

**Differentiated instruction in Science 12: Implementation, effectiveness, challenges,
and coping strategies among public senior high school teachers**

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ABSTRACT

Differentiated instruction has become an important teaching approach for addressing the diverse learning needs of students in contemporary science classrooms. Despite its recognized benefits, limited evidence exists on how Science 12 teachers implement differentiated instruction, the challenges they encounter, and the strategies they employ to sustain its classroom application in public senior high schools. This study assessed the effectiveness of differentiated instruction in teaching Science 12 in selected public senior high schools in Legislative District 1, Isabela, during the School Year 2025–2026. Using a descriptive-normative research design, data were gathered from 36 Science 12 teachers through a validated questionnaire, documentary analysis, and unstructured interviews. The findings revealed that differentiated instruction was often implemented and perceived to be very effective. The Science 12 Most Essential Learning Competencies were fully realized despite very serious challenges related to resources, time, curriculum demands, class size, and instructional complexity. Teachers addressed these constraints through reflective practice, professional development, collaboration, and adaptive instructional strategies. The study concludes that differentiated instruction is an effective approach for improving Science 12 instruction when supported by adequate resources, continuous teacher development, and strong institutional support.

Keywords: Differentiated instruction, Science 12, most essential learning competencies, instructional challenges, public senior high schools.

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INTRODUCTION

The rapid advancement of scientific knowledge and technology in the twenty-first century has significantly reshaped educational systems worldwide, compelling the widespread adoption of modern teaching methods, particularly in developing countries where traditional instructional approaches often fail to address the diverse needs of learners. Conventional teaching methods tend to constrain students' critical thinking, creativity, and active participation, producing learning environments that are less responsive to individual differences and to the evolving demands of contemporary education (Tomlinson, 2004). In

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response to these limitations, modern instructional strategies seek to integrate all essential components of the educational process, namely the teacher, the learner, the curriculum, and the school environment (Raud & Orekhova, 2020), fostering interactive and engaging learning experiences that create meaningful opportunities for teacher–student interaction and a deeper understanding of scientific concepts.

Central to this shift is the growing recognition of individual differences among learners, a principle firmly grounded in Howard Gardner's Theory of Multiple Intelligences, which holds that learners possess diverse cognitive strengths and learning preferences that necessitate instructional strategies responsive to these differences (Ardi et al., 2021). This theoretical premise has encouraged educators to adopt differentiated instruction, a systematic approach designed to address students' varying readiness levels, interests, and learning profiles (Dack, 2019). As an effective pedagogical approach, differentiated instruction (DI) promotes individualized learning by enabling students to participate actively in classroom activities while developing initiative, creativity, and self-discipline according to their unique abilities, goals, and stages of development (Manurung et al., 2023).

Empirical evidence lends strong support to these theoretical claims. Research has consistently demonstrated that differentiated instruction enhances academic achievement, promotes long-term learning, and increases students' motivation in science education (Smets et al., 2022), while students exposed to differentiated strategies tend to develop more positive attitudes toward learning, participate more actively, and gain a greater appreciation of the learning process (Alavinia & Farhady, 2012). The relevance of these findings extends across national contexts, as illustrated by Indonesia's Merdeka Curriculum, which strongly promotes differentiated learning. Studies conducted between September and April 2023 revealed that approximately 70% of science teachers successfully implemented differentiated instruction, resulting in improved student learning outcomes, although nearly half of the teacher's expressed concerns regarding the relevance of school lessons and learning tasks. These findings underscore the importance of aligning instructional practices with students' learning needs and cultural backgrounds to maximize educational outcomes (Manurung et al., 2023).

Notwithstanding these documented benefits, the implementation of differentiated instruction is far from straightforward, as several persistent challenges constrain its practical application. Curriculum constraints, heavy workloads, limited instructional resources, and inadequate administrative support often hinder effective implementation (Hajis & Othman, 2024), while the perceived complexity of differentiating instruction, large class sizes, and limited access to high-quality professional development further impede adoption (Meutstege et al., 2023). Compounding these structural barriers, many teachers possess only a limited understanding of differentiated instruction, which restricts their capacity to adapt classroom practices to accommodate diverse learning needs (Delisle, 2015). Even where teachers hold positive attitudes toward differentiated instruction, its classroom implementation remains inconsistent because of the difficulties associated with designing flexible curricula, monitoring student progress, and developing learning activities that address varying learner needs (DiPirro, 2017). This tension between favorable disposition and inconsistent practice suggests that positive attitudes alone are insufficient to ensure effective implementation without adequate structural and professional support.

The urgency of resolving this tension is heightened by the increasing diversity of contemporary science classrooms, which comprise students with varying levels of prior knowledge, learning styles, interests, cultural backgrounds, and abilities (Moosa & Shareefa, 2019). Such diversity renders the traditional one-size-fits-all method inadequate for addressing learners' individual needs (Santangelo & Tomlinson, 2012), reinforcing the necessity of differentiated instruction as a practical framework through which teachers can modify instructional content, learning processes, and assessment products according to students'

readiness levels, learning profiles, and personal interests (Tomlinson, 2017). Within this framework, content differentiation ensures that learners engage with curriculum materials in ways that match their cognitive abilities and preferred learning styles, process differentiation enables students to explore concepts through varied instructional activities, and product differentiation allows them to demonstrate understanding through multiple forms of assessment, collectively promoting deeper learning and greater engagement (National Science Teachers Association [NSTA], 2009).

The value of this framework is further affirmed by evidence of its effectiveness across educational levels. In elementary classrooms, differentiated instruction enhances students' motivation, comprehension, and classroom engagement (Demir, 2021), while in junior and senior high school settings, it improves academic performance, learning outcomes, and students' capacity to think critically and reflect on their own learning. Beyond cognitive gains, differentiated instruction also fosters creativity, practical skills, and lifelong learning by addressing students' physical, psychological, and social development (Al-Shehri, 2020), findings that collectively justify its strong recommendation for science classrooms seeking to accommodate learner diversity and maximize educational outcomes.

Given this convergence of documented benefits alongside persistent implementation challenges, it becomes essential to examine teachers' perceptions and classroom practices regarding differentiated instruction, since teachers' beliefs, attitudes, and professional knowledge significantly influence the extent to which such strategies are effectively enacted (Tomlinson & Moon, 2013). Survey research offers a practical means of capturing these perceptions while identifying gaps in teachers' professional preparation, instructional practices, and utilization of available resources (Yunaini, 2024). This concern is particularly salient in senior high schools, where the complexity of science concepts, the diversity of learners, and rising academic expectations create unique and demanding instructional conditions.

It is within this context that the present study sought to determine the extent to which differentiated instruction is implemented in teaching Science 12 across public senior high schools in Legislative District 1, Isabela. Specifically, it examined teachers' instructional practices, the challenges they encountered, and the perceived outcomes of differentiated instruction, with the expectation that the findings would provide valuable insights to inform instructional planning, evidence-based decision-making, and policy formulation aimed at enhancing the quality of science education in the district.

This study was anchored on the theory of differentiated instruction developed by Carol Ann Tomlinson, a leading proponent of differentiated instruction (Palieraki & Koutrouba, 2021), which posits that effective teaching requires modifying content, process, product, and learning environment according to students' readiness levels, interests, and learning profiles. In the context of Science education, where learners are expected to understand complex and abstract concepts, differentiated instruction enables teachers to make learning more accessible without compromising academic rigor and intellectual challenge, affirming that a one-size-fits-all approach is no longer sufficient to address the diverse learning needs of students in today's secondary school classrooms.

To further explain how differentiated instruction promotes meaningful learning, the study also drew on Lev Vygotsky's Zone of Proximal Development (ZPD), which asserts that learning occurs most effectively when instruction is provided just beyond a learner's current level of competence but remains within a range achievable through appropriate guidance and support. Differentiated instruction reflects this principle by designing learning tasks that appropriately challenge students while providing the scaffolding necessary for success, a consideration especially critical in Science education, where conceptual understanding,

inquiry, and problem-solving demand instruction closely aligned with learners' cognitive development and individual capabilities.

This theoretical foundation is further enriched by Albert Bandura's Social Cognitive Theory, which emphasizes the role of self-efficacy, observational learning, and the classroom environment in shaping student achievement. In a differentiated classroom, students gain confidence by observing peers successfully perform learning tasks suited to their abilities, an experience that enhances motivation, strengthens learners' belief in their own capabilities, and encourages active participation in Science learning activities. This perspective holds particular relevance in Science education, where many students experience anxiety or lack confidence when confronting unfamiliar or technically demanding concepts.

Taken together, these theories, Tomlinson's model of differentiated instruction, Vygotsky's Zone of Proximal Development, and Bandura's Social Cognitive Theory, form a coherent and mutually reinforcing theoretical basis for understanding how differentiated instruction addresses learner diversity in Science classrooms: Tomlinson's framework identifies what must be modified, Vygotsky's theory explains how instruction should be calibrated to learners' developmental readiness, and Bandura's theory accounts for the motivational and psychological mechanisms that sustain student engagement within a differentiated environment. Guided by this integrated theoretical perspective, the present study investigated the implementation of differentiated instruction in teaching Science 12 in public senior high schools in Legislative District 1, Isabela, specifically examining teachers' instructional practices, the extent of differentiated instruction implementation, the realization of the Most Essential Learning Competencies (MELCs), the challenges encountered by teachers, and the coping mechanisms they employed to address these challenges. The findings of this study are expected to contribute to the improvement of Science instruction by providing empirical evidence to inform instructional planning, professional development, and educational policy.

Statement of the problem

This study sought to determine the effectiveness of differentiated instruction in teaching Science 12 in public senior high schools in Legislative District 1, Isabela, during the School Year 2025–2026.

Specifically, it sought to answer the following questions:

1. What is the profile of the respondents in terms of age, gender, civil status, highest educational attainment, present position, latest performance rating, length of service, and level of in-service training attended?
2. To what extent is differentiated instruction implemented in teaching Science 12, and what are its perceived effects on teaching and learning?
3. To what extent are the Most Essential Learning Competencies (MELCs) in Science 12 realized through the implementation of differentiated instruction?
4. To what extent are the challenges encountered in implementing differentiated instruction in terms of teacher related factors, time management, student related factors, resource related factors, curriculum content, class size, and the nature of differentiated instruction?
5. What coping mechanisms do teachers employ to address the challenges encountered in implementing differentiated instruction?

METHODOLOGY

This study employed the descriptive-normative research design to assess the effectiveness of differentiated instruction in teaching Science 12 in selected public senior high schools in Legislative District 1, Isabela, during the School Year 2025–2026. According to Habaridota (2019), the descriptive-normative research design is appropriate for examining the current condition of a group, program, or situation, as it extends beyond the simple collection of facts by identifying relationships among variables, describing existing conditions, defining problems, and generating information that may serve as a basis for improving educational practices; this design involves the systematic selection of respondents, objective collection and organization of data, and careful interpretation of findings. Complementing this view, Kaiser (2017) explained that descriptive research is particularly appropriate in educational settings where the objective is to describe existing practices rather than determine cause-and-effect relationships, focusing instead on answering the question of what exists in a given setting; in the present study, this design enabled the researcher to describe how differentiated instruction was implemented in Science 12 classrooms and to identify the instructional practices and challenges encountered by teachers without manipulating any variables. In relation to the normative dimension of the design, Christiani (2016) emphasized that normative research seeks to establish typical practices or standards within a particular population by describing prevailing conditions and interpreting findings to determine educational norms or benchmarks, and in this study, the normative aspect was utilized to determine the prevailing practices in the implementation of differentiated instruction among Science 12 teachers. Synthesizing these perspectives, Short (2023) explained that descriptive-normative research combines the systematic description of existing practices with the identification of prevailing standards within a particular setting, an approach that enabled the researcher to document the implementation of differentiated instruction, identify common instructional practices, and generate findings that may contribute to improving Science instruction in public senior high schools.

The study was conducted in selected public senior high schools located within Legislative District 1 of the Province of Isabela. Originally, the Province of Isabela was represented as a single legislative district until 1972. It became part of the regional representation from 1978 to 1984 and later elected three assemblymen at large from 1984 to 1986. Following the reorganization of legislative districts in 1986, Isabela was divided into four congressional districts. Subsequently, Republic Act No. 11080, signed into law on September 27, 2018, reapportioned the province into six legislative districts, including Legislative District 1. Legislative District 1 presently comprises the City of Ilagan and the municipalities of Cabagan, Delfin Albano, Divilacan, Maconacon, San Pablo, Santa Maria, Santo Tomas, and Tumauini, and these localities served as the coverage area of the study.

The respondents of the study were 36 Science 12 teachers from selected public senior high schools in Legislative District 1, Isabela. The researcher employed purposive sampling to select respondents who were directly involved in teaching Science 12 during the conduct of the study. The respondents were drawn from the nine component local government units of Legislative District 1, and equal representation from each locality ensured that the data reflected the implementation of differentiated instruction across the entire district.

The study utilized three data-gathering instruments, namely the questionnaire, documentary analysis, and unstructured interviews. The primary instrument was a researcher-made questionnaire developed from relevant books, journal articles, theses, and dissertations. The questionnaire consisted of five parts: the respondents' profile, the extent of use and

effectiveness of differentiated instruction, the extent of realization of the Most Essential Learning Competencies (MELCs) in Science 12, the challenges encountered in implementing differentiated instruction, and the effectiveness of teachers' coping mechanisms in addressing these challenges. Prior to its administration, the questionnaire underwent pilot testing among selected Science 12 teachers from a neighboring municipality, wherein the respondents were requested to answer the instrument and provide suggestions for improving its clarity and content. The questionnaire was likewise reviewed by the researcher's adviser and the Dean of the Graduate School, and their comments and recommendations were incorporated into the final version before its administration. To validate and clarify selected questionnaire responses, the researcher conducted unstructured interviews with respondents during the retrieval of the questionnaires, and these informal interviews provided additional insights and helped verify responses that required clarification. The researcher also employed documentary analysis by examining relevant instructional documents such as lesson plans, curriculum guides, and other teaching materials, which served as supplementary sources of information that supported and validated the questionnaire data.

Prior to the conduct of the study, the researcher secured approval from the Office of the Schools Division Superintendent and sought permission from the respective school principals and school heads of the participating schools. After obtaining the necessary approvals, the questionnaire was validated, revised based on expert recommendations, reproduced, and personally administered to the respondents, with the researcher supervising both the distribution and retrieval of the questionnaires to ensure a high retrieval rate and the completeness of the responses. Upon retrieval, the completed questionnaires were checked for completeness, organized, encoded, and prepared for statistical analysis, and the findings were then interpreted in accordance with the objectives of the study.

After all questionnaires had been retrieved, the responses were organized, tabulated, and statistically analyzed to facilitate the interpretation of the findings. Frequency and Percentage were used to describe the demographic profile of the respondents, while Weighted Mean was employed to determine the extent of the use and effectiveness of differentiated instruction, the extent of realization of the Most Essential Learning Competencies, the seriousness of the challenges encountered by teachers, and the effectiveness of their coping mechanisms.

RESULTS AND DISCUSSION

The results and discussion presented in this section are based on data gathered from 36 Science 12 teachers from selected public senior high schools in Legislative District 1, Isabela, who served as respondents of the study. Consistent with the descriptive-normative research design employed and the purposive sampling technique used to identify teachers directly involved in teaching Science 12, data were collected through a researcher-made questionnaire supported by unstructured interviews and documentary analysis, and were statistically treated using Frequency and Percentage to describe the respondents' profile and Weighted Mean to determine the extent of use and effectiveness of differentiated instruction, the extent of realization of the Most Essential Learning Competencies, the seriousness of the challenges encountered, and the effectiveness of the coping mechanisms employed. The discussion that follows is grounded strictly in the data gathered and is interpreted in direct relation to the specific objectives of the study.

The demographic profile of the respondents revealed that they were generally experienced and academically prepared Science 12 teachers. Most of them were 31–35 years old, female, married, MAEd graduates, and held Teacher III positions. A large majority also received Outstanding performance ratings, while many had served for 6–10 years. These

findings suggest that the respondents were professionally mature, adequately trained, and capable of providing informed responses regarding the use of differentiated instruction in Science 12, lending credibility to the subsequent findings on instructional practice, competency realization, challenges, and coping mechanisms, since the data were sourced from teachers with substantial classroom experience and strong academic preparation.

With respect to the extent of use of differentiated instruction, the results showed that it was often used in teaching Science 12, as reflected in the overall weighted mean of 4.08. Among the specific strategies, peer tutoring and collaboration obtained the highest rating of 4.28, indicating that teachers commonly employed group-based learning to help students support one another. This finding implies that Science 12 teachers recognized the value of shared learning, particularly in handling complex lessons and varied learner abilities, a practice that resonates with Vygotsky's Zone of Proximal Development, which emphasizes that learning is most effectively facilitated when students are guided through tasks slightly beyond their current competence with the support of more capable peers or instructors. In contrast, assessing student readiness and interests received the lowest mean of 3.86, suggesting that although teachers actively used differentiated instruction, the practice of diagnosing learner needs prior to instruction still required strengthening. This gap is noteworthy given that Tomlinson's theory of differentiated instruction identifies the assessment of readiness, interest, and learning profile as a foundational step for effectively modifying content, process, and product, and its comparatively lower rating suggests that teachers may be more inclined toward implementing differentiation strategies than toward the diagnostic groundwork that should precede them.

In terms of effectiveness, the differentiated instruction strategies were found to be very effective, as shown by the overall weighted mean of 4.21. The use of scaffolded non-verbal aids obtained the highest mean of 4.31, followed by assessing student readiness and interests and strategic grouping, both with a mean of 4.25. This finding indicates that learners benefited from visual support, structured guidance, and flexible grouping, and it further suggests that differentiated instruction becomes more effective when teachers provide concrete learning aids and organize students according to their needs, readiness, or performance levels. This result aligns with the National Science Teachers Association's (2009) assertion that content, process, and product differentiation collectively promote deeper learning and greater engagement, and it also reflects Bandura's Social Cognitive Theory, insofar as scaffolded aids and strategic grouping create conditions in which students can observe and model successful task performance among peers, thereby strengthening self-efficacy and motivation. Notably, assessing student readiness and interests, despite being rated lowest in terms of frequency of use at 3.86, was rated highly in terms of effectiveness at 4.25, a pattern suggesting that teachers who did assess readiness and interest found the practice highly beneficial, even though it was not yet consistently applied across all classrooms.

The realization of the Science 12 Most Essential Learning Competencies (MELCs) through differentiated instruction was found to be full, with the first quarter obtaining a weighted mean of 4.34 and the second quarter obtaining 4.29, resulting in an overall mean of 4.32. This indicates that differentiated instruction helped teachers deliver the required competencies effectively across the two quarters examined. The slightly higher rating in the first quarter may suggest that topics during this period were more manageable or more suited to differentiated activities, although both quarters demonstrated strong realization of the competencies, implying that differentiated instruction consistently supported curriculum delivery across different Science 12 content areas. This finding corroborates earlier research indicating that differentiated instruction enhances academic achievement and long-term learning in science education (Smets et al., 2022), and it further supports Manurung et al.'s

(2023) observation that differentiated instructional strategies contribute to improved student learning outcomes when properly implemented.

Despite these generally positive outcomes, the teachers encountered very serious challenges in using differentiated instruction, as reflected in the overall weighted mean of 4.32. The most serious concerns were resource-related factors and the nature of differentiated instruction itself, both obtaining a mean of 4.38, followed by class size with a mean of 4.35 and time management with a mean of 4.31. These findings show that while differentiated instruction was useful, its implementation was also demanding, requiring more instructional materials, greater classroom space, additional preparation time, and stronger support in managing large and diverse classes. This is consistent with Hajis and Othman's (2024) findings that curriculum constraints, heavy workloads, limited instructional resources, and inadequate administrative support hinder the effective implementation of differentiated instruction, as well as with Meutstege et al.'s (2023) observation that the perceived complexity of differentiating instruction, coupled with large class sizes and limited professional development opportunities, impedes its adoption in actual classroom settings.

Teacher-related and student-related challenges were likewise rated very serious, both obtaining a mean of 4.27. Among the specific concerns, the lack of confidence in applying differentiated instruction obtained a notably high mean of 4.56, while low student motivation and large class size both received a mean of 4.47. These results suggest that the successful use of differentiated instruction depends not only on teacher competence but also on student participation and classroom conditions, indicating that even skilled teachers may find it difficult to differentiate instruction effectively when learners lack motivation or when large class sizes limit close monitoring. This finding reflects Delisle's (2015) observation that many teachers possess only a limited understanding of differentiated instruction, which restricts their ability to adapt classroom practices to accommodate diverse learning needs, and it also parallels DiPirro's (2017) contention that positive teacher attitudes toward differentiated instruction do not necessarily translate into consistent classroom implementation, given the practical difficulties of designing flexible curricula and monitoring diverse learners simultaneously.

Curriculum-related challenges were similarly rated as very serious, with a mean of 4.26. The large number of topics in the Science 12 curriculum and the pressure to follow pacing guides were found to limit teachers' flexibility in differentiating instruction. This finding implies that teachers may fully understand and appreciate the value of differentiated instruction, yet the demands of curriculum coverage can significantly restrict their ability to adjust lessons according to learner needs, a tension that echoes Moosa and Shareefa's (2019) characterization of contemporary science classrooms as increasingly diverse in terms of prior knowledge, learning styles, and abilities, conditions that inherently require more instructional time and flexibility than standard pacing guides typically allow.

In response to these challenges, the coping mechanisms employed by teachers were found to be very effective, with an overall weighted mean of 4.39. The most effective coping mechanism was regular reflection on differentiated instruction practices, with a mean of 4.75, followed by attending professional development and training, with a mean of 4.72, and collaborating with co-teachers, with a mean of 4.53. These results imply that teachers were not passive in facing instructional difficulties; rather, they actively adjusted their practices, sought professional growth, and relied on peer collaboration to improve the implementation of differentiated instruction. This finding is consistent with Tomlinson and Moon's (2013) assertion that teachers' beliefs, attitudes, and professional knowledge significantly influence the extent to which differentiated instructional strategies are effectively implemented, suggesting that the high effectiveness of reflection and professional development as coping mechanisms may itself be a product of teachers' underlying commitment to improving their differentiated instructional practices despite the serious challenges they faced.

Taken together, the findings demonstrate that differentiated instruction was often used and was considered very effective in teaching Science 12, and that it contributed to the full realization of the Most Essential Learning Competencies across the first and second quarters. At the same time, its implementation remained challenging because of limited resources, large class size, time constraints, curriculum demands, and the inherently complex nature of preparing differentiated activities, challenges that teachers addressed through regular reflection, professional development, and collaboration with colleagues. These results collectively affirm the theoretical premises underlying the study, namely Tomlinson's model of differentiated instruction, Vygotsky's Zone of Proximal Development, and Bandura's Social Cognitive Theory, by empirically showing that differentiation strategies rooted in peer collaboration, scaffolding, and strategic grouping can meaningfully enhance both instructional delivery and competency attainment even under resource and structural constraints. In addressing the specific objectives of the study, the findings establish that differentiated instruction is a strong and effective instructional approach in Science 12, but one whose full potential is contingent upon the availability of sufficient instructional materials, continuous teacher training, manageable class sizes, and stronger institutional support. These insights provide an empirical foundation for the conclusions and recommendations to be presented in the succeeding chapter, which will further examine the implications of these findings for instructional planning, teacher professional development, and educational policy formulation within the district.

CONCLUSION

The findings indicate that the respondents were generally professionally qualified and experienced Science 12 teachers. Most were 31–35 years old, female, married, MAEd graduates, and Teacher III, with Outstanding performance ratings. Most had attended district-level in-service training, suggesting that while teachers regularly participated in professional development, their training opportunities were largely limited to locally conducted programs.

The study further established that differentiated instruction was regularly practiced in Science 12 classes. Among the various strategies, peer tutoring and collaboration emerged as the most frequently used, while assessing student readiness, strategic grouping, scaffolded non-verbal aids, and collaborative learning were perceived to be the most effective. These findings demonstrate that differentiated instruction promotes active learning and responds well to the diverse needs of learners when teachers deliberately adjust instructional strategies according to students' readiness, interests, and learning profiles.

The Science 12 Most Essential Learning Competencies were fully realized during both the first and second quarters, indicating that differentiated instruction contributed positively to the attainment of the intended learning outcomes despite the varying complexity of the subject matter. This affirms that differentiated instruction is an effective approach for improving Science instruction when implemented consistently.

However, the implementation of differentiated instruction remained constrained by several serious challenges. The most pressing concerns involved limited instructional resources, the inherently demanding nature of differentiated instruction, large class sizes, time constraints, curriculum demands, and teacher- and learner-related factors. These conditions made it difficult for teachers to consistently plan, implement, and assess differentiated learning activities that address the diverse needs of students.

Despite these challenges, the teachers identified highly effective coping mechanisms, particularly continuous reflection on classroom practices, sustained professional development,

collaborative lesson planning, learner profiling, the use of lesson templates, flexible grouping, learning stations, peer-assisted learning, and the development of low-cost instructional materials. These practices demonstrate that teachers remain committed to improving instruction despite existing limitations.

In view of these findings, schools should strengthen professional development programs that focus on practical, classroom-based differentiated instruction strategies, particularly those applicable to Science 12. School administrators should encourage collaborative lesson planning, provide standardized instructional resources, and implement measures that reduce unnecessary administrative workload to allow teachers more time for instructional planning and learner support. Greater investment in instructional materials, technology, and flexible learning spaces is likewise necessary to facilitate effective differentiated instruction. Strengthening learner profiling, classroom management, and motivational strategies will further enhance the responsiveness of instruction to individual learner needs. At the curriculum level, schools may also consider allowing greater flexibility in pacing while maintaining alignment with the prescribed competencies.

Finally, future studies may investigate the effects of specific differentiated instruction strategies on students' academic performance across different learning environments, class sizes, and learner characteristics to provide stronger empirical support for instructional decision-making.

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