



Stackable Instructionally- embedded Portable Science (SIPS) Assessments Project

Grade 8 Science

Unit 3: Differentiation Strategies and Resources

Understanding Earth History and the Origin of Species

June 2023

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SIPS Grade 8 Unit 3 Differentiation Strategies and Resources

“Universal Design for Learning (UDL) is a framework to improve and optimize teaching and learning for all people based on scientific insights into how humans learn.” (CAST, 2022). Taking time to reflect on prior instruction when planning for accessible, differentiated, and culturally responsive instruction for diverse learners and culturally diverse classrooms serves to identify ways to improve future instructional practices. The [UDL Guidelines](#) provide a framework for this reflection. The guidelines include three principles, Multiple Means of Engagement, Multiple Means of Representation, and Multiple Means of Action & Expression as ways to focus on variety and flexibility in instructional practices. By examining instruction and instructional materials through the lens of each of these principles, we can identify and thus reduce or remove barriers to diverse learners. Accommodations typically reserved for students receiving special education, students who have a 504 plan, and English Learners can be made available to all students using the UDL principles, thus allowing all students to benefit from the accommodations.



Multiple Means of Engagement



Multiple Means of Representation




Multiple Means of Action & Expression

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This document provides strategies and examples for each UDL principle to support the design and delivery of accessible instruction and learning opportunities for all students aligned to the SIPS Grade 8 Unit 3 Instructional Framework.

Multiple Means of Engagement

Providing Multiple Means of Engagement (e.g., allowing choices, authentic scenarios, varying demands, and clear goals), broadens the opportunities for gaining and sustaining students’ interest and cognitive engagement in learning the content.

 Multiple Means of Engagement “Emotions drive our cognition, including our attention, memory, and planning/executive functions.” (Hartmann & Posey, 2020)	
Strategies	Examples
Provide choices.	<ul style="list-style-type: none"> Explore students’ experiences and interests in science through short inventories and interviews.
Allow ownership of parts of instructional tasks.	<ul style="list-style-type: none"> Have students set their own goals (academic or behavioral) that work toward the goals and objectives of the unit.



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Strategies	Examples
	<ul style="list-style-type: none">• Have students identify and choose sources to locate information on animal structures, traits across organisms, classification systems, etc.
Make work authentic and relevant.	<ul style="list-style-type: none">• Explain the goal in clear and simple terms and connect it to real-world applications (e.g., similarities and differences between familiar animals).• Provide information on the animals that will be compared to fossilized ancestors in print, images, and videos.• Highlight a diverse group of scientists, especially paleontologists, and their roles (e.g., incorporate in presentation, show videos, wall posters, etc.).• Share images by Ernst Haeckel and make the connection between science and art as information regarding how the microscope led him to propose a new classification to Linnaeus’ system.• Provide interactive games related to content.• Resources: All About Whales (UDL Book Builder); Amazing Facts About Whales; Meet the Scientist: Paleontologist Advait Jukar; Kristi Curry-Rogers – Rebels, Scholars, Explores. Women in Vertebrate Paleontology; Kunstformen der Natur by Ernst Haeckel, PaleontOlogy The Big Dig
Provide safety and reduce distractions.	<ul style="list-style-type: none">• Provide a variety of ways in which students can ask questions or seek help (e.g., individually, small group, asking a peer, etc.).• Offer opportunities for students to share in a way that is comfortable given their culture and family dynamics (e.g., Some cultures find talking over each other as normal while others wait for complete silence before contributing; some are comfortable with directness or do not have the language level to be polite. Some respond respectfully using facial movements. Eye contact varies by culture.).• Allow students to wear noise-canceling headphones during individual work.



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Strategies	Examples
	<ul style="list-style-type: none">Resources: Cultural Differences in the Classroom, 10 Sites for Creating Backchannel
Present clear and important goals and objectives.	<ul style="list-style-type: none">Have students write goals into simple “I can” statements (e.g., I can use a model of applied forces to predict how a motion of an object will change using different forces.).Explain scientific terms along with the goals so that students understand what they are working towards.
Provide different levels of support and scaffolds.	<ul style="list-style-type: none">Provide an example of the Blue Whale Taxonomy when students research the classification of their individual project organism.Paraphrase articles to reduce overall complexity of the text while maintaining key information.Resources: Scribbr Rephrasing Tool; Paraphraser
Encourage collaboration with partners and in groups.	<ul style="list-style-type: none">Be intentional about how groups are formed so that they include a variety of students (e.g., race, national origin, socioeconomic status, disability, etc.).Be aware that some cultures value working as a community while others value individualism, therefore provide choices when feasible.Ensure everyone has the means to contribute. For some, this might be to assign a role that matches their strengths or provide needed vocabulary on their AAC system. For others, it might be to reduce the size of the group and allow options for seating (e.g., exercise ball).
Support self-reflection and evaluation.	<ul style="list-style-type: none">Provide a variety of ways to reflect and evaluate.Have students use a self-reflection chart on which individual students can monitor his/her progress. Include ancillary behaviors such as asking questions, contributing to the group, and asking for help. Remind students to use the chart routinely.




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	<ul style="list-style-type: none">• Provide visual tools to foster independence, prepare students for the next activity, break tasks into smaller steps, and aid transition.• Resources: Visual tools to Support Behavior, Self-regulation & Independence; The Autism Helper: Self-Monitoring
Encourage communication about frustrations and guide self-management of the frustrations.	<ul style="list-style-type: none">• When students show signs of frustration such as withdrawing or exhibiting distracting behaviors, encourage them to communicate what is frustrating them and what they think might help. For some students, this might require a simple chart that includes symbols to indicate how they feel and options for dealing with the frustrations (e.g., I need a break. I need help. I need to work alone. etc.).
Use flexible ways to present information.	<ul style="list-style-type: none">• Share information in written text, graphic organizers, images, videos, etc.• Resources: Alleles and Genes;

Multiple Means of Representation

Providing Multiple Means of Representation (e.g., variety of presentation modes, clarifying vocabulary, activating background knowledge) allows for students to receive and comprehend the content.

 Multiple Means of Representation “Representation is the process of collecting and presenting information to students in a way that students can understand, engage with and learn from.” (Novak, 2021)	
Strategies	Examples
Present information in more than one way.	<ul style="list-style-type: none"> • Label models (e.g., geologic cross section, cladogram) with braille labels for students us use braille. • Present organisms and related information using multimedia so they can easily be enlarged, TO increase contrast between text and the background, and describe using alternative text. • Create tactile graphic of anatomical features of organisms. • Resources: Communication and Language Strategies for Science Inquiry, Design Principles for Tactile Graphics, Tactile Graphics
Describe the meaning of vocabulary and symbols.	<ul style="list-style-type: none"> • Place descriptions of content vocabulary with examples and images on the wall or in students’ notebooks (e.g., fossilized, analogous, homologous, vestigial structures). • Provide video explaining terminology (e.g., vestigial structures). • Describe meaning vs a formal definition. For example, “Vestigial describes an organ or body part that continues to exist without retaining its original function, such as our appendix.” Vocabulary.com • Speak slowly and clearly with gestures or acting out words, phrases, and directions to help English Learners and students develop science vocabulary. • Resources: Vestigial Structures video; Homologous Structures vs Analogous Structures: Key Differences video; TextProject Word Pictures; The Science Penguin, 10 Ideas To Teach Science Vocabulary
Provide information in a variety of ways.	<ul style="list-style-type: none"> • Have students research information (e.g., fossil records, traits of organisms, classification systems) in multiple ways such as grade-level science magazines, lower grade-level science magazines, books, internet, wall chart, video, etc.



Multiple Means of Representation

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Strategies	Examples
	<ul style="list-style-type: none">• Wait time between a question and a person’s reply varies across cultures. Therefore, during classroom discussion (e.g., What do you notice about these organisms?), be aware of this and ensure everyone has the opportunity to contribute.• Resources: Cultural Differences in the Classroom, Read About the Fossil Record, The Scientist: Researchers Watch Fish Rot, for Science,
Explain structure of graphs, charts, diagrams, models, etc.	<ul style="list-style-type: none">• Provide choices for what the labels on the axes on a graph could be.• Demonstrate how to graph data (e.g., observable traits).• Explain how to complete charts, diagrams, and models (e.g., cardiogram, Punnett Square).• Resources: We Are Teachers – 20 Graphing Activities for Kids That Really Raise the Bar (focus on the different mediums to create graphs); Beakers and Ink – 5 Easy Tips to Make a Graph in Science
Provide support for decoding written text and symbols.	<ul style="list-style-type: none">• Allow students to use a screen reader to read online articles and information.• Provide digital text to allow students to choose to listen, enlarge, highlight, etc.• Have peers read to each other, read aloud to the class, provide an audio version, provide a summarized version, etc.• Resources: What is a Gene
Support language acquisition (e.g., English Learners, AAC users, ASL users).	<ul style="list-style-type: none">• Connect dominant language (e.g., English) with first language (e.g., Spanish).• Resource: 6 Strategies to Help ELLs Succeed in Peer Learning and Collaboration
Supply or activate background knowledge.	<ul style="list-style-type: none">• Provide background information prior to having students complete a task (e.g., classification systems prior to having students sort organisms; defining traits, etc.).• Check student responses on understanding the content and not on sentence structure and grammar.• Connect dominant language (e.g., English) with first language (e.g., Spanish).




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	<ul style="list-style-type: none">• Allow students to use preferred and possibly multiple ways to communicate.• Ensure that the needed vocabulary is in a student’s AAC system.• Resources: Naming Nature video, What are Traits Supporting ELL Success with STEAM and Hands-On Learning (Part 2), Getting to Know your ELLs: Six Steps for Success
Emphasize key information.	<ul style="list-style-type: none">• Use graphic organizers, outlines, underline or highlight key information in print materials, etc.• Create a QR code and place it on a science poster, worksheet, study card, etc. that will link to a specific online resource.• Resources: Free Graphic Organizers, Best Free QR Code Sites for Teachers
Provide models and scaffolds to aid in comprehension.	<ul style="list-style-type: none">• Provide a model of an unknown species for the students to follow as they are reconstructing fossilized remains of an unknown species.• Provide graphics of plants and animals to support students in sorting organisms into Linnaeus’ two categories.• Provide sentence starters for writing tasks (e.g., This change was caused by _____).• Provide a variety of explicit prompts for each step or chunk of an activity (e.g., verbal, visual steps, checklist, checklist paired with graphics, tactile steps).• Resources: Scaffolds to Support English Language Learners in Writing and Discussion, Mini Schedules, Using Visual Schedules to Support Students with Autism
Support transfer and generalization of skills and knowledge.	<ul style="list-style-type: none">• Include opportunities to review and practice prior knowledge and skills along with new knowledge and skills.• Use a variety of materials to investigate (e.g., 3-D model showing gene expression, types of fossils)

Multiple Means of Action & Expression

Providing Multiple Means of Action & Expression (e.g., a variety of methods to respond to instruction, and a variety of ways to interact with the instructional materials) helps students to use their strengths and abilities to access the instructional materials and express what they understand.

 Multiple Means of Action and Expression “By divorcing the presentation mode from the learning, all learners can find a way to apply what they’ve learned and demonstrate proficiency.” (Hogle, 2018)	
Strategies	Examples
Provide options for accessing instructional activities and materials.	<ul style="list-style-type: none"> • Provide online or digitized text as an option to access information. • Have students use an OCR program to digitize text allowing for enlarging the font, highlighting key information, copying and pasting information, etc. • Provide tactile graphics for students with a visual impairment. • Ensure that all students can physically access and interact all activities and materials (e.g., table high enough to allow wheelchair access, adaptation that allows access to print material, space to move to all areas in a classroom or lab, book holder, adapted keyboard, single switch, etc.). • Allow for differences in rate, timing, speed, and range of motion (e.g., Allow enough time for all students to process the question and formulate their responses; Allow enough time for all students to move from one activity to the next, or to perform a task.). • Resources: App Accessibility Checklist; Compare the Top OCR Apps for iPad of 2023; Tactile Graphics
Vary the ways for students to respond to questions or a task.	<ul style="list-style-type: none"> • Place content-specific and activity-specific (e.g., the ranking system for determining how closely organisms are related to fossilized remains) vocabulary on cards or students’ communication system. • Allow students to use a variety of ways to create a model (e.g., drawing, pictures, objects). • Have students enter data online to create graphs using standard or adapted keyboards. • Provide a variety of ways in which students can “write” to respond to questions (e.g., traditional form of writing, with sentence starters, using pictures, etc.).



Multiple Means of Action and Expression

“By divorcing the presentation mode from the learning, all learners can find a way to apply what they’ve learned and demonstrate proficiency.” (Hogle, 2018)

Strategies	Examples
	<ul style="list-style-type: none">• Provide cut out versions of the cladogram printed on cardstock or mounted on small blocks to ease manipulation of the cut outs.• Resources: Power-Assisted Writing for Science: Developing Expository Writing in a Multimedia Environment, Better Living Through Technology – Keyboards for People with Disabilities, Pathways to Reading to Learning for Students with Cognitive Challenges.
Use technology or assistive technology (AT) to broaden access to instructional materials.	<ul style="list-style-type: none">• Provide students the option to develop a cladogram digitally or manipulate on a whiteboard.• Provide an online or digital Punnett Square tool.• Make use of technology such as spellcheckers, word prediction software, text-to-speech.• Provide different graphing options (e.g., enlarged, raised line, objects, digital).• Resource: How to Draw a Cladogram in PowerPoint; Punnett Square Calculator; Mouse Alternatives, The Use of Wikki Stix Within the Classroom, Creating Large Print and Tactile Graphs; DIY Reading Strips, 5 Benefits of a Slant Board for Writing, Clusive™: An Accessible, Digital Reading Platform, 8 Examples of Assistive Technology and Adaptive Tools
Provide varied levels of support and practice.	<ul style="list-style-type: none">• Provide prompts for the shared traits/characteristics to use in comparing similarities and differences between organisms.• Set bookmarks to specific pages for students to find information.• For students who are just beginning to learn about classifying, provide categories represented with graphics for classification of organisms.• Provide differentiated homework or seatwork that still practice the key concepts of the assignment (e.g., some students complete



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	<p>sentence starters as opposed to writing paragraphs).</p> <ul style="list-style-type: none">• Resource: 7 Clever, Teacher-Tested Tech Hacks
Support planning and strategy skills.	<ul style="list-style-type: none">• Include prompts to check their thinking and strategy to solving a task.• Check in with students to see if they are understanding the task and if they need support to understand a concept.• Model think-alouds of to solve a problem or think through a task.
Provide supports to help with managing information and resources.	<ul style="list-style-type: none">• Provide articles on fossils, organisms, inherited traits, etc. in the students’ first language as much as possible.• Bookmark key online resources.• Create a digital resource document that includes topic paired with graphics.• Link to specific part of a web page.• Resources: 3+ Digital Resources for Your Classroom, How to Link to a Specific Part of A Webpage & Share It, Share pages with a QR Code

Resources

1. [UDL: Action & Expression \(cast.org\)](https://udlguidelines.cast.org/action-expression)
[https://udlguidelines.cast.org/action-expression]
2. [Design for Each and Every Learner: Universal Design for Learning Modules | Design for Each and Every Learner: Universal Design for Learning Modules | Institute on Community Integration Publications \(umn.edu\)](https://publications.ici.umn.edu/ties/universal-design-for-learning-modules/design-for-each-and-every-learner)
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