



Stackable Instructionally- embedded Portable Science (SIPS) Assessments Project

Grade 5 Science

Unit 2: Differentiation Strategies and Resources

Matter and Energy in Organisms and Ecosystems

December 2022

The SIPS Grade 5 Science Unit 2: Differentiation Strategies and Resources, Matter and Energy in Organisms and Ecosystems was developed with funding from the U.S. Department of Education under the Competitive Grants for State Assessments Program, CFDA 84.368A. The contents of this paper do not represent the policy of the U.S. Department of Education, and no assumption of endorsement by the Federal government should be made.

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SIPS Grade 5 Unit 2 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.



Multiple Means of Engagement



Multiple Means of Representation




Multiple Means of Action & Expression

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 to promote accessible and equitable teaching and learning opportunities. Application of UDL guidelines and principles allows all students to engage with and be provided with multiple means of representing instructional content and expressing what they know and can do which is similarly the purpose of the use of accommodations for students receiving special education, students who have a 504 plan, and emerging Bilinguals.

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 5 Unit 2 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"> Allow students to choose how they model how matter cycles (e.g., drawing, cutting and pasting, using objects, etc.). Explore students’ experiences and interests in science through short inventories and interviews. |



Multiple Means of Engagement

“Emotions drive our cognition, including our attention, memory, and planning/executive functions.” (Hartmann & Posey, 2020)

| Strategies | Examples |
|--|--|
| Allow ownership of parts of instructional tasks. | <ul style="list-style-type: none">• Have students set their own goals (academic or behavioral) that work towards the goals and objectives of the unit.• Have students identify and choose sources to locate information on plant survival, invasive species, decomposers, etc.• Provide several options for students to practice the science vocabulary terms (e.g., use terms in a story, create a song about each, pair with illustrations that describe the term) and how to present what they did (e.g., perform live, record and share with photos, written format, orally share).• Resources: 10 Ideas to Teach Science Vocabulary, 5 Activities to Learn Science Vocabulary |
| Make the work authentic and relevant. | <ul style="list-style-type: none">• Explain the goal in clear and simple terms.• Use authentic activities such as making recycled plant containers, observing celery or sweet potatoes grow using only water, air, and light, constructing an ecosystem in the classroom, etc.• Show a video or pictures of owls or animals to investigate for the lesson.• Be aware of sensory sensitivities when working with soil and decomposing foods.• Present the goal and objectives in multiple ways (e.g., write on the whiteboard, read aloud, include on handouts).• Highlight a diverse group of scientists and their roles (e.g., incorporate in presentation, show videos, wall posters, etc.).• Resources: All About Owls for Kids: Backyard Bird Series, Owls for Kids, Ten Black Scientists that Science Teachers Should Know About, Disabilities Don't Stop These Experts In Science and Tech, 20 Immigrants & Refugee Scientists Who Made America Greater (Part 1) |



Multiple Means of Engagement

“Emotions drive our cognition, including our attention, memory, and planning/executive functions.” (Hartmann & Posey, 2020)

| Strategies | Examples |
|---|--|
| 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. Eye contact varies by culture).• Allow students to wear noise-canceling headphones during individual work.• Resources: Cultural Differences in the Classroom, 10 Sites for Creating a 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 gather information and talk about how the energy for motion and/or body warmth in animals comes from food).• Explain scientific terms along with the goals so that students understand what they are working towards. |
| Provide a different level of support and scaffolds. | <ul style="list-style-type: none">• Incorporate accommodations and supports into tasks for everyone. Some students may be able to complete a multiple-step task with no support, while other students may need verbal or visual cues to complete each step.• Provide graphics along with the direction steps. |




Multiple Means of Engagement

“Emotions drive our cognition, including our attention, memory, and planning/executive functions.” (Hartmann & Posey, 2020)

| Strategies | Examples |
|---|---|
| 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 providing choices when feasible.• Ensure everyone has the means to contribute. For some, this might be to assign a role that matches their strengths, or it might be to provide needed vocabulary on their AAC system, or it might be to reduce the size of the group and allow options for seating (e.g., exercise ball).• Have a collaborative group work on a fun activity with the teacher modeling how to provide support to a student with a disability.• Resources: Successfully Using Communication Practices in the Inclusive Class |
| 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.• 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.). |

Multiple Means of Representation

Providing Multiple Means of Representation (e.g., variety of presentation modes, clarifying vocabulary, activating background knowledge) allows 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 |
| Use a flexible way to present information. | <ul style="list-style-type: none"> • Present example models of the cycling of matter or types of decomposers using multimedia so it can easily be enlarged, increase contrast between text and the background, described using alternative text, etc. • Create example models, graphs, and charts using tactile graphics. • Pair graphic examples in anchor charts. • Resources: Design Principles for Tactile Graphics, Tactile Graphics, Water Cycle, Types of Decomposers, What are Decomposers, Fruit and Vegetable Decomposition, Time-lapse, Erik Pumpkin Collapse Timelapse |
| Provide information in a variety of ways. | <ul style="list-style-type: none"> • Have students collect information on food chains, food webs, plant needs, invasive species, and decomposers in multiple ways such as grade-level science magazines, lower grade-level science magazines, books, the internet, a wall chart, videos, etc. • Allow students to work with online interactive food chains and food webs. • Resources: Build Food Chains & Food Webs, Build a Food Chain, The Food Chain Game, Invasive Species, Conservationists for Kids, Ecosystem Food Chain and Food Web, Decomposers, Decomposer Facts for Kids |



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 |
|---|--|
| Describe the meaning of vocabulary and symbols. | <ul style="list-style-type: none">• Create a word wall or a glossary for science and academic terms such as ecosystem, cycles, matter, organisms, etc.• Pair vocabulary words in English and students’ primary or home language.• Describe the meaning, “An ecosystem is all the living things, from plants and animals to microscopic organisms that share an environment.” vs. a formal definition, “A system formed by the interaction of a community of organisms with their physical environment. For example, “ Vocabulary.com.• Pair vocabulary words with pictures.• Resources: Vocabulary.com, TextProject Word Pictures; The Science Penguin, 10 Ideas To Teach Science Vocabulary |
| Explain structure of graphs, charts, diagrams, models, etc. | <ul style="list-style-type: none">• Before having students graph the growth of plants, describe and make an anchor chart describing the parts of a graph.• Demonstrate how to graph.• Directly teach the purpose of arrows in a model. Resource: The Importance of Arrows in Science |
| Provide support for decoding written text and symbols. | <ul style="list-style-type: none">• Have peers read to each other, read aloud to the class, provide an audio version, provide a summarized version, etc.• Digitize text and have student use a screen reader. |
| Connect dominant language (e.g., English) with first languages (e.g., Spanish). | <ul style="list-style-type: none">• Have a student respond using first language and then translate into English. Check understanding of content and not on sentence structure and• Resources: Supporting ELL Success with STEAM and Hands-On Learning (Part 2), Getting to Know your ELLs: Six Steps for Success |



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 |
|---|--|
| Supply or activate background knowledge. | <ul style="list-style-type: none">• Show a short video or text with images on matter to support students to make links between what they already know about matter to how animals take what they eat and add that matter to their bodies.• Show a short video, objects, or photographs to remind students of the characteristics of living things.• Provide a video, photographs, or story about the zoo to ensure all students are familiar with the animals in a zoo.• To allow students to share and make connections with their personal and cultural experiences, ask students to share the types of unique food from their culture or unique animals from their native region or country.• Resources: All About Matter – More Way Cool Science on the Learning Videos Channel; What is matter? Living and Non-Living Things, Virtual Tour of Melbourne Zoo |
| 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 cards, etc. that will link to a specific online resource.• Resources: Best Free QR Code Site for Teachers, Corgi – Digital Graphic Organizers for Building Higher-order Thinking Skills |
| Provide models and scaffolds to aid in comprehension. | <ul style="list-style-type: none">• 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: Mini Schedules, Using Mini Schedules and Task Organizers to Help Students with ASD in Classroom Settings |



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 |
|--|--|
| 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 ecosystems to investigate food webs and decomposers. • Make explicit connections between concepts of matter and transfer of matter in a food web (e.g., concept map). • Resources: Matter In Our Surroundings; Concept Maps |

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"> • Ensure that all students can physically access and interact with all activities and materials (e.g., table high enough to allow wheelchair access, an 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.). • Place instructional materials on a slanted surface (e.g., 3-ring binder) to ensure better positioning of the head and more comfortable reading. • Ensure access is available for students who have a hearing impairment or visual impairment, who are blind, deaf, or deaf/blind (e.g., include audio description for video content, closed captions for video content, alternative text for graphics, preferential seating, an American Sign Language (ASL) interpreter, screen reader, enlarged text, 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">• 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: Best Practices for Creating Accessible Video for Blind and Low-Vision Viewers, Diagram Center – General Guidelines (alternative text) |
| Vary the ways for students to respond to questions or a task. | <ul style="list-style-type: none">• Allow students to use a variety of ways to create a model (e.g., drawing, pictures, objects, multimedia).• Have students enter data online to create graphs using standard or adapted keyboards.• Allow choices of how to collect and record data (e.g., Measure plant growth by taking photos next to a ruler.)• Use multi-media tools to assist students with disabilities and English Learners.• Provide sentence starters, a writing template, or an expanded word bank.• 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.).• Resources: Tactile Science Lesson: Using Play-Doh; 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. |



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 |
|---|--|
| Use technology or assistive technology (AT) to broaden access to instructional materials. | <ul style="list-style-type: none">• Make use of technology such as spellcheckers, word prediction software, and text-to-speech software.• Provide adapted card holders, purchased or DIY (e.g., cut a slit in a lengthwise section of a pool noodle for the “Go Grow” card game).• Provide different graphing options (e.g., enlarged, raised line, objects, digital).• Enhance 2-D models by adding tactile feedback (e.g., using Wikki Stix).• Provide adaptive science tools (e.g., talking scale, large key calculator, talking thermometer, adapted grips, etc.).• Provide a screen reader and web-based• Provide low-tech tools such as pencil grips, page-turners, reading guide/strips, slant boards, tactile rulers, manipulatives, etc.• Resources: The Use of Wikki Stix Within the Classroom, Creating Large Print and Tactile Graphs; DIY Reading Strips, Perkins eLearning – Talking Scale, 5 Benefits of a Slant Board for Writing, Clusive™: An Accessible, Digital Reading Platform, 8 Examples of Assistive |
| Provide varying levels of support and practice. | <ul style="list-style-type: none">• Provide captions for videos.• Set bookmarks to specific pages for students to find information.• 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 for solving a task.• Model think-aloud to solve a problem or think through a task. |
| Provide supports to help with managing information and resources. | <ul style="list-style-type: none">• Bookmark key online resources.• Create a digital resource document that includes topics paired with graphics.• Link to specific part of a web page.• Slip a page from a book, magazine, or a worksheet into a plastic page protector and circle or highlight the key section.• Resources: 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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3. [Promoting Self-Determination Among Students With Disabilities: A Guide for Tennessee Educators \(vumc.org\)](https://vk.vumc.org/assets/files/resources/psiSelfdetermination.pdf)
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4. [The Difference Between UDL and Traditional Education | Understood](https://www.understood.org/en/articles/the-difference-between-universal-design-for-learning-udl-and-traditional-education?_sp=4699b34b-0329-45fe-aaa9-03be1195cf0a.1643652688576)
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8. [Cultural Differences in the Classroom | Lifespan Development \(lumenlearning.com\)](https://courses.lumenlearning.com/suny-lifespandevelopment/chapter/cultural-differences-in-the-classroom/)
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