



# **Stackable Instructionally- embedded Portable Science (SIPS) Assessments Project**

## **Grade 5 Science**

### **Unit 3: Differentiation Strategies and Resources**

#### **Earth Systems and the Solution of Water Problems**

**January 2023**

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## SIPS Grade 5 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.



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. 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.

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 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.

 <b>Multiple Means of Engagement</b> “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"> <li>Allow students to choose a local water source and related issues to explore when feasible.</li> <li>Allow students to choose the way in which they model the movement of water and other factors in the well simulation activity.</li> </ul>
Allow ownership of parts of instructional tasks.	<ul style="list-style-type: none"> <li>Have students establish their own goals (academic or behavioral) that work towards the goals and objectives of the unit (e.g., “I can ask questions when I do not know what</li> </ul>



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Strategies	Examples
	<p>to do.” “I can take five deep breaths when I get frustrated.”)</p> <ul style="list-style-type: none"><li>• Allow students to choose how 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).</li><li>• Resources: <a href="#">Tips for Educators of ELLs: Teaching Vocabulary in Grades 4-12</a>, <a href="#">How to Teach ESL Vocabulary: Top Methods for Introducing New Words</a></li></ul>
Make work authentic and relevant.	<ul style="list-style-type: none"><li>• Make the connection between simulating well challenges with people who use or could benefit from using wells for their source of water.</li><li>• Have students share water source issues from their community or country and their feelings about it (e.g., People are not happy about a dam that was built that diverted water from their area. They conserve water and do not understand watering lawns.).</li><li>• Share pictures and/or videos of local dams and water reservoirs. Be sure to share ones located in a country or region where students who are first, second, or third immigrants are from.</li><li>• Share the goals in multiple ways (e.g., write on the whiteboard, read aloud, include on handouts).</li><li>• Resources: <a href="#">The Impact of Dams: Celilo Falls Case Study</a>, <a href="#">Dams Are Threatening California Salmon and a Native Tribe’s Culture</a>,</li></ul>
Provide safety and reduce distractions.	<ul style="list-style-type: none"><li>• Be responsive to cultural differences when asking students to participate in class and/or small groups (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</li></ul>



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	<p>the language level to be polite. Eye contact varies by culture.).</p> <ul style="list-style-type: none"><li>• Be aware of possible tactile sensitivities when working with organic substances and provide tools or gloves to avoid student distress.</li><li>• Allow students to ask questions or seek help in multiple ways, including anonymously (e.g., individually, emailing the teacher, sticky notes on board, in small groups, asking a peer, etc.).</li><li>• Resources: <a href="#">Cultural Differences in the Classroom</a>, <a href="#">What is tactile sensitivity?</a></li></ul>
Present clear and important goals and objectives.	<ul style="list-style-type: none"><li>• Share the goal in clear and simple terms (e.g., We are going to research the amount of water on Earth and create a model to help us estimate the percentages of the surface area of water on Earth. First, you will . . . then you will . . .)</li><li>• Have students write goals into simple goals (e.g., I will find three reliable online resources on aquifers to design a model of groundwater aquifers.).</li><li>• Resource: <a href="#">Goal Setting for Students: Nurturing a Growth Mindset</a></li></ul>
Provide different levels of support and scaffolds.	<ul style="list-style-type: none"><li>• As needed, assist the student in adequately entering information for tasks to be completed at home (e.g., tracking how the family uses water in a typical evening).</li><li>• Incorporate accommodations and support 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.</li><li>• Provide extended time as needed.</li><li>• Resource: <a href="#">Task Analysis Worksheets</a></li></ul>
Encourage collaboration with partners and in groups.	<ul style="list-style-type: none"><li>• Be clear about the purpose and expectations of cooperative group activities (e.g., the task, student roles, expectation of contribution,</li></ul>



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Strategies	Examples
	<p>freedom to share information within and across groups, cooperative and not competitive, etc.).</p> <ul style="list-style-type: none"><li>• Be intentional about how groups are formed so that each includes a variety of students (e.g., race, national origin, socioeconomic status, disability, etc.).</li><li>• 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 <a href="#">AAC</a> system, and for some, it might be to reduce the size of the group and allow options for seating (e.g., exercise ball).</li><li>• Resources: <a href="#">Successfully Using Communication Practices in the Inclusive Class</a></li></ul>
Support self-reflection and evaluation.	<ul style="list-style-type: none"><li>• Provide support to help with transitions (e.g., a task list, a personal checklist, a visual timer, etc.).</li><li>• Work with individual students to set personal goals and create an evaluation sheet for self-monitoring.</li><li>• Provide tools to foster independence, prepare students for the next activity, break tasks into smaller steps, and aid transition.</li><li>• Resource: <a href="#">The Autism Helper: Self-Monitoring</a></li></ul>
Encourage communication about frustrations and guide self-management of the frustrations.	<ul style="list-style-type: none"><li>• Provide a means for students to express frustration or attention fatigue in productive ways to avoid disruption (e.g., a symbol to request a break, an opportunity to sit alone for a few minutes, etc.).</li><li>• Develop a plan with an individual student for managing disruptive or distracting behaviors and support the student in monitoring the plan (e.g., Develop a discrete signal (e.g., tap on student’s desk) to alert the student to initiate the pan (e.g., counting backward from 20.).</li></ul>



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	<ul style="list-style-type: none"> <li>Resources: <a href="#">What Are Break Cards and How Do I Use Them?</a>, <a href="#">(Printable) Break Cards: How to Use Break Card Visuals at Home, School, and Special Education</a></li> </ul>

### 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
Provide flexible ways to present information.	<ul style="list-style-type: none"> <li>Use measuring tools with large, high-contrast markings to help students who have a visual impairment.</li> <li>Label investigation materials (e.g., materials for the well simulation challenge) with braille labels for students who use braille.</li> <li>Create example models, graphs, and charts using tactile graphics.</li> <li>Pair anchor chart information with graphics.</li> <li>Resources: <a href="#">Communication and Language Strategies for Science Inquiry Classroom (Part 2)</a>, <a href="#">Design Principles for Tactile Graphics</a>, <a href="#">Tactile Graphics</a></li> </ul>
Provide information in a variety of ways.	<ul style="list-style-type: none"> <li>Provide information in print, graphics, and videos (e.g., magazine articles on aquifers, videos on wells, images of water filtration systems, etc.).</li> <li>Wait time between a question and a person’s reply varies across cultures. Therefore, during brainstorming activities (e.g., where water comes from) or classroom discussions (e.g., usage of dams and how they could be part of the engineering solution), be aware of this and ensure everyone has the opportunity to contribute.</li> </ul>



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Strategies	Examples
	<ul style="list-style-type: none"><li>Resources: <a href="#">Information on Aquifers in Spanish</a>, <a href="#">Aquifers</a>, <a href="#">What is an Aquifer</a> video, <a href="#">What is Groundwater?</a> Information with graphics.</li></ul>
Describe the meaning of vocabulary and symbols.	<ul style="list-style-type: none"><li>Frontload vocabulary (e.g., glacier, groundwater, aquifer, well, watershed, etc.) by using a word wall or a glossary paired with pictures.</li><li>Provide a video describing terminology (e.g., groundwater, aquifer, watershed).</li><li>Provide illustrated vocabulary word banks in science journals.</li><li>Speak slowly and clearly combined with gestures or acting out words, phrases, and directions to help English Learners and students developing science vocabulary.</li><li>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, <a href="#">Vocabulary.com</a>.</li><li>Resources: <a href="#">What is Groundwater?</a>, <a href="#">What is a Watershed?</a>, <a href="#">Watersheds</a>,</li></ul>
Explain structure of graphs, charts, diagrams, models, etc.	<ul style="list-style-type: none"><li>Before having students review or create data about freshwater supplies and distribution, provide a wall chart describing the parts of a graph.</li><li>Directly teach the purpose of arrows in a model.</li><li>Resource: <a href="#">The Importance of Arrows in Science</a></li></ul>
Provide support for decoding of written text and symbols.	<ul style="list-style-type: none"><li>Have students read about groundwater and water tables to each other.</li><li>Digitize text and have student use a screen reader.</li></ul>



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Strategies	Examples
Support language acquisition (e.g., English Learners, AAC users, ASL users)	<ul style="list-style-type: none"><li>• Connect dominant language (e.g., English) with first language (e.g., Spanish).</li><li>• Have a student respond using their first language and then translate into English. Check understanding of content and not on sentence structure and grammar.</li><li>• Allow students to use preferred and possibly multiple ways to communicate.</li><li>• Ensure that the needed vocabulary is in a student’s AAC system.</li><li>• Resources: <a href="#">Supporting ELL Success with STEAM and Hands-On Learning (Part 2)</a>, <a href="#">Getting to Know your ELLs: Six Steps for Success</a></li></ul>
Supply or activate background knowledge.	<ul style="list-style-type: none"><li>• Allow students to share and make connections with their personal and cultural experiences with water sources, water filtration, and dams.</li><li>• Show a short video, objects, or photographs to remind students of the water cycle and sources of water on Earth.</li></ul>
Emphasize key information.	<ul style="list-style-type: none"><li>• Use graphic organizers to emphasize important information and key concepts.</li><li>• Create a QR code and place it on science posters, worksheets, study cards, etc. that will link to a specific online resource.</li><li>• Resources: <a href="#">Free Graphic Organizers</a>, <a href="#">Best Free QR Code Sites for Teachers</a></li></ul>
Provide models and scaffolds to aid in comprehension.	<ul style="list-style-type: none"><li>• Provide sentence frames or prompts to support student responses.</li><li>• Provide opportunities for partner talks to allow students to build confidence in their knowledge and speaking prior to sharing with the class.</li><li>• Resources: <a href="#">Scaffolds to Support English Language Learners in Writing and Discussion</a>, <a href="#">Mini Schedules</a>, <a href="#">Using Visual Schedules to Support Students with Autism</a></li></ul>





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Strategies	Examples
Support transfer and generalization of skills and knowledge.	<ul style="list-style-type: none"> <li>• Include opportunities to review and practice prior knowledge and skills along with new knowledge and skills.</li> <li>• Use a variety of materials to investigate local water supply, wells, dams, aquifers, etc.</li> </ul>

### 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"> <li>• Provide raised-lined paper to assist students with visual impairment and students who have fine motor limitations for writing notes, record observations, and answering questions.</li> <li>• Provide an interactive map on water sources in the United States for students to access using assistive technology as needed.</li> <li>• 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.).</li> <li>• Resources: Interactive Map: <a href="#">Water Utilities and Drought</a>, <a href="#">Best Practices for Creating Accessible Video for Blind and Low-Vision Viewers</a>, <a href="#">Diagram Center – General Guidelines (alternative text)</a></li> </ul>



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Strategies	Examples
Vary the ways for students to respond to questions or a task.	<ul style="list-style-type: none"><li>• Allow students to dictate their science journals, explanatory model on sources of water and its destinations.</li><li>• Allow students to use their preferred mode of communication to respond to questions and present information (e.g., writing in first language and then transcribing into second language, provide in writing, using AAC, etc.).</li><li>• Ask questions that only require one-word responses or a physical response (e.g., pointing, gesturing, matching, sorting) for students who are developing language or just learning English.</li><li>• Resources: <a href="#">Power-Assisted Writing for Science: Developing Expository Writing in a Multimedia Environment</a>, <a href="#">Better Living Through Technology – Keyboards for People with Disabilities</a>, <a href="#">Pathways to Reading to Learning for Students with Cognitive Challenges</a>.</li></ul>
Use technology or assistive technology (AT) to broaden access to instructional materials.	<ul style="list-style-type: none"><li>• Provide an infographic program for students to complete. Provide a premade template appropriate for the information regarding where school or home water comes from.</li><li>• Use three-dimensional objects for students who have fine motor limitations (e.g., small Legos® to cover and estimate the percentages of surface area of water on Earth).</li><li>• Enhance 2-D models by adding tactile feedback (e.g., using Wikki Stix®).</li><li>• Have students be actively involved in presentations by using an adapted mouse to advance slides, AAC system to orally share information, an ASL interpreter to share information, etc.</li><li>• Provide low tech tools such as pencil grips, page turners, reading guide/strips, slant board, tactile ruler, manipulatives, etc.</li></ul>



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Strategies	Examples
	<ul style="list-style-type: none"><li>Resources: <a href="#">Mouse Alternatives</a>, <a href="#">The Use of Wikki Stix Within the Classroom</a>, <a href="#">Creating Large Print and Tactile Graphs</a>; <a href="#">DIY Reading Strips</a>, <a href="#">5 Benefits of a Slant Board for Writing</a>, <a href="#">Clusive™: An Accessible, Digital Reading Platform</a>, <a href="#">8 Examples of Assistive Technology and Adaptive Tools</a></li></ul>
Provide varied levels of support and practice.	<ul style="list-style-type: none"><li>Provide images of the various shampoo bottle pumps for students to use when describing the water movement in the well simulation activity.</li><li>Provide possible materials to use for creating filters for students to choose from when exploring the idea of water purification.</li><li>For students who are just beginning to learn about classifying, provide categories represented with graphics for classification of items found on the nature walk.</li><li>Provide differentiated homework or seatwork that still practices the key concepts of the assignment (e.g., some students complete sentence starters as opposed to writing paragraphs).</li><li>Provide articles on wells, dams, aquifers, etc. in the student’s first language as possible.</li></ul>
Support planning and strategy skills.	<ul style="list-style-type: none"><li>Model think-alouds showing how to solve a problem or think through a task (e.g., In the video, it showed the people building small dams to slow the flood peak. I’m going to look at ways people do that now.).</li><li>Check in with students to see if they are understanding the task and if they need support to understand a concept.</li></ul>
Provide supports to help with managing information and resources.	<ul style="list-style-type: none"><li>Provide the option, as available, for students to conduct initial research in their first language.</li><li>Bookmark or place hyperlinks on the homepage of relevant online resources.</li></ul>



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Strategies	Examples
	<ul style="list-style-type: none"><li>• Create a digital resource document that includes links to websites paired with graphics.</li><li>• Slip a page from a book, magazine, or a worksheet into a plastic protector and highlight key information.</li><li>• Resources: <a href="#">3+ Digital Resources for Your Classroom</a>, <a href="#">How to Link to a Specific Part of A Webpage &amp; Share It</a>, <a href="#">Share pages with a QR Code</a></li></ul>

## 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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