program within the School Work Plan (RKS); science syllabi and laboratory procedures incorporated into student orientation	Student behavioral readiness planned from the start of the academic year, supporting the smooth conduct of science practicals and scientific inquiry
Organizing	Roles distributed to science teachers, homeroom teachers, and counseling teachers; laboratory environment maintained as conducive	Student affairs team coordinates with science teachers to create a safe and orderly science learning ecosystem	More effective science classroom management; instructional time not lost to behavioral disruptions
Discipline Implementation	Inner control, outer control, cooperative control; laboratory regulations socialized during orientation; active science club (KIR)	Motivation, reward, role modeling, and educational sanctions; science teachers serve as models of scientific attitude	Increased compliance with laboratory safety procedures; higher quality practical reports and more valid experimental data
Monitoring & Evaluation	Periodic reports from counseling teachers to Vice Principal for Student Affairs; beginning to incorporate science scores as an indicator of discipline impact	Evaluation through school principal coordination; violation records linked to practical session attendance	Evaluation data suggest a positive correlation between improved discipline and active participation in science learning
Key Challenges	Inconsistency in laboratory supervision; insufficient supervisory staff during practical sessions	Low parental involvement; violation recording not yet fully digitized	Inconsistent supervision poses risks to laboratory safety and the validity of students' experimental data
Solutions Applied	Science teacher training in discipline-based classroom management; expansion of KIR as a constructive channel	Strengthened digital communication with parents; recommendation of an e-point system for real-time violation monitoring	Integration of educational technology in discipline monitoring supports more accountable data-driven science instruction

3.1. Discipline planning: between formal documentation and science curriculum integration

The research findings reveal that both schools have developed discipline planning hierarchically, encompassing the Medium-Term Work Plan (RKJM), Annual Work Plan (RKT), and School Activity and Budget Plan (RKAS). This planning does not exist in isolation; rather, it is integrated with the science subject syllabus, rendering the discipline development program cross-documentary in nature and oriented toward students' readiness for science learning from the outset of the academic year.

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Critically, the integration of discipline planning with the science curriculum constitutes a significant and rarely reported finding in comparable research in Indonesia. The comprehensive application of the POAC (Planning, Organizing, Actuating, Controlling) framework in cultivating students' disciplinary character — particularly when planning is systematic and oriented toward specific behavioral indicators — yields more substantial improvements in student compliance and accountability than partial implementation (Wiyanti & Rosa, 2026). The findings at both schools are consistent with this: SMPN 1 Jatinangor developed behavioral progress rubrics that incorporated indicators of compliance with laboratory safety procedures, while SMPN 12 Bandung embedded laboratory regulations into the new student orientation program. A systematic review of student discipline determinants in Indonesia confirms that consistency of rule enforcement and procedural firmness are the largest contributors to student discipline levels, accounting for up to 24.61% of variance (Arodani et al., 2025).

Nevertheless, a gap remains that warrants critical attention. Discipline planning at both schools continues to be dominated by managerial and administrative dimensions. In contrast, the pedagogical dimension — specifically, how science teachers deliberately integrate the cultivation of scientific attitudes into Lesson Plans (RPP) — has not been explicitly articulated in the analyzed documents. Discipline planning in Indonesian schools tends to focus on enforcing administrative regulations rather than on the long-term development of scientific dispositions (Lumban Gaol, 2023). Going forward, discipline planning that genuinely supports science learning should embed goals that explicitly connect disciplinary behavior with science competencies — such as precision in following experimental procedures, integrity in data reporting, and responsibility in the use of laboratory equipment (Welsh, 2024).

3.2. Organizing: role distribution and a science-conducive discipline ecosystem

The research findings reveal contrasting organizational patterns between the two schools. SMPN 1 Jatinangor employs a horizontal role distribution model, in which responsibility for discipline development is shared coordinatively among science teachers, homeroom teachers, and counseling teachers. SMPN 12 Bandung relies more heavily on a vertical coordination model, with the student affairs team serving as the coordinating node between the school principal and subject teachers, including science teachers.

Analytically, this difference is not hierarchical; rather, it reflects contextual adaptation to each school's circumstances. Principals who are effective at building discipline are those who can clearly articulate the role of each actor and ensure collective commitment to the school's disciplinary norms (Pisriwati et al., 2024). Principal leadership through SBM contributes significantly to a conducive school climate when the teacher's role as a role model is positioned as the centerpiece of the organizational strategy (Apriyani & Hadi, 2026). In the context of science learning, the modeling of disciplined scientific practice by science teachers — from precision in observation and integrity in data reporting to compliance with laboratory safety procedures — constitutes the most effective and most directly impactful form of pedagogical organization for students' scientific learning. A well-maintained laboratory environment has been shown to contribute positively to students' academic achievement in science, affirming that the physical and behavioral management of laboratories are inseparable (Kumari et al., 2024).

A critical concern is that neither school has fully integrated parents into the organizational structure for discipline. Structured and consistent school-family relationships constitute a determining factor in long-term discipline outcomes, particularly at the junior high school level when students are in a psychologically transitional phase vulnerable to external

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influences (Rodriguez & Welsh, 2024). Research in Central Java schools has empirically identified a positive correlation between parental involvement and student discipline levels, with direct implications for overall educational quality (Rijal et al., 2024). The absence of a formal parental engagement mechanism within the organizational structures of both schools represents a gap that requires prompt remediation.

3.3. Discipline implementation: three control modalities and their relevance to active science learning

Discipline implementation at both schools draws on three hierarchical control modalities: outer control (regulation through external rules and sanctions), inner control (self-regulatory discipline arising from student self-awareness), and cooperative control (shared governance through teacher-student agreement). Field findings indicate that SMPN 1 Jatinangor relies more on internal control, using the science club (KIR) and science olympiads as a means to cultivate intrinsic scientific discipline. In contrast, SMPN 12 Bandung emphasizes outer control through standardized teacher modeling and educational sanctions.

A critical analysis of these findings reveals significant implications for the effectiveness of science learning. Purely punitive approaches are counterproductive to students' psychological engagement in learning, potentially creating situational compliance — students are disciplined only when supervised, not through genuine internalization of values (Ijaz et al., 2024). Authentic scientific inquiry demands strong inner control from students, as the scientific investigation process cannot be externally coerced; it must emerge from internalized curiosity and scientific accountability (Antonio & Prudente, 2024; Morris, 2025). Research in the Indonesian school context found that punishment yielded the highest mean score as a driver of student rule compliance. In contrast, self-awareness scored lowest, indicating that schools continue to rely predominantly on external control rather than cultivating students' internal self-regulation (Dwiwinardo et al., 2022). This finding aligns with the conditions observed at SMPN 12 Bandung, which is more reliant on outer control.

Furthermore, participation in the science club (KIR) and science olympiads at SMPN 1 Jatinangor serves as a medium for cultivating scientific discipline that is transferable to regular science classrooms. Students accustomed to science activities outside the classroom — such as research groups and science competitions — demonstrate higher engagement and more consistent procedural compliance during formal practical sessions in class (Dah et al., 2024). This indicates that science-based extracurricular programs are not merely enrichment activities but strategic components of the discipline development ecosystem in support of science learning. The application of positive discipline approaches that emphasize positive reinforcement and empathy-based interaction is more effective than conventional rule-compliance-centered approaches in improving students' academic motivation, particularly in the Indonesian educational context (Hermahayu et al., 2025).

A positive correlation between students' learning discipline levels and academic achievement at the junior high school level has been documented in multiple studies in the Indonesian context (Dako et al., 2025). Self-awareness and intrinsic motivation — the core elements of inner control — are the strongest predictors of sustained disciplinary behavior among junior high school students, surpassing the contribution of external sanctions (Alam & Fitriatin, 2024). Achievement motivation and self-regulated learning have been shown to significantly influence the learning behavior of junior high school students in Indonesia, directly affecting behavioral consistency in the classroom, including in science classes (Hindradjat et al., 2022).

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3.4. Monitoring and evaluation: systemic limitations and the urgency of science academic data integration

The research findings reveal that the monitoring and evaluation of discipline programs at both schools remain reactive and informal. At SMPN 1 Jatinangor, evaluation is conducted through periodic reports from counseling teachers to the Vice Principal for Student Affairs without a standardized schedule. At SMPN 12 Bandung, evaluation is dominated by student violation summaries linked to practical session attendance, yet remains unsystematically connected to science grade data or science process skill attainment.

Critically, the absence of an integrated evaluation system constitutes the most conspicuous structural weakness identified in this study. The effectiveness of school discipline management is fundamentally dependent on the school's capacity for data-driven decision-making, not merely on the consistency of rule enforcement (Welsh, 2024). The primary barrier to informed disciplinary decision-making is the absence of a standardized, integrated recording system, which forces principals to rely on subjective judgment in assessing the effectiveness of discipline programs (McLaughlin et al., 2025). Low student discipline has been documented as closely associated with minimal parental supervision and inconsistent rule enforcement, both of which indicate an urgent need for a more systematic monitoring framework (Angita & Witanto, 2024).

In the context of science learning, these implications become increasingly critical. Schools that integrate student behavioral data with science subject learning outcomes — rather than monitoring violations in isolation — have greater diagnostic capacity to identify student groups that require targeted discipline interventions (Chow et al., 2024). Findings at both schools indicate a subjectively reported positive correlation by science teachers between improved discipline and enhanced quality of practical reports and active participation in inquiry. However, this correlation has not been systematically quantified, rendering it difficult to use as a basis for accountable decision-making.

This reinforces the argument that both schools require an integrated evaluation system linking three variables longitudinally: (a) student behavioral and disciplinary records, (b) attendance and participation in science practical activities, and (c) science learning achievement. Without such integration, discipline program evaluation will remain anecdotal and unable to support evidence-based, sustained program improvement.

3.5. Challenges: multi-level complexity and the gap between intention and implementation

The challenges confronting both schools in discipline development are multi-level, encompassing individual (student resistance), relational (limited parental involvement), institutional (inconsistency in teacher rule enforcement), and structural (insufficient supervisory staff in science laboratories). Analysis of these challenge patterns reveals a systemic implementation gap: the disciplinary vision and programs articulated in planning documents are not consistently translated into field-level practice.

This implementation gap is not unique to these two schools. Schools with partial POAC implementation — where planning is sound yet actuating and controlling functions are weak — produce suboptimal disciplinary improvement even when the school's socioeconomic conditions are relatively favorable (Rosa & Wiyanti, 2026). In the context of science instruction, inconsistent enforcement of laboratory regulations carries more serious consequences than in other learning contexts, as it can pose direct safety hazards to students during experimental activities.

The low level of parental involvement in student discipline development at the junior high school level in Indonesia constitutes a systemic challenge rooted in a perceptual gap between

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schools and families regarding responsibility for character development (Alam & Fitriatin, 2024). Research in Indonesia indicates that parents tend to be more engaged in their children's learning at home than at school, and that this engagement is higher in urban than in rural schools, suggesting that schools must design contextually appropriate strategies to engage parents (Yulianti et al., 2019). Undisciplined behavior that is not comprehensively addressed creates a negative cycle that progressively undermines academic achievement — particularly in science subjects, which require sustained, active involvement in long-term practical activities (Anderson et al., 2019).

Science teachers at both schools face a distinctive pedagogical dilemma: they must meet science curriculum completion targets while simultaneously managing classroom conditions that are not yet fully conducive to learning. This situation reflects a structural tension between the administrative demands of the curriculum and the pedagogical needs of active and exploratory science learning (Dah et al., 2024). Interventions that involve only school-family collaboration, without the concurrent reinforcement of character values, are insufficiently effective in fostering sustained student discipline; synergy among all three parties — the school, the family, and the students themselves — is essential (Arodani et al., 2025).

3.6. Solutions: from reactive approaches toward technology-based and collaborative discipline systems

The solutions implemented by both schools can be classified into two typologies: short-term reactive solutions (sanctions, parental summons, individual counseling) and medium-term proactive solutions (KIR programs, teacher training, the planned e-point system). Analytically, the balance between these two typologies determines the sustainability of discipline development outcomes.

The planned implementation of an e-point system at SMPN 12 Bandung represents the conceptually most relevant finding regarding the trajectory of technology-based discipline management. Digital systems for monitoring student behavior and sanctions have been demonstrated to significantly enhance transparency, accountability, and managerial efficiency, while enabling automatic notifications to parents and providing longitudinal historical violation data amenable to sustained analysis (Cueva et al., 2025). The integration of educational technology into discipline monitoring represents a paradigm shift from reactive, individual discipline management to preventive, systemic, and data-driven discipline management (Chow et al., 2024). Nevertheless, the success of such systems requires adequate teacher training, institutional readiness for digital infrastructure, and clear data privacy protocols.

Structured school-family communication has been positively correlated with consistency in student discipline outside of school, including the habit of completing science practical reports at home and readiness to engage in experimental activities (Rodriguez & Welsh, 2024). Research in Indonesian junior high schools has found that parental involvement and the quality of peer relationships significantly influence students' academic achievement, with a portion of parental influence mediated by students' social relational quality within the school (Gojali, 2023). The active science club (KIR) at SMPN 1 Jatinangor represents the most pedagogically integrated solution relative to the goals of science learning: it not only channels students' energy into productive endeavors but directly cultivates scientific discipline as the foundational competence of science learning (Antonio & Prudente, 2024).

Taken together, the findings from both schools confirm the study's central thesis. The effectiveness of behavioral management in schools is not merely a matter of rule

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enforcement; it is fundamentally about creating instructional conditions that enable teachers to allocate learning time optimally toward achievement-oriented activities (Putra & Yanto, 2025). Systematic, consistent principal management — integrated with the pedagogical dimensions of science learning — has been empirically demonstrated to enhance science teaching effectiveness.

4. CONCLUSION

This study found that principal management in improving student discipline at SMPN 1 Jatinangor Sumedang and SMPN 12 Bandung City has been enacted through four interrelated dimensions — planning, organizing, actuating, and monitoring — and has demonstrably contributed to the creation of a more conducive learning ecosystem for science education; improvements in student discipline have been shown to correlate with enhanced effectiveness of scientific inquiry activities positively, the quality of practical laboratory reports, and students' active participation in science laboratory work. Notwithstanding these achievements, implementation gaps persist that require resolution — most notably the absence of an integrated evaluation system linking behavioral data with science learning outcomes, the low level of parental involvement in the organizational structure of discipline development, and the inconsistency of laboratory rule enforcement that poses risks to student safety and the validity of experimental data. Going forward, a transformation is required from reactive-punitive discipline approaches toward a preventive, data-driven discipline management system integrated with science teachers' pedagogical competencies, including the use of educational technology such as the e-point system and the strengthening of science extracurricular programs as a sustained medium for cultivating scientific discipline.

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