Int. j. adv. multidisc. res. stud. 2026; 6(2):1905-1938

Received: 10-03-2026
Accepted: 20-04-2026

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Conceptual Understanding Through Differentiated Interest-Based Learning and Instruction (DIBLI) in Teaching Exogenic Processes in Earth and Life Science

[1] Stephanie Jean A Obayan, [2] Anne S Lorca, [3] Cristina B Ramas, [4] Sunliegh C Gador, [5] Robert Jay N Angco, [6] Hedeliza A Pineda, [7] Nolasco K Malabago

[1] Department of Education, Mandaue City, Philippines
[2, 3, 4, 5, 6] Cebu Technological University, Main Campus, MJ Cuenco Ave. R. Palma St. Cebu City, Philippines
[7] Dean, Cebu Technological University, Main Campus, MJ Cuenco Ave. R. Palma St. Cebu City, Philippines

DOI: https://doi.org/10.62225/2583049X.2026.6.2.6190
Corresponding Author: **Stephanie Jean A Obayan**

Abstract

This research affirmed that Differentiated Instruction (DI) using the Interest-based Learning (IBL) or Differentiated Interest-Based Learning and Instruction (DIBLI) strategy at Canduman National High School at H. Abellana St., Canduman, Mandaue City, Cebu, showed efficacy in dealing with mixed-ability learners having diverse learning styles and interests during the first quarter of S.Y. 2024-2025, as the basis for the Enhanced Detailed Lesson Plan in teaching exogenic processes in Earth and Life Science. A mixed-methods design was applied in the study with 47 respondents. The pre-test and post-test scores were gathered using the adapted questionnaires. The respondents were also asked about the challenges they encountered. Based on the findings, the learners' performance on the pre-test and post-test reveals a significant increase in scores for competencies of describing how rocks undergo weathering and explaining how the products of weathering are carried away by erosion and deposited elsewhere, while a non-significant improvement was observed for making a report on how rocks and soil move downslope due to the direct action of gravity. The non-significant outcome regarding the competency of making a report on how rocks and soil move downslope due to the direct action of gravity does not necessarily indicate that the learning material is ineffective; rather, it highlights areas needing improvement. Moreover, the respondents' feedback to challenges they encounter about the implementation of the Differentiated Interest-Based Learning and Instruction (DIBLI) strategy reveals four main themes:(A) Struggles in Managing Time, (B) Limitations in Resources and Accessibility Issues, (C) Difficulties in Sustaining Engagement and Aligning Interests, and (D) Issues with Visual Learning and Interpretation. There is a need for additional time to plan and implement differentiated instruction effectively. In addition, develop an upgraded, detailed lesson plan to guarantee the effective use of the lesson in order to enhance learners' scores in the lesson.

Keywords: Differentiated Instruction (DI), Interest-Based Learning (IBL), Differentiated Interest-Based Learning and Instruction (DIBLI), VARK Learning Theory, Inclusive Education

1. Introduction

1.1 Rationale of the Study

Interest is a powerful motivating factor in education, significantly enhancing learner engagement and success (Tlais, 2024). In this face-to-face modality, educators come up with various instructional designs that are compatible with the new learning setup after the pandemic. In this case, Subban (2006) and Insorio (2024) state that Differentiated Instructions (DI) can provide various avenues in learning that will keep the learners engaged and make them more interested. Quijano (2023) and Fu *et al.* (2024) attest that interest, by definition, is an exceptional factor for motivation that drives learners to learn and accomplish academic success, while engagement, by definition, is the magnitude of attention, interest, and passion of learners in learning that can also increase learners' motivation and result in outstanding academic performance.

Traditional teaching in the Philippine education system followed a "one-size-fits-all" model, focusing on standardized instruction to improve National Achievement Test scores (Behiga, 2022). It was discussed by Goodwin (2024) that the teacher-centered approach was obsolete in 21st-century learning, which aims to develop lifelong learners. In a heterogeneous setup with mixed-ability learners, a teacher-centered approach cannot sustain the various learning needs and interests of these diverse learners. Inclusive education was highly encouraged in the Philippine Educational system to address this. It is recommended that there be a need for additional time to plan differentiated instruction effectively and successfully implement. In addition, develop a detailed lesson plan to guarantee the effective use of the lesson, in enhancing learners' performance in the subject as well as in other areas of learning concern (Beltran *et al*., 2025).

It was widely acknowledged that differentiated instruction benefited all students within the classroom, from those with special needs to those with giftedness and disabilities. It became clear that distinguishing learners' levels of learning style and interests, common approaches for tailored instruction, and topic literacy included adapting and extending work, and communicating learning objectives (Koehler, 2023).

Bal (2023) specifies that a secondary school learner exhibits a range of academic skills and achievement levels. Contributing to this variation is the need to tailor the curriculum to meet individual learners' requirements. Consequently, with the growing diversity among learners in the classroom, there is an increasing demand for teaching methods such as differentiated instruction. This aligns with socio-constructivist theories that reinforce the concept of the Zone of Proximal Development (Vygotsky, 1978; and Rahman, 2024), which highlights that educational requirements differ based on students' achievement levels, and adjusting education to address these varying needs fosters more effective learning.

Sari and Putri (2022) assert that interest is paramount for learners' academic attainment. Academic achievement and interest are associated, according to earlier research. As a result, learners who are more interested in their studies perform better academically. As mentioned by Widya Karmila Sari Achmad *et al*. (2024), it is vivid in 21st-century learning wherein teachers are challenged to provide inclusive education to a diversity of 21st-century learners. The central idea of inclusivity and fairness in education policy, which emphasizes that "every learner is important and valued equally," necessitated changes across all levels of education, affecting everyone from educators to national policymakers. It is very crucial not to overlook the understanding of how learners learn most effectively within their Zone of Proximal Development.

Khelifi and Hamzaoui-ElAchachi (2025) emphasize that in today's increasingly diverse classrooms, a "one-size-fits-all" teaching method is not as effective as it was before. To align with individual learners' mindsets and treat teaching as a responsive process, differentiated instruction is an effective approach to tailoring teaching and learning. The mentioned author explained further that the priority in a learner-centered paradigm is the individual's desires for learning, which have been inspired by the insufficiency of one-size-fits-all instruction in meeting the varied needs of learners. This change in education is consistent with learner-centered learning's core premise of equity in education, which highlights that equitable and fair learning opportunities are necessary for active student engagement.

Boholano *et al*. (2020) confirm that traditional teachers' pre-training hardships became an opportunity to comprehend their 21st-century students and devise strategies to meet their demands. Furthermore, it offered them a way to change the overwhelmingly instructional nature of the teaching and learning process to one that is student-centered. These educators can proficiently incorporate technology into their lessons and educational procedures. Continuous implementation of this will lead to students' infinite learning opportunities.

Che Mat and Jamaludin (2024) expound that the development of critical thinking and cognitive skills is another facet of improved student-centered learning outcomes. Students exposed to a student-centered learning environment become more adept at cognitive processes, problem-solving, analytical thinking, and metacognitive awareness, which enhances their cognitive capacities.

Lloyd and Yang (2025) note that the substantial long-term costs associated with even temporary declines in educational quality suggest that policymakers should exercise extreme caution when implementing reforms that could potentially disrupt early learning environments. Lai (2022) explains that when tests play a significant role, teachers feel increased pressure as they are accountable for enhancing students' test performances. Consequently, assessments lead to a focus on teaching specifically for the test. Teaching to the test means making use of all available resources and classroom time to prepare students for standardized assessments. Lloyd and Yang (2025) added that a significant shift in Philippine early education policy resulted in an unanticipated decline in academic performance and test scores. As supported by Lai (2022), this approach diminishes the aspect of teaching the subject matter in depth. More class time is dedicated to activities such as exercises, drills, and rote memorization. Additionally, the focus on basic skill courses during examination periods often comes at the expense of developing higher-order thinking skills.

Moreover, in the School Monitoring, Evaluation, and Adjustment Report (SMEA) in the first quarter of school year 2023-2024, the Mean Percentage Score (MPS) of the learners in the First Quarter Exam is 78.73%, and the General Scholastic Average (GSA) is 88.95% in Earth and Life Science.

In relevance, this study was motivated by the observed gap among the teacher-centered approach associated with "one-size-fits-all" curriculum; development of 21st-century skills for lifelong learners including critical and creative thinking, collaboration and technology integration; implementation of standardized, unified national assessments to all basic education learners lastly the School Monitoring, Evaluation, and Adjustment Report (SMEA) in Mean Percentage Score (MPS) during the first quarter examination and General Scholastic Average (GSA) of Earth and Life Science in the First Grading period.

It is important to prioritize inclusive education through the implementation of differentiated instruction using interest-based learning as a pivotal paradigm shift to a learner-centered curriculum, as needed in 21st-century lifelong learners.

As mentioned above, interest-based learning and differentiated instruction are both enrichment theories; thus, both are complementary to escalating learners' engagement and academic achievement, followed by standardization and product creativity (Reis *et al*., 2021).

Theoretical Background

This research assumed that Differentiated Interest-based Learning and Instruction (DIBLI) is effective in improving the learner's school performance before and after the intervention. This assumption is supported by the three key theories: Neil Donald Fleming's VARK Learning Style Theory (1987), John Dewey's Interest-Based Learning Theory (1938), and Carol Ann Tomlinson's Differentiated Instruction Theory (1995).

These theories are interconnected to each other supporting the efficacy of Differentiated Instruction and Interest-Based Learning combined to be Differentiated Interest-based Learning and Instruction (DIBLI).

This study was also grounded in the three legal frameworks of DepEd Memorandum No. 017, s. 2025 entitled Interim Guidelines for the Department of Education Performance Management and Evaluation System (PMES) for Teachers in the School Year 2024-2025, Republic Act No. 11650: Instituting a Policy of Inclusion and Services for Learners in Support of Inclusive Education Act, and Republic Act No. 10612: Expanding the Coverage of the Science Technology (S&T) Scholarship Program and Strengthening the Teaching of Science and Mathematics in Secondary Schools otherwise known as the "Fast-tracked S&T Scholarship Act of 2013.

These highlight the essence of inclusive education through differentiated activities addressing the different needs of learners, both with special needs and giftedness.

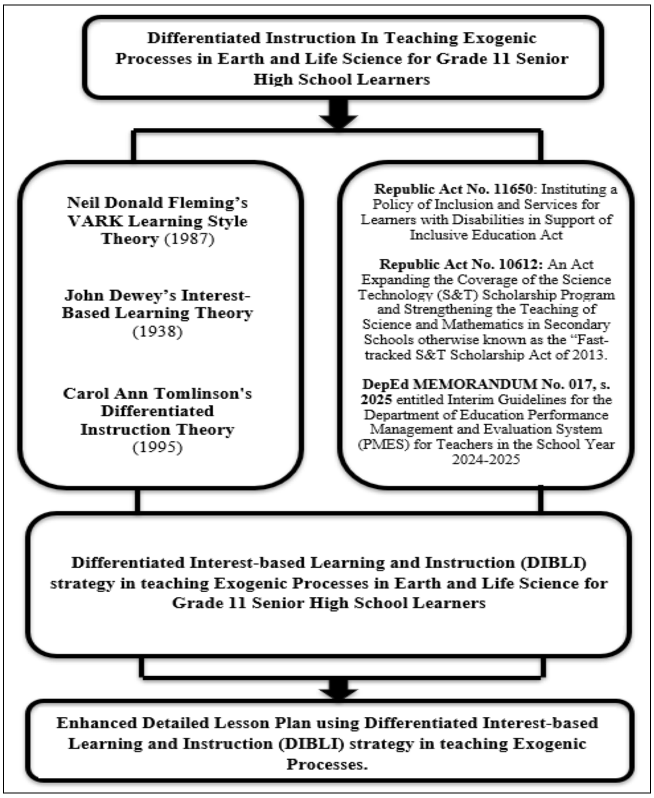


Fig 1: Theoretical-Conceptual Framework of the Study

Vark Learning Style Theory

The four main learning styles in the VARK Model are: Visual, Auditory, Read/Write, and Kinesthetic. Visual learners learn through sight. Auditory learners learn through their sense of hearing. Read/write learners learn through reading and writing. Kinesthetic learners learn through touch or by doing (Ansari, 2023).

Learning styles refer to the unique ways individuals perceive, process, and retain information, influenced by cognitive, emotional, and environmental factors Ansari, 2023; Hussain, 2017.

O'Leary (2025) elaborates on the four learning styles in the VARK learning style theory: (1) **Visual** (Spatial), observed when learners learn best by seeing first what they need to understand. The visual learners' preferences are pictures, images, charts, mind maps, videos, diagrams, flowcharts, symbols, etc. (2) **Aural** (Auditory-Musical), observed when learners learn best by listening to lectures from the teacher associated with sound. The aural learners' preferences are rhythms, rhymes, drama, songs, poems, attending lectures, tutorials, group discussion, etc. (3) **Reading/Writing** (Linguistic), observed when learners learn best through spoken and written words. The reading/writing learners' preferences are reading a text out loud, having someone narrate a script, and university-style courses. (4) **Kinesthetic (**Physical), observed when learners learn best when physically involved with the lesson. The kinesthetic learners' preferences are learning by doing, drawing diagrams, and showing some gestures in speaking, laboratories, and tutorials, etc.

Enas El-Saftawy *et al*. (2024) indicate that Fleming's theory or VARK is the springboard to a variety of learning and teaching styles appropriate to the diverse learning preferences of each learner. Additionally, it was stated that Fleming's VARK Learning Style Theory is widely used to categorize learners' learning styles. Fleming's theory, also known as VARK Learning Style Theory, aligns with interest-based learning theory, in which learners' interests match the four primary learning styles relevant to this study's attainment. Multiple intelligences unify learners' interests and preferred learning styles. Identifying learners' diverse interests and preferred learning styles based on the VARK Learning Style Theory is required for planning the appropriate differentiated activities and teaching processes. Moreover, the VARK Learning Style theory is categorized as a pivotal learning style for the learning process. Rasheed and Wahid (2018) define cognitive style as remembering, perceiving, thinking, and solving problems, whereas learning style is an application of cognitive style. In addition, cognitive style is the way individuals approach cognitive tasks; by contrast, learning styles are the ways individuals approach learning tasks that differ for each person.

Interest-Based Learning Theory

Afis Baghiz Syafruddin (2023) preference, curiosity, focus, determination, effort, knowledge, and skills are the emotions that encompass interests. Learning interest is recognized through three key indicators: attention, interest, and motivation to learn. A strong interest in learning encourages students to engage more actively and deepen their understanding of the subject matter. Students tend to show high enthusiasm for learning content because of the enjoyment it brings. When students are interested, their attention improves, concentration increases, and comprehension of the material being taught is easier. Thus, it is essential to continuously enhance interest in learning.

Dewey (1938) and Patierez (2024) were known to drive learners' interest in their teaching instruction. He also assumed that traditional classroom settings are not well-suited to young learners in the 21st century as lifelong learners. Hence, interest comprises cognitive and affective factors, and the results are congruent with the situation. The application of Interest-based learning theory can be widely observed and developed through progressive education, constructivism, learner-centered theory, and experiential knowledge (Dewey, 1938; Patierez, 2024), which can be integrated into various teaching methods influenced by those theories by aligning with Interest-based learning theory. Educators in this challenging time shall continue to advance and enhance learners' interest in science as an academic discipline and to foster them as lifelong learners in 21st-century learning. In connection with Dewey's perception that educational institutions and classrooms should inculcate real-life scenarios into the teaching-learning process while engaging in a different set of activities in which social interaction is present and highly observed, Dewey (1938) and Patierez (2024).

Oh (2024) articulates that the theoretical framework indicates that interest serves as a foundation for self-efficacy and underscores the significance of cultivating interest during the initial stages to improve self-efficacy in the future. These findings have practical significance for teachers, indicating that early strategies to enhance students' interest in English can result in heightened self-efficacy and improved academic performance over time.

Miha Slapničar *et al*. (2024) report that students tend to have favorable attitudes toward inquiry-based activities in science classrooms, leading to increased interest in learning science, though this is partially guided by the teacher. Consequently, it is logical to infer that a student's personal interest in learning chemistry may affect their perceptions of learning and how inquiry-based learning (IBL) activities shape their situational interest and attitudes toward the IBL method and the activities performed in the chemistry laboratory. When students' interest is stimulated, their relationships with each other also improve, leading to enhanced attitudes toward science. Nevertheless, some research suggests that IBL does not have a statistically significant effect on students' levels of interest and knowledge.

Purcell *et al*. (2020) states that the interest-based learning theory is designed to be universally applicable. It is also known as Universal Design. This serves as the basis for curriculum development and decision-making. The learners' interest is supported by various teaching methods to ensure their complete engagement, satisfaction, and motivation in learning science. Science educators address Interest-based learning theory by facilitating certain topics in science while advocating for learners' interests.

Differentiated Instruction

Yaman (2024) discusses how differentiated instruction influences both the academic achievements and positive attitudes of gifted students. The talented students participated in a tour of the Kaz Mountains National Park via the Imedu Educational Metaverse platform on three separate occasions. In addition, their experience in the Metaverse was enriched by using the Oculus Quest 2 VR headset. Teaching with immersive virtual reality in the Metaverse improves students' comprehension of environmental issues and climate change. According to teacher observations, gifted students have been actively involved in the implementation process. The students reported that they found learning enjoyable, had fun, and often lost track of time. They completed all assigned tasks meticulously. The students readily share knowledge with both their teachers and peers. They participate in inquiry-based processes, seek creative solutions to challenges, and develop a deep understanding of the learning content. Students interact socially in both the Metaverse and traditional classroom environments.

Schiefele *et al*. (1983) and Salazar and Gumanoy (2025), state that differential sector theory focuses on individual differences and differentiation, which refers to individual interests. This can link to diverse learners' interests and needs, including learners with mixed abilities.

Differentiated Instruction pursues inclusion for all types of learners, in relevance to their learning abilities, skills, and needs. This also entails Dewey's learner-centered theory (Dewey, 1938) and Gheyssens (2023). As featured by Tomlinson and Strickland (2005) and Tas and Minaz (2024), interest serves as a motivator for the learners to learn. The teacher who considers learners' interests and connects them through the differentiation he provides in the learning process and activities makes learners develop their academic performance.

Purcell (2020) highlighted the benefits of Interest-based learning theory where learning became: (1) more learner-centered and learners also became more existentialist (2) was empirically aligned to standards (3) was fun and joyful at the same time very engaging and motivating even to learn more lastly (4) astounded for the faculty and the people in the community because learners work are extremely improving as they contribute to the curriculum development. Interest-based learning theory can also develop cognitive mastery.

Dewey (1938 and Gheyssens (2023) contrastingly stated that this ideology states that schools and classrooms must be conducive to learning by conceptualizing real-life situations in lessons. This allows learners to participate in learning activities interchangeably and flexibly in a variety of social settings. Dewey believed that learners can develop problem-solving skills as part of the skills needed in 21st-century learners through collaboration.

The result of the study Kotob and Abadi (2021) revealed a development in academic performance for low-achiever learners within a heterogeneous classroom setup. It was proven that there is a positive impact of implementing differentiated instruction in teaching English for there's a development happening in the class standing of low achiever learners but less significance on the high-achiever learners. This signifies that the procedure of differentiated instruction is successfully utilized to meet the needs of mixed-ability learners, especially those learners with learning disabilities. Low-achieving learners are the ones who benefit the most in the practice of differentiated instruction based on the results they've come up with. There's true progress from the pre-test and post-test scores of low-achieving learners in the English language as part of the heterogeneous class in EFL. Thus, differentiated instruction works in the mixed-ability classroom, as shown in the development of their pre-test scores to post-test.

Sood and Sarin (2021) support the notion that processing and learning new information differ across individuals. Sufficiently knowing a learner's learning styles can surely help learners stay engaged and interested in the teaching and learning process.

These theories offer a comprehensive perspective on how various learning styles, interests, and needs of mixed-ability learners in a heterogeneous setting were addressed. By grounding itself in these theoretical foundations, the research aims to provide an impactful, learner-centered, and inclusive learning environment.

Legal Frameworks

Republic Act No. 11650

Congress (2022), enacted in Republic Act No. 11650, March 11, 2022, entitled An Act Instituting a Policy of Inclusion and Services for Learners with Disabilities in Support of Inclusive Education, Establishing Inclusive Learning Resource Centers for Learners with Disabilities in all schools, districts, municipalities, and cities, providing for standards, appropriating funds therefore, and for other purposes. This law was approved by his excellency Rodrigo Roa Duterte, the former President of the Philippines. Section 3, entitled Declaration of Policy, Paragraph 3 states that the State shall encourage and support the provision of services that aid students with disabilities in their learning. It shall also promote learning institutions, including those for higher education, technical education, and vocational training, to consider the diverse needs of learners with disabilities regarding the use of facilities, class scheduling, and requirements for physical education.

Section 4, entitled Definition of Terms, states that, in this Act, the following terms shall be defined as follows:

(v) Universal Design for Learning (UDL) is a research-based framework that directs educational practices to create inclusive and effective learning strategies. It focuses on:

(1) Diverse approaches to presenting information, various methods for students to express their understanding, and different ways to engage learners in the educational process; and

(2) Minimizing instructional barriers by offering suitable accommodations and support for students with mental or physical challenges while maintaining high standards for success for all learners, including those with disabilities.

UDL is also defined by a collection of principles that guide the development of inclusive instructional strategies and accessible educational resources. These principles include:

1. Recognition – Utilizing various methods of representation to give learners multiple options to access information and build comprehension;
2. Strategic Learning – Implementing a range of approaches for student actions and expression, providing alternative methods for students to show what they know and can do; and
3. Affective Learning – Creating multiple pathways for student engagement that align with students' interests, present suitable challenges, and promote sustained motivation for learning.

Republic Act No. 10612

Department of Science and Technology (DOST) and the Department of Education DepEd (2014), present that the implementing rules and regulations of Republic Act No. 10612, otherwise known as the "Fast-tracked S&T Scholarship Act of 2013 section 2 entitled Declaration of Policy, Paragraph 2 states that the government shall offer scholarships to deserving students in the sciences as well as to other exceptionally gifted individuals, enabling them to attain higher education or training in the fields of science, technology, and engineering. Additionally, it aims to encourage them to become secondary school educators, particularly in their local areas.

This is aimed at students who have a strong passion for Science, Technology, Mathematics, and Engineering. This opportunity is open to all students who are interested in these fields.

Deped Memorandum No. 017, S. 2025

Angara (2025) discusses in DepEd Memorandum No. 017, s. 2025 entitled Interim Guidelines for the Department of Education Performance Management and Evaluation System (PMES) for Teachers in the School Year 2024-2025. The PPST-based Tools were used in the evaluation of Proficient Teacher Tools, as indicated in Classroom Observable Indicators (COIs), objective number 8 states that design, adapt, and implement teaching strategies that are responsive to learners with disabilities, giftedness, and talents *(PPST Indicator 3.3.2).* This entails the positive application of differentiated instruction and inclusive education in basic education.

These legal foundations provide a comprehensive viewpoint for the analysis of interest-based learning which is also known as a Universal Design in Learning that addresses the diverse needs and interests of the learners associated with the high-interest of individuals in the field of Science and Mathematics as well as the different learning styles, which pertains to VARK learning theory that corresponds to differentiating instruction, activities, and assessments to cater the diverse needs of the learners. This also emphasizes the essence of inclusive education in the Philippines, which caters to the needs of learners with disabilities and their holistic needs. By understanding these legal principles, it was, no doubt, successfully implemented.

This Theoretical-Conceptual Framework of the Study emphasizes Differentiated Instruction for teaching "Exogenic Processes in Earth and Life Science" to Grade 11 Senior High School learners. The research is based on three theories: (1) Neil Donald Fleming's VARK Learning Style Theory (1987), (2) John Dewey's Interest-Based Learning Theory (1938), and (3) Carol Ann Tomlinson's Differentiated Instruction Theory (1995). These theories are interconnected, forming the core of the Differentiated Interest-based Learning and Instruction (DIBLI) strategy that has been implemented.

This is associated with the following legal foundations: (1) Republic Act No. 11650: Instituting a Policy of Inclusion and Services for Learners with Disabilities in Support of Inclusive Education Act, (2) Republic Act No. 10612: An Act Expanding the Coverage of the Science Technology (S&T) Scholarship Program and Strengthening the Teaching of Science and Mathematics in Secondary Schools otherwise knowns as the "Fast-tracked S&T Scholarship Act of 2013 and (3) DepEd MEMORANDUM No. 017, s. 2025 entitled Interim Guidelines for the Department of Education Performance Management and Evaluation System (PMES) for Teachers in the School Year 2024-2025. These legal foundations are also interrelated, emphasizing inclusive education for both learners with special needs and those with giftedness. Hence, differentiated activities are encouraged in the diverse classroom setup.

These three theories are associated with the three legal foundations encompassed by these dependent variables in the study. (1) Pre-test and Post-test Scores of Grade 11 Senior High School learners, (2) Significant Difference of Pre-test and Post-test Scores of Grade 11 Senior High School learners, and lastly, (3) Challenges encountered by the Grade 11 Senior High School learners in implementing Differentiated Interest-Based Learning and Instruction (DIBLI).

This research was conducted jointly with the three mentioned theories and legal foundations, leading to this output, the Enhanced Detailed Lesson Plan using Differentiated Interest-Based Learning and Instruction (DIBLI) strategy in teaching "Exogenic Processes."

According to Liou *et al*. (2023), differentiated instruction heightened students' interest in learning, encouraged independent and focused thinking, and fostered a sense of academic accomplishment. The proportion of passive learners increased. The study's favorable outcomes support the implementation of differentiated instruction in the EBN course. Furthermore, nursing students' receptiveness to the Evidence-Based Nursing (EBN) course improved. These results are consistent with the tenets of student-centered teaching methods, which prioritize flexibility, choice, collaboration, and active engagement in the learning experience— all essential characteristics of differentiated instruction.

As stated by Melesse and Belay (2022), this research confirmed that the differentiation of learning content has a comparatively greater direct effect on process differentiation. Likewise, this research confirmed that variation in students' characteristics has a more significant direct impact on differentiating content and the learning environment than on its moderate effect on differentiating process and product.

The Problem

Statement of the Problem

This study assessed the effectiveness of teaching Exogenic Processes in Earth and Life Science at Canduman National High School during the first semester of the school year 2024-2025 as the basis for crafting an enhanced, detailed lesson plan using the Differentiated Interest-based Learning and Instruction (DIBLI).

Specifically, this answered the following questions:

1. What are the pre-test scores of the Grade 11 Senior High School learners in Exogenic Processes on the following competencies:
   Describing how rocks undergo weathering;
   Explaining how the products of weathering are carried away by erosion and deposited elsewhere and;
   Making a report on how rocks and soil move downslope due to the direct action of gravity?
2. Using the DIBLI strategy, what are the post-test scores of the Grade 11 Senior High School learners on the competencies mentioned above?
3. Is there a significant difference between the pre-test and the post-test scores teaching Exogenic Processes in Earth and Life Science of Grade 11 Senior High School learners?
4. What are the challenges encountered by the Grade 11 Senior High School learners in implementing DIBLI?
5. Based on the findings, what enhanced detailed lesson plan can be crafted using the DIBLI strategy in teaching Exogenic Processes?

Null Hypothesis

This research is set at a 0.05 level of significance.

H_0: There is no significant difference between the pre-test and post-test scores of Grade 11 Senior High School learners in teaching Exogenic Processes in Earth and Life Science.

Significance of the study

The findings of this study can be beneficial for the following:

Learners: Learners are given opportunities to cultivate and showcase a wide array of skills while advancing academically through interest-driven education within the Differentiated Interest-Based Learning and Instruction (DIBLI) framework. This method enables learners to nurture their unique strengths in a nurturing, adaptable classroom setting that encourages adjustment to the changing requirements of 21st-century education. The drastic shift from remote learning to a full return to in-person classes — learners need comprehensive support to ensure their overall development. It is crucial to uphold their essential right to education, and improving academic achievement remains a vital goal in addressing the needs of today's learners.

Teachers: This research encourages teachers to pursue ongoing professional development, which is essential to effectively implement this teaching strategy. Moreover, this research enhances teachers' instructional skills, enabling them to better support digital-native learners. By participating in various seminars and workshops focused on different instructional designs and teaching strategies suitable for fully face-to-face classroom environments, teachers can refine their teaching skills. These professional development opportunities.

Administrators: This research contributed to participants' ongoing professional development through training, seminars, and workshops, boosting their capacity to offer effective guidance and support to their faculty teams. It also significantly influenced educational quality, ensuring that future graduates embody the institution's dedication to academic excellence. The administrators, through their strategic direction and execution of instructional programs, effectively enabled the implementation of a curriculum aimed at impactful learning. In addition, enhancements to institutional facilities were achieved to facilitate meaningful and effective learning experiences. Consequently, the institution is now better equipped to produce globally competent graduates who can enhance its recognition on the international level.

Researcher: This research offers valuable opportunities for the researcher to improve teaching skills and promote professional development, ultimately aiding the journey toward becoming a fully competent teacher capable of addressing the needs of 21st-century learners. The positive effects on both personal and professional growth signify a noteworthy accomplishment. Furthermore, the knowledge gained from this research serves as a strong impetus to pursue further studies aimed at enhancing the educational landscape in the Philippines. In this way, the outcomes of this study may provide a basis for refining the teaching and learning experience, aiming to cultivate lifelong learners ready to succeed in the 21st century.

Future Researchers: This research provides a foundation for future educational studies on who might find this teaching strategy engaging and effective for further exploration.

Research Methodology

This section outlines the research methodology used to assess the effectiveness of differentiated instruction in teaching exogenic processes in Earth and Life Science. The study's progression is highlighted to show the sequence of actions from preparation to data evaluation. It offers an in-depth discussion of the research design, detailing the strategy used to address the research problem. Furthermore, this section outlines the research environment and the attributes of the participants, providing context for the study's execution. It also explains the research tools employed to collect pertinent data and the steps taken during the data-gathering process. Lastly, the techniques for analyzing the data are described, ensuring that the results are correctly interpreted and aligned with the study's goals.

Design

This study used a mixed-methods design. The researcher evaluated the intervention's impact on a single group. The learners were assessed through pre-tests and post-tests to determine the efficacy of DIBLI, and the detailed lesson plan for teaching exogenic processes in Grade 11 Senior High School learners was enhanced based on the results. Kingma *et al*. (2022) indicate that the chosen research design for the pre-experimental quantitative study involves administering pre-tests and post-tests with a group. This pre-experimental research design is a type of experimental design. One type is the one-group pretest-posttest, which evaluates a group before and after the intervention. In addition, the qualitative method used a phenomenological design to describe respondents' detailed perspectives regarding the intervention.

Flow of the Study

This study assesses the effectiveness of the DIBLI strategy to the mixed-ability learners in teaching Exogenic Processes in Earth and Life Science discipline, as revealed in the advancement of their academic performance as shown in Fig 2, emphasizing the Input-Process-Output-Process (IPO) Approach in relevance to the implementation of the study.

Input: This study focused on the use of Interest-based Learning as a differentiated instruction strategy/Differentiated Interest-based Learning and Instruction (DIBLI), in the teaching-learning process to acquire knowledge better and develop learners' advancement in academic performance during full face-to-face classes. The online survey via a Google Form is given to a single group of Senior High learners, Academic Strand Accountancy, Business and Management (ABM) section 11 ABM-B S.Y. 2024-2025. The survey results served as the basis for their categorization based on their interests. The pre-test questionnaire was given to the learners through a Google Form before the use of the DIBLI strategy, aligned with the competencies. The post-test questionnaire was also given to the learners through a Google Form using the enhanced Differentiated Interest-based Learning and Instruction (DIBLI) strategy. The significant difference between the pre-test and the post-test was calculated.

Process: The process began with the approval of the transmittal letter to conduct this study. The pre-test questionnaire is given online through Google Forms to the learners before the implementation of the intervention, Interest-based Learning (IBL) as Differentiated Instruction (DI) strategy or Differentiated Interest-Based Instruction (DIBLI). Afterward, Interest-based Learning (IBL) as a Differentiated Instruction (DI) strategy or Differentiated Interest-Based Instruction (DIBLI) was implemented in the mixed-ability classroom, where an inclusion approach was necessary. The post-test questionnaires were carefully administered to the learners as an assessment still through online via Google Forms. The results were tabulated for a transparent presentation. The collected data were analyzed and interpreted through the appropriate statistical tools.

Output: The output was the enhanced, detailed lesson plan using the Differentiated Interest-Based Learning and Instruction (DIBLI) strategy to teach the topic, "Exogenic Processes" in Earth and Life Science for Grade 11 learners.

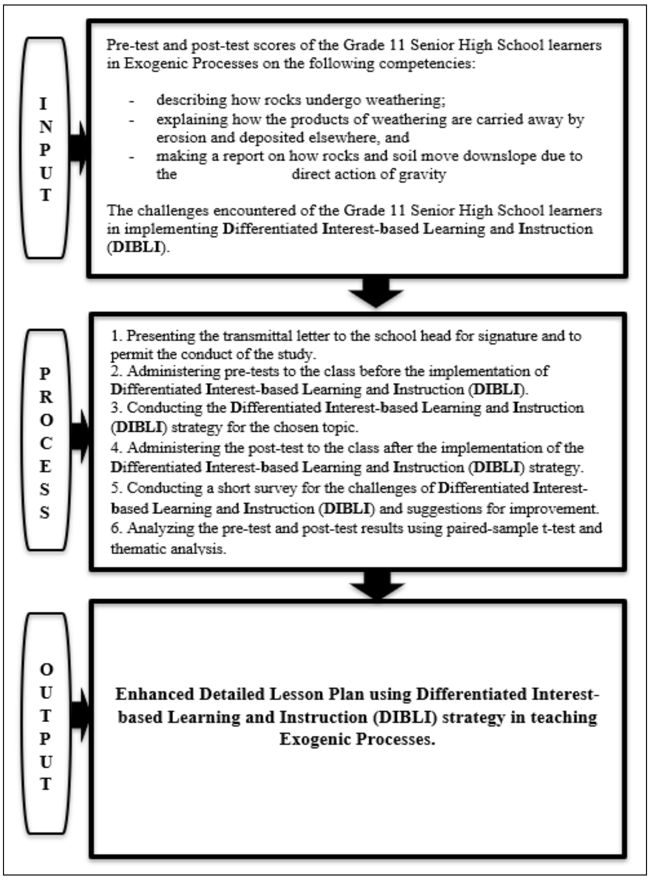


Fig 2: Flow of the Study

Environment

This study was conducted at Canduman National High School. It was founded in 1981. Canduman National High School is an urban school with a current population of 3,181 learners, of whom 1195 are Senior High School learners (Grade 11 and 12) for the first semester, while the remaining are 1986 Junior High School learners (Grades 7 to 10) for this School Year 2024-2025. Canduman National High

School was also considered a very large school because of its current total population from JHS to SHS. It was part of the WEST II Secondary educational institution under the Department of Education within the Mandaue City Division. This institution is located in A. Borbajo St., Canduman, Mandaue City. Canduman National High School has a Vision and Mission in line with DepEd's Vision and Mission, which aims to promote child-friendly, safe, and conducive to learning, gender-equality, and an inspiring environment.

This secondary institution offers only the Academic and Technical Vocational Livelihood Track. These are the only strands this institution offers: (1) Accountancy, Business and Management (ABM), Humanities and Social Sciences (HUMSS), General Academic Strand (GAS), and Technical Vocational Livelihood (TVL) Electrical Installation Maintenance (EIM) and Computer Systems Servicing (CSS).

It has eleven buildings, of which buildings 1 and 9 are intended for Senior High School learners, and only two classes of Senior High School learners are separated, located on the ground floor of building 2, a Junior High School building. Each room in every designated building for Senior High School learners shared the same room for both Grade 11 and Grade 12 learners. After the first shift, Grade 11 learners, the second shift, Grade 12 learners, will also enter their respective classrooms.

Respondents

The respondents in this study were the Grade 11 learners who were enrolled in ABM section B in their first semester for the school year 2024-2025. These learners belong to one class. The target population of these respondents was 47 learners in one class. The learners served as a single group. The interest inventory questionnaire was given first to the learners, and the pre-test questionnaire followed. Lastly, the post-test questionnaires were administered to see the significant difference between the two and to assess the effectiveness of Interest-based Learning (IBL) as a Differentiated Instruction (DI) strategy/Differentiated Interest-based Learning and Instruction (DIBLI).

Instruments

The researcher used an adapted questionnaire from the Department of Education – Teacher Education Council. 2020); (the Department of Education – National Capital Region, n.d.) and (Quilona, 2018). It was aligned with the learning competency mentioned in the statement of the problem. These questionnaires served as a pre-test and post-test for the study. This instrument examined the impact of Interest-based Learning (IBL) as a Differentiated Instruction (DI) strategy/Differentiated Interest-based Learning and Instruction (DIBLI) on learners' academic advancement. Interest-based learning was the most preferred differentiated instruction strategy.

Fig 3: Location Map of the Research Environment

Data Gathering Procedure

Before carrying out the study, formal consent was obtained from the school administration. After receiving approval, the researcher provided participants with clear instructions regarding the procedures of the study to ensure their comprehension. Subsequently, the learners filled out an interest inventory questionnaire that was distributed online. Based on the inventory findings, the researcher applied Interest-Based Learning (IBL) as a method of Differentiated Instruction (DI), specifically termed Differentiated Interest-Based Learning and Instruction (DIBLI) in this research, aimed at teaching "Exogenic Processes" in Earth and Life

Science. Following this, the researcher conducted an online pre-test questionnaire with learner-respondents. After reviewing the pre-test results before implementing Differentiated Interest-Based Learning and Instruction (DIBLI), the intervention was carried out for the selected lesson. Once the intervention was completed, a post-test questionnaire was given to evaluate the effectiveness of the strategy.

Statistical Treatment

To analyze the data, the following statistical tools were used: all required information obtained through the instrument was counted, arranged, examined, and interpreted accurately.

Weighted Mean: This method was utilized to calculate the average responses of a single group based on their pre-test and post-test scores.

Paired-sample t-Test: This test assessed the within-group differences following the intervention to determine whether students' scores improved after exposure to the Differentiated Interest-Based Learning and Instruction (DIBLI) strategy.

Significant Difference: This measures the difference between the pre-test and post-test scores of the learner-respondents before and after the implementation of the Differentiated Interest-Based Learning and Instruction (DIBLI) strategy.

Data Scoring Procedure

Based on DepEd Order No. 8 series of 2015, the scoring method was applied and implemented in this study. To determine the performance rating, the following scoring criteria were employed.

Table 1: Score Range, Category, and Description

Score Range	Category	Description
9-10	Outstanding	Learner's performance level is between 96%- 100%.
7-8	Very Satisfactory	Learner's performance level is between 86%- 95%.
5-6	Satisfactory	Learner's performance level is between 66%- 85%.
3-4	Fairly Satisfactory	Learner's performance level is between 35%-65%.
1-2	Did Not Meet Expectations	Learner's performance level is between 16%-34%.

Definition of Terms

The following terms were defined operationally:

Differentiated Instruction (DI): Differentiation was used to provide inclusion to the learners by meeting their different learning needs to achieve excellence in their academic performance and to eradicate the one-size-fits-all mindset. This theory is done through differentiated activities based on their preferred interests, maximizing their learning experience.

Differentiated Interest-Based Learning and Instruction (DIBLI): A strategy used when differentiated instruction is combined with interest-based learning as a learner-centered approach. This intervention focused on the varied interests of the learners and addressed their diverse needs, tailored to the inclusive approach in basic education.

Pre-Test and Post-test: Learners undergo a pre-test before the implementation of the intervention and a post-test after the implementation of the intervention.

Interest-based learning: This strategy was used based on the learners' interest and relates it to the topic. This theory motivated the learners to perform well and be engaged while doing certain tasks related to the topic.

Enhanced Detailed Lesson Plan: Learners' scores in the post-test are the basis for improving the detailed lesson plan used in the implementation of the DIBLI teaching strategy.

Exogenic Processes: The topic is used in teaching and implementing the DIBLI teaching strategy.

2. Presentation of Data Analysis and Interpretation

This chapter outlines the study's findings through an organized presentation of data, followed by an analysis and interpretation of the results. The outcomes are structured in alignment with the research goals and are supplemented with tables and statistical evaluations. The research evaluated the performance of respondents in pre-tests and post-tests administered before and after implementing the Differentiated Interest-Based Learning and Instruction (DIBLI) strategy.

Pre-Test Scores of Grade 11 Senior High School Learners in Exogenic Processes

This section presents the pre-test performance of the respondents in the following competencies: describing how rocks undergo weathering; explaining how the products of weathering are carried away by erosion and deposited elsewhere and; making a report on how rocks and soil move downslope due to the direct action of gravity, which was recorded before the implementation of the Differentiated Interest-Based Learning and Instruction (DIBLI) strategy. Analyzing the respondents' performance before the intervention for the post-test results, which are also examined later in the study. The pre-test data provide the foundation for determining the effectiveness of the interest-driven experience. The pre-test performance of the respondents is presented in Table 2 below.

Table 2: Pre-Test Scores of Grade 11 Senior High School Learners in Exogenic Processes

Competencies	Range of Score	f	%	Category
Describing how rocks undergo weathering	9-10	5	10.6	
	7-8	5	10.6	
	5-6	15	31.9	
	3-4	21	44.7	
	0-2	1	2.1	
	Mean	**5.09**		**Satisfactory**
	Standard Deviation	**1.86**		
Explaining how the products of weathering are carried away by erosion and deposited elsewhere	9-10	6	12.8	
	7-8	14	29.8	
	5-6	21	44.7	
	3-4	5	10.6	
	0-2	1	2.1	
	Mean	**6.26**		**Satisfactory**
	Standard Deviation	**1.66**		
Making a report on how rocks and soil move downslope due to the direct action of gravity	9-10	4	8.5	
	7-8	12	25.5	
	5-6	14	29.8	
	3-4	12	25.5	
	0-2	5	10.6	
	Mean	**5.40**		**Satisfactory**
	Standard Deviation	**2.32**		

Legend: (Outstanding); 7-8 (Very Satisfactory); 5-6 (Satisfactory); 3-4 (Fairly Satisfactory); 1-2 (Did Not Meet Expectations)

The results presented in Table 2 highlight the pre-test performance of the respondents in the first most essential learning competency, which focuses on describing how rocks undergo weathering. The data reveal an overall mean score of 5.09, corresponding to the Satisfactory level. The standard deviation of 1.86 indicates a moderate variability in the learners' scores, suggesting differing levels of prior knowledge. An examination of the frequency distribution shows that 21 learners or 44.7% scored within the 3-4 range, which falls under the Fairly Satisfactory category. This indicates that nearly half or most of the respondents had only a basic understanding of the topic prior to the intervention. Additionally, 15 learners or 31.9% performed at the Satisfactory level, with scores ranging from 5-6, reflecting a moderate level of prior knowledge. Only a small percentage of learners achieved higher levels of performance. Specifically, 5 learners or 10.6% attained scores of 9-10, classified as Outstanding, while another 5 learners or 10.6% scored 7-8, corresponding to the Very Satisfactory category. Conversely, one learner, or 2.1%, fell into the Did Not Meet Expectations category with a score between 1 and 2.

The pre-test performance suggests that while learners possessed a foundational understanding of the topic, their knowledge of some Earth and Life Science concepts, particularly related to weathering and mass wasting, was incomplete Aquino, 2023. This is evident in questions 23 to 25 of the assessment, which require learners to distinguish between chemical, physical, and biological weathering, such as oxidation, carbonation, and freeze-thaw cycles, which are processes that weaken rock and make it susceptible to gravity-induced mass wasting. The high number of learners performing Satisfactory and Fairly Satisfactory levels implies that there is difficulty in differentiating among types of weathering and in understanding their link to mass wasting processes such as landslides, rockfalls, and soil creep. Sulaiman and Abdullah (2023) state that the distribution of scores within these levels underscores the need for instructional interventions such as the DIBLI strategy to cater to varied learning preferences and enhance conceptual understanding through hands-on and contextualized experiences.

The pre-test performance of the respondents, particularly on the competency of explaining how the products of weathering are carried away by erosion and deposited elsewhere. The respondents obtained an overall mean score of 6.26, which falls under the Satisfactory level. The standard deviation of 1.66 indicates moderate variability in the scores, suggesting that while many learners have a fair grasp of the basic concepts, there are still noticeable differences in their levels of understanding. The distribution of scores shows that the majority, which is 21 learners or 44.7%, have scored within the Satisfactory range, indicating an average understanding of how erosion and deposition transport weathered materials. Additionally, 14 learners or 29.8% achieved scores in the Very Satisfactory category, reflecting above-average comprehension. Meanwhile, 6 learners or 12.8% demonstrated strong mastery of the topic by scoring in the Outstanding level, even before further instruction. On the lower end. 5 learners or 10.6% fell under the Fairly Satisfactory level, and 1 learner or 2.1% scored in the Did Not Meet Expectations category.

Sulaiman and Abdullah (2023) assert that the respondents' pre-test scores in this competency emphasize their knowledge of erosion and deposition processes using the basic definitions, real-life situations, and conceptual classifications for this topic. In particular, questions 15-20 evaluate the respondents' understanding of types of erosion and characteristics of water erosion, and these items would demand deeper content knowledge and analytical reasoning. If the respondents have misconceptions in these areas, then these would contribute to the lower scores in the Fairly Satisfactory and Did Not Meet Expectations levels. While some demonstrated strong foundational knowledge, there are still several respondents who had not yet mastered the distinctions between erosion, weathering, and deposition, nor the ability to apply this knowledge in practical or scenario-based questions. National Science Teaching Association (2022) asserts that the presence of learners in lower performance categories points to the need for reinforcement strategies, such as differentiated instruction and experiential learning, to deepen comprehension and improve retention of these Earth and Life Science concepts.

The pre-test performance of the respondents, particularly in the competency of making a report on how rocks and soil move downslope due to the direct action of gravity. The results show an overall mean score of 5.40, which falls under the Satisfactory level.

The standard deviation of 2.32 indicates a relatively wide dispersion of scores, suggesting variation in learners' prior knowledge of this topic. The score distribution reveals that only 4 learners, or 8.5%, have attained Outstanding scores, while there are 12 learners, or 25.5 % reached the Very Satisfactory level. The results also indicate that there are 14 learners, or 29.8% performed within the Satisfactory level, representing the largest proportion and indicating an average understanding of the competency. Meanwhile, 12 learners or 25.5% fell within the Fairly Satisfactory category, and 5 learners or 10.6% scored in the Did Not Meet Expectations range, showing the need for score improvement. Nagal (2020) describes that this performance profile suggests that while several learners had a good grasp of gravity-induced geological processes, a considerable portion still demonstrated only basic or limited understanding.

In the evaluation, many struggled to apply their knowledge to practical scenarios and interpret visual representations, which are foundational to understanding how rocks and soil move due to gravity. For example, the Questions in 2 to 6, which focused on identifying different types of mass wasting events such as slumps, flows, landslides, rockfalls, and rockslides, are processes that weaken rock and make it susceptible to gravity-induced mass wasting. The presence of 25.5% of learners in the Fairly Satisfactory category and 10.6% in the Did Not Meet Expectations range may indicate difficulty in analyzing questions that require learners to distinguish between types of downslope movement based on speed, moisture content, and material, which could be challenging to understand without sufficient visual aids or experiential learning. Pozas *et al*. (2021) explain that the distribution of scores within these levels underscores the need for instructional interventions such as the DIBLI strategy to cater to varied learning preferences and enhance conceptual understanding through hands-on and contextualized experiences.

Post-Test Scores of Grade 11 Senior High School Learners in Exogenic Processes

This section presents the post-test results of the respondents in the learning competencies of Earth and Life Science after the implementation of the DIBLI strategy. By analyzing their post-test scores, the effectiveness of the intervention in enhancing learners' conceptual understanding and application of topics can be evaluated. The findings provide insight into whether the implementation enhanced learners' retention of concepts, problem-solving abilities, and overall mastery of the targeted learning competencies in Earth and Life Science. The results of the respondents' post-test performance for the first essential competency are summarized in Table 3 below.

Table 3: Post-Test Scores of Grade 11 Senior High School Learners in Exogenic Processes

Competencies	Range of Score	f	%	Category
Describing how rocks undergo weathering	9-10	10	21.3	
	7-8	9	19.1	
	5-6	16	34.0	
	3-4	10	21.3	
	0-2	2	4.3	
	Mean	**6.17**		**Satisfactory**
	Standard Deviation	**2.27**		
Explaining how the products of weathering are carried away by erosion and deposited elsewhere	9-10	13	27.7	
	7-8	20	42.6	
	5-6	6	12.8	
	3-4	5	10.6	
	0-2	3	6.4	
	Mean	**6.98**		**Very Satisfactory**
	Standard Deviation	**2.45**		
Making a report on how rocks and soil move downslope due to the direct action of gravity	9-10	6	12.8	
	7-8	11	23.4	
	5-6	17	36.2	
	3-4	8	17.0	
	0-2	5	10.6	
	Mean	**5.72**		**Satisfactory**
	Standard Deviation	**2.24**		

Legend: 9-10 (Outstanding); 7-8 (Very Satisfactory); 5-6 (Satisfactory); 3-4 (Fairly Satisfactory); 1-2 (Did Not Meet Expectations)

Table 3 presents the respondents' post-test performance, specifically in the learning competency of describing how rocks undergo weathering, after the implementation of the DIBLI strategy. The overall mean score increased to 6.17, remaining within the Satisfactory level but showing a noticeable improvement from the pre-test mean of 5.09. The standard deviation is 2.27, suggesting a broader range of individual scores. This indicates that while some learners demonstrated higher scores, others showed more modest gains. The distribution of scores reveals that 10 learners, or 21.3%, fell within the Outstanding level, a notable increase from 10.6% recorded in the pre-test. Likewise, 9 learners or 19.1% achieved the Very Satisfactory level, up from 10.6% in the pre-test. Meanwhile, 16 learners or 34.0% scored within the Satisfactory level, maintaining stability in this performance band. The proportion of learners in the Fairly Satisfactory level decreased from 44.7% to 21.3% or 10 learners, indicating that many learners progressed to higher performance levels. Only 2 learners or 4.3% remained in the Did Not Meet Expectations level, a slight increase from one learner in the pre-test, likely reflecting individual learning challenges.

This post-test performance highlights a stronger grasp of the targeted concepts following the intervention. For instance, Questions 2 to 6 of the assessment emphasize that learners need to differentiate between chemical, physical, and biological weathering, including processes like oxidation, carbonation, and freeze-thaw cycles, which contribute to the weakening of rocks and necessitate precise classification and contextual comprehension. McPherson-Geyser and Kavai (2020) claim that the higher scores in the upper categories suggest that learners were able to resolve previously confusing or overlapping concepts. This improvement may be attributed to the strategy's emphasis on hands-on activities and interest-based learning, which would likely enhance learners' visual reasoning, engagement, and deeper conceptual connections for this competency.

The post-test performance of the respondents, particularly in the learning competency of explaining how the products of weathering are carried away by erosion and deposited elsewhere, after the implementation of the DIBLI strategy. The respondents obtained an overall mean score of 6.98, which fell within the Very Satisfactory level. This mean is higher by 0.72 compared to the pre-test mean of 6.26, indicating a notable gain in learners' conceptual understanding after the intervention. The standard deviation increased to 2.45, suggesting wider score dispersion. This means that while many learners have improved scores, a few still struggle with some aspects of the topic. The distribution of scores reveals that 13 learners, or 27.7%, achieved Outstanding scores, more than double the 12.8% who reached this level in the pre-test. It also shows that 20 learners, or 42.6%, scored within the Very Satisfactory level, up from 29.8% previously. There were 6 learners, or 12.8%, in the Satisfactory level, a drop from the pre-test's 44.7%, suggesting that many from this group improved and moved into higher performance brackets. In addition, there are 5 learners, or 10.6%, who remain at the Fairly Satisfactory level, the same as in the pre-test. There are also 3 learners, or 6.4%, who fell into the Did Not Meet Expectations level, a slight increase from just one learner in the pre-test, possibly due to external factors or individual learning difficulties.

The post-test performance of the learners can be attributed to better mastery of concepts evaluated, for instance, in the previous Questions 15-20, which focus on types of erosion and their effects. Muhib (2025) affirms that the ability to distinguish between these concepts demands higher-order thinking, such as identifying real-world scenarios and understanding environmental outcomes. The large number of learners in the higher performance levels suggests that the DIBLI strategy helped clarify such distinctions, possibly through interactive or context-based learning. Valencia-Gallego and Montoya (2024) attest that the positive shift in scores, particularly on concepts related to erosion mechanisms, transportation processes, and deposition outcomes, reflects the learners' enhanced ability to engage with and apply scientific knowledge.

The post-test performance of the respondents in the learning competency of making a report on how rocks and soil move downslope due to the direct action of gravity, Following the implementation of the DIBLI strategy. The respondents obtained an overall mean score of 5.72, which falls within the Satisfactory category. This represents a slight increase from the pre-test mean of 5.40, suggesting a modest improvement in learners' understanding of mass wasting processes after the intervention. The standard deviation of 2.24 indicates a relatively wide spread of scores, implying that while several learners improved, learning outcomes still varied among the group. The score distribution shows that 6 learners or 12.8% reached the Outstanding level, an improvement from 8.5% in the pre-test. There are 11 learners or 23.4% who performed at the Very Satisfactory level, slightly lower than the previous 25.5%.

However, 17 learners or 36.2% scored in the Satisfactory level, which is an increase from a slight 29.8% in the pre-test. Meanwhile, 8 learners or 17.0% were classified as Fairly Satisfactory, a slight decrease from the previous 25.5%. In addition, 5 learners or 10.6% remained in the Did Not Meet Expectations level, consistent with the pre-test result. Kindica and Gumanoy (2025) show that this performance indicates that while a significant number of learners moved up to higher performance categories, some retained their prior levels of understanding, and a small group continued to struggle despite the intervention. The persistence of performance variability and the number of learners in the lowest category suggest that additional reinforcement may be needed for learners requiring more support.

To determine whether the improvement in learners' scores from the pre-test to the post-test was statistically significant, a paired *t*-test was conducted for each competency. The results, as presented in Table 4 below, summarize the interpretation of the p-value for each competency, which reveals a significant increase in scores for the first and second competencies, while a non-significant improvement was observed for the third competency.

Significant Difference Between Pre-Test and Post-Test Scores of Grade 11 Senior High School Learners

For the first competency, describing how rocks undergo weathering, the mean difference yielded a t-value of 2.77 and a p-value of 0.008, which is less than 0.05. This result leads to the rejection of the null hypothesis and indicates a significant difference in performance, with a moderate effect size of 0.404. The study by Şentürk & Sari (2018) shows that differentiated instruction significantly improves science literacy by providing customized learning experiences that engage learners' curiosity and enable them to delve into subjects that match their interests and readiness levels. In the first competency, differentiated learning was shown to be a successful approach for mastering concepts, allowing learners to engage with the content in a manner tailored to their individual learning needs. This strategy not only fostered a deeper comprehension of the concepts but also boosted motivation, as learners could participate in activities that suited their preferred learning styles and progress. Herliana *et al.* (2024) indicate that the significant enhancement in performance highlights the success of differentiated instruction in facilitating meaningful learning outcomes.

Table 4: Significant Difference between Pre-Test and Post-Test Scores of Grade 11 Senior High School Learners

Competency	Mean		Mean Difference	t-value	p-value	Effect Size	Decision	Interpretation
	Pre-test	Post-test						
Describing how rocks undergo weathering	5.09	6.17	1.08	2.77	0.008*	0.404	Reject Ho	There is a significant difference
Explaining how the products of weathering are carried away by erosion and deposited elsewhere	6.26	6.98	0.72	2.03	0.048*	0.297	Reject Ho	There is a significant difference
Making a report on how rocks and soil move downslope due to the direct action of gravity	5.40	5.72	0.32	0.92	0.134	0.80	Failed to Reject Ho	There is no significant difference

Note: *$p<0.05$ indicates a significant difference.

It is worth noting that learners initially showed a limited understanding of the first competency, particularly concerning scientific terminology, as many struggled to apply their knowledge to real-world contexts and to interpret visual representations related to rock weathering. Learning A-Z (2024) claims that, within the framework of differentiated instruction, it is crucial to offer educational materials that allow learners to read and explore scientific concepts on specific topics. These resources help learners build the foundational knowledge necessary for meaningful engagement with the content. As pointed out by Garcia-Carmona (2021), this approach can greatly enhance scientific literacy, especially in the ability to describe scientific phenomena using appropriate scientific language.

The analysis of the second competency regarding the explanation of how weathering products are transported by erosion and subsequently deposited elsewhere reveals a mean difference of 0.72 between the pre-test and post-test scores. This is accompanied by a *t*-value of 2.03 and a *p*-value of 0.048. Given that the p-value is below the significance level of 0.05, the null hypothesis is rejected, indicating that the observed difference is statistically significant, although with a small effect size of 0.297. It is noteworthy that the pre-test results in this competency indicate that learners faced challenges in establishing a fundamental understanding of the processes of erosion and deposition. These difficulties were particularly evident in their ability to apply basic definitions, interpret real-world examples, and categorize essential concepts related to this competency. Consequently, misconceptions regarding erosion and deposition were also noticeable, which adversely affected their performance. Marlina *et al.* (2021) emphasize the importance of differentiated learning, suggesting that tailoring the educational experience to align with learners' interests can enhance learning outcomes. In this way, a better understanding of the scientific ideas can be attained by shaping a strong motivation and improved interest in learning science concepts. Inevitably, it is essential for the planning and implementation of differentiated teaching strategies to consider learners' interests (Getie, 2020).

However, for the third competency of making a report on how rocks and soil move downslope due to the direct action of gravity, the mean difference between pre-test and post-test scores was only 0.32, with a *t*-value of 0.92 and a *p*-value of 0.134, which exceeds the 0.05 level of significance. As a result, the null hypothesis is not rejected, indicating that there is no statistically significant difference in learner performance before and after the intervention for this particular competency, despite the large effect size of 0.80. This suggests that while the magnitude of the change may appear substantial, it was not consistent enough across the group to reach statistical significance. Loche and Scaringi (2022) attest that it can be observed that this competency involves more complex cognitive demands, such as differentiating among types of weathering and understanding their relationship to mass wasting. Milara and Orduña (2024) explain that these higher-order thinking skills may not have been sufficiently supported by the differentiated learning approach employed, highlighting the need for more targeted strategies when addressing conceptually integrative topics.

In this context, Pozas and Letzel-Alt (2023) point out in their systematic review that differentiated teaching strategies often present difficulties, particularly concerning the extra time commitment required from educators. If no notable enhancement is detected in this skill, it could create obstacles for teachers in developing innovative methods. Moreover, both the planning and implementation stages of differentiated instruction are viewed as considerable challenges for educators. Karakaya and Yildirim (2023) further note that teachers have voiced a need for additional time to plan differentiated instruction effectively, preferably in partnership with their colleagues. Additionally, a study by McCarthy (2023) emphasizes the vital importance of peer collaboration in the effective application of inclusive practices for learners. The following section offers more detailed insights into the challenges faced by respondents when implementing the differentiated interest-based learning instruction strategy.

Challenges Encountered by Grade 11 Senior High School Learners in Implementing Dibli

By conducting a thematic analysis of the feedback from the respondents, the difficulties they faced during the execution of the strategy. The challenges reported by the respondents encompassed the following themes: (A) **Struggles in Managing Time**, (B) **Limitations in Resources and Accessibility Issues**, (C) **Difficulties in Sustaining Engagement and Aligning Interests**, and (D) **Issues with Visual Learning and Interpretation**.

A. Struggles in Managing Time

Across the learners' responses, a common and recurring challenge is the struggle in managing time when engaged in the Differentiated Interest-Based Learning and Instruction (DIBLI) strategy. While learners express motivation and engagement in learning tasks aligned with their interests, the effectiveness of these tasks is often hindered by limited time allocation to complete them. These challenges impact the quality and timeliness of outputs, particularly when learning is self-directed or collaborative. The following are the excerpts of their responses:

"One challenge I face is managing time effectively since different tasks require varying amounts of effort." ***-R2***
"Time management, because I find it hard to balance different tasks." ***-R9***
"The challenges that we face while engaging in DIBLI are that we were given little time, and we have a hard time finding the things to complete the task given to us. It is because we need to find the things inside the school, and we can't go any further." ***R11***
"One challenge we face in Differentiated Interest-Based Learning (DIBLI) is time management. It often takes us a long time to find the things that our teacher gave us to find, which can delay our progress and affect the quality of our output despite our motivation and engagement in the learning process." ***-R22***

In the study of Schwab (2021), teachers may already have substantial workloads. and the extra responsibility of ongoing differentiation, along with the necessary time and resources to execute it effectively, as well as fulfilling both curriculum requirements and the unique needs of each learner, may be viewed as a significant burden. Consequently, educators might neglect the practice of differentiated instruction, which in turn may fail to provide learners with the necessary time to complete their assignments.

B. Limitations in Resources and Accessibility Issues

The collected responses from learners highlight a common challenge faced During the implementation of Differentiated Interest-Based Learning and Instruction (DIBLI) which is a difficulty in accessing necessary resources to support their learning tasks and interests. This theme emerged across several responses, revealing both practical and instructional barriers. The following sub-themes were gathered from their responses:

"We're struggling to find the required things to report in class; however, we're still able to because we've found a solution to it, even though we're struggling." ***-R5***
*"Finding different rocks like sedimentary, and cracked rocks, and identifying what type of weathering it is."****-R6***

These responses from the learners highlight the tangible difficulties learners encounter when sourcing physical materials, such as specimens or topic-specific objects, which are often necessary in science-related tasks under Differentiated Interest-Based Learning and Instruction DIBLI. Without these materials, it would be difficult for the learners to attain an effective appreciation of the strategy and bridge the gaps in their learning. The struggle to locate and identify appropriate items limits their ability to fully engage in hands-on, interest-based activities. In the research conducted by Faizah *et al*. (2021), they identified that environmental stressors and resource limitations, in addition to the attitudes of learners and parents, pose significant challenges to the implementation of differentiated instruction in an online teaching environment. Differentiated learning demands considerable time and effort from educators in both planning and execution, as it necessitates the development of tailored lessons and a diverse range of instructional materials.

"Additionally, limited resources or a lack of guidance from educators can make it harder for learners to explore their chosen topics effectively." ***-R16***
"The need for more personalized instruction may require extra preparation and effort. DIBLI demands more time and resources than traditional teaching methods." ***-R7***
"One of the biggest challenges in Differentiated Interest-Based Learning (DIBLI) is making sure every learner feels seen and valued while still covering all the required material." ***-R15***

In Gibbs (2023) research, enhancing teacher resources is crucial for enabling educators to create essential teaching materials that actively involve all learners in the educational process, alongside establishing a flexible classroom setting that promotes learners' motivation and learning, which is a key element of differentiated instruction. Such provisions can significantly improve classroom management and organization. Learners' feedback indicates that inadequate instructional support and resources present challenges that are vital for effectively implementing the strategy. The DIBLI's focus on personalization adds to the difficulties faced by both learners and educators when there is a lack of sufficient tools, time, or support systems. To cater to the interests of every learner, a variety of materials may be required, which are often not easily accessible, making resource availability a notable constraint. The feedback reveals that while DIBLI encourages engagement and personalization, its effectiveness is often hindered by a shortage of material resources, a lack of support for teachers, and increased demands for instructional preparation. Addressing these limitations is essential to fully realize the benefits of differentiated, interest-driven learning approaches.

C. Difficulties in Sustaining Engagement and Aligning Interests

The subsequent responses highlight this theme regarding the challenges learner face in sustaining engagement and aligning their interests. Achieving high levels of learner engagement poses a significant challenge within DIBLI. When educational activities or options do not closely match learners' authentic interests, their motivation and ongoing engagement may decrease. Additionally, the need to reconcile personal interests with academic obligations can further complicate the situation for learners within this process. The following responses elaborate on this theme.

*"Not all learners may be fully engaged or self-motivated to explore topics deeply. This can lead to uneven engagement across the classroom."****-R1***
"In Differentiated Interest-Based Learning, choices don't always match what I like, so it's harder to stay interested." ***-R8***
"Balancing my passion for creative writing with the demands of other school subjects, especially when using a DIBLI approach, is a constant struggle." ***-R19***

Tomlinson (2014) and Tas and Minaz (2024) identified several crucial principles for differentiated instruction (DI), including planning lessons, being flexible with teaching strategies and student arrangements, integrating assessment with instruction, providing appropriate support, and motivating students to take charge of their own learning. She emphasized that the main goal of DI is to promote learning growth by meeting the unique needs of each student, whether in individual or small-group situations, through various methods of expression and numerous opportunities for learning through diverse instructional strategies across content and skills.

Successfully differentiated instruction demands careful planning to meet the wide-ranging interests of students, which might be overlooked by teachers attempting to apply this model. It is vital for educators to thoroughly assess and incorporate students' individual passions, learning preferences, and levels of readiness into their lesson plans. Without intentional and organized planning, differentiation risks becoming superficial, thus failing to fully engage every student. Effective preparation also means offering a range of resources, suitably scaffolding tasks, and continuously monitoring student progress to make timely adjustments that genuinely address individual needs.

D. Issues with visual learning and interpretation

Another theme was identified in the learners' feedback, which is about the struggle with processing visual materials. Learners expressed difficulties in interpreting images, connecting visual content to larger concepts, and effectively organizing their thoughts. The absence of visual aids during group discussions increased comprehension challenges for certain learners, indicating that DIBLI activities that incorporate visual elements need to be meticulously structured. The subsequent responses elaborate on this theme.

> *"The challenges I face in the visual category are, it's okay, but I find it hard to understand the picture." -* ***R10***
> *"Struggling to guess the image, hard time connecting ideas and concepts and struggling to organize and structure my thoughts."****-R18***
> *"Sa group work, usahay lahi akong style sa uban ug kung wala'y visual aids, maglisod ko pagsabot sa discussions (In group work, sometimes my style is different from others, and if there are no visual aids, I have a hard time understanding the discussions)."-* ***R14***

According to Gibbs (2023), differentiated instruction involves structured learning opportunities, teacher demonstrations, and gradually reducing guidance until learners can work autonomously. Additionally, a range of effective resources, such as handouts, visual aids, videos, and review quizzes, can enhance instruction and learning experiences if carefully put into consideration for this strategy.

3. Summary of Findings, Conclusion, and Recommendations

This chapter presents the summary of the key findings in the study, the conclusions drawn based on the research objectives, and the recommendations for future research and more practical interventions.

Summary of Findings

Based on the findings, there was a clear enhancement in learners' scores from the pretest to the post-test. There was a statistically significant increase in performance for the first competency, describing how rocks are weathered, and the second competency that described how the products of weathering are carried away by erosion and deposited elsewhere, indicating that the intervention was effective as it strengthened learners' understanding, about things they misunderstood at first. In contrast, the third competency—making a report on how rocks and soil move downslope due to the direct action of gravity—demonstrated an increase in scores; however, this rise was not statistically significant. This attests that it was not consistent enough among learners, while some advancement was observed, potentially due to the higher-order thinking skills needed for this competency.

As to the challenges encountered by the Grade 11 Senior High School learners in the implementation of DIBLI, it was found out that the most challenging is the **Limitations in resources and accessibility issues**.

Conclusion

It can be concluded that the application of the Differentiated Interest-based Learning and Instruction (DIBLI) strategy has led to improved scores of Grade 11 ABM-B Senior High School learners for the school year 2024-2025 within the chosen topic in Earth and Life Science, the Exogenic Processes. As revealed in the significant increase in post-test scores for the first competency, which refers to describing how rocks undergo weathering, and the second competency, which is explaining how the products of weathering are carried away by erosion and deposited elsewhere. Furthermore, improvements to the enhanced detailed lesson plan should be considered to enhance learners' scores.

Recommendations

Based on the results of the study, the following are recommended:

1. Enhanced Detailed Lesson Plan using the Differentiated Interest-based Learning and Instruction (DIBLI) strategy may be utilized by: The Grade 11 Science teachers may use this crafted Enhanced Detailed Lesson Plan using the Differentiated Interest-based Learning and Instruction (DIBLI) strategy for Grade 11 Senior High School learners.

2. A faculty training may be conducted to: To further the great potential of every educator for personal and professional development, focusing on Differentiated Instruction and Interest-based Learning interconnected to each other, which actualized Differentiated Interest-based Learning and Instruction (DIBLI) strategy.

3. An improvement on the Enhanced Detailed Lesson Plan in Grade 11 Earth and Life Science using the Differentiated Interest-based Learning and Instruction (DIBLI) strategy may be practiced through: Constant feedback and monitoring were carried out through benchmarking with colleagues and other educators after the strategy was implemented.

4. Science teachers are encouraged to: Adopt personalized and differentiated instructional activities using the Differentiated Interest-based Learning and Instruction

(DIBLI) strategy, and this positively impacts learners by motivating them to complete personalized tasks.

5. A constant instructional support for: The administration and faculty body can be enhanced, a detailed lesson plan in teaching Exogenic Processes in Grade 11 Earth and Life Science, incorporating the Differentiated Interest-based Learning and Instruction (DIBLI) strategy, which allows educators to provide guided, personalized learning activities. This strategy promotes ongoing learner motivation and engagement, thus enhancing the overall learning experience.

6. Relevant future study on other topics in Earth and Life Science: To investigate and confirm the efficacy of the enhanced, detailed lesson plan in teaching Exogenic Processes in Grade 11 Earth and Life Science, employing the Differentiated Interest-based Learning and Instruction (DIBLI) strategy, for an inclusive education.

4. Output of the Study

Enhanced Detailed Lesson Plan Using the Differentiated Interest-Based Learning and Instruction (DIBLI) Strategy in Teaching Exogenic Processes

This chapter presents the final output of the study based on the key findings of the study – the Enhanced Detailed Lesson Plan using the Differentiated Interest-Based Learning and Instruction (DIBLI) Strategy in teaching Exogenic Processes, concentrating on the three interesting competencies under the Most Essential Learning Competencies (MELC), as indicated by the pre-test and post-test results of this research. This enhanced, detailed lesson plan uses the Differentiated Interest-Based Learning and Instruction (DIBLI) strategy is designed seek to improve learners' performance in the following learning competencies: "Describe how rocks undergo weathering"; "Explain how the products of weathering are carried away by erosion and deposited elsewhere"; and "Make a report on how rocks and soil move downslope due to the direct action of gravity." Each learning activity includes a variety of learning tasks tailored to the VARK Learning style model, anchored with their interests based on the Interest Inventory Questionnaire result, which pertains to Interest-based Learning (IBL). These variations lead to Differentiated Instruction (DI), given differentiated activities for each learning style.

Rationale

The recent DepEd MEMORANDUM No. 017, s. 2025 entitled Interim Guidelines for the Department of Education Performance Management and Evaluation System (PMES) for Teachers in the School Year 2024-2025. The PPST-based Tools were used in the evaluation of Proficient Teacher Tools, as indicated in Classroom Observable Indicators (COIs). Objective number 8 states that design, adapt, and implement teaching strategies that are responsive to learners with disabilities, giftedness, and talents (PPST Indicator 3.3.2), formulated by Angara (2025). This requires the 21st century basic education teachers to differentiate instruction through differentiated activities to cater to the individual differences of each learner. Hence, this enhanced, detailed lesson plan using the Differentiated Interest-Based Learning and Instruction (DIBLI) Strategy in teaching Exogenic Processes actualized the said memorandum.

Objectives

This Enhanced Detailed Lesson Plan using the Differentiated Interest-Based Learning and Instruction (DIBLI) Strategy in teaching Exogenic Processes has these learning objectives: (1) Explain the different types of weathering, (2) Differentiate the types of erosion, (3) Compare the classification of mass wasting, and (4) Participate actively in the class discussion and learning activities. This covered the first quarter learning competencies: "Describe how rocks undergo weathering"; "Explain how the products of weathering are carried away by erosion and deposited elsewhere"; and "Make a report on how rocks and soil move downslope due to the direct action of gravity." The effects of the Differentiated Interest-Based Learning and Instruction (DIBLI) Strategy were investigated by reviewing post-test results to understand its possible influence on learning outcomes.

Scheme of Implementation

The researcher collaborated with the School Principal to explore the potential integration of the proposed enhanced, detailed lesson plan in the curriculum. After receiving approval, a brief orientation was conducted for the target respondents to ensure the successful application of the intervention for the learners. Following the implementation, areas needing improvement were identified and helped in the improvement of their effectiveness.

Based on the results and key findings of the study, this is now the Enhanced Detailed Lesson Plan using the Differentiated Interest-Based Learning and Instruction (DIBLI) Strategy in teaching Exogenic Processes.

Table 5: Enhanced Detailed Lesson Plan using Differentiated Interest-based Learning and Instruction (DIBLI) strategy in teaching "Exogenic Processes"

1	**Learning Area**	**Grade Level**	**Quarter**	**Date**	**August 12, 2024**
	Earth and Life Science	**11**	**1st**	**Day**	**Monday**
				Time	**6:00 AM – 7:00 AM**

Learning Competency/ies	1. Describe how rocks undergo weathering. 2. Explain how the products of weathering are carried away by erosion and deposited elsewhere. 3. Make a report on how rocks and soil move downslope due to the direct action of gravity.	**Code**	**S11/12ES-Ib-11** **S11/12ES-Ib-12** **S11/12ES-Ib-13**

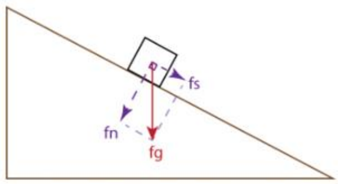
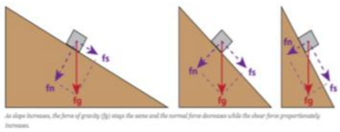
Key Concepts / Understandings to be Developed	▪ **Weathering** –the breakdown of rocks at the Earth's surface by water, temperature, and biological activities. ▪ **Erosion** - is the geological process in which earth materials are worn away and transported by natural forces like wind and water. ▪ **Physical/Mechanical Weathering** – happens when rock is physically broken without changing its chemical composition due to different temperatures and water. ▪ **Chemical Weathering** – decomposes rock through chemical reactions and changes. ▪ **Biological Weathering** –when rocks are broken up by the actions of living things. ▪ **Erosion by water** - changes the shape of coastlines. ▪ **Erosion by wind** - happens when light materials, such as small rocks and pebbles, are carried by wind to different places. ▪ **Erosion by ice** – happens when the ice moves downhill and plucks out chunks of rock, and causes scraping between the ice and the rock. ▪ **Erosion by soil** – happens when the topsoil is removed and leaves the soil infertile. ▪ **Erosion by gravity** – gravity pulls any loose bits down the side of the hill or mountain, also known as Mass Wasting. ▪ **Mass Wasting** –a process whereby weathered material is moved downslope under the immediate influence of gravity. ▪ **Slope strength** - Slope stability is ultimately determined by two principal factors: the slope angle and the strength of the underlying material.  *Forces on a block on an inclined plane (fg = force of gravity; fn = normal force; fs = shear force).*  ▪ **Slope Angle and Angle of Repose** (the steepest angle that can be assumed by loose fragments on a slope without downslope movement) are strongly related to rates of mass wasting. ▪ **Classification of Mass Wasting**

TABLE 15.1
Different Kinds of Mass Wasting Processes

Motion	Material	Speed	Effect
Creep	Soil	Slow	
Slump	Soil or debris	Slow or fast	
Slide	Rock or debris	Fast or slow	
Flow	Debris or mud	Fast or slow	
Avalanche	Ice and snow or debris or rock	Fast	
Fall	Rock	Fast	

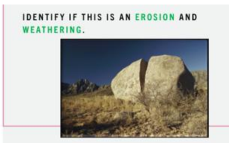
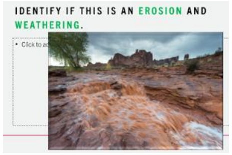
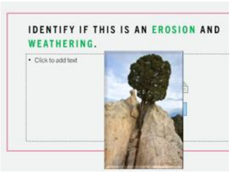
© 2007 Thomson Higher Education

Adapted Cognitive Process Dimensions (D.O. No. 8, s. 2015)

Domain	**Categories**	**1. Objectives**
Knowledge	***Remembering***	
	Understanding	Explain the different types of weathering.
Skills	***Applying***	
	Analyzing	Differentiate the types of erosion.
	Evaluating	Compare the classification of mass wasting.
	Creating	
Attitude	***Receiving Phenomena***	
	Responding to Phenomena	Participate actively in the class discussion and learning activities.
	Valuing	
	Organization	
	Internalizing Values	
Values	***Maka-Dios***	
	Makatao	
	Makabansa	
	Makakalikasan	

2. Content	Exogenic Processes
3. Learning Resources	▪ Self-Learning Module 2, Quarter 1, Week 2, ▪ Educational sites

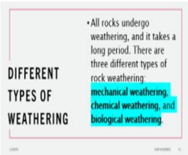
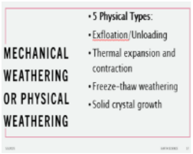
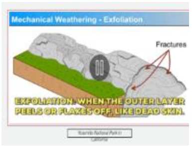
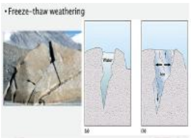
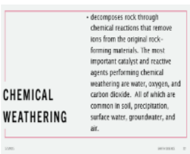
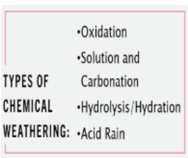
4. Procedures		**Teacher and Learners' Responses**
4.1. Introductory Activity (15 minutes)	Routinary Activities 1. Prayer 2. Greeting the Class **Learning Task 1:** The learners must sing a short chant or melody following the tune of "Made for You" for weathering, erosion, and deposition while making silly hand motions. Weathering breaks it! Erosion takes it! **Learning Task 2:**	Teacher okay let's start on this side: Learners on the right side: Okay, this is what we are going to do…. How about this? Sure, sure, I agree with you… Okay, let's sing this with this action, follow me. Weathering breaks it! Erosion takes it! Teacher: Very good, that's nice. How about this side? Learners on the left side:

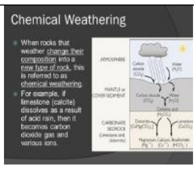
	Identify if this is Erosion and Weathering.         	What will be ours? Okay, okay. We get it! Okay, let's sing this with this action, follow me. Weathering breaks it! Erosion takes it! Teacher: Very good, amazing! Learners raised their hand and one learner was called and answered: Weathering Teacher: Very good, this is weathering Next, this one? What is this? Learners raised their hand and one learner was called and answered: Weathering Teacher: Good answer, but this is ... Erosion Learner: Ahh, erosion? Teacher: How about this one? What do you think this is? Learners raised their hand and one learner was called and answered: Weathering Teacher: Very good, this is weathering Next, this one? What is this? Learners raised their hand and one learner is called and answered: Erosion Teacher: Very good this is erosion. Next, this one? What is this? Learners raised their hand and one learner is called and answered: Erosion Teacher: Nice try, but this is weathering Learners: Ahh, weathering
4.2. Activity (30 minutes)	**Learning Task 3:** **Differentiated Class Activity:** The learners are divided into four groups. The first group will be VISUAL Learners, and a specific activity will be given to them. They will choose the group's leader, reporter, timekeeper, and secretary. These individuals will present their outputs/results to the class. They are all given at least 6 minutes to accomplish each task and a 1-minute presentation once the time is up.	Teacher: This time you will be with your respective groups. The VISUAL learners will be here, the AUDITORY learners will be here, the READING/WRITING learners will be here and the KINESTHETIC learners will be here. For VISUAL learners this will be your tasks please work as a team. Your collaboration is highly needed. Here's the link for the answers of the visual learners first task.

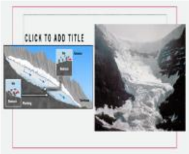
	I. Visual Learners The learners will watch this short informative video about weathering and erosion. The learners will be given various infographics and graphic organizers illustrating different types of weathering, other agents of erosion, and classifications of mass wasting. **Task:** 1. They were asked to take down notes to retain the important information. 2. The learners will evaluate the different infographics showing the various types of weathering, different agents of erosion, and the classifications of mass wasting. They will do this on their notebooks. A. B. Result for the task of visual learner: The second group will be the AURAL (AUDITORY-MUSICAL) Learners **II. Aural (Auditory-Musical) Learners** A. B.	Teacher: For AURAL learners this will be your task. Please collaborate as a team. Teacher: For the read/write learners these are your tasks. Learner: Yes miss. Teacher: Very good Read/write learners these are the answers to crossword puzzle. You got it all correct. 1.Sediment 2.Delta 3.ice 4.erosion 5.water 6.Deposition 7.Dune 8.weathering 9.canyon 10.Glacier 11.Gravity Teacher: For Kinesthetic Learners this is your task. You have 5 minutes to look for all of these within school premises only. Learners: Aweehh!! This is so exciting. Noted Miss (and they run outside).

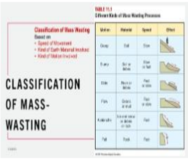
	1. What can you conclude from this video? 2. Write your takeaways about the different videos. **Task:** The learners will answer the given question as part of the learning process and will write their answers in their notebooks. They are also tasked to create a 1-minute jingle or a brief song related to exogenous processes within a 1-minute or less than a 1-minute presentation. The third group will be the READ/WRITE Learners **III. Read/Write Learners** **Task:** 1. The learners will answer the crossword puzzle. They will do this on the answer sheets given. 2. The learners will watch this short video about this chemical weathering then write a short informative paragraph about this video. The fourth group will be the KINESTHETIC Learners. **IV. Kinesthetic Learners** **Task:** The learners will do a "*Scavenger Hunt*" to walk around the school and look for the things listed in the guide.	
4.3. Analysis (10 minutes)	The learners will present their answers to the class through their representatives for a minute.	The presentation for each representative begins. VISUAL Learners: These are our answers and our brief insight about the video. Teacher: Very good visual learners you got it all correct. How about for the aural learners? AURAL Learners: We're presenting to you our short originally made short song about weathering of rocks and erosion. Rocks don't endure endlessly; they fracture and flake, As time and nature collaborate in a gradual exposure. Rain and wind, with heat and frost, They erode effortlessly through natural processes.

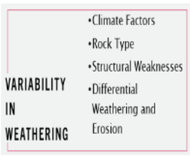
		Mechanical forces, like a hammer's strike, Or chemical reactions—acids in charge. Roots from plants can split the rock, Weathering occurs quite naturally! Break it down, take it slow, Turning rocks to sand, let erosion flow. Wind, water, ice in motion, Molding the Earth in a natural performance! Teacher:
	The learners will present their answers to the class through their representatives for a minute.	Very good aural learners you got it all correct. How about for the read/write learners? READ/WRITE Learners These are our answer for the crossword puzzle. Teacher:
	The learners will present their answers to the class through their representatives for a minute.	Very good !You got it all correct. READ/WRITE Learners This is for our short informative paragraph. Weathering and erosion are natural phenomena that gradually shape the Earth's landscape. Weathering involves the breakdown of rocks into smaller fragments due to physical forces such as changes in temperature, water, ice, and biological activity, or through chemical reactions that modify the rock's makeup. After rocks have been disintegrated, erosion transports those fragments through agents like wind, water, ice, or gravitational pull. These natural processes can sculpt valleys, create canyons, and generate new landforms such as deltas and dunes. Together, weathering and erosion are essential in the ongoing transformation of the Earth. Teacher:
	The learners will present their answers to the class through their representatives for a minute.	Very good read/write learners You got it all correct. How about for the kinesthetic learners? Kinesthetic Learners: These are the things we found outside the classroom. 1. Deposition of sediments in a new place. 2. cracked rock 3. A pile of sediments 4. Evidence of weathering 5. A mud 6. A drainage pipe Teacher: Wow, very good Kinesthetic learners. Even if you aren't able to find all, just like the: 1. A small channel from runoff 2. Exposed tree roots above the ground 3. A sidewalk crack 4. A sloped hill 5. Evidence of ice wedging

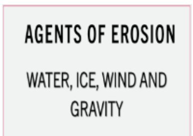
4.4. Abstraction (30 minutes)	The teacher will discuss the topic further with the class.          	Teacher: Okay class let's identify now what is weathering and its types. Teacher: What are the different types of weathering? Learners: Mechanical, chemical and biological weathering. Teacher: Let's have first the mechanical weathering. These are the five types of mechanical weathering. Teacher: First, we have exfoliation. This is what happens during exfoliation. Teacher: What have you observed with the rock? Learner: It peels off. Teacher: Yes, The outer layer of a mountain or rock will peel off like dead skin. Teacher: The next image shows us the freeze-thaw weathering. The next image will elaborate the scenario. This also shows the thermal expansion and contraction of rocks due to temperature differences. Teacher: What have you observed in the image? Learner: The rock breaks after the repeated expansion and contraction of rocks. Teacher: Yes, very good what happens first? Learner: First, the water collects in rock crack so at the beginning there's a small crack in the rock. Next, the water in the rock's crack freezes and starts to expanding so the crack becomes bigger. Then, the ice thaws, contracts and water gets deeper into cracks again. Until it breaks into two small rocks. Teacher: Yes, very good Serad nice observation. Teacher: Next, what have you observe in the next image? Learner: Ehh,, There's a lot of holes in the rocks. Learner: It's near the sea, I guess. Learner: It's a cave? Teacher: Yes, very good this is a cave resulting from haloclasty wherein there's a salt crystal formation on the rocks. Teacher: Next, we have Chemical weathering. Everybody please read the definition of Chemical weathering. Learners: The learners read in unison. Teacher: These are the types of chemical weathering Teacher: What have you observed in the first image? Learner: It rains then the cabin dioxide and water go to the ground and becomes Carbonic acid then goes deeper and becomes dolomite and limestone. Teacher: Yes very good, at the same time the dolomite and limestone is composed of Magnesium, Calcium, and Bicarbonate. This procedure shows aid rain formation and carbonation on rocks. Teacher: How about in this next image? What do you think is the type of chemical weathering shown in this image? We have here what? Learner: Cave. Teacher: What's in the wave? Learner: A stalactite. Teacher: Yes, very good a stalactite. It's a stone formation in the cave. What do you think is the opposite of a stalactite? Learner: Stalac…. wait, it's on the tip of my tongue. Teacher: yes what is it? Learner: Stalac….mite?

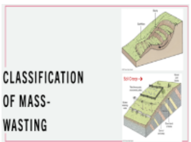
<table>
<tr>
<td></td>
<td>


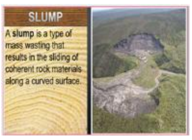


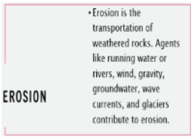
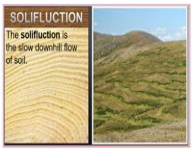
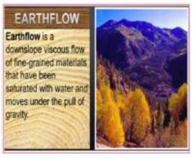
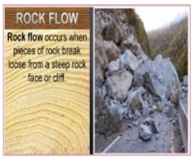
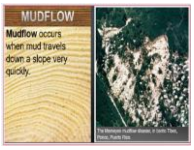
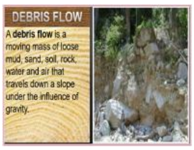
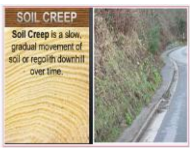
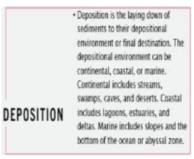
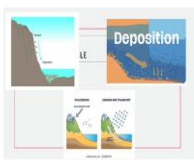



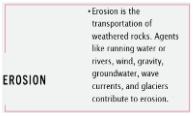



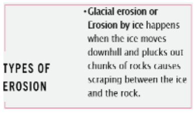


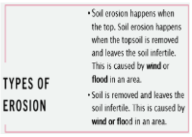


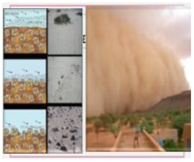
</td>
<td>Teacher: Yes, very good. This image shows a stalactite. What have you observed with the position of the stalactite?
Learner:
It's on the top.
Teacher: Yes, very good when we say Stalactite From the letter”c” could stand for “ceiling,” so it is where the Stalactite forms. However, for Stalagmite, it’s on the floor. It’s the opposite of Stalactite.
Learner:
Ahh…
Teacher: So Stalactite formation shows carbonation of rocks as well.
Teacher:
The next image shows what type of chemical weathering? What happens to the first image, which shows the before and after effect of rock?
Leaner:
It rust.
Teacher: Rust? Are you sure?
Learner: Yes.
Teacher: This shows the effect of acid rain in the rocks. It can destroy the appearance of the rock material.
Teacher: What do you think this image shows?
Learner:
A big rock near the sea.
Teacher:
What do you think happens to rock?
Learner:
There’s a big hole?
Teacher: What do you think this type of chemical weathering is?
Learner: Hydration.
Teacher: No, not hydration.
Learner: Hydrolysis.
Teacher:
Yes, it’s Hydrolysis.
Teacher: Now we will move to the next type of weathering. It’s called Biological weathering. Everybody, please read the definition.
Learners:
(Start reading)
Teacher:
Now, what have you observed with these images?
Learner:
There are roots on rocks.
Teacher: Yes, very good. What do you think the roots do to the rock?
Learner:
The roots are spreading from the ground to the top of the rocks.
Teacher: Yes, very good answer. Hence, this shows biological weathering. Why do you think so?
Learner:
Because of the roots?
Teacher: Yes, because of the roots that can break the rocks into smaller pieces.
Teacher:
Next, what have you observed in that photo?
Learner: A lichen?
Teacher: Yes, a lichen. Have you seen those in person?
Learner: Yes.
Teacher:
What happens to the rock with lichens?
Learner:
The lichens cover the rocks, which changes their appearance and color.
Teacher: Very good.
How about the next picture?</td>
</tr>
</table>

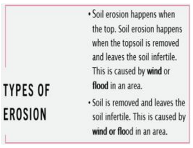
	          	Learner: There's a rabbit? Teacher: Are you sure it's a rabbit? Learner: Hmmm… a big hamster? Teacher: A hamster? Are you sure? Learner: Hmm…A ….ferret? Teacher: Yes, it's a ferret. What does the ferret do to the rock? Learner: It hides in that small hole between the rocks. Teacher: Yes, very good. How will it fit in the narrow hole between rocks? Learner: It will burrow through the rocks. Teacher: Yes, very good, so that's why it's biological weathering because of living things' activity that can weather the rocks. Teacher: Next, we have erosion. Everybody, please read its definition. Learner: (Start Reading) Teacher: The Agents of erosion are water, ice, wind, and gravity The first type of erosion is glacial erosion. Please read its definition. Learner: (Start Reading) Teacher: What have you seen in the image? Learner: The ice moves down from the iced mountain. Teacher: This is called In glacial erosion, the ice moves downhill. Teacher: Everybody, please read the next type of erosion. Learner: (Start Reading) Teacher: What have you observed in this image? Learner: There's a sandstorm. Teacher: Yes, these sands are carried by the wind. This is when soil erosion occurs, too, because of the wind. How about the next picture? Learner: There's a runway of water with muddy soil. Teacher: Yes, it's soil erosion caused by running water. This usually occurs on canals. Teacher: Everybody, please read the definition of mass wasting. Learner: (Starts reading) Teacher: This image shows a mass -wasting. Teacher: Everybody, please read the definition of slope angle and angle of repose. Learner: (Start reading) Teacher: In this image, you can see the angle of repose at which loose fragments can move downward. Teacher: This image shows the classification of mass wasting

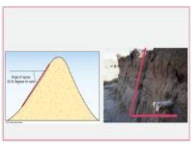




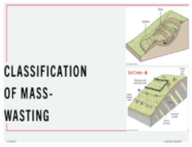
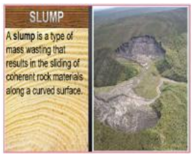
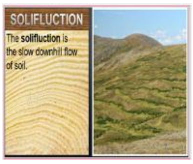
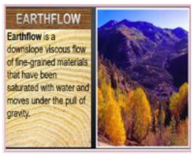
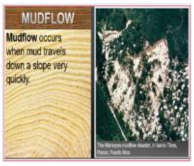
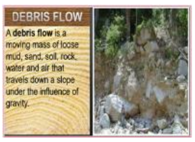
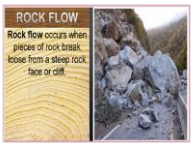
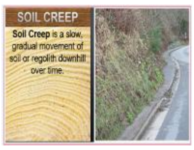
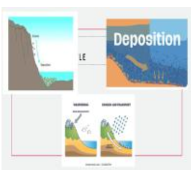








based on seed, kind of material, and motion.
Teacher:
This image shows a creep.
A creep's speed is slow its material is soil.
Teacher:
Another image shows the classification of mass wasting based on moisture content and the speed of movement.
Teacher:
Rockfall is fast and dry; landslide is in the middle of dry and wet and it's fast; mudflow is wet and fast; Earthflow is wet and it's speed is in the middle of fast and slow; Solifluction is in the middle of wet and dry and slow; slump is near slow and in the middle of wet and dry lastly creep is slow and dry.
Teacher:
The next image shows a slump. Please read the definition of slump
Learner:
(Start reading)
Teacher:
The next image shows a solifluction. Everybody, please read the definition of solifluction
Teacher:
The next image shows an earthflow. Everybody, please read its definition.
Teacher:
The next image shows a mudflow. Everybody, please read a mudflow.
Teacher:
The next image shows a debris slide. Everybody, please read the definition of a debris slide.
Learner:
(Start reading)
Teacher:
The next images shows a debris flow. Everybody, please read the definition of a debris flow.
Teacher:
The next image shows a rock flow. Everybody, please read the definition of rock flow.
Teacher:
The next image shows soil creep. Everybody, please read the definition of soil creep.
Teacher:
The next image shows a deposition. Everybody, please read the definition of deposition.
Learner:
Start reading the deposition
Teacher: This image shows deposition.
From this image, what can you infer from deposition?
Learner:
First, the rock undergoes the process called weathering, then it is eroded in different places and deposited into the bodies of water.
Teacher:
The next image shows a deposition. Everybody, please read the definition of deposition.
Learner:
Start reading the deposition
Teacher: This image shows deposition.
From this image, what can you infer from deposition?
Learner:
First, the rock undergoes the process called weathering, then it is eroded in different places and deposited into the bodies of water.

	          	
4.5. Application (20 minutes)	Directions: The learners will be in their groups based on their learning	The kinesthetic learners perform one by one this given task.

	styles. Each group is given at least 5 minutes to finish the task. 1.First, the **Kinesthetic** LEARNERS will do the paint-me-a-picture challenge. They will perform the situations written on a ¼ size paper. They are given 1 minute to perform each written scenario. 2. Second, the **Visual** Learners will guess the scenario performed by the **Kinesthetic Learners**. 4.Third, the **Read/Write Learners** will write something they have observed from the Kinesthetic Learners' performance and the experience of Visual learners. 5. Lastly, the **Aural (Auditory-Musical) Learners** will create a short song about the written work of the Read/Write Learners.	1. Mechanical weathering thermal expansion and contraction 2. Chemical weathering – Acid rain 3. Chemical weathering – Stalactite formation 4. Scenario of soil erosion 5. Scenario of mass wasting – landslide Teacher: Very good kinesthetic learners job well done. The visual learners guess it. 1. Mechanical weathering hmmm… ice-thaw? ice-freeze? Thermal expansion and contraction? Teacher: correct Next. 2. Hmmm… rain? Acid rain Chemical weathering Teacher: correct next 3. Mountain? Ahhhh…. cave? hmm…stalagmite? hmm…Stalactite? Teacher: Correct. Next 4. Hmmm… rain? erosion? Ahhhh… Soil erosion Teacher: Correct Next 5. Ahhh… mudflow? mass wasting? Ahhh… Landslide? Teacher: Correct. Very good visual learners. This is the output of the read/write learners. 1.The visual learners picture out the first scenario as rock getting really hot during the day and then cold at night. It cracks little by little. 2.The visual learners picture out the second scenario as a statue getting wet by acid rain. It's surface slowly wearing away. 3.The visual learners picture out the third scenario as the water dripping from the cave. Those pointy rocks (stalactites) forming over time. 4.The visual learners picture out the fourth scenario as the soil being washed away by heavy rain. The ground losing its top layer. 5.The visual learners picture out the last scenario as a big hill suddenly, the soil and rocks slide down. The trees and houses are moving as well downslope. Teacher: Very good read/write learners now let's have the aural learners for their originally made song. This is the output of aural learners. The earth keeps changing every day, Shaped by nature in its own way. Heat makes rocks expand, then break A small crack forms with each mistake. Wind and rain water down the land, Breaking stones with a gentle hand. Acid rain falls from the sky, Changing rocks as time goes by. In caves below where light is rare, Stalactites form with patient care. Crip by drip, they slowly grow. A quiet process, steady and slow. When heavy rains wash soil away, Erosion happends day by day. The topsoil's gone, the land feels thin, and farming struggles to begin. Then come landslides, fast and loud, Rushing down like a dusty cloud. Pulled by gravity, they can't be stopped. The slope gives in, and rocks are dropped.

		Nature's forces, big and small, Change the earth for one and all. It's always moving, never still Shaped by time and nature's will. Teacher: WOW! Excellent Aural learners such a nice performance and meaningful lyrics. Teacher: Congratulations everyone you did it. 1.
4.6. Assessment		
Observation		
Talking to Learners /Conferencing		
Analysis of Learner's Product		
Test (30 minutes)	Learning Task 4: The learners will answer the post-test through the google form link send in their class group chat.	
4.7. Assignment		
Reinforcing/Strengthening the Day's Lesson		
Enriching /Inspiring the Day's Lesson		
Enhancing /Improving the Day's Lesson		
Preparing for the New Lesson	**Directions:** In your notebook, define the following: 1. Volcanism 2. Earthquakes 3. Magma 4. Convection current 5. Viscosity of magmas	
4.8. Concluding Activity		
Remarks		
Reflections		

Prepared by:

Name	**Stephanie Jean A. Obayan**	**School**	**Canduman National High School**
Position/Designation	**Teacher II**	Division	**Mandaue City**
Contact Number	**09266652942**	Email Address	stephaniejean.obayan@deped.gov.ph

5. References

1. Adobe Stock. "Crustose lichen" images. Adobe Stock, n.d. https://stock.adobe.com/ph/search/images?k=%22crustose%20lichen%22
2. Achmad WKS, Rachman SA, Aras L, Amran M. Differentiated instruction in reading in elementary schools: International Journal of Evaluation and Research in Education (IJERE), June 2024; 13:1997-2005. Doi: 10.11591/ijere.v13i3.27134
3. Afis Baghiz Syafruddin DH. Development of Instagram-Based Learning Media to Increase Students Learning Interest in Acid-Base Materials. Turkish Online Journal of Distance Education-TOJDE, September 22, 2023; 25:228-247. Retrieved April 26, 2025, from: https://files.eric.ed.gov/fulltext/EJ1422489.pdf
4. Akmal Rijal AB. Effectiveness of differentiated learning in mathematics: Insights. Journal of Education and Learning (EduLearn), February 2025; 19:241-248. Doi: 10.11591/edulearn.v19i1.21806
5. Al-Shaboul Y, Al-Azaizeh M, Al-Dosari N. Differentiated Instruction between Application and Constraints: Teachers' Perspective. European Journal of Education Research. 2020; 10(1):127-143. Retrieved from: https://files.eric.ed.gov/fulltext/EJ1284002.pdf
6. Angara S. Interim Guidelines for the Department of Education Performance Management and Evaluation System for Teachers in the School Year 2024-2025. All regions, February 7, 2025. Retrieved April 26, 2025, from: Department of Education: https://bit.ly/PMESTeachersSY2425
7. Ansari SJ. Psychological Aspects of VARK. International Journal of Creative Research Thoughts. (IJCRT) An International Open Access, Peer-reviewed, Refereed Journal, 2023, 352-362.
8. Aquino R. Increasing Academic Performance on Earth Science Among Grade 9 Learners through Developed Self-Learning Materials, 2023. https://www.researchgate.net/publication/382795147_
9. Bal AP. Assessing the impact of differentiated instruction on mathematics achievement and attitudes of secondary school learners. South African Journal of Education, February 2023; 43:1-10. Doi: https://doi.org/10.15700/saje.v43n1a2065
10. Balanlay BC, Jr. Chapter 4: Soil classification [PDF]. Scribd, n.d. https://www.scribd.com/document/544600580/CHAPTER-4-Soil-Classification
11. Behiga RC. Issues with National Achievement Test

(NAT) in the Philippines. University of Science and Technology of Southern Philippines, June 11, 2022. https://www.researchgate.net/publication/361229592_ISSUES_WITH_NATIONAL_ACHIEVEMENT_TEST_NAT_IN_THE_PHILIPPINES
12. Beltran KA, Agripa SA, Bustarga AJO, Dela Cruz KB, Marmol SL, Morallo SJA. Practices and challenges in implementing inclusive education in Philippine elementary schools. Journal of Education Research. 2025; 6(1):8-22. Doi: https://doi.org/10.37985/jer.v6i1.2251
13. Benavides JC. 10 Geomorfología: Procesos agradativos. Geosistemas ID 026671, Pontificia Universidad Javeriana, 2022. https://lepicolea.wordpress.com/wpcontent/uploads/2022/03/10-geomorfologia-procesos-
14. Boholano Helen, Balo Vincent Theodore, Pogoy Angeline, Alda Rivika. Technology-Enriched Teaching in Support of Quality Education in the 21st Century Skills. Solid State Technology. 2020; 63:6795-6804. https://www.researchgate.net/publication/346973326_Technology-Enriched_Teaching_in_Support_of_Quality_Education_in_the_21st_Century_Skills/link/5fd6c9b545851553a0b55ce1/download?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIn19
15. Brandle J. 15.2 Classification of mass wasting. In K. Lutgens, E. Tarbuck, & D. Tasa (Eds.), Physical geology (2nd ed.). University of Saskatchewan, 2019. https://openpress.usask.ca/physicalgeology/chapter/15-2-classification-of-mass-wasting/
16. Brown E. Mass movements and human responses. SA Geography, January 22, 2013. https://sageography.co.za/wiki/grade-11-caps/grade-11-caps-geomorphology/mass-movements-and-human-responses/:contentReference[oaicite:0]{index=0}
17. Canva. Abrasion as agent of wind erosion.jpg. Canva, 2025. https://www.canva.com/
18. Canva. Abrasion of ice.jpg. Canva, 2025. https://www.canva.com/
19. Canva. Abrasion type of weathering of rock.jpg. Canva, 2025. https://www.canva.com/
20. Canva. Acid rain effect on rock.jpg. Canva, 2025. https://www.canva.com/
21. Canva. Biological weathering on rocks.jpg. Canva, 2025. https://www.canva.com/
22. Canva. Burrowing animals on rocks.jpg. Canva, 2025. https://www.canva.com/
23. Canva. Creep as an agent of erosion.jpg. Canva, 2025. https://www.canva.com/
24. Canva. Creep of rock.jpg. Canva, 2025. https://www.canva.com/
25. Canva. Deflation as wind the agent of erosion.jpg. Canva, 2025. https://www.canva.com/
26. Canva. Glaciers as an agent of erosion.jpg. Canva, 2025. https://www.canva.com/
27. Canva. Hydrolysis effect on rock.jpg. Canva, 2025. https://www.canva.com/
28. Canva. Ice wedging.jpg. Canva, 2025. https://www.canva.com/
29. Canva. Landslides. Canva, 2025. https://www.canva.com/
30. Canva. Lichen on rocks.jpg. Canva, 2025. https://www.canva.com/
31. Canva. Mud flow.jpg. Canva, 2025. https://www.canva.com/
32. Canva. Mudslide.jpg. Canva, 2025. https://www.canva.com/
33. Canva. Oxidation effect on rock.jpg. Canva, 2025. https://www.canva.com/
34. Canva. Plant roots as biological weathering.jpg. Canva, 2025. https://www.canva.com/
35. Canva. Plant roots on rocks.jpg. Canva, 2025. https://www.canva.com/
36. Canva. Plucking as ice agent of erosion.jpg. Canva, 2025. https://www.canva.com/
37. Canva. Rivers and Streams.jpg. Canva, 2025. https://www.canva.com/
38. Canva. Rockfalls.jpg. Canva, 2025. https://www.canva.com/
39. Canva. Rocks moving downhill.jpg. Canva, 2025. https://www.canva.com/
40. Canva. Root expansion.jpg. Canva, 2025. https://www.canva.com/
41. Canva. Slump of rocks.jpg. Canva, 2025. https://www.canva.com/
42. Canva. Water as an agent of erosion.jpg. Canva, 2025. https://www.canva.com/
43. Canva. Waves.jpg. Canva, 2025. https://www.canva.com/
44. Career Assessment Site. The Strong Interest Inventory Test, n.d. https://careerassessmentsite.com/tests/strong-tests/about-the-strong-interest-inventory/
45. Castlepaloma. Lessons from a tree. HubPages, n.d. https://discover.hubpages.com/health/Lessons-From-A-Tree
46. Che Mat N, Jamaludin KA. Effectiveness of practices and applications of student-centered teaching and learning in primary schools: A systematic literature review. International Journal of Academic Research in Progressive, 2024.
47. Cocozza C, De Domenico M. Lichen recolonization on restored calcareous statues of three Venetian villas. Science of the Total Environment. 2008; 407(1):338-344. Doi: https://doi.org/10.1016/j.scitotenv.2008.08.054
48. College Sidekick. Types of mass wasting, n.d. https://www.collegesidekick.com/study-guides/geophysical/types-of-mass-wasting
49. Congress SA. Republic Act No. 11650, An Act Instituting a Policy of Inclusion and Services for Learners with Disabilities in Support of Inclusive Education, establishing Inclusive Learning Resource centers of learners with disabilities in all schools districts, MUNICI, March 21, 2022. Retrieved April 26, 2025, from: https://elibrary.judiciary.gov.ph/thebookshelf/showdocs/2/94483
50. Department of Education - National Capital Region. Learning Assurance for Monitoring and Progress: Pre-Test. DepEd Learning Management System, n.d. https://ncr2.lms.deped.gov.ph/moodle/course/index.php?categoryid=553
51. Department of Education - Teacher Education Council. PPST Resource Package: Module 10 - Design, select, organize and use diagnostic, formative and summative

assessment strategies consistent with curriculum requirements, 2020. https://tec.deped.gov.ph/wpcontent/uploads/2020/09/PPST.RP_Module-10.pdf:contentReference[oaicite:0]{index=0}
52. Department of Education. DO 8, s. 2015 - Policy guidelines on classroom assessment for the K to 12 basic education program. Department of Education, Republic of the Philippines, April 1, 2015. Retrieved from: https://www.deped.gov.ph/2015/04/01/do-8-s-2015-policy-guidelines-on-classroom-assessment-for-the-k-to-12-basic-education-program/
53. Department of Science and Technology (DOST) and the Department of Education (DepEd). Implementing Rules and Regulations of Republic Act No. 10612, otherwise known as the "Fast-Tracked S&T Scholarship Act of 2013", August 4, 2014. Retrieved April 26, 2025, from: https://elibrary.judiciary.gov.ph/thebookshelf/showdocs/10/79258#:~:text=The%20State%20shall%20give%20priority%20to%20research%20and%20development%2C%20invention%2C%20innovation%20and%20their%20utilization.&text=7687%2C%20otherwise%20known%20as%20the%20%E
54. Dewey J. Experience and education. Kappa Delta Pi, 1938. https://archive.org/details/ExperienceAndEducation
55. EduRev. Soil: Composition, characteristics & types of soils, n.d. https://edurev.in/t/103549/Soil-Composition--Characteristics-Types-of-Soils
56. Enas El-Saftawy, Ahmed A Abdel Latif, Asmaa M ShamsEldeen, Mansour A Alghamdi, Amal M Mahfoz, Basma Emad Aboulhoda. Influence of applying VARK learning styles on enhancing teaching skills: Application of learning theories. BMC Medical Education, September 26, 2024. Retrieved April 26, 2025, from: https://bmcmededuc.biomedcentral.com/articles/10.1186/s12909-024-05979-x
57. EPIC Virtual Field Experiences. Erosion. University of California Museum of Paleontology, n.d. https://epiccvfe.berkeley.edu/glossary/erosion/
58. Faizah I, Zainal Asri NA, Baharom NN. Has differentiated instruction gone 'awry' in online teaching and learning? Journal of Language Teaching and Research. 2021; 12(3):501-510. Doi: https://doi.org/10.17507/jltr.1203.13
59. Fleming ND. Not another inventory, rather a catalyst for reflection, 1987. Retrieved from: https://vark-learn.com/introduction-to-vark/
60. Freie Universität Berlin. Erosion and wind erosion. GeoLearning, n.d. https://www.geo.fu-berlin.de/en/v/geolearning/mountain_building/weathering/Erosion/index.html
61. Fu, Yu, Qiu Y. The impacts of learning motivation, emotional engagement, and psychological capital on academic performance in blended learning. Frontiers in Psychology. 2024; 15, Article 1357936. Doi: https://doi.org/10.3389/fpsyg.2024.1357936
62. García-Carmona A. Learning about the nature of science through the critical and reflective reading of news on the COVID-19 pandemic. Cultural Studies of Science Education. 2021; 16(4):1015-1028.
63. Getie AS. Factors affecting the attitudes of students towards learning English as a foreign language. Cogent Education. 2020; 7(1):1738184.
64. Getty Images. Tree growing in cracked rock [Photograph]. Getty Images, n.d. https://www.gettyimages.com/detail/photo/tree-growing-in-cracked-rock-royalty-free-image/523640996
65. Gheyssens E. Differentiated instruction as an approach to establish effective teaching in inclusive classrooms. In Effective Teaching Around the World. Springer, 2023, 677-689. Doi: https://doi.org/10.1007/978-3-031-31678-4_30
66. Gibbs K. Voices in practice: Challenges to implementing differentiated instruction by teachers and school leaders in an Australian mainstream secondary school. The Australian Educational Researcher. 2023; 50(4):1217-1232.
67. Goodwin JR. What's the difference? A comparison of student-centered teaching methods. Education Sciences. 2024; 14(7):736. https://www.mdpi.com/2227-7102/14/7/736?utm
68. Gruszka's Earth Science GIFtionary. https://uag-earthsci.blogspot.com/2019/11/day-048-giftionary-physical-weathering.html
69. G310stu. Hillside moving over a sidewalk [Photograph]. Wikimedia Commons, March 4, 2007. https://commons.wikimedia.org/wiki/File:Hillside_moving_over_a_sidewalk.jpg
70. Halle. Landforms 2-Gradational Forces [PowerPoint slides]. SlideServe, July 25, 2014. https://www.slideserve.com/halle/landforms-2-gradational-forces
71. Herliana F, Hafinda T, Firmayanto R. Differentiated instruction through adaptive learning platform in science education: A systematic literature review. Jurnal Pendidikan MIPA. 2024; 25(1):1-15. https://jpmipa.fkip.unila.ac.id/index.php/jpmipa/article/view/92
72. Hussain I. Pedagogical Implications of VARK Model of Learning. Journal of Literature, Languages and Linguistics an International Peer-Reviewed Journal, 2017, 33-37. https://www.researchgate.net/publication/337274707_Pedagogical_Implications_of_VARK_Model_of_Learning
73. Insorio AO. Integrating differentiated instruction to improve STEM students' mathematical engagement and academic performance. International Journal of Didactical Studies. 2024; 5(2), Article 27678. Doi: https://doi.org/10.33902/ijods.202427678
74. Joseph S, Thomas M, Simonette G, Ramsook L. The Impact of Differentiated Instruction in a Teacher Education Setting: Successes and Challenges. International Journal of Higher Education. 2013; 2(3). Doi: 10.5430/ijhe.v2n3p28
75. Kale SR. Lecture 11: Conservation equations of mass, momentum, and energy. In Fundamentals of Theoretical and Experimental Aerodynamics [PDF]. National Programme on Technology Enhanced Learning (NPTEL), IIT Bombay, 2015. http://kcl.digimat.in/nptel/courses/video/105107200/lec11.pdf

76. Karakaya K, Yildirim A. Challenges and opportunities of implementing differentiated instruction in inclusive classrooms. Education Sciences. 2023; 13(10):989. Doi: https://doi.org/10.3390/educsci13100989:contentReference[oaicite:4]{index=4}
77. Khelifi K, Hamzaoui-ElAchachi H. Beyond 'One-Size-Fits-All' Teaching: Embracing the Learner-Centered Paradigm Through Differentiated Instruction. TAALIMIA Review. 2025; 14(2):708-726.
78. Kimes K. Exploring the different types of soil erosion. CORE Erosion Control, March 18, 2024. https://www.coreerosioncontrol.com/exploring-the-different-types-of-soil-erosion/
79. Kindica JPH, Gumanoy RM. Improving academic achievement of students in Mathematics 10 through contextualized learning worksheet. International Journal of Research and Innovation in Social Science. 2025; 9(4):2873-2880. Doi: https://doi.org/10.47772/IJRISS.2025.9040021
80. King HM. What is a debris flow? Geology.com, n.d. https://geology.com/articles/debris-flow/
81. Kingma TJ, Hoch V, Johnson C, Chaudhry B. Avascular Necrosis of the Hip: A Post COVID-19 Sequela, October 22, 2022. Doi: 10.7759/cureus.29976
82. Koehler S. The influence of differentiation: Student engagement, academic achievement, and motivation. Bethel University Digital Library, 2023. https://spark.bethel.edu/cgi/viewcontent.cgi?article=1898&context=etd
83. Kotob MM, Abadi MA. The influence of differentiated instruction on academic achievement of students in mixed ability classrooms. International Linguistics Research. 2021; 2(2):8-15. Doi: https://doi.org/10.30560/ilr.v2n2p8
84. Kozhuharov V. Chapter 5.3 mass movements [PowerPoint slides]. SlidePlayer, n.d. https://slideplayer.com/slide/15717898/
85. Lai Y. The double effects of standardized testing on students and environment. Journal of Education, Humanities and Social Sciences. 2022; 8:1615. https://www.researchgate.net/publication/346973326_Technology-Enriched_Teaching_in_Support_of_Quality_Education_in_the_21st_Century_Skills
86. Lake City Chamber of Commerce. Slumgullion Earthflow. Lake City - A Peak Experience, n.d. https://lakecity.com/slumgullion-earthflow/
87. Lecomte KL. Honeycomb weathering caused by salt crystallization at Yehliu, Taiwan [Photograph]. In P. J. Depetris, A. I. Pasquini, & K. L. Lecomte, Weathering and the Riverine Denudation of Continents (Fig. 2.4). Springer, 2014. https://www.researchgate.net/figure/Honeycomb-weathering-caused-by-salt-crystallization-at-Yehliu-Taiwan-Wikimedia-Commons_fig4_264118646
88. Learning A-Z. K-6 literacy, science, reading, & teaching resources. Learning A-Z, 2024. Retrieved from: https://www.learninga-z.com/
89. Liou S-R, *et al*. Effectiveness of differentiated instruction on learning outcomes and learning satisfaction in the evidence-based nursing course: Empirical research quantitative. Nursing Open. 2023; 10(1):123-132. https://onlinelibrary.wiley.com/doi/10.1002/nop2.1926?utm
90. Liv BA. The importance of river ecosystems (surprising facts). Pond Informer, September 3, 2023. https://pondinformer.com/importance-of-river-ecosystems/
91. Lloyd T, Yang D. The long shadow of early education: Evidence from a natural experiment in the Philippines. National Bureau of Economic Research, 2025. https://phys.org/news/2025-04-early-spur-unexpected-scores-philippines.html
92. Loche M, Scaringi G. Temperature continuously controls the stability of clay slopes, 2022. arXiv preprint arXiv:2211.09046. https://arxiv.org/abs/2211.09046
93. Marlina M, Kusumastuti G, Ediyanto E. Differentiated learning assessment model to improve involvement of special needs students in inclusive schools. International Journal of Instruction. 2023; 16(4):423-440. Doi: https://doi.org/10.29333/iji.2023.16425a
94. Matthews E. Study guide chapter 15 [PowerPoint slides]. SlidePlayer, n.d. https://slideplayer.com/slide/6383867/
95. McCarthy J. Using differentiation to challenge all students. Edutopia, April 20, 2023. https://www.edutopia.org/article/differentiation-challenge-all-students/:contentReference[oaicite:7]{index=7}
96. Mc Pherson-Geyser G, De Villiers R, Kavai P. The use of experiential learning as a teaching strategy in Life Sciences. International Journal of Instruction. 2020; 13(3):877-892. Doi: https://doi.org/10.29333/iji.2020.13359a
97. Mead R. Mass movements [PowerPoint slides]. SlideServe, October 22, 2014. https://www.slideserve.com/mead/mass-movements
98. Megan. Types of soil erosion and their environmental impact. Substrata, April 24, 2024. https://www.substrata.us/blog/types-of-soil-erosion-and-environmental-impact
99. Melesse T, Belay S. Differentiating instruction in primary and middle schools: Does variation in students' learning attributes matter? Cogent Education. 2022; 9(1):1-20. https://www.tandfonline.com/doi/epdf/10.1080/2331186X.2022.2105552?needAccess=true
100. Miha Slapničar LR. Inquiry-Based Chemistry Education Activities in a Non-formal Educational Setting for Gifted Students. CEPS Journal. 2024; 14:143-169. Doi: https://doi.org/10.26529/cepsj.1706
101. Milara IS, Cortés Orduña M. Possibilities and challenges of STEAM pedagogies, 2024. arXiv preprint arXiv:2408.15282. https://arxiv.org/abs/2408.15282
102. Mitchell M. South Island High Country [PowerPoint slides]. SlidePlayer, n.d. https://slideplayer.com/slide/12854232/
103. Muhib M. Differentiated learning strategies in improving science learning achievement in elementary schools. Scientica Education Journal. 2025; 1(6):10-20. Doi: https://doi.org/10.62872/5bjdjf30
104. Nagal Raphael Kevin. Glocalized Experiential Learning Infused Resource Package in Earth and Life Science.

JPAIR Multidisciplinary Research. 2020; 40:153-180. Doi: 10.7719/jpair.v40i1.777
105. National Geographic Society. Weathering. National Geographic Education, n.d. https://education.nationalgeographic.org/resource/weathering/
106. National Park Service. Erosion. U.S. Department of the Interior, n.d. https://www.nps.gov/subjects/erosion/erosion.htm
107. National Science Teaching Association. Differentiation in the Life Science Classroom Using Station Rotations. Science Scope, 2022. https://www.nsta.org/science-scope/science-scope-mayjune 2022/differentiation-life-science-classroom-using-station
108. Neser L. Introduction to Earth Science. Virginia Tech Libraries, 2023. https://pressbooks.lib.vt.edu/introearthscience/chapter/10-mass-wasting/
109. Nunag N. 6 Must-Sees in Callao Cave, Peñablanca, Cagayan, Philippines. TravellingPeoples.com, 2018. https://travellingpeoples.com/2018/08/24/7-must-sees-in-callao-cave/
110. Oh J. Longitudinal relations between interest and self-efficacy in L2 motivation: A latent growth curve modeling approach. The Asia-Pacific Education Researcher. 2024; 33(1):45-60. Doi: https://doi.org/10.1007/s40299-023-00789-0
111. O'Leary JH. Learning Styles, Preferences, or Strategies? An Explanation for the Resurgence of Styles Across Many Meta-analyses. SpringerNatureLink, April 1, 2025; 37. Retrieved April 26, 2025, from: https://link.springer.com/article/10.1007/s10648-025-10002-w
112. Patierez JG. Effects of Learning Motivation and Engagement on the Academic Performance and Satisfaction of Senior High School Students. Dinkum Journal of Social Innovations. 2024; 3(5):251-266. Doi: https://doi.org/10.71017/djsi.3.5.d-0318
113. Petrovska M. The baby face of a broken angel [Photograph]. Dreamstime, n.d. https://www.dreamstime.com/baby-face-broken-angel-close-up-old-statue-full-cracks-weather-beaten-paint-falling-off-image276818620
114. Pinterest. Rock fall or rock-fall refers to quantities of rock falling freely from a cliff face [Image]. Pinterest, n.d. https://www.pinterest.com/pin/159737118007220041/
115. Pozas M, Letzel V, Schneider C. Teachers and differentiated instruction: Exploring differentiation practices to address student diversity. Journal of Research in Special Educational Needs, 2023.
116. PPTSchierl Z. Honeycomb weathering from the desert to the sea. Zach Schierl Photography, January 11, 2013. https://zschierlphotography.com/tag/weathering/
117. Purcell JH, Burns DE, Purcell WH. A Blueprint for Interest-Based Learning, 2020. Retrieved from ascd: https://www.ascd.org/el/articles/a-blueprint-for-interest-based-learning
118. Quijano AM. Learning motivation and student engagement among senior high school students. International Journal of Multidisciplinary: Applied Business and Education Research. 2023; 4(9):1-10. Doi: https://doi.org/10.11594/ijmaber.04.09.01
119. Quilona GMM. Weathering of rocks [PowerPoint presentation]. Department of Education - Learning Resources Management and Development System, 2018. https://lrmds.deped.gov.ph/detail/12367
120. Rahman L. Vygotsky's Zone of Proximal Development of Teaching and Learning in STEM Education. International Journal of Engineering Research & Technology. 2024; 13(8). https://www.ijert.org/vygotskys-zone-of-proximal-development-of-teaching-and-learning-in-stem-education
121. Rasheed Fareeha, Wahid Abdul. The Theory of Differentiated Instruction and its Applicability: An E-Learning Perspective, 2018. https://www.researchgate.net/publication/324843878_THE_THEORY_OF_DIFFERENTIATED_INSTRUCTION_AND_ITS_APPLICABILITY_AN_E-LEARNING_PERSPECTIVE
122. Reis SM, Renzulli S, Renzulli JS. Enrichment and Gifted Education Pedagogy to Develop Talents, Gifts, and Creative Productivity. Education Science, October 8, 2021, 1-9. Retrieved from: https://files.eric.ed.gov/fulltext/EJ1317646.pdf
123. Rijal A, Aswarliansyah Walayu B. Effectiveness of differentiated learning in mathematics: Insights. Journal of Education and Learning (EduLearn), February 2025; 19:241-248. Doi: 10.11591/edulearn.v19i1.21806
124. Salazar RR, Gumanoy RM. Differentiated learning activities: Effects on students' motivation and involvement in teaching mathematics. International Journal of Research and Innovation in Social Science. 2025; 9(3):1707-1714. Doi: https://dx.doi.org/10.47772/IJRISS.2025.903SEDU0131
125. Sari DP, Putri RA. Academic interest determines the academic performance of undergraduate accounting students: Multinomial logit evidence. Cogent Education. 2022; 9(1):2101326. Doi: https://doi.org/10.1080/2331186X.2022.2101326
126. Schiefele H, Krapp A, Prenzel M, Heiland H, Kasten H. Principles of an educational theory of interest, 1983. Retrieved from: https://www.researchgate.net/publication/262535690_Principles_of_an_Educational_Theory_of_Interest
127. Schwab S. Inclusive and special education in Europe. In Oxford research encyclopedia of education, 2020.
128. Şentürk C, Sari H. Investigation of the contribution of differentiated instruction into science literacy. Qualitative Research in Education. 2018; 7(2):197-237.
129. Simon AC. Mass wasting [PowerPoint slides]. SlidePlayer, n.d. https://slideplayer.com/slide/13118970/
130. Slapničar M, Ribič L, Devetak I, Vinko L. Inquiry-based chemistry education activities in a non-formal educational setting for gifted students. Center for Educational Policy Studies Journal. 2024; 14(1):143-169. Doi: https://doi.org/10.26529/cepsj.1706
131. Sood A, Sarin J. Learning Styles: An Overview. Indian Journal of Forensic Medicine & Toxicology. 2021; 15(3):66-71. Retrieved from: file:///C:/Users/stephanie%20jean/Downloads/ojsadmin,+12.pdf
132. Subban P. Differentiated instruction: A research basis. International Education Journal. 2006; 7(7):935-947. Retrieved from:

https://files.eric.ed.gov/fulltext/EJ854351.pdf

133. Sulaiman AH, Abdullah SA. The use of active learning strategies to foster effective teaching in higher education institutions. Zanco Journal of Human Science. 2023; 27(1):140-152. https://www.researchgate.net/publication/380889377_The_Use_of_Active_Learning_Strategies_to_Foster_Effective_Teaching_in_Higher_Education_Institutions
134. Taş H, Minaz MB. The effects of learning style-based differentiated instructional activities on academic achievement and learning retention in the social studies course. SAGE Open. 2024; 14(2):1-14. Doi: https://doi.org/10.1177/21582440241249290
135. Thomson Higher Education. Different kinds of mass wasting processes [Diagram]. In C. C. Plummer, D. McGeary, & D. H. Carlson, Physical geology (10th ed.). Thomson Higher Education, 2007.
136. Tlais S. AI-Driven Interest-Based Learning for Enhanced Engagement in General Chemistry, December 4, 2024. Doi: https://doi.org/10.35542/osf.io/qkfp7
137. Tomlinson CA. The differentiated classroom: Responding to the needs of all learners (2nd ed.). Association for Supervision & Curriculum Development, 2014.
138. Tomlinson CA. How to differentiate instruction in mixed-ability classrooms. Alexandria, VA: Association for Supervision and Curriculum Development, 1995.
139. Tomlinson C, Strickland CA. Differentiation in Practice: A resource guide for Differentiating Curriculum. Association for Supervision and Curriculum Development, 2005. Retrieved from: https://books.google.com.ph/books?hl=en&lr=&id=OiKfhxJ-np8C&oi=fnd&pg=PR7&dq=Tomlinson+(2005)&ots=74H0ebsHkL&sig=JPjSUuViKuMa0kxFKQDCvaLaUKo&redir_esc=y#v=onepage&q=Tomlinson%20(2005)&f=false
140. University of Oxford. Scientists show accelerating CO_2 release from rocks in Arctic Canada with global warming. Phys.org, October 9, 2024. https://phys.org/news/2024-10-scientists-arctic-canada-global.html
141. U.S. Geological Survey. Eroding coastal cliff, Pacifica, California [Photograph]. U.S. Department of the Interior, n.d. https://www.usgs.gov/media/images/eroding-coastal-cliff-pacifica-californi
142. u/thanatocoenosis. Geologists, what caused this patterning to appear? [Online forum post]. Reddit, June 11, 2017. https://www.reddit.com/r/geology/comments/6gypah/geologists_what_caused_this_patterning_to_appear/
143. Valencia-Gallego V, Montoya L-J. Erosion mechanisms in unpaved roads: Effects of slope, rainfall, and soil type. Air, Soil and Water Research. 2024; 17:11786221241272396. Doi: https://doi.org/10.1177/11786221241272396
144. VARK Learn Limited. The Vark Questionnaire how do you learn best, June 6, 2024. https://vark-learn.com/the-vark-questionnaire/
145. Vygotsky LS. Mind in society: The development of higher psychological processes. Harvard University Press, 1978. Retrieved from: https://archive.org/details/mindinsocietydev00vygo
146. Walters A. Physical weathering: Mechanical/physical weathering-the physical breaking up of rock but does not change composition [PowerPoint slides]. SlidePlayer, n.d. https://slideplayer.com/slide/10837850/
147. Widya Karmila Sari Achmad SA. Differentiated instruction in reading in elementary schools. International Journal of Evaluation and Research in Education (IJERE), June 2024; 13:1997-2005. Doi: 10.11591/ijere.v13i3.27134
148. Yaman YE. Differentiated Science Instruction in the Metaverse with Gifted Students: Araştırma Temelli Etkinlik Dergisi (ATED) / Journal of Inquiry Based Activities (JIBA). 2024; 14:46-65. Retrieved April 26, 2025, from: https://files.eric.ed.gov/fulltext/EJ1447128.pdf
149. YouTube. Examples of weathering-erosion-deposition [Playlist], May 23, 2025. https://www.youtube.com/playlist?list=PLurjkZV1ykGa4oEXpn91lHOE5LIo_jBUD
150. Zamboni J. What is biological weathering? Sciencing, July 25, 2018. https://www.sciencing.com/biological-weathering-5633317/
151. Zamorano Ormeño R. Precipitation plays a critical role in how glaciers sculpt their environment. Fundación Glaciares Chilenos, June 1, 2020. https://www.glaciareschilenos.org/en/science/precipitation-plays-a-critical-role-in-how-glaciers-sculpt-their-environment/