Stackable Instructionally-embedded Portable Science (SIPS) Assessments Project

Grade 5 Science

Unit 1: Differentiation Strategies and Resources

Matter and Its Interactions

March 2023

SIPS Grade 5 Unit 1 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 1 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.	• Allow students to choose the way in which they model particles (e.g., drawing, cutting and pasting, using objects, etc.). • Explore students' experiences and interests in science through short inventories and interviews.
Allow ownership of parts of instructional tasks.	• Have students set their own goals (academic or behavioral) that work towards the goals and objectives of the unit.

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Strategies	Examples
	- Have students identify and choose sources to locate information on signs of chemical change. - 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).
Make the work authentic and relevant.	- Explain the goal in clear and simple terms (e.g., Example of mixing two substances to make a new substance to solve a problem. Soap example). - Present the goal and objectives in multiple ways (e.g., write on 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: 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)
Provide safety and reduce distractions.	- 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 and 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-cancelling headphones during individual work. - Resource: Cultural Differences in the Classroom, 10 Sites for Creating a Backchannel
Present clear and important goals and objectives.	Have students write goals into simple I can statements (e.g., I can describe how properties

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Strategies	**Examples**
	of matter can be used to compare and contrast materials.). • Explain scientific terms along with the goals so that students understand what they are working towards.
Provide different levels of support and scaffolds.	• 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.
Encourage collaboration with partners and in groups.	• Be intentional about how groups are formed so that they include a variety of students (e.g., race, national origin, socioeconomic status, disability, etc.) • Ensure everyone has the means to contribute. For some this might be to assign a role that matches their strengths, for some, it might be to provide needed vocabulary on their AAC system, and for some, 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.
Support self-reflection and evaluation.	• 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.	• 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.

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Strategies	Examples
	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.	• Present example models of particles using multimedia so it can easily be enlarged; increase contrast between text and the background; describe using alternative text, etc. • Display a chart showing the physical and chemical properties of matter that include graphic examples. • Resource: Particle Nature of Matter, 3 States of Matter Song, Examples of Chemical and Physical Properties,
Provide information in a variety of ways.	• Have students collect information on different particles making a substance in multiple ways such as grade-level science magazines, lower grade-level science magazines, books, the internet, wall chart, video, etc. • Resource: Properties of Matter Made Easy!, The Particle Model of Matter, Chemical Change Facts For Kids, Chemical Kinetics, The Particle Model of Matter
Describe the meaning of vocabulary and symbols.	• Create a word wall or a glossary for science and academic terms such as particles, substance, chemical change, variable, control, etc. • Describe meaning vs. a formal definition. For example, "The control in an experiment is the group that gets left alone so scientists can compare 'before and after' changes in other groups." Vocabulary.com. • Pair vocabulary words with pictures.

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Strategies	Examples
	• Resources: TextProject Word Pictures; The Science Penguin, 10 Ideas To Teach Science Vocabulary
Explain structure of graphs, charts, diagrams, models, etc.	• Before having students graph the weight of water when frozen and when melted, describe and make an anchor chart describing the parts of a graph. • Demonstrate how to graph. • 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.	• Have peers read to each other, read aloud to the class, provide an audio version, provide a summarized version, etc. • Digitize text and have students use a screen reader.
Connect dominant language (e.g., English) with first languages (e.g., Spanish).	• Have a student respond using their first language and then translate it into English. Check understanding of content and not on sentence structure and grammar. • Resource: Supporting ELL Success with STEAM and Hands-On Learning (Part 2), Getting to Know your ELLs: Six Steps for Success
Supply or activate background knowledge.	• Show a short video on states of matter to support students to make links between what they already know about matter to the new goals. • To allow students to share and make connections with their personal and cultural experiences with mixing substances, ask students to share their experiences such as cooking, crafts, construction, etc. • Resources: States of matter for kids; States of Matter, CAST UDL Book Builder – Changes in States of Matter
Emphasize key information.	• Use graphic organizers, outlines, underline or highlight key information in print materials, etc. • Create a QR code and place on science poster, worksheet, study cards, etc. that will link to a specific online resource.

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Strategies	Examples
	• Resource: 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.	• Provide a variety of explicit prompts for each step or chunk of an acitivity (e.g., verbal, visual steps, checklist, checklist paired with graphics, tactile steps). • Resources: Mini Schedules, Using Mini Schedules and Task Orgainzers to Help Students with ASD in Classroom Settings
Support transfer and generalization of skills and knowledge.	• Include opportunities to review and practice prior knowledge and skills along with new knowledge and skills. • Use a variety of materials to investigate mixtures and describe physical properties. • Make explicit connections between concepts of matter, particles, physical properties, and substances (e.g., concept map). • Resource: 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	
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.	• Ensure that all students can physically access and interact with 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.). • 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

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Strategies	Examples
	video content, alternative text for graphics, preferential seating, an American Sign Language (ASL) interpreter, screen reader, enlarged text, 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: 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.	• 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 sentence starters. • 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: Playdough to Plato – States of Matter; 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.	• Make use of technology such as spellcheckers, word predition software, text-to-speech software. • Provide different graphing options (e.g., enlarged, raised line, objects, digital). • Provide adaptive science tools (e.g., talking scale, large key calculator, talking thermometer, adapted grips, etc.) • Provide a screen reader and web-based reader. • Provide low tech tools such as pencil grips, page turners, reading guide/strips, slant board, tactile rulers, manipulatives, etc. • Resources: 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

	Multiple Means of Action and Expression
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Strategies	Examples
	[Examples of Assistive Technology and Adaptive Tools](#)
Provide varied levels of support and practice.	• 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.	• Include prompts to check their thinking and strategy for solving a task. • Model think-alouds to solve a problem or think through a task.
Provide supports to help with managing information and resources.	• Bookmark key online resources. • Create a digital resource document that includes a topic paired with graphics. • Link to specific part of a web page. • Slip a page from a book, magazine, or worksheet into a plastic page protector and circle or highlight the key section. • Resource: [How to Link to a Specific Part of a Webpage & Share It](#)

Resources

1. [UDL: Action & Expression (cast.org)](https://udlguidelines.cast.org/action-expression)

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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://vkc.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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5. [Collaborative Group Techniques | Scientific Reasoning Research Institute (umass.edu)](https://www.srri.umass.edu/topics/collaborative-group-techniques/)

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6. [Impact of UDL on Academic and Cultural Diversity - A Study on Universal Design Learning (google.com)](https://sites.google.com/site/astudyonudl/impact-of-udl-on-academic-and-cultural-diversity)

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7. [Universal Design for Learning Instructional Strategies (storyboardthat.com)](https://www.storyboardthat.com/articles/e/udl-universal-design-for-learning)

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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/)
   [https://courses.lumenlearning.com/suny-lifespandevelopment/chapter/cultural-differences-in-the-classroom/]

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Hogle, P. (2018, November 29). *UDL is the Key to Culturally Inclusive Instructional Design*. Retrieved from Learning Solutions: https://learningsolutionsmag.com/articles/udl-is-the-key-to-culturally- inclusive-instructional-design

Novak, K. (2021, March 28). *UDL: Providing Multiple Means for Representation*. Retrieved from Novak Education: https://www.novakeducation.com/blog/udl-providing-multiple-means-for-representation