UNIVERSITY OF CALIFORNIA SAN DIEGO

Bilingual STREAM: Inquiry of Water through Science and Engineering

A thesis submitted in partial satisfaction of the requirements for the degree Masters

in

Teaching and Learning: Bilingual Education (ASL-English

by

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The Thesis of Elena Besse Mayer is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

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Chair

University of California San Diego

2018

DEDICATION

For all the people who love asking why.

The above sentiment applies to all of my former students, who, with their distinctive personalities, broadened my horizons in ways I couldn't have imagined myself. It also applies to my master teachers during student teaching placements and my professors at UCSD, who invited me to ride along the roller coaster of wonderment that is education.

To my dog, Louie, a constant companion during work breaks and insistently reminding me that there is indeed fresh air and important occurrences outside of my computer screen.

To my brother, who taught me the notion that not everyone learns or thrives the conventional way, and that they and the world are much better for it.

To Moi, for always partaking in our cozy "How was your day?" ritual and believing in me to do my best in every avenue of my life.

To my parents, who never asked me if I wanted to go to graduate school, but where I would like to go for graduate school. Thank you for instilling in me the values of the great outdoors, a healthy debate and explaining why instead of saying "just because".
You both have been my biggest teachers from Day One.

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ABSTRACT OF THE THESIS

Bilingual STREAM: Inquiry of Water through Science and Engineering

by

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The field of science and engineering is rapidly expanding with new innovations. This bilingual American Sign Language/English curriculum provides inquiry in STREAM education for Deaf and hard of hearing students, incorporating visual and hands-on activities in three units and nine lessons. The first two units focused on science inquiry with the third unit being an engineering component, all integrating Next Generation Science Standards with bilingual strategies. The three goals of this curriculum focus on utilizing inquiry, developing academic language in ASL and English, and gaining a sense of responsibility for the environment. Implementation of this curriculum was done in a period of ten weeks, as measured by data collection of field notes, KWL charts, student vlogs and science journals, worksheets and group presentations.

Introduction and Overview

In human experience, individuals in wonder have looked upward and wondered what propels clouds to move across the sky, looked downwards and pondered what lies beneath the soil, or what makes the water in their cup crystal clear. Wonder is what leads to inquiry, and "has little to do with textbooks and lectures and everything to do with our inherent need as a species to learn about and reflect on the world around us. Humans, and particularly children, are natural scientists" (Bresser & Fargason 2013). Excitingly, recent education reform has brought student-driven inquiry to the forefront of the classroom along with new pedagogy of exploration skills, critical thinking, and problem solving applicable to real-world issues, making it highly motivating.

The old-fashioned approach to science education of simply hearing about, reading about or seeing pictures of things, has shifted especially with new research and standards. The well-known term Science, Technology, Engineering, and Mathematics (STEM) learning has been revised to "STEAM", as to include art and give students the opportunity to create multiple representations of their understanding. Even more recently, the acronym has added an "R" for reading in "STREAM" to incorporate literacy throughout content (Pietrowski, 2017).

However, in my experience as a student teacher, integrated STREAM (Science, Technology, Reading, Art, Engineering and Math) education is not found consistently in Deaf and hard of hearing classrooms. These classrooms often heavily emphasize supporting language acquisition in two content areas, Math and English, that are assessed through state standardized tests. Fortunately for Deaf and hard of hearing students, as quoted in Bresser and Fargason's book, Becoming Scientists, "discovery or inquiry-based science instruction is an effective means for helping ELL students successfully learn science concepts and develop English language

skills" (Wright 2010, 251). There are Deaf and hard of hearing English language learners with a native language other than American Sign Language (ASL) or English, therefore these emerging levels of ASL and English levels provide opportunities for language exposure and solid language role models within the classroom. Recognizing the need to meet emerging language learnings, learning science will enhance their language experiences.

This curriculum aims to fill the gap of inquiry and STREAM with 9 lessons focusing on water use, the first two units focusing on science and the third on engineering. Since this curriculum is structured in a way to transition between pre-determined units, it utilizes guided inquiry to engage students in deeper learning that applies to making connections to the world around them. Guided inquiry involves scaffolding from the teacher, who presents activities and supports students in asking questions, making observations and constructing explanations (Martin-Hansen, 2002).

This curriculum, "Bilingual STREAM: Inquiry of Water through Science and Engineering" focuses on three goals to:

1. Utilize inquiry to create models and solve problems related to science phenomena.
2. Develop academic language using ASL and English to communicate science ideas.
3. Increase awareness of individual and community responsibilities for environmental resources.

This curriculum primarily focuses on the investigation of the water system and important points such as human dependency, conservation, and sustainability. In each unit of this curriculum, students will consistently engage with informational texts, visuals, and activities in discussions to strengthen their conceptual understanding of the role the environment. Knowing the role of the environment is critical to our day to day lives as well as the impact we have on our

surroundings. Students will delve into project based learning, to demonstrate their inquiry by investigating a particular question related to how the world works, how we affect the world around us, and how it can affect us. Across units and through science and engineering, students will do inquiry of water footprints, plan to conserve water, as well as design a water filter. Instructional strategies, such as making connections to the world and engaging with visual, hands-on, collaborative learning and literacy development through bilingual strategies will enhance language learning, especially for Deaf students who have been language deprived.

Justification of Need

As many of us learn in elementary school, the majority of the human body, as well as the planet, is made up of water. This precious resource is the responsibility of citizens to preserve and protect. Water in California is used up in agriculture to feed the whole nation. New solutions are needed to resolve issues of pollution and waste, engineering difficulties, water scarcity (drought), conservation, and find ways to reduce the human ecological footprint. Innovations in STEM have emerged in the last ten years and is currently a dominant and ever-growing field for opportunity. According to the National Science Foundation, 6 million Americans work in STEM-related careers with earnings mostly double the average national wage as of 2017, which is predicted to increase to more than 9 million jobs by 2022 (Gunn, 2017).

Despite the initiative of the Obama administration that pushed for more STEM graduates in the last decade, "our generation's Sputnik moment", the lack of minority representation continues to exist. Of the current STEM workforce, 26% are women, 7% are Latino and 6% are African American. These staggering results are due to the lack of a sufficient quality education and plentiful resources, as well as a lack of science student role models (New York Times Editorial Board, 2013; U.S. Department of Education). Moreover, while 15.30% of the general

population works in STEM, only 0.19% of the Deaf population works in STEM, as shown in the ASL Clear resource (Hoffmeister, & Reis. 2016). Given this unfavorable premise, it is our responsibility to provide academic preparedness to ready Deaf and hard of hearing students for involvement in STEM.

Deaf children, who are born into hearing families and do not learn ASL at birth, are in dire need of language and executive function skills such as self-monitoring, organization and memory (Hauser, Lukomski & Hillman, 2008). They come to school with very little language and teachers therefore must stimulate a rich language learning environment. Teachers of the Deaf can expect that "all students can become scientists and think critically" as long as ASL, a fully accessible language, is used in inquiry science to foster development of students' critical thinking and metacognitive skills (Bresser & Fargason, 2013). Bresser & Fargason (2013) emphasizes the fact that "providing a thinking curriculum is especially important for those children in diverse classrooms who have been underserved by our educational system". A comprehensive review of Stanford studies shows the impact of environmental education on academic, emotional and social skills development while fostering feelings of civic responsibility (Ardoin, Bowers, Roth & Holthuis 2016). Environmental education includes spiral learning and applicability, which are key to deepening knowledge and engagement throughout content areas and contexts. The opportunity for Deaf and hard of hearing students to learn outside in the natural and real-life context where visual and tactile experiences stimulate engagement is beneficial (eeWORKS, 2017**)**.

In my student teacher experiences in Deaf and hard of hearing classrooms, I noticed a consistent lack of emphasis on science as a subject on a daily basis. There is a gap in Deaf students' knowledge of science and social studies subjects. To find that these topics continue to

be on standardized tests, these students could fail in those areas resulting in an overall weak academic performance. In my informal survey of teachers use of science materials in Southern California, one group of teachers of the Deaf use FOSS kits with hands on materials that cost around one thousand dollars per unit, another group of teachers do not have a curriculum but instead make do with studying the NGSS or doing activities that coincide with Common Core State Standards. Concerns with the language of instruction within these kits/resources were raised. The materials were heavy on English texts and sophisticated vocabulary, but did not provide scaffolding in ASL, Deaf students' most accessible language. Not having those materials in their native language, Deaf students' ability to understand basic concepts is hindered.

It is my intention to maximize the use of resources and the national standards to focus on problem-solving skills and adapting them for bilingual education. The goal is to give Deaf and hard of hearing students access to visual and tactile content and language-rich experiences. This curriculum has been designed to provide an interactive bilingual Science unit that builds on foundational concepts such as the water system and sustainability in ASL and English. By equipping them with a toolbox of thinking strategies, Deaf students will become forward-thinkers, critical thinkers, and ultimately environmental citizens. By teaching them problem-solving skills, the goal is to have more Deaf people enter the field of STEM workforce and become role models for the next generation of Deaf children. Accessible STREAM education for Deaf incorporates a bilingual philosophy, in this case, ASL and English.

Bilingual Approach

All children have a right to an accessible education. Therefore, establishing an enriched multicultural and bilingual ASL and English environment, Deaf and hard of hearing students can

engage in learning using a variety of strategies such codeswitching, translanguaging, and separation of both languages when appropriate. The case for bilingual environmental science education for Deaf children is presented in the following section and has been organized in three sections: research, sociocultural, and pedagogical practices.

Research

A multitude of studies have shown that language acquisition in ASL at an early age is essential for human linguistic, cognitive, social and emotional development (Hauser, Lukomski & Hillman, 2008; Henner et al, 2016; Mayberry, 2010). Researchers call this optimal time of language learning for both signed and spoken modalities the "critical period". Children who acquire a full language within the critical period are able to acquire other languages thereafter.

However, if a Deaf child is immersed in English but cannot access or understand it, the child loses the benefits of acquiring a full language and may never reach native proficiency. Since 90% of Deaf children are born to hearing parents, there is a need to educate and support these families to ensure language exposure of ASL exist on a regular basis rather than have no access and end up being language deprived. Hearing parents of Deaf children can be falsely led to believe that they will not be able to learn ASL well enough to be strong language models, that ASL acquisition interferes with English acquisition, and so they choose ASL as a back-up plan. This results in parents choosing monolingual English during the critical period for their child. These children end up not being exposed to strong ASL models or being involved in a Deaf school or community. Children that do not acquire an accessible language during the critical period have correlated difficulties in comprehension and cognitive processing later in life (Hauser, Lukomski & Hillman, 2008). Language acquisition results depend on whether if the Deaf child can access the spoken language of English or the sign language of ASL. Far too

many Deaf children are being immersed in a monolingual spoken English environment of which they cannot access or understand.

Conversely, signing from birth or having Deaf parents has positive relationships with students' linguistic and cognitive levels. Native signers have stronger metacognitive, executive function skills and develop a theory of mind, the understanding of mental states (Henner et al., 2016; Mayberry, 2010). Since ASL is a visual and spatial language, it is the most accessible language for Deaf children. It is not surprising to see Deaf children acquire sign language with ease. Early language acquisition in any language including sign language is crucial for fluency to occur and therefore the same principle applies for them to have to have exposure and immersion in it at an early age. Children who acquire ASL as a primary language are able to simultaneously develop English as another language (Mayberry, 2010).

One way to study positive language acquisition is to look at Deaf family cultural practices. Deaf mothers and their Deaf children develop joint attention using visual cues. During the first year of their child's life, Deaf mothers are more direct with visual cues for attention, by using touch, such as moving the signing towards the child's visual field and even signing on the Deaf baby. Deaf mothers use child-directed signing, with exaggeration and repetition. However, Deaf mothers decrease their cues over time so that by age two, Deaf children are able to autonomously give and switch attention to important people or objects in their environment. This decrease of scaffolding of cues for attention as children grow is a skill for "meaningful language exchange" that follow Deaf people for the rest of their lives (Lieberman, Hatrak & Mayberry, 2013).

If Deaf children are able to acquire ASL proficiently as their L1 during the critical period, their existing linguistic structures will support the learning and transfer of knowledge in English

literacy as their second language. The more practice with a second language can they become fluent. In fact, research from Gallaudet's Visual Language and Visual Learning (VL2) Lab show that higher ASL proficiency is correlated with higher reading and writing levels of achievement in English for Deaf and hard of hearing children (Fish & Morford, 2017; Mayberry, 2010; Padden & Ramsey, 1998; Strong & Prinz, 1997). TheVL2 Lab provides a wealth of information about the effects of sign language on learning for parents to read. The aforementioned research refute the false claims that many hearing stakeholders tell hearing parents such as that oral English is the only way to achieve academic success. With recent legislation such as SB 210 in California, the Deaf community, as always, strives to support more families with multilingualism from the dawn of Deaf and hard of hearing people's lives.

Since sound is not necessary for English language development, Deaf children with strong L1 proficiency in ASL are able to acquire English literacy as their L2. They learn English through print by mapping concept equivalence in English and ASL. Children who have Deaf parents learn language through social interactions and the parents become reading mentors to engage in successful communication. Deaf children not only struggle to develop English fluency, they have not had translation training from English to ASL and vice versa mainly due to their limited ASL skills (Hoffmeister, 2014).

The modern Deaf and hard of hearing classroom has a variety of students, including many children with cochlear implants (CIs), as 80% of Deaf children in developed countries have CIs. Davidson, Lillo-Martin & Pichler (2013) compared children with cochlear implants from Deaf families who signed from birth to hearing children of Deaf adults (CODAs) and found that ASL acquisition does not harm English development. These CI signing children were found to have more success in spoken English language skills when compared to their oral-only

counterparts with CIs. ASL acquisition benefits children with CIs' English reading, writing and spoken skills (Humphries, et. al, 2012; Humphries, et. al, 2013).

Sociocultural Factors

The woven fabric of Deaf and hard of hearing people include many linguistic and cultural identities, and/or additional disabilities. The diverse population of Deaf bilinguals have varying hearing loss, childhood experiences, education, language proficiencies, usage of modalities and social communities. They are able to codeswitch and translanguage on the "language mode continuum", between formal or informal ASL and English, as well as use both in a bilingual mode, depending on appropriate contexts. Deaf children who have access to a natural language will be able to communicate and form relationships with their families, as well as develop cognitively and socially and obtain world knowledge (Grosjean, 2010).

While the global norm is multilingualism, the United States of America continues to emphasize a monolingual English worldview, where English is the language of citizenship, education and law. All other minority languages are often not valued in school or workplaces. This is problematic for the Deaf communities who do not have access to spoken language and instead live and work bilingually with ASL and English print. To make this country and various spaces accessible, there must be an expansion to value language modes other than spoken English.

The narrow view of monolingualism is also compounded with the ideology that spoken language is the only way to success and such concept is believed to be the only by many educational and medical communities. This deficit perspective inhibits Deaf communities from using their own natural human sign language as the language of instruction leading to cases of language deprivation. This prejudiced emphasis of hearing and speaking over signing ignores

the sociocultural and linguistic value ASL offers Deaf people (Baker, 2006; Garcia 2009; Grosjean, 2010; Humphries 2013).

As an indigenous practice of the Deaf community, ASL has a significant role in bilingual education for students' academic development. Using ASL allows social interactions between students, teachers, staff, and the world. For over a century, ASL and all its linguistic structures are being linguistically recognized as having equivalent status to the spoken language. ASL can be the language of instruction particularly in all core subjects. The use of English as a second language can be demonstrated in multiple modalities such as writing, reading and speaking, when appropriate. With this philosophy in mind, ASL, English and home languages are respected in that they are distinct, with their own grammar and syntax. Deaf culture is also taught and incorporated in the classroom. This approach turns away from a deficit model and special education for a child with a hearing disability in Deaf education and focuses on the whole cultural bilingual/bimodal child. This approach helps children develop emotionally and cognitively as well as their sense of self (Baker, 2006; Cummins, 2006; Garcia, 2009; Humphries, 2013).

Pedagogy

The only way to adequately empower minority Deaf and hard of hearing students, is to implement a dynamic bilingual approach within the classroom, where Deaf communities' linguistic and cultural backgrounds are valued. By incorporating additive bilingualism skills such as translanguaging and code switching between the multiple modalities of ASL, English, and home languages (Cummins 1986; Garcia 2009), students will not only gain a firm visual language access but also a full primary language to foster learning a second language, English.

Navigating a bilingual life is like driving an all-terrain vehicle, adapting to various situations (Garcia, 2009). The benefits of bilingual practices ensures a safety net in language acquisition. Various ASL-English bilingual techniques are shown to be effective, such as chaining and chunking through multiple languages (Humphries & McDougall 2000). Chaining associates ASL and English through fingerspelling, print, sign, picture, realia, signing and facial markings to help Deaf students make meaning using all modalities. Scaffolding of chaining strategies can help emerging bilinguals develop skills in code switching and translanguaging (Humphries, 1999).

Even though Deaf children may not yet be "balanced bilinguals" with expert fluency in both ASL and English, they are emerging bilinguals who exhibit code-switching habits purposefully. These habits include switching within sentences or dialogue. Teachers can capitalize on these strategies to improve fluency, vocabulary and reading skills. Chaining is a Deaf cultural practice where meaning is shared. Deaf teachers share knowledge during "teacher talk" through chaining or fingerspelling with Deaf students to emphasize specific components of language to introduce new vocabulary. Proficiency in students' visual modality will foster literacy in other modalities.

Using these Deaf family cultural practices such as fingerspelling and child directed signing when engaging with objects, books, and words lead to a high rate of success in literacy. ASL discourse and the various registers ought to be incorporated within teacher and student conversations to build language proficiency (Andrews & Rusher, 2010; Humphries, 1999; Padden & Ramsey, 1998). It is my intention to adopt this bilingual approach when integrating science with inquiry learning.

Review of Existing Materials and Curricula

Inquiry science in education is integrated with the new Next Generation Science Standards (NGSS). These standards were designed as a result of the recent worldwide push towards a greater awareness and understanding of the human responsibility to Earth, to help equip students for "college, careers and citizenship" and take an active role in preserving and protecting the ecological and natural resources that sustain human life (National Science Teachers Association, 2018).

Bresser & Fargason's book, "Becoming Scientists" (2013) is grounded in 8 NGSS Scientific and Engineering Practices, which I will implement in my lessons:

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

The 4th, 6th, 7th, and 8th standards of NGSS emphasize reflection in science learning. Ødegaard, Haug, Mork & Sørvik (2014) conducted a Norwegian study looking at literacy within inquiry-based science and found that while language supports science learning, there is a need for more consolidating wrap-up discussion and reflection while using multiple modalities to learn; reading, writing, hands-on, and talking. To replicate this model, this curriculum will include discussion and reflection in every unit in order to build on students' experiences and consolidate their meaning making experiences.

A study done by Samarapungavan, Patrick & Mantzicopoulos (2011) of how guided inquiry affects motivation and learning in science found that after six units of inquiry-based

science, kindergarteners improved their science learning and understanding compared to their peer counterparts who experienced non-inquiry science. Literacy was incorporated across units, with each student keeping a scientific notebook to document, evaluate, and refine questions, predictions, investigation procedures, models, outcomes, and conclusions through notes and drawings. This curriculum aligns with this research as it enables students to practice and record use of literacy during guided inquiry with their science journals, group worksheets, vlogs, and presentations.

Since I wanted to use inquiry science to give students opportunity to explore their responsibility to the environment, I researched about the current statewide approach to teaching sustainability. I found that a 2003 California law led to the state school board's approval of the Education and the Environment Initiative (EEI), a free curriculum "inspired by a vision of environmental literacy for all" (EEI website). It is based on 5 main environmental principles:

1. People Depend on Natural Systems
2. People Influence Natural Systems
3. Natural Systems Change in Ways that People Benefit from and can Influence
4. There are no Permanent or Impermeable Boundaries that Prevent Matter from Flowing Between Systems
5. Decisions Affecting Resources and Natural Systems are Complex and Involve Many Factors

I attended a EEI training at a local school district and learned that its multi-dimensional approach connects complex concepts within various subjects such as environment, economy, society, literacy to help bridge the gap for cross-disciplinary learning. Participants did an activity to investigate water as a resource and how the system of water is interdependent with human

society. I will model my curriculum after EEI's approach to science education as whole and complicated concepts rather than segmented facts to learn.

Several science resources were collected and embedded within this curriculum. The first resource was the long-time nonprofit for water science education, Project WET. It supports solving water issues locally and globally while advocating for sustainable management and personal responsibility. The Project WET Curriculum & Activity Guide (1995) includes activities that have been field-tested by teachers nationally. "A Drop in the Bucket" and "Every Drop Counts?" are two full lessons in particular that center around water use and conservation. These lessons have been modified and integrated with bilingual strategies for this curriculum in Units 1 & 2.

The second resource I used was the California Academy of Sciences, a museum based in San Francisco's Golden Gate Park. They offer lesson plans and activities that build on each other based on grade level on their website, at https://calacademy.org/educators. The website features a lesson "How Much Water Do You Eat", that enables students to evaluate how much water goes into the production of their diet, especially meat, modified for use in Unit 2.

The third resource was the NASA's Jet Propulsion Laboratory (JPL) website where educational lessons were included, at https://www.jpl.nasa.gov/edu/teach/activity/water-filtration-challenge/. I adapted the "Water Filtration Activity", in which students engineer solutions to cleanse dirty water, for incorporation in the third unit of this curriculum.

Thanks to the internet, there are an abundance of free resources and lessons online, specifically for environmental science, water systems and sustainability. Teachers often use content-sharing platforms such as Pinterest or teacher blogs to network and exchange resources. There are many lesson plans integrated with NGSS available from the National

Science Teachers Association website at http://ngss.nsta.org/Classroom-Resources.aspx that empower teachers with rich curricula that contain plenty of experiment set-ups, visuals and texts for each grade level.

Another critical resource relevant to signing students is the online ASL Clear (http://clear.aslstem.com/) resource center with various STEM units with vocabulary and definitions in ASL. They provide signs for STEM terms that make it more effective to discuss in the bilingual classroom. ASL Clear features a water cycle topic on their website that include terms like precipitation and condensation in a clearly signed video (Hoffmeister & Reis, 2016).

Lastly, while I took the graduate Science Methods class, Brandon Reynante from UCSD Global Ties came to present about teaching engineering and having students design, test and refine products for clients. I met with him again while developing this curriculum and gained insight on teamwork and the process of designing a product as a group.

Previous UCSD theses developed environmental science curricula for Deaf and hard of hearing students. In her thesis, "Going Green – an Environmental Studies Curriculum for Deaf Learners", Megan Hicks (2014) had students "think critically about their energy use and therefore make environmentally aware decisions" while learning about pollution and the "Three R's: Reduce, Reuse, and Recycle" in which students created "Going Green" posters shown on campus to educate others. Cynthia Bronson (2007) wrote "Connecting Science to Terra Firma: Inquiry Based Applications in Life Science for Deaf Students" that focused on inquiry, in which students chose an animal to further study, "encouraging students to create and answer their own ecological questions" while connecting to their personal lives, discussing in groups, and keeping a journal. I will draw on these wonderful works to further expand science curricula, bringing together environmental awareness and inquiry for Deaf and hard of hearing students.

Key Learning Theories

This curriculum is grounded in three learning theories: Krashen's comprehensible input theory, Vygotsky's sociocultural learning and Cummins' language interdependence all influence the planning of my lessons. I expand on how each learning theory is connected to my curriculum below.

Krashen's Comprehensible Input Theory

The demographics of today's Deaf and hard of hearing classroom requires sensitivity to the fact that Deaf and hard of hearing students will come from a wide range of linguistic backgrounds, be it one or a combination of ASL, English, gestures, another signed system, or other language. Krashen (1982) coined the theory of comprehensible input, which includes the variable "i" to represent the starting point of any student's language base. By capitalizing on what students already use to communicate using visual means, the teacher will identify with the "i + 1" model, where "i" represents the student's current level of language competency, adding (+ 1) the comprehensible input to enhance their learning. The goal is to allow students to feel comfortable where they are and to advance in their language ability in a safe visual environment. Comprehensible input involves accessible extra-linguistic information such as knowledge of the world, pictures, and realia. This visual and tactile comprehensible input offers a universally designed student-centered curricula. Through these lessons, students will be creating their knowledge of the world together through studies of realia and pictures and experiments while building their L1 and L2 through discussions and work. The learning in an authentic context, in which meaning is built through curiosity, observation and discussion, will provide comprehensible input to support students' growth in both ASL and English. One feature of this learning theory is that although all students may not accelerate at the same rate or be at

the same level at the same time, a classroom environment and pedagogical practices with comprehensible input will cultivate their bilingual language acquisition (Krashen, 1982).

Vygotsky's Sociocultural Learning

When children learn, they co-construct knowledge in social contexts with individuals who are experts. Experts provide scaffolding opportunities but they must figure out where novices are to help build new schemas. Vygotsky's Zone of Proximal Development (ZPD) is the learning spectrum that is feasible, accessible and manageable by the novice learner. What each student can do independently with new experiences that are not too difficult nor too abstract. Each student is at the initial zone of performance where they can function without any help. Guided inquiry, the sense-making of the world, is designed with scaffolding in mind and students get varied support throughout the process to make meaning. With teachers or peers, together they expand on their zone of proficiency using academic language. As students gradually progress in a social setting with experimentation, observation and discussion, they interact with peers who may act as leaders and more knowledgeable others (MKOs) in ASL, English, science, or the current topic.

An abundance of academic language development is ingrained in this curriculum, with scaffolds ranging from teacher modeling and support, whole group work, small group work, structured activities, and sentence frames. These technical, cultural and psychological tools are what Vygotsky considered to guide children's cognitive development. The social conversations and meaningful interactions in class, will be internalized into "inner speech". The cognitive dialogue they have with themselves in problem solving and looking at the world will be reinforced (Vygotsky 1978, as cited in Galotti, 2011).

Cummins' Language Interdependence

This science inquiry curriculum has various parts of ASL and English in which students will interact with each language for different purposes and activities. Knowing their first and second languages (L1 and L2) abilities will guide language planning within the classroom. As mentioned in Cummins' interdependence hypothesis, using students' L1 as a mode of learning does not harm the acquisition of their L2, but actually promotes proficiency in both the L1 and L2. The metaphor of an iceberg describes bilingual proficiency, what we see as the tip of the iceberg requires the common underlying cognitive and academic skills. By strengthening the first language can the acquisition of the second become feasible. Most of the discussion in this curriculum will occur in ASL to deepen cognitive and academic processing and learning to support students' acquisition of English. Once students have a firm understanding of the content in ASL, they are more likely to understand the context in text. In the same way, reading text in English will require understanding by translating what they know in ASL.

Curriculum Description

The curriculum, "Bilingual STREAM: Inquiry of Water through Science and Engineering" is composed of nine inquiry lessons in total, equally segmented in three units. The first and second units focus on science discovery (introduction to science concepts in Unit 1 and bridging science concepts to solutions in Unit 2), while the third unit applies engineering practices. During Unit 1, students have the opportunity to come up with questions with the structure of a KWL chart and investigate various issues pertaining to the current state of water on Earth. As the class moves on to Unit 2, students will create scientific solutions to water crises they investigated with water conservation pledges. By Unit 3, students have learned that there is

a need to innovate pertaining current problems, and will develop a water filter to cleanse dirty water, undertaking engineering processes.

Throughout the curriculum, students will develop their academic ASL and English skills with science journals, group work, vlogs and presentations. This work throughout the curriculum addresses the goals of utilizing inquiry, developing academic language, and increasing awareness of responsibility. The curriculum is aligned with NGSS and CCSS at the 5th grade level, as well as 3rd-5th grade ASL Content Standards.

Although the current developed lesson plans pertain to the water system, these units can be modified for any topic to use inquiry. Educators can also choose either Unit 1 & 2 or Unit 3 to focus on either science or engineering.

Evaluation Plan

The three goals for this curriculum are the following:

1. Utilize inquiry to create models and solve problems related to science phenomena.
2. Develop academic language using ASL and English to communicate science ideas.
3. Increase awareness of individual and community responsibilities for environmental resources.

To assess whether the Deaf and hard of hearing students in my class have met these goals, I used four avenues of assessment, formative and summative, as well as individual and collaborative were used: Field Notes, KWL Chart, Science Journals & Group Journals, and Vlogs & Presentation.

Reflection Notes: My field notes are comprised of daily reflections for lessons as well as real-time notes taken during class discussions, which especially captures active inquiry of students in a space that they feel comfortable to express their understandings and wonderings.

These notes also include interaction with academic vocabulary as students learn new concepts and how to organize their thoughts in a clear and structured way in ASL.

Content Language Knowledge Evidence: The KWL (Know, Want to Know, and Learned) chart will be used at the beginning of the first unit and the end of the second unit. Students each will have an individual KWL chart in their science journals which they will make entries throughout the curriculum. I will use the KWLs to measure growth of academic language and a growing awareness of responsibility for environmental resources by comparing the first and last column. Entries of questions in the center column (Want to Know) provides crucial information about how students' wonderings were activated during the inquiry process after establishing what they already know in the first column.

Written student work samples that I will collect include their science journals and group journals. I will use the "Rubric For Written Work" to evaluate development in academic vocabulary, organizational structure to establish relationships, and illustration of scientific concepts across units. Students craft writing samples in this curriculum through a variety of supports such as class discussions in ASL, academic vocabulary walls, graphic organizers and prompts, collaborative work, and support from peers and staff in the classroom. The aim of having these scaffolds in place are to support students to express their scientific thinking effectively in English, a language that may not be their primary or strongest mode of communication. Although students are evaluated individually and in small groups, scientific thinking at its core is truly a collaborative effort and students will not be impeded from, but rather encouraged to participate in, social learning from shared thought processes and modeled writing.

To measure growth in ASL academic language over time, I will collect videos of signed recordings in each unit. In Unit 1 and 2, students will make a vlog reflecting on the importance of water on Earth or their personal solution to water conservation. At the end of the engineering group project in Unit 3, teams will present their findings and revisions to their classmates. For the ease of evaluation, I will film these presentations. I will use the "Rubric For Signed Work" to evaluate illustration of scientific concepts, use of academic vocabulary, focus on topic, and organizational structure as shown in space and body shift. Individual students' Academic ASL development can be measured by comparing Vlogs from the first two units. I will evaluate overall development in Academic ASL of the class by comparing average scores of signed recordings in all three units.

Written and signed work will also be examined for elements of inquiry and responsibility. All student work can be found in Appendix B.

Implementation

School Context

I implemented this curriculum during my student teaching placement in 5th grade at a state school in a suburban area. The school has a strong bilingual philosophy in ASL and English. Many students commute by bus from outside the county for services. The campus has a Parent Infant Program, Early Childhood Education center, elementary school, middle school, high school, and Career Technology Education in various buildings. In elementary, several teachers work in each grade level and often collaborate for lessons or events.

Class Context

The 5th grade is divided into three classrooms with one teacher per class, including two mixed-level classes of 13 students, plus two 5th graders in a 4-5th grade ACE class (Alternative

Curriculum Education) for Deaf plus students. All of the 5th grade students walk freely between classrooms based on their grouping for various subjects.

My Cooperating Teacher, who teaches one of the mixed level classes of 7 students, has her classroom set up as the "ELA room". The other mixed level class teacher's classroom of 6 students is set up as the "STEM room". During morning literacy in the ELA room, students from both the mixed level classes are organized into the Red group (4th-5th grade level reading) and the Gray (1st-3rd grade level reading). In the afternoons, students flock to STEM class down the hallway. During math, students from both the mixed-level classes participate in the lecture and then grouped based on the level of support they need on their homework. Science and social studies (which alternate on a 2-3 week basis) are taught in the STEM room as well and include students from ACE. This time period is more of an opportunity for interactive group activities, spot-on for the implementation of this inquiry science curriculum.

Student demographics range between 10 and 12 years of age and are of mostly Latino background. Most of the students' families sign or are ASL natives, with the majority of students having hearing parents. To preserve confidentiality, I used pseudonyms for all students involved in this curriculum.

The students described as following:

1. Student A: Caucasian, Advanced ASL and Early Advanced English User, uses spoken English at home, Deaf family, Red ELA group, clever bookworm with advanced language and math skills. As the most gifted student in the class, she easily gets bored and loses motivation to do her best, so requires challenge and prompting to be persistent.
2. Student B: Latino, Intermediate ASL and Intermediate English User, uses ASL at home, Hearing parents with Spanish speaking background, Red ELA group, mature student who is

an active listener in group discussion, budding leader. Math comprehension and proficiency is his strength and although he has a good sense of story structure, he needs support in decoding vocabulary in reading and using descriptive words in writing.

3. Student C: Caucasian, Advanced ASL and Early Intermediate English User, Native ASL user, Deaf family, Red ELA group, clever bookworm with advanced language and math skills. His strength is discussion and debate in ASL with peers, as well as a strong grasp of concepts in math. He not only works well with his classmates, but is a natural leader. He is working on his reading habits by taking time to review vocabulary and spelling words and needs support in expressing his ideas in writing. He can participate well when he has his stress ball for anxiety.
4. Student D: Caucasian, Advanced ASL and Early Intermediate English User, Native ASL user, Deaf family, Red ELA group, clever bookworm with advanced language and math skills. He is a bright student and his strength is storytelling in ASL and persistence with math problem-solving. Although he has many great ideas, he struggles with organization and time management and needs support. He has mild Asperger's and is not used to working in small groups and needs warnings about changes to schedule and clear time.
5. Student E: African American, Intermediate ASL and Early Advanced English User, uses ASL at school and spoken English at home, hearing family, Red ELA group. He is a highly motivated student who takes care in thinking things through before expressing his answer during discussions or writing, therefore needs extended time to answer in class discussion or for written assignments.
6. Student F: Latino, Early Advanced ASL and Advanced English User, uses ASL at school and both ASL and spoken English at home, Deaf family, Red ELA group. She enjoys sharing

experiences and opinions with peers and is a skilled writer. Although she is competent in math, she needs guidance and affirmation.

7. Student G: Latino, Early Intermediate ASL and Beginning English User, uses ASL at school and home, Hearing family and Deaf brother, Gray ELA group. He is a determined student with passion for learning who transferred from the mainstream last year and needs support in all content areas. He can participate well when he has a stress ball for ADHD and reminders to stay on task and keep calm when he isn't sure of the answer. He prefers one on one assistance when he is struggling with an assignment or gets frustrated.
8. Student H: Latino, Early Intermediate ASL and Beginning English User, uses ASL at school and home, Hearing family, Gray ELA group. He has a positive attitude and thrives in small group work. He receives one on one support from a reading specialist during mornings and from an aide during math time.
9. Student I: Latino, Beginning ASL and Beginning English User, uses ASL at school and home, Hearing family with Spanish speaking background, Gray ELA group. She is a sweet girl who recently transferred from a mainstream program and has Kindergarten-1st grade reading and math levels, and benefits from repeated modeling and use of questioning to develop ideas.
10. Student J: Latino, Intermediate ASL and Early Intermediate English User, uses ASL at school and home, Hearing family with Spanish speaking background, Gray ELA group. She is a hardworking and caring student who exhibits strength in using various strategies in math. She needs to develop more confidence in brainstorming and her language skills and benefits from encouragement.

11. Student K: Latino, Early Advanced ASL and Early Intermediate English User, uses ASL at school and home, Hearing family with Spanish speaking background, Gray ELA group. She is a creative student who loves music and dance. She receives one on one support from a reading specialist during mornings and from an aide during math time.
12. Student L: Latino, Early Advanced ASL and Early Intermediate English User, uses ASL at school and home, Hearing family, Gray ELA group. She is a sweet girl who is beginning to show more self-confidence. She struggles with grade level skills in reading and writing and does well with assistance and positive reinforcement.
13. Student M: Latino, Early Advanced ASL and Early Intermediate English User, uses ASL at school and ASL and LSM at home, Deaf family, Gray ELA group. She is a funny and hard-working student, needs guidance with reading comprehension and transcribing her ideas in ASL in writing.
14. Student N and O are students from another class who attended part of a few class sessions.

Since there are so many students during science time, a total of 14 to 15 students, whole group discussions are held with extra chairs and students sitting beyond the u-shaped cluster of desks so they can see each other. If students engage in discussions, the teachers will allow them to discuss as long as they are on point, and engage in guided discussion (inquiry) with asking more questions. However, the classroom setup is very flexible and has two tables in the back of the room at which students can engage in small group discussions.

The daily schedule is as follows:

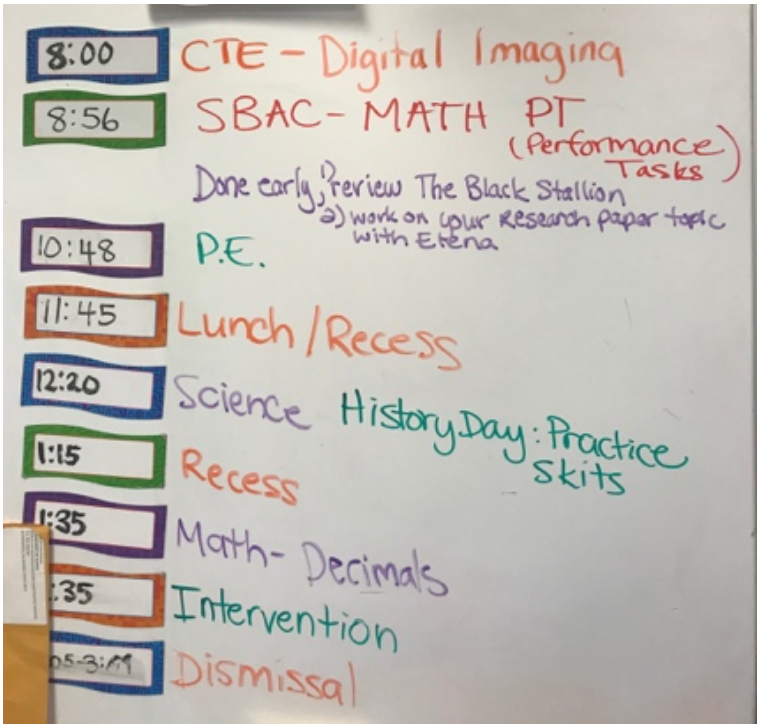


Figure 1: Class Schedule

I taught this science curriculum Mondays to Thursdays after lunch, from 12:20 pm to 1:15 pm, after which students went to recess. On Fridays, students had early release and a minimum day schedule, which did not include social studies or science.

My cooperating teacher gave me a valuable piece of advice: have your eye "blinds" all the way open to monitor what students are doing during class, not just pertaining to the lesson. After students come in from recess, either teacher will do a gesture everyone must follow (cup one hand on head to create an ear like the "cub" mascot of the school) and also time how many seconds with one hand to show how long it takes students to transition in class. These are a few strategies I can incorporate for classroom management and to facilitate a learning environment.

In preparation prior to implementing my curriculum during the first week of my placement, I sent a parent letter home, created and printed materials for lessons. Fortunately, the

teacher from the STEM room requested composition notebooks from the elementary department for every student to use as their science journal.

Curriculum Implementation

Unit 1, Lesson 1: Why Do We Need Water? (April 16 to 18 - 3 class sessions)

Lesson 1, Session 1 – April 16

I introduced the KWL to students and asked them what they thought about the heading, "Water". Students instantly connected by using prior learning from last week's lesson about various Earth systems and identified water as part of the "hydrosphere", fingerspelling the word with fervor.

As most of the fifteen students worked on their KWLs, I noticed two students from ACE (Alternative Curriculum Education), had their papers blank and were struggling to come up with ideas. To differentiate instruction, I flashed the lights for attention and encouraged all students to draw a picture if they were unsure how to start. I helped a few students label their pictures and generate phrases first in ASL then in English.

I noticed ¾ of the class was done with filling out the KWL chart but the other ¼ was still in progress and seeking assistance from myself and the other staff. I made the spontaneous decision to have the majority of students who finished their KWLs move to the table in the back of the room and share what they wrote. Once the remaining students in the front of the room recorded a question on their KWLs, I encouraged them to join the larger group. They hesitated, not wanting to be embarrassed by joining late. Regardless, their kindhearted classmates made sure they had an opportunity to share at least one question each, especially Student I, who just moved from a different school district and has had a hard time transitioning.

In reflecting back on this incident, I realized the benefits of students sharing their work helps the struggling students to see models from their peers. My suggestion is to provide a time for everyone stops writing and share out their KWLs, to help students see their classmates' ideas.

The students were already on a roll in the inquiry process! I noticed that several students mentioned "humans die" while watching the back of the room. I called all the students back to a whole group discussion and applauded them on critical thinking, their turn-taking and caring discourse. I asked what their most popular questions were and modeled, "I wonder….?". Students came up with these three, which I wrote on the board:

1. What effect does water have on humans and why do we need water? (the most popular question by far)
2. How does water freeze?
3. How did water appear on Earth?

Their main questions were reiterated in the next lesson and in the following weeks to help them stay on track and get their answers.

During the map ball activity to identify types and bodies around the world, I noticed a range of responses:

- Student K chose a river and labeled it as salt water.
- Student C described a lake in Canada to be fresh water.
- Student B pointed out the ocean near the South Pole and responded to my question of what happens when it is cold there with "ice".

Some students are not clear about what bodies of water are salt or fresh water and will undergo the inquiry process in Lesson 2, in which they analyze distribution of water on Earth.

To wrap up class, I asked students, “Even though there is water all around the world, do you think all people have enough water?” At first, Student D signed “Yes, there is PLENTY!”. Student C signed “there is a scarcity” and Student A stated that it depends where you are born and if it is close to water or not. Several students emphasized Africa not having enough water, a perfect transition to our discussion of South Africa’s Day Zero tomorrow.

The lesson objective and curriculum goal of inquiry was met, as students were able to state their understanding about water in the world and utilize inquiry by coming up with their own questions, as measured by in-class discussion and KWL entries.

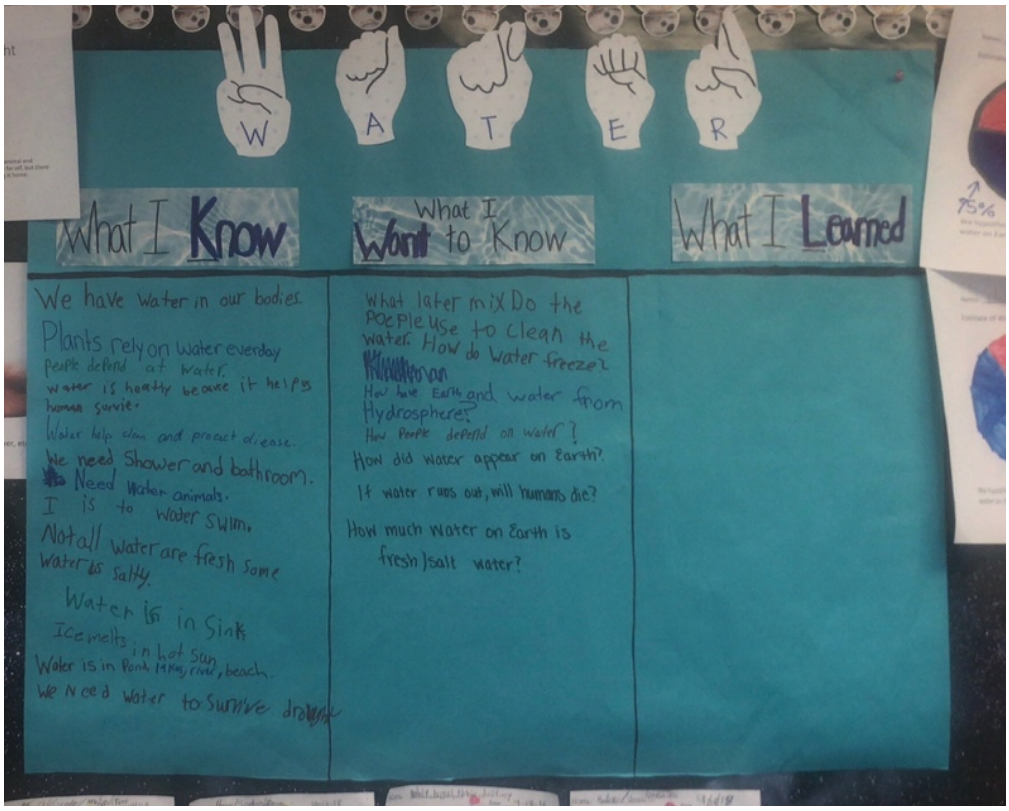


Figure 2: Class KWL Unit 1

The figure above is transcribed in the table below for clarity.

Table 1: Class KWL Unit 1

What I Know	What I Want To Know	What I Want to Learn
We have water in our bodies. Plants rely on water everday. People depend at water. Water is healty because it helps us human survie. Water help clean and procect diease. We need shower and bathroom. Need water animals. I is to water swim. Natall water are fresh some water is salty. Water is in sink. Ice melts in hot sun. Water is in pond, lakes, river, beach. We need water to survive drought.	What later mix do the people use to clean the water. How do water freeze? How have Earth and water from Hydrosphere? How people depend on water? How did water appear on Earth? If water runs out, will humans die? How much water on Earth is fresh/salt water?	

Unit 1 Lesson 1, Session 2 – April 17 Water Abundance

In this session, students contributed ideas and questions from the previous day to the class KWL and took turns writing on a large poster. However, having most of 15 students waiting in line to write, it took up the first half of class, which led to distractions and side conversations. The class KWL could have been done with the teacher transcribing students' statements as a language model to maintain a faster pace, especially since the students have already written their own KWL and they are not being assessed for their writing skills.

During the mini PowerPoint presentation, students were able to make sense by looking at the pictures of the slides and identifying the new words as a result, signing "WATER- PLENTY" for "Water Abundance" by looking at the picture of a waterfall. Students made more connections to the vocabulary words of the earth systems they learned last week (hydrosphere, geosphere, atmosphere, biosphere). My cooperating teacher noticed that I used the strategy of asking what the opposite of water abundance is to elicit answers from the students to predict the

next vocabulary word, “drought”. Due to this success, I will continue to introduce vocabulary words using picture descriptions or tapping previous learning throughout the rest of the curriculum.

While discussing drought, I asked students if they remember having to save water in Riverside.

- Student C: “Two years ago, there was a bad drought in California. It was so bad that my brother, who tends to take really long showers (20 min), had to take shorter showers.”
- Student B: “My uncle moved to a different house because the water in one of the bathrooms didn’t work”.

Students were enamored with discussing the extreme drought South Africa after watching the video from BBC and were able to complete the writing prompt in their journals as homework.

The lesson objective and curriculum goal of inquiry was met, as students were able to state their understanding about water in the world and utilize inquiry by coming up with their own questions., as measured by in-class discussion and KWL entries.

Unit Lesson 1, Session 3 – April 18 Venn Diagrams

I had my first technical difficulty with the doc cam and struggled to turn it on. The teachers pointed out that it wasn’t even plugged in. The students and I had a great laugh about it. What a simple solution.

PAH. Finally moved on to small group work! This class section focuses on comparing and contrasting pictures of drought and water abundance with ASL structure and Venn Diagram. With my cooperating teacher’s help, I organized four mixed-ability small groups with

3-4 students per group. This effective grouping strategy combines students from both Red and Gray language groups to have balanced teams in which students can learn from each other. Students loved the creative water-related team names!

Table 2: Team Names

Ice	**Cloud**	**Rain**	**Wave**
Student E	Student A	Student F	Student D
Student H	Student L	Student C	Student J
Student G	Student N	Student K	Student M
Student B	Student I	Student O	

After modeling the ASL objective of body shifting and use of space, I asked students what the purpose of that structure was. Student D made the great connection stating that we utilize body shifting when role-shifting especially during storytelling about two characters. Mary signed the difference between two ways to compare and contrast by signing information about drought and water abundance with organization from the objective.

I set a time limit (7 minutes) for groups to work on their Venn Diagrams and reminded them to use ASL structure while working. Students were enamored with their worksheets. The Ice group already was in group formation, taking turns and in deep discussion about where words from the word bank would fit in their Venn Diagram. Student F from the Rain group went up to the bulletin board to use the vocabulary words from the lesson as a reference. I closely observed the Wave group to watch Student D, who has Asperger's' and prefers to work alone during group activities. He was hogging the worksheet, but with objection from his teammates, gave in and allowed it to be passed around. With further group formation and development, I hope that

teamwork in science will give him practice in working with others as he transitions to middle school.

My cooperating teacher's co-teacher supported the Cloud group. Student A, who tends to take charge and be a strong leader, was absent. Student L, typically reserved and shy took leadership and supporting the two other teammates in contributing to the worksheet.

I gave students a few more minutes to complete their Venn Diagrams and noticed that most students hadn't used ASL structure yet and were more focused on finishing their worksheet. I flashed the lights and announced that writing time was over and now students were to discuss using ASL structure in their small groups. This spontaneous decision to change the discussion from a whole group session to small group work helped students feel comfortable and develop their ASL skills more deeply.

The majority of the students achieved the objective for using ASL structure when comparing and contrasting. I noticed Students H, C and N especially succeeding in finishing their work after clear use of ASL structure.

Student M caught her mistake on body shift while Student F struggled with her body shift. Student I did not use ASL structure on her body after prompting from me but was able to point to parts of the Venn Diagram to support spatial organization of ideas. I will support Student F and I while we practice more tomorrow.

In transition back to whole group, Student C asked me hopefully if we would practice the ASL objective in the large group. This was not in my plans but I decided to ask students to reflect on their use of ASL structure. Did they like it? How did they feel? Student C said he liked it and it felt natural and not a big deal to him. Student K liked watching her other teammates sign to practice so she could use the structure confidently at last. Student E raised his

hand and said that it was awkward and he felt unsure. I responded, “Yes, we are very used to using formal structure while using English, but it is important to use formal structure in ASL as well, since it is a language equal to English. We will have more practice tomorrow!”

The lesson objective and curriculum goal of inquiry was met, as students were able to state their understanding about water in the world and utilize inquiry by coming up with their own questions, as measured by in-class discussion and KWL entries. The curriculum goal of developing academic ASL and English was met, as students used scientific vocabulary words to create Venn Diagrams in teams and used ASL structure such as shoulder shifting and use of space and categorization to compare and contrast during team and whole class discussions.

Unit 1, Lesson 2: How Much Water Is There on Earth? (April 18 to 23 - 3 class sessions)

Lesson 2, Session 1 – 4/18

In this short fifteen minute lesson, the class creates a model of the distribution of water on Earth. Upon introducing the vocabulary words, usable and unusable water, students had a discussion about the definitions, referring to usable water as clean drinking water and unusable water as salty or unusable water. I then prompted students to estimate the percentage of usable water in the world in a pie chart. Estimates varied and were at least 30%, which reflects misconceptions in the area of student knowledge that needs expansion. I am looking forward to confusion and disequilibrium tomorrow when the students uncover that usable water is only 3% of the world’s total water!

The lesson objective and curriculum goal of inquiry was met, as students were able to make a model of water distribution on their estimate Pie Charts.

Unit 1, Lesson 2, Session 2 – 4/19 Water Distribution

Science class today was launched with representatives from each team coming up to the board and explaining what their estimate was with a signed ASL sentence frame (WORLD TOTAL WATER, CAN USE I FEEL _____ PERCENT). Students D, E, K, L and A were representatives for their team and were able to use the ASL structure to explain their estimates. Student D explained that at first he thought the pie chart was a graph for warm and cool temperatures for water, but realized what it was for and changed the number, showing that although he may be familiar with pie charts, his conceptual understanding of usable water is still developing.

The experiment for this lesson was to tap into students' biases about how much water in the world is usable. To manage the class and students' responses, I asked the class to discuss what is expected of them for the experiment and got the responses "don't play with materials, share, follow rules, take turns and make sure everyone participates, respect and listen to instructions". To prepare students for their upcoming disequilibrium, I asked the class what their response should be if they find that their observations do not match their estimates, and got the responses, "accept it, don't be mad, fine, be calm, say wow that's cool!"

After modeling the measurement activity related to water distribution with all students watching, materials (cards, measuring instruments, and one liter of water) were passed out to various teams. Students were hooked! Each card was labeled with a body of water and the proportion it makes up out of the total water on the Earth (scaled to 1 liter), in milliliters. Students received four cards (Oceans, Glaciers, Groundwater, and Lakes & Rivers) and measured out the according amount of water in four separate containers, as shown in the picture below.

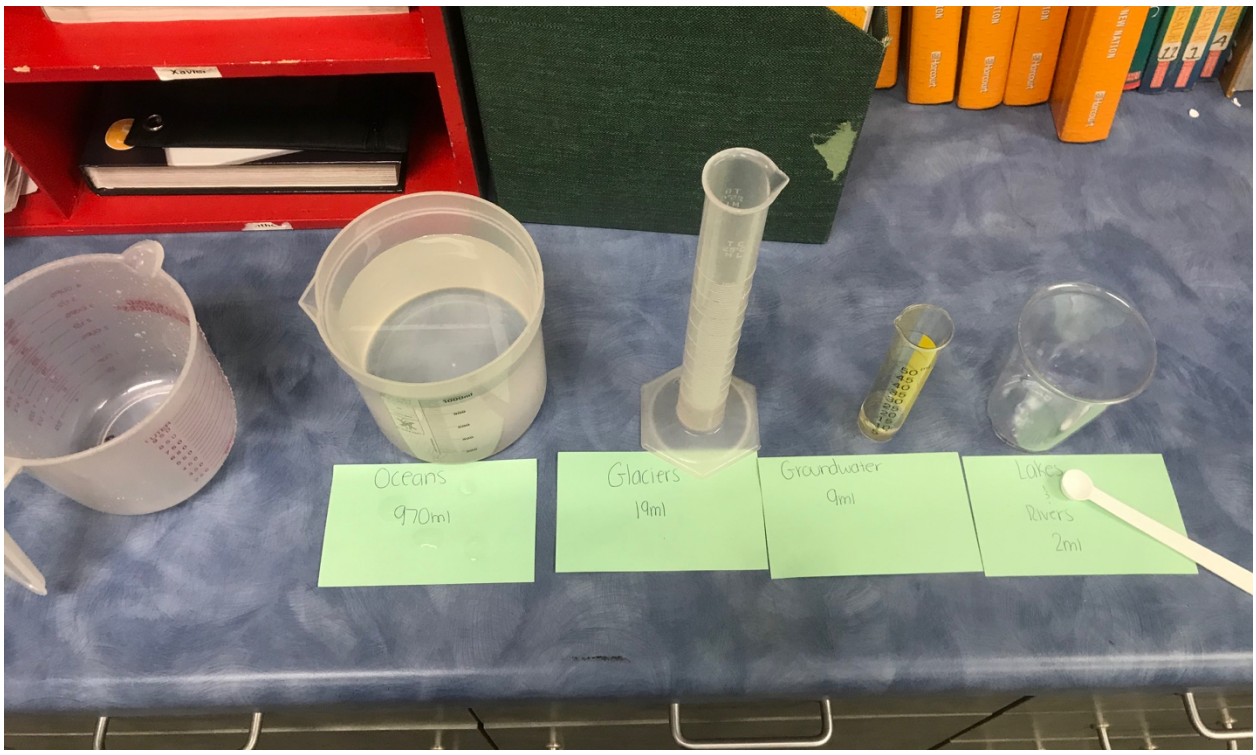


Figure 3: Student Water Distribution Model

When teams finished, I handed out their science notebooks with the bar graphs already inserted. Realizing that I hadn't introduced the bar graph yet, I sought counsel with the cooperating teacher, who recommended going ahead and passing out the journals and providing support if needed. With some prompting for half the groups, students were able to discuss and create bar graphs using the data from the experiment.

In whole group discussion, I had students come up and show where bars were to be drawn on the bar graph PowerPoint slide. I asked them if the data matches their estimate and got mixed responses. I asked the class, "Is water distribution evenly or unevenly distributed on Earth?" Students answered that its unevenly distributed. I asked if we can use ocean water for daily needs? The students joked "Yes!!" but several confirmed no. Because we were working

from a model and photos, some students may still have vague comprehension of the reality of water distribution.

To close, I asked them how much of the 1000 mL total was distributed to unusable water – oceans (970 mL), and how much for the rest (30 mL). Using the bar graphs drawn on the PowerPoint slide as a scaffold, all students were able to respond correctly. This measures their ability to use the class chart, but their deeper understanding will be assessed tomorrow as they create their own pie chart from the data to assess whether they can evaluate the distribution of water and the implications of having a small amount of usable water on Earth. Tomorrow, we will delve into the problem-solving skill of analyzing data for what a particular number can represent, in relation to other numbers and what they represent.

The lesson objective and curriculum goal of inquiry was partially met, as students were able to question if their results matched their estimates, creating new models from new data. Students still need to develop and exhibit skills in analyzing and interpreting data. Students incorporated academic language in ASL, using the ASL sentence frame to describe their estimates during class discussion, "All water in the world, percentage CAN use, I gut-feeling/estimate about _____ percent".

Lesson 2, Session 3 – 4/23 Pie Charts

Today, we wrapped up the water distribution lesson and students created their pie charts of their experiment results. To nudge students into discussion mode, I took coloring markers away and prompted them to use ASL structure for compare and contrasting their estimates and results.

I observed the Ice group taking turns and enjoying practicing role shifting and giving each other lively feedback. Student F in the Rain group began with, "In reflection, my gut feeling (originally) was…". In the Wave group, Student M supported Student J, who responded in contrast "water less". Student D compared both pie charts by saying "same what? have something can or can't use".

As a wrap up, I posed the question, "Even though there is water all over the world called a…? (students signed "water abundance!") …and South Africa and California are on the coast and surrounded by water, why do they still have droughts?" This led to a great discussion.

- Student F: "Because in those areas, it is sunny and dry. There is no rain".
- Student E: "People take water for themselves, so water runs out".
- Student A: Animals run and take all the water before humans get to it".
- Student D "because of salt water. People can't drink it."

Someone even offered up pool water as a substitute, but other students said it had too many chemicals and was dirty. Here, the students' inquiry process included critical inquiry, in which students disagreed with each other's solution that didn't make sense, criticized answers and proposed a new solution.

Feedback from CT

- Write directions on the board in addition to signing them.
- A few students were confused about red and blue colors for the pie chart and mistook them as hot and cold temperatures. If students come up with what colors they want to use on their own, it may accelerate learning better. (ex. Brown for unusable water)

The lesson objective and curriculum goal of inquiry were met, as students were able to make a new model of water distribution on their observation Pie Charts and deepen their thinking,

interpreting the data to show negative causes and implications for having a small amount of usable water. Students also used ASL structure to compare and contrast.

Unit 1, Lesson 3: How Do We Use Water? (April 24 to 26 -2 class sessions)

Lesson 3, Session 1 – 4/24

Before setting up centers to investigate various human uses of water today, the class had a great discussion about the vocabulary words: direct use / indirect use. When looking at the picture of a shower, I asked students if water was "clearly seen" and it they could observe it. Students answered, "yes, it is clear", assigning the ASL sign for "clear" to "direct". I asked students to look at the picture of products (soda, bread, etc.) and asked if water was "clearly seen" and they answered, "clear not". I asked if there was another way to sign "not clear/ clear not", and Student A signed "blurry", which is a great sign for "indirect".

Students asked how water was involved in bread. Now that students had formed some conceptual understanding of direct and indirect water use, we could delve into the more difficult of the pair, indirect water use. There were some answers like flour being mixed with bread, which I confirmed as true. I wrote "Bread" on the board, and asked students what bread is made from, and students answered "that white powder…. f…..flour!". I wrote down further student answers that broke bread down to "wheat/oats", crops, and the classifiers of stalks moving in the wind on a farm. I asked if the crops need water? Students answered, "YES!!!"

The writing on the board looked like this:

Bread ← Flour ← Wheat/Oats ← Crops ← (drawing of stalks moving in the wind on a farm).

I asked students again how is water involved in the process of making bread. With discussion, students were able to answer that a lot of water was used to help the crops grow, which in turn

was processed to become bread. Finally, I asked if through this long process, we could SEE the water just by looking at bread and is it direct or indirect? Students responded, "No, indirect!".

I set up centers by writing them on the board and asked students which center they wanted their teams to be assigned to. Each center's purpose is as follows:

Products: Watch videos of how things are made! Draw to show how water is used in the process of creating the product.

Community: Play an online game to identify water use and water waste.

Create Vlogs: Sign your answer: Earth Day was on Sunday. Why is it important to be responsible for the environment all year?

Agriculture: Read about water use in the production of a hamburger. Create a poster to inform In N Out Customers.

Table 3: Center Assignments

Center	Products	Community	Agriculture	Vlogs
Team	Ice	Cloud	Wave	Rain

To give instructions for centers, I showed students that for the Agriculture center, an important passage of article was highlighted yellow and they could focus on that. I emphasized that the group in the Vlog center needed to discuss the question first before going on to signing their answers. Students were excited and moved to their centers in teams!

Shortly, students at the Community center complained about problems opening the computer game on their iPads. I realized that Flash Player, required to play the game, couldn't run on the iPads. As a fast solution, my cooperating teacher suggested using her teacher computer and projector. Students were able to play the game near the white board with a wireless mouse.

I realized that I needed to remind the Products center to turn on closed captions throughout the video during the next rotation.

In observation, I realized that reading the article in the Agriculture center was a complex activity and the concept of water use for meat was an abstract concept for many of the students. They needed more time to digest the article before they could transfer their understanding into a drawing. The first group spent the whole time discussing the article. During the second rotation, the Cloud group discussed first then when they said they were ready, I gave them paper to draw with. I noticed that they were interested in one picture from the article that listed how much water was used by each part of the hamburger, a clear conceptual representation that was effective comprehensible input for this group. On the Cloud group's paper, they added up the numbers of gallons in the water footprint of a bun, lettuce, tomato and beef patty, and checked their work, planning to write a number fact on their poster. I hope I can find time to allow them to finish this.

The curriculum goal of inquiry was partially met, as some students needed time to digest the information to ask questions. The discussion of how bread came to be was easily manageable and the concept of how bread has a water footprint was co-constructed by several students. Students are learning to digest the information before they can ask questions. While the activity was a good one, stressing on comprehension of the material is what makes inquiry possible too. If students don't understand a concept, they may not ask for clarification. Students self-initiated the use of math to figure out how much water a hamburger really uses. Students developed academic ASL and English by using vocabulary words throughout the lesson.

Lesson 3, Session 2 – 4/26 Finishing Center Rotations

This session consisted of each group finishing up the last two center rotations they hadn't touched in the previous session and having a class discussion.

For some reason today, both groups in the Product center struggled with typing the long link for the video. With assistance from the CTs and myself, they were able to access it. A note for teaching this lesson in the future: create a shortened link for that YouTube video that is easier to type! In creating the vlog about Earth Day, many students had a common narrative about litter causing harm to wildlife, so I presume they must have had a prior experience or lesson about this.

My cooperating teacher gave support to the Agriculture center and led discussions about the article to deepen students understanding. She observed Student C signing, "Wow, my friend goes to In N Out so often. He should not." Also, Student F said, "It's a good thing that I don't eat hamburgers often". These are great recognitions of personal responsibility for water use, especially for food.

I discussed ideas for future improvement for the Agriculture center with my cooperating teacher and Dr. Gabrielle Jones, my professor from UCSD, who visited that day.

- Have art supplies ready to inspire students to draw their thoughts about how to advocate their opinions with regards to water consumption and water preservation.
- Model a visual response by having one available for students to add or create a new one.
- Instead of having students draw about the article, they could sign what they learned in a vlog or in class discussion (depending on time constraints and conceptual constraints – allow flexibility in responses).

In a future revision of this lesson, there could also be a wrap-up class discussion in which we present a key issue from each center as a class.

I am looking forward to our lesson on Monday, in which students will delve more into the water footprint of individual foods. I will gather infographics as visual representations of this abstract concept.

When we made a list of Direct/Indirect uses as a class, Student D described the entire process of making paper as if he memorized it from the video and classified it as indirect water use! Students included food on the indirect list. For direct use, showering, drinking, etc. was mentioned. Student E said that erasers and tables, and EVERYTHING were also indirect use. I asked him what category those items were in. With a questioning silence from students, I picked up the paper with instructions from the "Product" center and showed the class. I asked, "What does P-R-O-D-U-C-T mean?", fingerspelling "product". Student A signed "things", which I wrote on the poster.

The lesson objective and curriculum goal of developing academic language in ASL and English was met from students use of fingerspelling and correct conceptual signs to represent scientific terms. Students were able to use academic vocabulary to summarize main ideas about indirect and direct water use and record their findings in journal entries and discussion. Students also utilized inquiry by changing their preconceptions about footprints and came up with questions such as what other products have water footprints and what happens if water runs out. Eventually, they contributed to different ways of direct and indirect use as a class on the poster. Another curriculum goal, developing responsibility, was also met as students discussed the importance of not wasting water throughout this session.

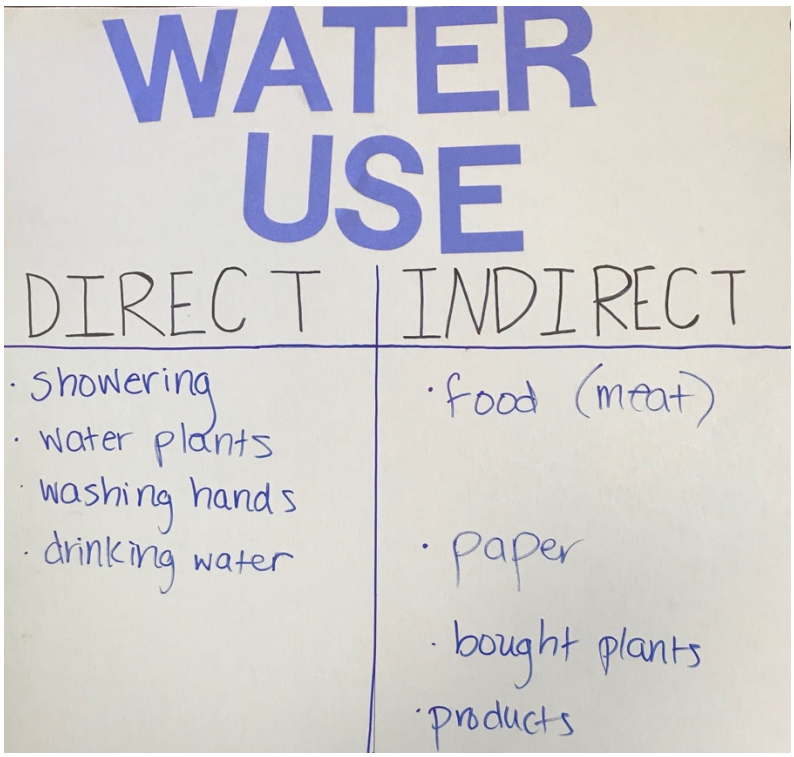


Figure 4: Direct/Indirect Water Use Class Chart

Unit 2, Lesson 4: What Is Our Food's Water Footprint? (April 30 - 1 class session)

To utilize existing resources from the Cal Academy website, I downloaded and printed food cards for this activity, in which students created a balanced meal with a low water footprint using cards with the name and picture of food on the front, and the specific water footprint of that food on the back.

During the intro discussion about the various indirect water footprints, students were to come up with foods they eat that require a lot of water consumption. Student A shared the following, "I feel my family uses A LOT of water, since my family drinks a lot of Coke. We have three bathrooms and flush our toilets a lot". As small groups created meals on their plates, Student M concluded that cows have a large water footprint because "meat eat a lot of grass" to imply that we need to water the grass for the cows to eat. On the other hand, Student G showed some confusion; he had a hard time accepting that eating meat could have a negative effect and

kept insisting that meat is good protein. This nutrition comment is a great opportunity to evaluate other sources of protein that could be used instead of meat.

During large group discussion, (students H, E, A, F, C participated) had an intriguing conversation about how including dairy on their plates contributed to the water footprint. I asked students if dairy was an animal product. Many students were unsure or said "no". Student A said, "Cow milk gets turned into ice cream, which is basically frozen milk". Student H posed the question of how meat gets turned into cheese, showing that the provoking discussion elicited more questions! Students also mentioned that pizza had a high water footprint, but were unsure what animal product was in it other than cheese. On the white board, I drew a picture of a slice of pizza with pepperoni circles to make it clear to students.

Upon writing the data from all groups on the board, many students noticed that spinach had a lower water footprint when compared to the rest of the foods and after discussion, instantly moved to rearrange their plates to include spinach. I reminded students of ASL structure for compare and contrast for their group discussion but students were distracted by the statistics on the board and analyzing their data. It may have been overwhelming to compare and contrast four different groups as opposed to their usual two.

I am seeing that some students are getting too comfortable in their science groups, various passive and dominant personalities creating conflict. To keep students' energy high and morale uplifted, I will create new science groups for tomorrow's lesson.

The lesson objective which was to evaluate the different types of foods and water footprints and the curriculum goal of establishing a line of inquiry stirred up critical thinking. Students posed more questions about the relationship of dairy and cheese with water footprints and revised the elements on their foot plates to include spinach and more vegetables. This

reflective exercise demonstrated an active evaluation of students' growing concern about the amount of water. They were able to enact a sense of responsibility by changing the way they could eat and creating a meal with a low water footprint. Students developed academic language in ASL and English by using "low" and "high" structure in discussions and using "less" and "more" structure in their writing. However, I did not observe students using ASL structure for compare and contrast.

Table 4: Class Chart of Meals

Group	Entree	Side Dish	Drink	Dessert	TOTAL
Ice	pizza	french fries	orange juice	ice cream	791 gal
Rain	Meat & spaghetti	french fries	apple juice	ice cream	405 gal
Cloud	Spinach	Banana	apple juice	ice cream	150 gal
Wave	chicken	rice	apple juice	ice cream	222 gal

Unit 2, Lesson 5: Reflecting on What We Learned about Water: A KWL (May 1 - 1 class session)

Every Tuesday, students have homework to respond to a prompt in their writing journal. Students in the Red and Gray groups receive similar prompts that are differentiated based on level of vocabulary and syntax. For Tuesday's homework prior to this lesson, I assigned a prompt with the following question: What could you do to conserve water?, in their science journal rather than their usual writing journal. I developed two differentiated journal prompts to fit the Red and Gray language groups. Since the students from ACE did not have journal homework from our writing class, I did not have the opportunity to assign them this homework.

Since I only had four days left to complete my curriculum, I spent one day on Lesson 2.2, one day on Lesson 2.3, and the remaining two days on Unit 3. There is enough time for students to design, build, and test their filters, but perhaps not enough time for them to redesign their filters.

During the completion of individual and class KWLs, students used scientific vocabulary terms such as water abundance, drought, indirect, direct, usable, unusable, and pollution, and completed work posted on our science bulletin board, now dedicated to this curriculum. They also flipped through their journals. Students were able to reflect on what they learned and revisit their thinking about the ways humans use water, water distribution on Earth, water footprints, and conservation methods. Both my cooperating teacher and the co-teacher mentioned that today's lesson had a great pace with students completing their individual KWLs for the first 15 minutes, then discussing as a class and contributing to the class KWL for 20 minutes. In whole group, the KWL chart was posted on the white board. Individual students signed what they learned and I was able to model translanguaging by writing their statements in the "L" column.

The lesson objective which was to synthesize what the students learned about water use and answer their previous questions on the KWL charts and during discussion, the students were clear in their thought processing and wrote about responsibilities they had to do to conserve water. This objective required students to describe and explain details of scientific concepts which required a level of academic ASL and when they were to write in English in their journals they had to make connections with what they learned and assert their own opinions about water conservation. Their use of academic signs in discussion were supported by the English and picture word wall and their previous work posted in class.

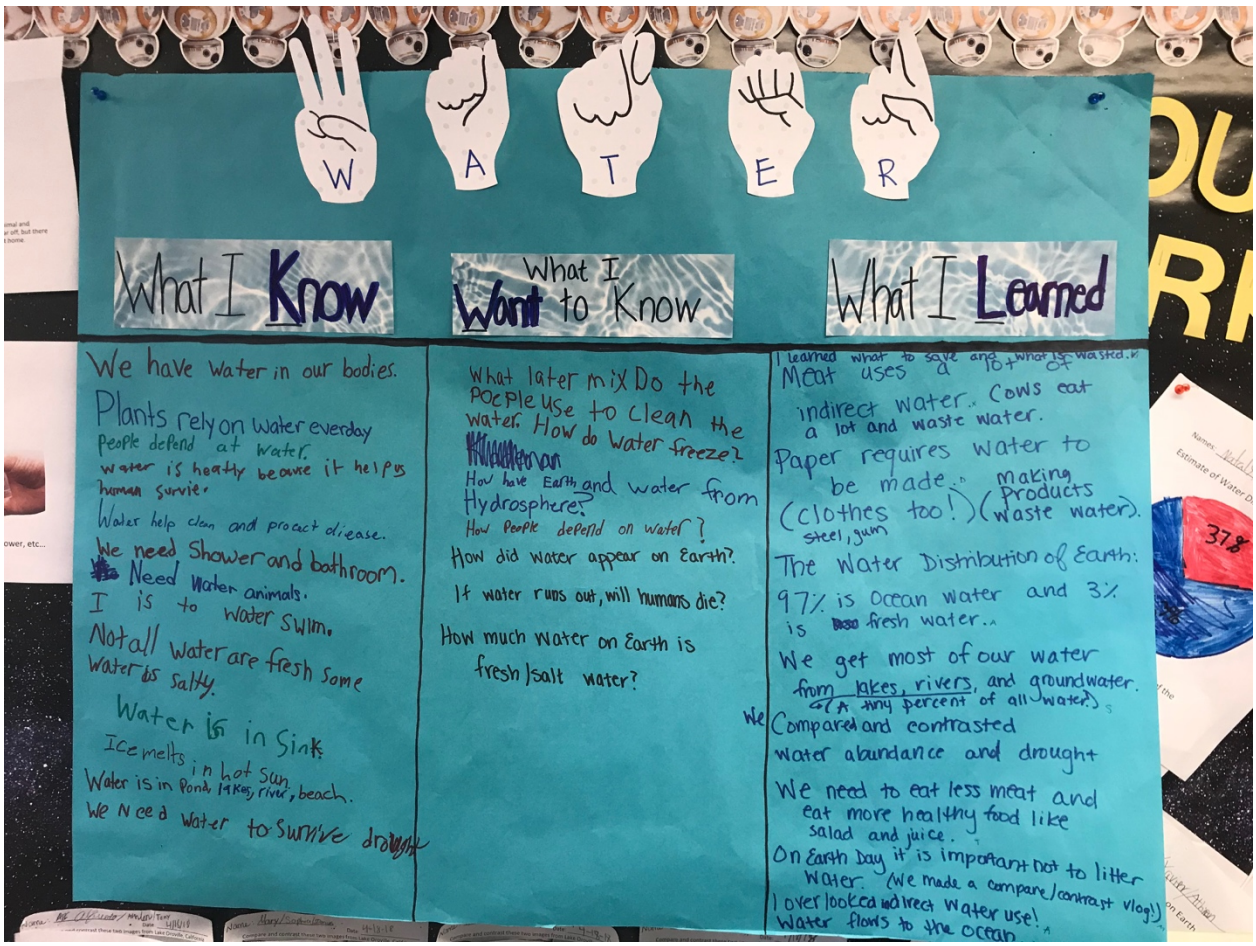


Figure 5: Class KWL Unit 2

The figure above is transcribed in the table below for clarity.

Table 5: Class KWL Unit 2

What I Know	What I Want To Know	What I Learned
We have water in our bodies. Plants rely on water everday. People depend at water. Water is healty because it helps us human survie. Water help clean and procect diease. We need shower and bathroom. Need water animals. I is to water swim. Natall water are fresh some water is salty. Water is in sink. Ice melts in hot sun. Water is in pond, lakes, river, beach. We need water to survive drought.	What later mix do the people use to clean the water. How do water freeze? How have Earth and water from Hydrosphere? How people depend on water? How did water appear on Earth? If water runs out, will humans die? How much water on Earth is fresh/salt water?	I learned what to save and what is wasted. Indirect water. Cows eat a lot and waste water. Paper requires water to be made. Clothes, steel, gum too! Making products waste water. The water distribution of Eart: 97% is ocean water and 3% is fresh water. We get most of our water from lakes, rivers, and ground water. Lakes and rivers are a tiny percent of all water. We compared and contrasted water abundance and drought. We need to eat less meat and eat more healthy food like salad and juice. On Earth Day it is important not to litter water (we made a compare/contrast vlog!) I overlooked indirect water use! Water flows to the ocean.

Unit 2, Lesson 6: How Can We Change Our Water Footprint? (May 1 to 3 - 2 class sessions)

Lesson 6, Session 1 – 5/1

As we had some time left in class after Lesson 5, I thought to start Lesson 2.3 early and introduce the concept of water conservation. Another technical difficulty proved itself to be diabolical in impeding the class' progression. As we were waiting for the Apple TV to turn on, I led an improv ASL song about the water cycle. Two of the questions on the "W" column we hadn't fully addressed were about how water freezes and where water comes from. Thus, as a class, we used heavy classifiers and facial expressions to sign the full water cycle three times! Students were overjoyed and standing with big box signing styles, begging for another round. This impromptu activity ended up incorporating physical movement, language, and the arts. In

future adaptations of this curriculum, I strongly encourage teachers to go ahead and, either on the spot or with preparation, engage with students with an ASL song about science. Creating visual and kinesthetic interpretations can help students learn about a complex system!

In the last few minutes of the 15 minute session, technology became connected again and students were able to figure out the vocabulary word "water conservation" by looking at the picture of hands holding the earth and signing "save".

The objective of academic language was met however, the students were to fingerspell and explain the word "water conservation".

Unit 2 Lesson 6, Session 2 – 5/3 Water Conservation Pledges

Student M was absent today and Student C came in late due to being stung by a bee during recess. The lesson began with reviewing the water conservation vocabulary from the previous and students correctly signed the concept "save water". I asked students what the different ways were that they could conserve water, and they answered in turning off the water, showering for a shorter time, and switching to food with a lower water footprint.

I modified this lesson from its original plan of having a reading about water conservation to having students view a PowerPoint slide of water conservation icons. This revision is due to the time constraint of doing this lesson in one day. Also, students are familiar with most of the methods as they have seen them during the computer game during Unit 1, Lesson 3, or mentioned it during discussion throughout the curriculum thus far.

We looked at the infographic of direct and indirect water conservation methods. Student K connected to the infographic by frowning and signing, "my sister doesn't care about saving water. When she washes the dishes, she leaves the water running".

When looking at the infographic of direct and indirect water conservation methods, students had some misconceptions that about the eco-friendly toilet icon. They said that water conservation was possible by not flushing the toilet or that flushing the toilet used a lot of water and pushed waste down. I drew a picture on the board of a toilet with a handle sticking out, with two arrows going outward on either side of the handle (up or down) and asked students if they had seen this in a public restroom before, and received mixed responses. Students mentioned that the toilet flush is powerful, so I labeled the downward arrow as "heavy flush", and asked students if this would be necessary for #1 or for #2. I then asked students what the opposite of "heavy" is, which to they answered "light", and I wrote this on the upward arrow. From there, we had a discussion in which students determined which type of flush would be appropriate for #1 or #2.

Students then chose a conservation method of their preference. The icons of direct and indirect conservation methods projected on the board were provided as a scaffold. After large group discussion in which several students stated which conservation methods they were going to focus on (showering for a shorter amount of time, eating less meat, etc.), water conservation pledge worksheets were passed out.

I decided to use worksheets instead of science journals due to recognizing the benefit of having students see their own and each other's work posted around the classroom and naturally discussing each other's work.

Some students chose to draw first and write their pledge later, and others wrote their pledge first and drew later. It is important for students to be able to choose which part of their pledge they complete first as it gives flexibility for language construction.

Students used iPads to sign their water conservation pledge. I reminded some to use ASL structure for compare and contrast. Completed videos were sent to me via Airdrop.

The lesson objective of coming up with various ways of conserving water was partially met, students were able to plan to reduce their water footprint in pledges and vlogs. They also developed academic language by practicing communicating science ideas in their vlogs and pledges.

Unit 3, Lesson 7: How Can We Conceptualize Design for Conservation? (May 3 to 4 - 2 class sessions)

Lesson 7, Session 1 – 5/3

In this lesson, students were to design a water filter in teams, with the given building materials. Fortunately, my school has wonderful resources and a storage room designated for science materials. I was able to obtain necessary things for the lesson, such as scissors, tape, cotton balls, gravel, and rubber bands. However, the school didn't have a triple balance to weigh various materials used in filters so I excluded the weighing component from this unit, which saved time anyway since there is only one week left of the curriculum!

After watching the video about water pollution, Student G mentioned pipes and if they weren't working they would be "T-O-X-I-C", he fingerspelled. Not only did the student include an appropriate description of the condition, he was able to interpret the outcome of a failed infrastructure.

I hadn't yet prepared the wastewater so in giving students a rationale for this experiment, I showed a Google Image of "dirty vs clean water" in two cups. Student E thought the cup of brown water was soda, as the idea that some places in the world could have such low quality of

water was unfathomable. I am looking forward to showing them the wastewater and asking them if they are willing to drink this "soda"!

Since this session was taught at the very end of class after completing Lesson 6, no objectives or goals were met. Students used their observation skills to evaluate the conditions of water and made connections with their personal experiences to determine whether the conditions of water were drinkable.

Unit 3 Lesson 7, Session 2 – 5/4 Creating Water Filters

The purpose of the lesson here was to design water filters. I had limited filter materials in the bins dedicated to each small group, so did not model how to make the water filter physically. Instead, I drew two examples of water filters on the white board with different patterns showing possible layers of cotton balls, gravel, etc. and wrote the names of the materials on the board for language support. I noticed that students used these patterns in their planning worksheets to represent types of material.

In this unit, to give opportunities for students to mix up and work with different types of partners, I organized new groups for creating the water filter, with three students per group.

Table 6: Water Filter Groups

1	2	3	4	5
Student D	Student A	Student C	Student F	Student B
Student E	Student G	Student H	Student J	Student M
Student O	Student K	Student L	Student N	Student I

*On the day of the lesson, since most of Group 4 was absent, Student F moved to Group 1.

Students explained their rationale for designing their water filter. In Group 2, Student H signed that once the dirty water is poured into the filter, the cotton will deflate (soak up water). Student L, from this group, although part of the Gray language group in the mornings, usually joined my Red group for spelling tests. I reminded her of one particular spelling word we had

been practicing during the week that started with a……., and she remembered with a smile, "absorbent!" and went on to teach her classmates the meaning of the word.

I asked Group 2 about their rationale. Students A and K stated that they saw this exact experiment on YouTube before and simply wanted to test if what they saw would work for them too.

The lesson objective and curriculum goal of inquiry was met, as students were able to design the solution of a water filter on their group worksheets in preparation for a test. Students also developed academic language by writing on their group worksheets.

Unit 3, Lesson 8: How Can We Construct Sustainable Design? (May 4 - 1 class session)

In this lesson, students engineered and tested their water filter designs to measure water purity. I also incorporated the design revision aspect from Lesson 9, since this was the last day of teaching the curriculum.

Thank goodness for support staff! The aide helped make simulated wastewater while I set up for today's lesson. The preparation for this lesson requires 1 hour. The experiment involved cut water bottles, wastewater and materials organized into bins. Students were to put together their water filters according to their designs and make observations based on the trial. Students had funny reactions of smelling the vinegar-laden water and definitely did not classify it as soda.

I provided some support reminding and affirming students to nest the two bottles with several coffee filters in between and a rubber band or masking tape to secure the design.

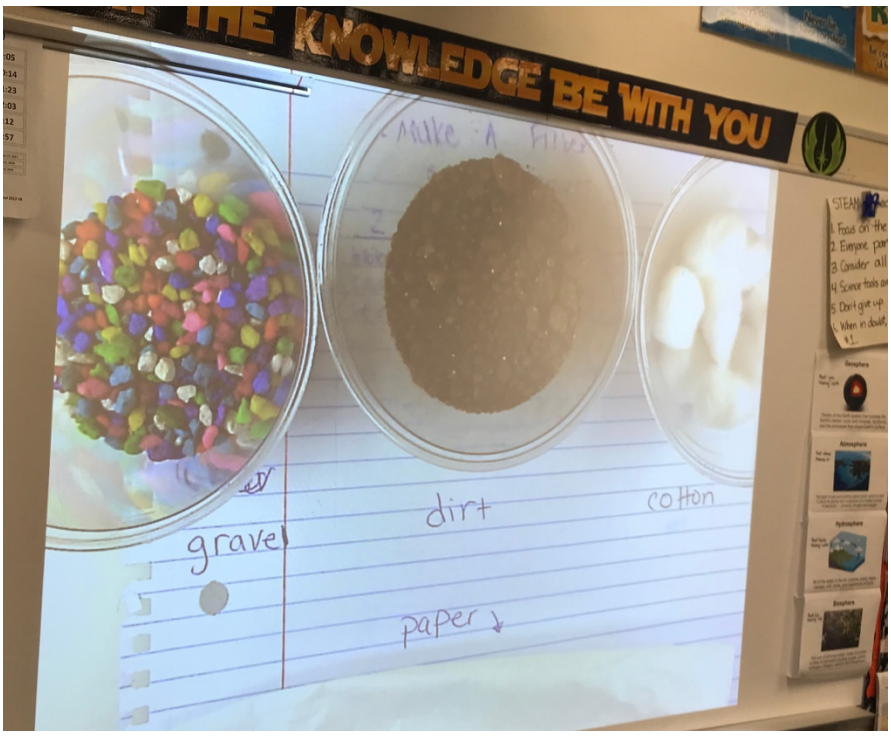


Figure 6: Labeled Filter Materials

When all teams' filters were built and ready, I prompted students to remember the basic requirement of scientific inquiry which was observation. That word was one of their spelling words for this week.

After creating labels 1-5 on post-its and putting them on the table by each team's water filter, I had one representative from each group hold their water filter on one side of a long table in the back, with the rest of the class observing from the other side of the table.

As we were waiting for all the water to filter down through their creations, students made observations.

- Student D: "I feel that Team 1's filter is the dirtiest, NOT filter"
- Student E: (The water at the bottom of) "Team 4's filter is the darkest, all others are the same color"
- Student A: "Student C wins (Team 3) Why? The water is the most clear of all"

- Student L: “Let’s make another one.”

After Student L’s comment, I told the class that I wished we could build another filter! However, we would imagine plans for revision today. Since today was the last day of the curriculum, there was no time to do Lesson 3 and build a revised version of the filters.

To incorporate comparison and contrast within the context of experimentation, students were to judge the team’s performance with the filter. Since the general consensus was that Group #5 and #3 had the clearest water tied for first place, I asked Student C (Group #3) and Student M (Group #5) how many coffee filters they used in their design and why. Students answered that the more papers (coffee filters) used, the cleaner water would be filtered. This observation led students to deduce the outcomes with an explanation.

Student F from Group #1 said that she thinks her group put the filter materials in the wrong order, as the water went through too fast. Student M (Group #5) added that her group added equal amounts of all the filter material but did not use all of the gravel. Student L observed, “If all the paper is used, the water will be clear. If some of the paper is used, the water will be dirty”. Student M concluded that some of the groups used “the wrong strategy”, pointing at the filters with dirtier water.

Figure 7: Students Testing Filters

Students went outside to smell their filtered water and many signed “improvement” and said it smelled better.

Even though there was not enough time and materials to build another filter, I still had students fill out the last section of their worksheets and come up with ways they would improve their filter if they were to rebuild.

As it was already 11:15, there was only time to do one presentation (11:15). The other three groups presented after lunch, as transcribed in Table 7.

Table 7: Transcripts of Filter Presentations

Group 1	Group 2	Group 3	Group 5
Student D: We just built the filter. We started with (body shifts towards the "Design Phase" column and away from the "Revision Phase column") dirty water, I mean DIRTY! We filtered it, which had two water bottles attached, with THREE papers as a border, wrapped it with a rubber band until it was sealed. In assembling the filter, we put together…wait I forgot… **Student E:** Gravel. **Student D:** Right, we started with gravel. Next, dirt. **Student E:** Cotton next. **Student D:** Added cotton, then I added one more paper that was left, ripping it up and putting it in until it was perfect and we can see what happens. When we pour the water in, we'll see what it looks like. **Student F:** What was the result? The result is that the water became light pink, but we think that we should change it to more paper, less dirt, more cotton and gravel.	**Student G:** Why did we do this? The water was dirty, smelled bad and was muddy. *point to the drawn filtered layers* Poured the dirty water in this. **Student K:** *fingerspelling from the projected worksheet* Filter, pebbles, next cotton, dirt, and up there is paper. **Student A:** Aha, this did not filter. *body shift to "Design Phase" column*, This did not filter well, *body shift to "Revision Phase" column*, but I feel this will filter very well with the extra construction. First layer *point* is dirt, next is pebbles, cotton, paper, then gravel again, and paper. This will have more chance of being SPARKLING clean water, I feel.	**Student H:** *pointing to the drawn filtered layers* This is rock, and dirt, and that ball thing…cotton (fingerspelling). **Student C:** The fish rock was not good, because it was not heavy and did not filter all the water. When the water was poured in, it went through and was not well filtered. *slight body shift and pointed to the "Revision Phase" column* We would add the same things but would change stuffing more paper in to filter the water better.	**Student I:** (reading written answer) Water can go...I think **Student M:** The water can go through cotton *points to the bottom layer*. *Student M helps Student I sign the written answer by modeling first which Student I copies:* if water can't go through gravel *points to the top layer* like the fish rocks **Student B**: *body shifts to stand by the "Revision Phase" column* We need more paper and more gravel because we feel it is dirty. So most of the water was dirty and we need more to have clean and fresh water.

I observed much fingerspelling in these presentations. One can argue that fingerspelling may not be knowledge of the word's meaning, but I commend students in using strategies to fingerspell a word they are not familiar with, rather than standing puzzled at the word. Also, this gave the opportunity for students to help each other and construct meaning for English print!

Feedback from CT: Add a list of directions on the board and handouts for students and staff to follow during the water filter experiment.

As a closing to my curriculum, I asked students to reflect about their experience in the last few weeks. Student comments were as follows:

- Student D: Yes, I learned about dirty water. I felt like..ohhhhh, I did not realize many things. And I learned about using role shifting in ASL.
- Student F: I learned about water use. Direct and indirect.
- Student A: We need to think about what makes it (filters) less dirty.
- Student C: My favorite part was today.
- Student M: Today and learning about being healthy.

The lesson objective was to have the students experiment, observe and evaluate a variety of filter scenarios. Their participation and contribution to the observation and conclusions were reflective of a thinking mind. For this matter, the curriculum goal of inquiry was met, as students engineered and tested water filters, discussed test results and revised filters as measured by their worksheets and presentations. Students developed academic language by using ASL structure of classifiers, and vocabulary in group presentations and described their filters on group worksheets.

Results of Evaluation

In the following section, evidence of student progress were evaluated to measure success of this curriculum. The goals of the curriculum were to:

1. Utilize inquiry to create models and solve problems related to science phenomena.
2. Develop academic language using ASL and English to communicate science ideas.

3. Increase awareness of individual and community responsibilities for environmental resources.

This section will show evidence to evaluate how goals were met in this curriculum.

1. Utilize inquiry to create models and solve problems related to science phenomena.

A hallmark element of inquiry is creating questions from mixture of prior knowledge and curiosity. Students generated their own questions in their KWL journal entries and continued coming up with questions in class discussion and in individual journal entries. In Lesson 4, students posed more questions about the water footprint of dairy and cheese and revised their plates to include spinach and more vegetables after seeing other teams' lower water footprints, as measured by teacher observation, plates and worksheets.

With guided inquiry, students were able to solve problems and create models. In Lesson 2, students created a model of water distribution on Earth by measuring out water in various containers. Students came up with their own estimates that between 30-75% of the Earth's water was usable and questioned their own thinking if their results would match their estimates. The students' sense of shock with their results of the distribution of water that did not match their estimates (only 3% of Earth's water is usable) demonstrates the disequilibrium when uncovering information in inquiry.

The Cloud small group in Lesson 3 self-initiated the use of math to figure out how much water a hamburger really uses in its water footprint by adding up the various water footprints of bread, meat, and vegetables in the meal. This is one example of many engaging discussions in which social learning and creativity took place during implementation. All students then drafted a solution to the problem of water scarcity by creating a water conservation pledge and vlog in Lesson 6, using various methods of conservation that they had learned throughout the

curriculum. Some methods of conservation students chose were: eating less meat and dairy, and reducing direct water wasting habits such as long showers and leaving the water on while brushing teeth and washing hands, dishes, or the lawn.

In Unit 3, students followed the engineering process by designing a water filter in preparation for a test, and compared effectiveness by analyzing the clarity of each team's filter and came up with ways to improve their filters by adding more or less paper, dirt, cotton or gravel.. During the test, students evaluated their own and each other's filters with a critical lens, debating which team had filtered the clearest water and figuring out that it was because they used the most cotton. All teams ended up revising their design plans, as measured by team worksheets and group presentations. Based on the evidence presented, students are emerging in their inquiry on various levels of clarification inquiry and deeper inquiry, therefore goal 1 of utilizing inquiry in science was partially met.

2. *Develop academic language using ASL and English to communicate science ideas.*

Because Unit 3 was taught wholly in one day due to time constraints, I have included data from Unit 1 & 2 in my analysis of academic language to reflect students' development.

Academic ASL

For analysis of academic ASL, I created transcripts of vlogs from students who shared both videos from Unit 1 & 2, then scored each vlog on the Academic ASL rubric for use of scientific concepts, academic vocabulary, focus on topic, and space and body shift. From the data table of rubric scores, I created a bar graph comparing the performance of academic ASL of the class as a whole, between Vlog 1 and Vlog 2.

Table 8: Transcripts of Student Vlogs

Student Name	Unit 1 Vlog: Why is observing Earth Day important all year?	Unit 2 Vlog: How can you conserve water and reduce your water footprint?
Student A	Earth Day is important, why? Because if you care about Earth and clean everything, Earth will be clean, not polluted(fs). Cleaner, less disease(fs) from trash that you eat and get sick, which can be passed on to the whole world. Absolutely clean will lead to less sickness and bugs. It is important for everyone to clean all year round, not just one day. That will reduce sickness. That's why it's important to care about Earth.	I can help conserve water in my indirect and direct ways. How do I start? *body shifts to left* EATING LOTS of hamburgers and DRINKING LOTS of soda. Wasting water by showering and bathing for a long time. I change that to…*body shifts to right* eating vegetables instead of hamburgers, drinking lemonade and water instead of coke, and bathing and showering for 3 minutes maximum. That explains the improvement from wasting a lot of water. Finally!
Student B	Why should we care about Earth Day on Sunday? We don't need to throw litter into the ocean, trash, beach or river or lakes. CARE about Earth Day. If we litter in lakes, IF you drink water, it will taste terrible. And animals can choke like ducks. Turtles will get trash up their nose. Care about Earth, don't litter, ok? I'm WARNING YOU!!!	I can help. I will conserve water indirectly and directly. If I wash cups or dishes or anything…washing dishes….if I wash dishes *body shifts to right* and leave water on, that WASTES water. I should turn the water off. When I am finished washing the dishes, I can turn the water on then off then put dishes in the dish rack. That will conserve water.
Student C	This past Earth Day was important. Should we just celebrate Earth Day once and leave it or celebrate it all year round? I choose to care for the Earth all year because of water and nature. Some animals like cows need to drink water, and we need to drink too. Do not celebrate one day then litter all year around. If you throw trash in the river, it is hard to clean. Take care then we will have more water to drink than being careful with the amount of water we have left.	I will compare. *body shifts to left* This is showering for a long time, 1 hour! I suggest not to do that because that WASTES water. Why? We need to drink and cows need to drink too. Do not waste water then water runs out and becomes scarce, NO! *body shifts to right* This is a short, 2-3 minute shower. Fine, no big deal. Not a TWENTY minute shower, just 3 minutes. Showering quick feels good and shows you care about water.
Student E	Why do we need to take care of our Earth? Because we should not throw trash on the land, and not the water. If we do that, then animals who live in the water *mimics struggling* could die. I suggest not to do that. Throw in a trash can or recycling. Do not throw on the grass or in the water. Keep our water clean. We can have some clean drinking water.	I always tend to eat meat, OOH that has a HUGE water footprint! It is a waste of water. I need to reduce meat like cheeseburgers, and like, less pasta, less of any different type of meat. I need to start eating more chicken, that uses less water. And vegetables and fruit that have less water and are healthy. That's great. And it doesn't waste water, either! Awesome.
Student F	Earth Day is important because water is part of Earth and if we have no water, we will die or become dehydrated(fs), because our bodies need water. If rivers, the sea and ponds disappear, we will die, even animals, birds and bugs. All the water goes in grass, trees and many other things. That's why Earth Day is important.	What do I need to improve? *body shifts left* Showering for 5 minutes? *body shifts right* No, my shower needs to be 3 minutes. *body shifts left* Letting the water run while washing dishes? No, I should not. *body shifts right* I should turn the water off while washing dishes then turn it on. *body shifts left* Leaving the water running continuously while I brush my teeth. No, I should not. *body shifts right* What should I do? Brush my teeth and turn the water off. *body shifts left* Flushing the toilet many times and being fascinated with the water going down? *body shifts right* I should flush one time.
Student G	Why/how is water dirty? Frogs and mud dirty. Frogs on a lily pad in dirty water. If it water is dirty and old, throw up and trash in water. If swim in summer, dirty water will go in your mouth. All dirty and tastes bad. Lousy! A better idea is if water is clean and light blue. If its dirty, its lousy and I do not like dirty water, it is not safe! See you later, water will now be clean.	For clean, shower wash body and wash hair and teeth. In the bathroom, flush (fs) the toilet. All those things in the bathroom, I should. *shows written pledge to camera*

Table 8 Continued

Student H	What is caring about Earth? People who care throw cans, glass and plastic bottles in the ocean. Fish and animals choke and die. Should care about the planet. People who throw might not know, so let them know to pick it up so they can throw it in the trash and litter clears up. This is better for the planet to be happy.	I can do what with water? Indirect not waste, shower short, 3 minutes.
Student J	There is plenty of water and it is full. Care and pretty and there are trees.	I can help. Need….*body shifts left* *sighs and mimics washing dishes* The water runs and fills the sink. *body shifts right* "hey!" *taps the version of herself on the left* *body shifts left* *feels a tap on her shoulder from the right* What? *body shifts right* *talks to the version of herself on the left* You need to not fill the sink with the water. Turn it off and save. Care for your family. *body shifts left* Ok, sorry. Turn off the water. Finish washing dishes. 10 seconds. Next, I was ignorant, brushing my teeth while the water was running and filling up the sink. *body shifts right* Hey *talks to the version of herself on the left* You need to save. Turn off the water by pushing the handle. *body shifts left* Ok, I'll turn off the water. I'm sorry, I forgot.
Student K	Earth Day is important because we have no Earth, we all will die with no breathing and no home. Plus, we need to breath.	*body shifts left* A long time ago, I took a 10-15 minute shower. *body shifts right* Now, it is better. I will reduce to a 5 minute shower.
Student L	Earth Day…*body shifts to left* This is the desert. "body shifts to right" Can use water for swimming, showering and you can always use water. *body shifts to right* Can eat? No. There are no vegetables. The water is low and swimming is boring and people poor. *body shifts to left*. This is better with high levels of water and swimming is fun. *body shifts to right*. In the desert, there is no water and people die. I don't know what to do. You should help water levels go up. There should not be a lot of trash. *body shifts to left* This water is better and pretty.	Before, *points to right spatial field* I would waste water by hose-watering and flooding the grass. No, this wastes during the day. *points to left spatial field* This is short, 5 minutes. Not a lot, watering the grass to help it grow. *points to right spatial field* This is a LOT. *rolls eyes* To keep watering the grass wastes water. Watering the grass should be short, ok? 5 minutes, or something. Not a lot. Like ONE HOUR, TWO HOURS, THREE HOURS, one day, two days, three days, NO. 1 day, no. 1 hour, no. 13, no. 10 minutes ok.

While many of the students' Vlog #1 were very general, broad with scientific concepts, and included information about littering and animals, which I sense students must have had previous learning experiences with in school, only Student L utilized body shift. However, in Vlog #2, the majority of students improved their usage of space and all students mentioned at least one specific conservation method they feel the need to commit to.

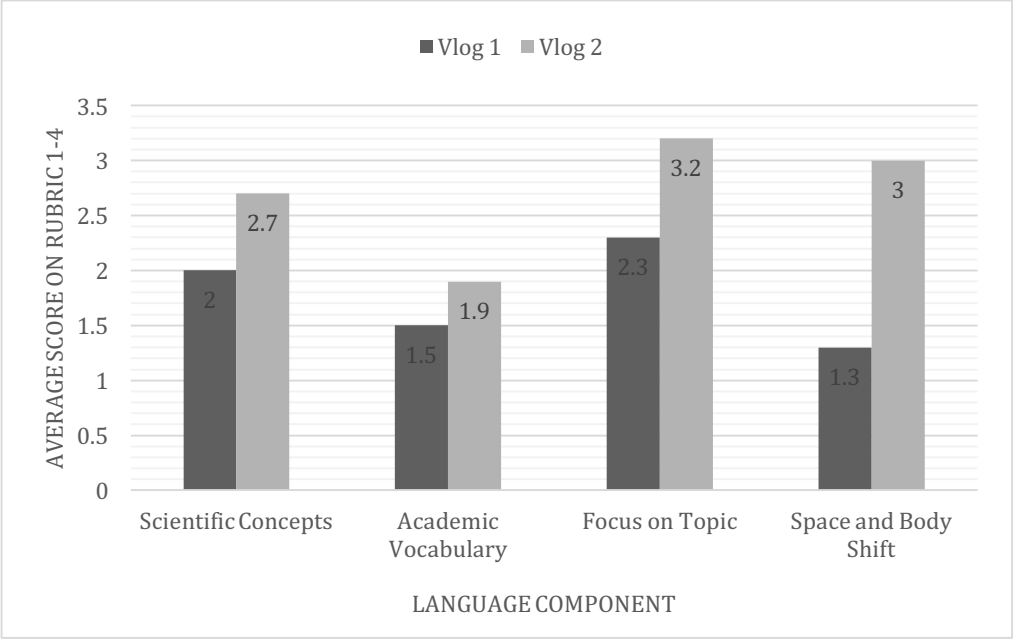
Even though most students demonstrated standard use of body shift or spatial arrangement, there is a fascinating exception. In her final vlog, Student J created a story scheme

in which she went back in time to remind and correct herself in wasting water. She utilized role shifting between two characters instead of shoulder shifting. This illustrates the art of the narrative in science, using storytelling to communicate science ideas.

Table 9: Rubric Score of Academic ASL Vlog Comparison

	Vlog #1 – Earth Day					Vlog #2 – Conservation Pledge					
Student	Scientific Concepts	Academic Vocabulary	Focus on Topic	Space and Body Shift	**Average**	Scientific Concepts	Academic Vocabulary	Focus on Topic	Space and Body Shift	**Average**	**Increase of Avg**
A	3	2	2	2.5	**2.375**	4	4	4	4	**4**	**1.625**
B	3	1	3	1	**2**	3	3	4	2	**3**	**1**
C	3	1	2	2	**2**	3	3	4	4	**3.5**	**1.5**
E	2.5	1	3	1	**1.875**	4	1.5	3	1	**2.375**	**0.5**
F	3	2	3	1	**2.25**	2	1	3	4	**2.5**	**0.25**
G	2	1	2	1	**1.5**	2	2	2	1	**1.75**	**0.25**
H	2	1	2	1	**1.5**	2	2	2	1	**1.75**	**0.25**
I	X	X	X	X	**X**	3	1	4	4	**3**	**X**
J	1	2	1	1	**1.25**	2	1	3	4	**2.5**	**1.25**
K	2	1	2	1	**1.5**	2	1	2	4	**2.25**	**0.75**
L	2	2	3	2	**2.25**	3	1	4	4	**3**	**0.75**
M	3	2	2	1	**2**	X	X	X	X	**X**	**X**
Average	**2.35**	**1.455**	**2.272**	**1.318**	**1.864**	**2.6**	**1.864**	**3.182**	**3**	**2.693**	**0.829**

Graph 1: Academic ASL of Class



Academic ASL was summatively assessed by a vlog from each Unit 1 & 2 for scientific concepts, academic vocabulary, focus on topic, space and body shift. Students were evaluated on the rubric with a score ranging from 1 to 4. A score of 4 means that the student demonstrated competency above expectation or grade level, while a score of 3 means that the student demonstrated competency at expectation and grade level. A score of 2 means that the student demonstrated competency with some support, while a score of 1 means that the student did not demonstrate competency and struggled with the task.

After two units, there was an average improvement of 0.829 on a four-point rubric, with increases across the board. The biggest improvement students had was in the area of spatial arrangement and body shift, of more than 100%, 1.682 points on the rubric. It was successful to use sign vocabulary and body shifting in discussions across the curriculum. This structure of compare and contrast is important to bilingual science education, as it allows for concept building. In my formative assessment in Lesson 2, I had observed a group of students giving each other feedback in effectively comparing and contrasting their estimates and results of water distribution on Earth. These boys were laughing with discomfort in practicing a new language skill but felt safe enough in a small group to do so and support each other positively through the process.

Another instance of irregular body shift popped up in Unit 3, in which students presented their teams' "Design Phase" and "Revision Phase". In group presentations, students often stood at different areas near the smartboard but shifted towards either side of the board, according to which phase they were discussing. Since this is different than individual use of body shift, it can be debated whether this way of showing space can be called ASL or body movement. In Lesson 4, while designing their plate with a low water footprint in discussion, students also comparative

structure to describe their own and other groups' high or low water footprints for their plate arrangements, per field notes.

Academic English

For analysis of academic English, I compared students' progress between Unit 1 and Unit 2. For Unit 1, the first two columns of each students' personal KWL chart, and a writing prompt about saving California from drought were used in evaluation. For Unit 2, the last column of the KWL chart, and a writing prompt regarding water conservation methods were used in evaluation. I scored these entries with the Academic English rubric for use of scientific concepts, academic vocabulary, focus on topic, and organizational structure. From the data table of rubric scores, I created a bar graph comparing the performance of academic English of the class as a whole, between Unit 1 and Unit 2, for both the KWL and the journal entries.

Table 10: Student Written Entries

Student Name	**"Know & Want to Know" of KWL**	**Unit 1 Journal Entry – Why is it important to save water?**	**Unit 2 Journal Entry How can you change your water footprint?**	**"Learned" of KWL**
Student A	Water comes from clouds. Water is usually at beach, lake, pond, our saliva, river, the whole world! We need water to survive droughts. How did water first appear, how does water freeze up?	Dear Selina, You might have not noticed but we are running out of water! We need water to be alive because water keeps us hydrated and alive. If we run out of water everything will be utter chaos! Lets find a way to stop the water from running out! Sincerely, Student A	I will/would do is eat more veggies instead meat and reduce bath/shower time because vegetables use less water and shorter bath/shower time will reduce using water.	I learned 7 vocabulary related with water. We all use up the water for paper clothes and etc. etc.
Student B	Water is river, ocean, and beach. Water is important because wash dishes, bath, and wash hand. I use water use for drink is important. I wonder how appear water and water animals?	Dear Student C, I will tell you. Not do water leak long time, because I not want run out water. Do you want run out water. I WARNING YOU! Sincerely, Student B	Why need reduce meat, because lot water. The person lot feed cow because cow have body is meat, from ground. But you need little feed to cow because reduce the water meat. My mom did, my mom wash the car and water run. I know it, I will told my mom.	I learn the water usable but sometime, run out of water. Unusable is 97% and usable is 3%.

Table 10 Continued

Student C	People depend at water. Water is important why water keep I life. Water use for people. If water disappear, and people will dead, how get water?	Dear Student B Why important to save water why we need drink keep I life and you want die? I not want to, and important off water by you fished wash your hand, and I not want like south Africa.	Do not stay shower long because caring water, not eat meat everyday because people feed water to cow to then they must! Veg, fruits, we must caring about water is important why I need to drink water!	How get water from river/lake. And people use water how many 3%. I am shock meat is indirect why water at meat why people feed water to cow then get meat.
Student D	I know the world Earth has water. And how has water from hydrosphere. I wonder if haven't water Earth? Then people could be dead without water?	Dear Grandpa Tom and Grandma, We really poor the water in California! We really need your help! Or you can pick up left to California then become live in your house? Please? We're very thirsty! Thank you, Love, Family!	I'll drink in big rivers. And we'll move live in Maryland with my grandpa and grandma. Or eat watermelons, orange and rivers. Why eat orange, watermelons, rivers. Because meat most lots water gallons.	It's 3% water fresh! Paper from water! How to make are cutshirts white, put water, soap, some put paper, then get paper wet put the and become paper.
Student E	Water is very important because it healthy and also for surviving. Same for the animals who drink water too. And also can fun for swimming or water balloon fight. I wonder why the ocean water is salt and how we got fresh water.	Dear Student C, It is important to save water because it is important to all people in the world. We need it for surviving and it healthy. It keep us hydrated. If we don't have water we could die. If we playing recess and we are tired we usually drink water, to hydrated ourself and that make ourselve feel good. We should save water. Sincerely, Student E	Eat less meat and eat more vegetables and fruit. Because meat is had some water while vegetables or fruit had lesser water and healthier and not to run out of water. Like a hamburger had bunch of meat that had water so it takes a lot of water. Still vegetables and fruit it healthier.	I learned that some product that we don't see is actually made up of water like paper, eraser, bubble gum, steel and hot dog. I learned that meat is water too. And I learned new science words like water abundance.

Table 10 Continued

Student F	You need water to survive or else you will become dehydrated. And we need water to clean ourself. Animals also need water to survive. Water is liquid, hydrospheres the earth. I want to know why we can't live without water. If we can drink water why can't we breath underwater? Why is water liquid?	Dear Student M I want to tell you a lot of reasons why we need water in California, ok. What if there was a fire what would you do to get the fire out. We could die of dehydration without water your body will become a bone fast. We definitely need water for plants especially trees if we had no trees cause of water there will be NO AIR so everything will die. Animals will die also, with no water means no pets ahhwah. That is why we need WATER. Ok thank you. Sincerely, Student F	I could stop eating meat and eat more fruits, vegetable. I could stop using a lot of papers for weird reasons. I could take a 3 minute shower ot save time and if it rains I'll get a big bucket to fill it up and put it in my bathtub. I could water my plants 3x a day instead everyday. Lastly I would wash my pet 2x a month instead of 3x a WEEK!	I learned what to save and what is waste. I also learned that we need water for planting and human and animals. Paper and meat has water. Only 3 percent of usable water and 97 is NOT USABLE.
Student G	Water is hydrosphere. Water is important drink. Can use water for out. Water can hot or cold. I swim in water. Live fish. I wonder all water clear.	Dear elena, I for save why water not have run out need water more all people water pause not yet wait start drink all save good more all water very very good successful. WATER BIG Sincerely, Student G	The for right but water save. Drink droughts dirty need water cold better can drink ok right so many water save better all more people good now happy save water. Save water!	It is cow off meat blood clean water hose off blood end fire drought eat meat end.
Student H	I is water swim. I is water healthy. What later mix do the people use chemical to clean the water?	Dear Animal water summer do sun water dry culd.	Water the lawn less often. Turn off the faucet while washing dishes.	Cows waste a lot water because of the food they eat.
Student I	I use water for swim. Water is in the river. Water is important because for wash dishes. Water in the shower. Water for drinking.	N/A	All the people, plants and animals need water to live and grow. We need to learn about safe water for our benefits. We close the faucet to not waste water.	Water connect to oceans.
Student J	Water use wash hand. Water use thirsty. Water use rain. Water use fountain. Water use swim. Water use tired. Car wash water drink balloon water.	I why happen water floor drought other I perfect water floor not drought why sun hot dry that water not have I that WATER NOT! Love, Student J	I why bunny hard I hot droughts everyone save water floor up perfect were is water caring to and happen water down drought not is save I don't know why sunny more every. Water need eat meat, apple juice, rice.	Ways we use water. Water distribution. For write book oceans I fun enjoy. Cow body milk in cold get ice cream.

Table 10 Continued

Student K	Water is thirsty. Tired. Have water earth. Have animals tired. Rain have in water ice melt. Can people drink earth all.	Dear friend. It is important to save water. There are three reasons why to save water. First, if you be are thirsty, you will have plenty to water and be satisfied. Next, you need water to wash dishes, take a shower and be clean. Last, the water is needed to irrigate fruit trees, plalnts, vegetables.	We need to save water by different ways. You can save water turn off the tap. While brushing your teeth and washing your ahands, don't leave the water running. Saves up to 20 litres per day. You can save water. Take a shower of 5 minutes or less. Saves up to 70 litres per shower. You can save water use a bucket of water to wash your car without a hosepipe saves more than 300 liters with each wash.	Paper in have water. Meat in water.
Student L	We need drink and help water. Some people not have water. Can help give at the on people and animals need use water. We need river and wash hand. I wonder not have water. They can people dead! And nothing? Water need help water feel best. Need water without.	Dear, Hello all people. All people care keep for water. We not want won't dead. Please not want less people. We need help drink water feel breathe help feel best water and need shower because smell bad need good shower. We care people big world care! Sincerely, Student L	#1 We save because water can't stay on bath shoulder not lots. We short bath fast. #2 Not lots on wash box water wash reduce can water can't water. #3 We can dead not good should water healthy feel best should short for water.	Learn from meat for learn how water many go and team learn about water and food meat has inside water. And food about % did it 5m% why no meat.
Student M	What is river. Water is important because live use water for bath. I wonder want to live? Need water save. If no water not live.	Dear Student F, If not water can dead people. I will water buy bottle ten. Tree no one water can dead. Friend, Student M	1.If no water, will die it keep. 2. Need it keep water. 3. Low meat, bath short and water care. 4. People save forever live. 5. People need good food. Need low meat.	Food need low meat. River and lake many what 2 ml that wow. Meat many will no water. Pie chart that learned paper more that learned.

In the Unit 1 analysis, students included some vocabulary words introduced prior to and in the beginning of the curriculum, such as hydrosphere (Students F & G), drought (Students A & J), and run out (Students B & G). These inclusions were honored and scored on the rubric. By Unit 2, students included many science concepts and vocabulary such as percentages, low water footprints (low), wasting water, measurements of water distribution and usage.

I observed the students often looking to the back of the classroom and using the word wall as an effective strategy of incorporating scientific concepts and academic vocabulary in

their journal entries. They also flipped through their science journals to spark thinking and apply prior writing to the last column of the KWL. This shows that the science journals have served its purpose as a valuable of documented thinking that students themselves use as a resource.

Table 11: Average Overall Rubric Score of Academic English Comparison

	Unit 1			Unit 2			
Student	"K & W" of KWL	First Journal Entry	**Average**	"L" of KWL	Last Journal Entry	**Average**	**Increase of Avg**
A	2	2	**2**	3	2	**2.5**	**0.5**
B	2	1	**1.5**	3	3	**3**	**1.5**
C	2	1.5	**1.75**	3	3	**3**	**1.25**
D	1.5	1	**1.25**	3	3	**3**	**1.75**
E	2	2	**2**	2.5	3	**2.75**	**.75**
F	2.5	2.5	**2.5**	3.5	3.5	**3.5**	**1**
G	2	1	**1.5**	2	2.5	**2.25**	**.75**
H	1	1	**1**	2.5	2.5	**2.5**	**1.5**
I	2	N/A	**2**	2	1	**1.5**	**-0.5**
J	1.5	1.5	**1.5**	2.5	2.5	**2.5**	**1**
K	1	2	**1.5**	3	2	**2.5**	**1**
L	1.5	1	**1.25**	2.5	2.5	**2.5**	**1.25**
M	1.5	1.5	**1.5**	2.5	2.5	**2.5**	**1**
Average	**1.731**	**1.5**	**1.616**	**2.692**	**2.538**		**1**

Graph 2: Academic English of Class

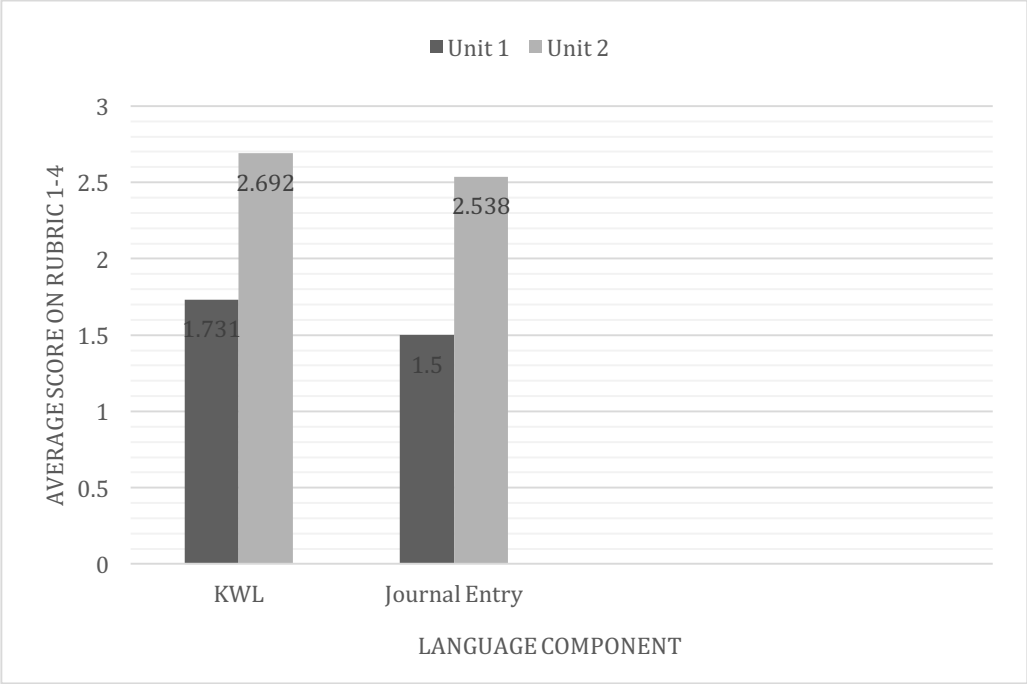


Table 12: # of Vocabulary Used in Academic English Comparison

Student	"K & W" of KWL	First Journal Entry	Total	"L" of KWL	Last Journal Entry	Total	Increase of Total
A	1	1	2	1	0	1	-1
B	0	0	0	1	2	3	3
C	0	0	0	0	2	2	2
D	1	0	1	1	1	2	1
E	0	1	1	0	2	2	1
F	1	0	1	0	2	2	1
G	1	1	2	1	1	2	0
H	0	0	0	0	0	0	0
I	0	N/A	0	0	0	0	0
J	0	1	1	1	2	3	2
K	0	1	1	1	0	1	0
L	0	0	0	0	1	1	1
M	0	0	0	0	2	2	2
Average	0.308	0.41	0.962	0.462	1.154	1.615	0.923

Some students had a more significant improvement in journal entries (0.744 points on the rubric) than in the KWL (.154 points on the rubric), as in Unit 2, most students wrote longer content in their journal entries and simply listed several facts on their "Learned" column of the KWL chart. Also, students had already used some vocabulary (such as water abundance, drought, indirect, direct, usable, unusable, and pollution) they picked up in the beginning of the curriculum, increasing their KWL score for Unit 1. As a class, students' individual contributions to the class KWL in Unit 2 resulted in a much more comprehensive list. However, I averaged the improvement of both sources of data for each unit. After two units, the class still had an average improvement in academic English of 1 point on a four-point rubric, due to inclusion of science concepts, vocabulary and much more organized structures.

Reflection of Academic Vocabulary

The lowest improvement, albeit still an improvement, that students had was in the area of vocabulary, of 0.409 points on the Academic ASL rubric and 0.923 in the average number of vocabulary words scored on the Academic English rubric. Some of the scored vocabulary include: water conservation, indirect, direct, scarcity, water use, water abundance, water footprint, drought.

This lack of growth may or may not mean language delay for some students who arrived at the school for the Deaf late and are struggling to transition to academic ASL. To promote more vocabulary development, I suggest for students to choose a subtopic that they are interested in. Given more time, students can practice and internalize the vocabulary with each other in various activities.

However, many emerging examples of sophisticated vocabulary being included are present in the vlog transcripts and journal entries. For instance, in Student E's final vlog, he discussed about eating less meat and hamburgers while exaggerating the sign, "water footprint" and using furrowed eyebrows to truly illustrate how many gallons of water the item takes to produce. Based on the evidence presented, goal 2 was partially met with development of academic language, specifically with the abundance of spatial arrangement and science ideas, with gradual development in vocabulary.

3. *Increase awareness of individual and community responsibilities for environmental resources.*

These were a wonderful and conscientious group of 5th graders who exemplified what it means to be an environmental citizen. Field notes show that the class discussion in Lesson 3, 4 and 6 involve perceptive reflections of themselves or people they know that have water-wasting habits, even before the lesson on water conservation, also present in students' journal responses about why it is important to save water in California if we had a drought as bad as South Africa. For example, Student B said he will tell his mother about ways to reduce water use in his journal entry. Student J even apologized to the audience in her vlog for letting the faucet run.

In Lesson 4, all four teams' written description of a balanced, nutritious meal with a low water footprint mentioned eating less meat. Three out of four groups mentioned eating more fruits and vegetables, as per team responses:

- We should use less meat and eat some more vegetables and fruit. We should eat vegetables and fruit with lesser water.
- Eat healthy food for example fruit or vegetables drink 1 liter each hour. We live healthy. We eat healthy food.
- Food good, low need meat. Care water become like.
- How to lessen water is to eat more healthy food like bell peppers, salad, bananas, strawberry, grape, tomato, spinach, pickles, olives.

Students especially practiced communicating science ideas and responsibility for water conservation in pledges in Lesson 6. Review of student vlogs, written pledges and journal entry about conservation methods:

Table 13: Conservation Methods Used in Student Pledges

Type of Water Footprint Pledged to Conserve	**Direct** (showering, bathing, watering lawn, turning faucet off while brushing teeth or doing dishes) 6/14	**Indirect** (Eating less meat and more vegetables and fruit) 1/14	**Both** 7/14
Student	G, H, I, K, L, O	E	A, B, C, D, F, J, M

Remarkably, all of the students who pledge to conserve in both direct and indirect ways, except for Student A, vlogged about their direct water footprint but wrote about eating less meat in their journal. However, all students explained a way to reduce their water footprint in either form.

Finally, as engineers, all teams recognized the need to design a more efficient water filter to clean water by stating their revision ideas on their worksheet and in presentations to use more or less material of cotton, gravel, paper and dirt, as per team responses to what they would revise:

- We changed that we need more paper and less dirt. And more cotton. More gravel too.
- I changed nothing just add one more layer (paper & dirt) to get it clean.
- We need more paper and more gravel because we have for dirty water and most dirty water. We want nice freshwater.
- Nothing change and we need paper in water bottom.

Interestingly, two teams did not recognize that they changed something but provided a plan for revision. One group especially explained the reason for an effective filter in wanting "nice freshwater". Based on the evidence presented, goal 3 was partially met.

Conclusion

The experience of planning and teaching this curriculum has given me the opportunity to blossom as a future bilingual educator, gain tools to build and modify lessons to be engaging and facilitating to students' development, especially those that involve social learning and are applicable to the real world. The biggest gratification throughout the curriculum is to see the lightbulb go on in students' heads after moments of frustration or confusion. It is my greatest aspiration that these students are hooked on the practices of critical thinking and continue in the STREAM approach to life. By giving students ownership of their education with guided inquiry, all three curriculum goals were achieved.

In reflection, while evaluating this curriculum, I had to think about what Academic ASL looks like. Does it involve fingerspelling, as many students did during their group presentations in Unit 3? Should we teachers give credit for a common sign assigned to jargon, such as "save water" for "water conservation"? For this reason, I am excited to see a growth in the signing community regarding the development of linguistically appropriate and conceptually accurate signs by Deaf people who are involved in the STREAM field at ASL Clear. Deaf and hard of hearing teachers especially have a role as users of ASL to establish boundaries for assessment of academic ASL, such as defining what formal structures and vocabulary students should appropriately use for their age, level, and topic. It is the responsibility of teachers of Deaf and hard of hearing students to ensure that students develop bilingual skills applicable to the STREAM field.

Although I had to shorten the third unit that focused on engineering into a day and half – students do need to be allowed more time for the process of innovation, as this proved to be

students' favorite part of the curriculum. Additional time would also allow for them to write and reflect individually and practice group presentations, as well as actually build the revised filter.

There are so many directions scientific inquiry can take a classroom, such as growing plants or building aerodynamic cars. By choosing this topic, I learned about the water system along with students. Should this curriculum be implemented again, I encourage teachers to disassemble it to align with current events, adding deeper elements of art and mathematics, with the goal of all in the classroom sparking a new, seemingly unanswerable question.

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Appendix A: The Curriculum

Table of Contents

- Curriculum Overview
- Rubrics
- Lesson Plans & Materials

Curriculum Overview

Unit 1: Introduction to Water Use	**Unit 2: Responsibility for Conservation**	**Unit 3: Designing for Sustainability**
Lesson 1: Why Do We Need Water? *KWL Chart* *Compare Before & After A Drought*	Lesson 4: What Is Our Food's Water Footprint? *Create Meal With Low Water Footprint*	Lesson 7: How Can We Conceptualize Design For Conservation? *Design Water Filters*
Lesson 2: How Much Water Is There on Earth? *Create Water Distribution Model*	Lesson 5: Reflecting On What We Learned *KWL*	Lesson 8: How Can We Construct Sustainable Design? *Engineer and Test Water Filters*
Lesson 3: How Do We Use Water? *Research Inquiry of Direct & Indirect Use*	Lesson 6: How Can We Change Our Water Footprint? *Conservation Pledge & Vlog*	Lesson 9: How Can We Improve Sustainable Design? *Revise Water Filters*

Rubrics

Rubric For Signed Work

Student Name: _____

	Scientific Concepts	Academic Vocabulary	Focus on Topic	Space and Body Shift
4	Illustrates an accurate and thorough understanding of scientific concepts underlying the activity.	Exhibits skillful use of vocabulary that is precise and purposeful. (4+ vocabulary signs or fingerspelled words)	There is one clear, cohesive topic. Main idea stands out and is supported by detailed information.	Organizational structure establishes strong relationships between/among ideas using space or body shift.
3	Illustrates an accurate and thorough understanding of most scientific concepts underlying the activity.	Exhibits reasonable use of vocabulary that is precise and purposeful. (2-3 vocabulary signs or fingerspelled words)	Main idea is clear but the supporting information is general.	Organizational structure establishes relationship between/among ideas, using space or body shift.
2	Illustrates a limited understanding of scientific concepts underlying the activity.	Exhibits minimal use of vocabulary that is precise and purposeful. (1 vocabulary sign or fingerspelled word)	Main idea is somewhat clear but there is a need for more supporting information.	Organizational structure establish little relationship between/among some ideas. The structure is minimally complete.
1	Illustrates inaccurate understanding of scientific concepts underlying the activity.	Lacks use of vocabulary that is precise and purposeful. (0 vocabulary from activity used)	The main idea is not clear. There is a seemingly random collection of information.	Organizational structure does not establish relationship between/among ideas. The overall structure is incomplete or confusing.

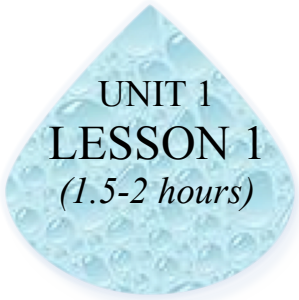
(adapted from Rubistar)

Rubric For Written Work

Student Name: _____

	Scientific Concepts	Academic Vocabulary	Focus on Topic	Organizational Structure
4	Illustrates an accurate and thorough understanding of scientific concepts underlying the activity.	Exhibits skillful use of vocabulary that is precise and purposeful. (4+ vocabulary words)	There is one clear, cohesive topic. Main idea stands out and is supported by detailed information.	Organizational structure establishes strong relationships between/among ideas using space or body shift.
3	Illustrates an accurate and thorough understanding of most scientific concepts underlying the activity.	Exhibits reasonable use of vocabulary that is precise and purposeful. (2-3 vocabulary words)	Main idea is clear but the supporting information is general.	Organizational structure establishes relationship between/among ideas, using space or body shift.
2	Illustrates a limited understanding of scientific concepts underlying the activity.	Exhibits minimal use of vocabulary that is precise and purposeful. (1 vocabulary word)	Main idea is somewhat clear but there is a need for more supporting information.	Organizational structure establish little relationship between/among some ideas. The structure is minimally complete.
1	Illustrates inaccurate understanding of scientific concepts underlying the activity.	Lacks use of vocabulary that is precise and purposeful. (0 vocabulary from activity used)	The main idea is not clear. There is a seemingly random collection of information.	Organizational structure does not establish relationship between/among ideas. The overall structure is incomplete or confusing.

(adapted from Rubistar)



Why Do We Need Water?

Bilingual Science/Engineering Goals

To utilize inquiry
To develop academic language in ASL and English
To increase awareness of responsibility for resources

Standards

Next Generation Science Standards, Environmental Science

5 –ESS2-: Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

5- ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

ASL Content Standards, Grade 5

VOCABULARY ACQUISITION AND USE.3: Acquire and use accurately grade-appropriate general academic and domain-specific signs, fingerspelled words, and phrases, including those that signal contrast, addition, and other logical relationships (e.g., UNDERSTAND++, BUT, B-U-T, #BUT, CAN, RESULT-WHAT-Q).

COMPREHENSION AND COLLABORATION.1: Engage effectively in a range of collaborative discussions (e.g., one-on-one, in groups, teacher- led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

Common Core State Standards

CCSS.ELA-LITERACY.W.5.8: Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or

paraphrase information in notes and finished work, and provide a list of sources.

Content Objectives
Given discussion, students will state their understanding about water in the world and how it affects people and things, as measured by in-class discussion and journal entries.

Language Objectives
ASL: Given before/after pictures of a drought, students will use body shifting and spatial arrangement to evaluate (compare and contrast) how water affects people and things, as measured by a checklist for teacher observation.

ENGLISH: Given a Venn Diagram, students will create a written description comparing and contrasting environments incorporating academic vocabulary, as measured by journal entries.

Formative Assessment
The students will be formatively assessed during discussion and creation of the KWL chart, participation in partner talk and discussion for discussing the effect of water, as measured by teacher observation notes.

Questions to ask:
How are these two pictures the same? How is this picture different from the other picture? What do you know about water? How do you know? Why do we need water? What do we use water for?

Summative Assessment
The students will be summatively assessed by Venn Diagrams in science journals for compare and contrast structure, academic vocabulary, and ideas about water, as measured by a rubric.

The students will be summatively assessed by signed discussion of body shifting and spatial arrangement to show compare and contrast regarding the effect of water, as measured by a checklist.

Preparation
- Create a Class KWL chart on a poster with the heading "Water" and three columns with the headings "What I Know", "What I Want To Know", and "What I Want To Learn".
- Print academic vocabulary used in lesson from the slides (water abundance, water scarcity/drought) and post on the Science wall**.**
- Print and tape an Individual KWL chart worksheet and Compare & Contrast worksheet on the first and second page of each Science Journal

- Print several Picture Word Banks (one for each group of students)

Materials

- Class KWL Chart
- Academic Vocabulary printouts
- Picture Word Banks
- PowerPoint slides
- Computer and projector
- Tape
- Beach ball with world map design (globe can be substituted)
- Picture Word Banks

For each student:

- Science Journal with an Individual KWL chart worksheet and Compare & Contrast worksheet inside

Differentiation

- Some students may need additional support in spelling or identifying English words for signs.
- Students may need varied support throughout the lesson.

Teaching Strategies for English Language Learners:

- Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas. (W.9-10.4-5; WHST.9-10.4-5; SL.9-10.4, 6; L.910.1, 3, 5-6. CA CCSS for ELA/Literacy).
- Pair shares, wait time
- ELD standards in line with the lesson
- Reminder about what vocabulary to use and how to communicate ideas throughout the activity and group discussion.

Teaching Strategies for BLA-ASL Requirements:

- Role shifting
- Be Explicit and Elaborate (state the unstated)
- Fingerspelling

Use eye gaze to elicit participation (IMPORTANT).

Instructions

<u>Launch</u>

- Show students a KWL Chart, with three columns and labels “What I Know, What I Want to Know, What I Learned”. Ask if anyone has experienced a “KWL Chart” before and what it is for. Explain that students will write what they know, what they want to learn/questions they have, and what they

have learned after investigation. Inform students they will be filling out their own KWL chart.

- Pass out a science journal to each student and state this is their "Science Journal", a place to keep ideas and drawings to keep track of activities, learning and use the information to contribute to the class discussion. Instruct students to write their name on the front cover. They will find their individual KWL chart taped inside on the first page.
- Highlight the title of KWL chart, "Water" and ask students: "What do we know about water?" Show sentence frames on the worksheet: (Water is_____., Water is important because _____., _____ use water for _____.) Have students fill out "Know" and "Want to Know" on their individual KWL. Tell them they will be filling out the L part at the end of the week.
- Share out in class.

Explore

- Hold up the map ball and ask students how they know the difference between water and land on the ball (blue color = water). Ask students where the water can be found on Earth. Briefly discuss various reservoirs of water such as oceans, rivers, lakes, groundwater, and ice. (Model first) Have students pass the map ball around the room and declare whether the place their hands touch is water or not, what kind of water, and how they know. Ask the class: Do you think we can use all of the water on the Earth for drinking and showering, and why? After a brief discussion, explain that students will investigate this later on and the answer will not be found today.
- Discuss vocabulary word "water abundance" and "water scarcity/drought" and how it impacts other earth systems (biosphere, geosphere). Tap prior knowledge and encourage students to think if they have seen the 2nd picture of the "water crisis" anywhere near school or their home. Can lead the discussion to these points (Remember last year, it was very rainy. Do you remember, two years ago in California, there was a huge drought? What did that change about your use of water?)
- Ask: Even though we have a lot of water on Earth, does every place have enough water? Show video of water crisis in South Africa Ground Zero. **https://www.youtube.com/watch?v=RJ4Z2bOh5jo**
  Facilitate Socratic discussion using open questions with students, covering the following points:
  - What is the crisis in South Africa? *There has been 3 years of drought and the dams are at a low capacity. Cape Town is the first major city in the*

world to run out of water.
    - What happens when the taps go off? *Day Zero is when the water supply will be turned off. Residents have to go to water collection sites in the city to collect a maximum 6 gallons of water a day.*
    - Is this time peaceful? *Cape Town will have armed guards to make sure people only collect the maximum amount of water.*
    - How are Cape Town and California alike? What do we need to do to avoid a water crisis?
- To wrap up this class discussion, have students write a new science journal entry with the prompt, "Imagine California will run out of water this summer! Write a letter to a friend explaining why it is important to save water."

---------- Day 2 ----------

- Discuss ASL structure for compare and contrast. Model body shifting and usage of space to compare and contrast two students in the classrooms using signs (same, different). Have students show body shifting.
- Ask students to recall the vocabulary word "drought" and what it means. Show short video of drought. **https://www.youtube.com/watch?v=RVmr9g3axfI**. Model contrasting a drought with sufficient water at the beginning and end of the video.

Summarize

- Show two selected pictures from Lake Oroville, California showing the effects of a drought (2011 – water abundance in lake, 2014- drought and water crisis). With ASL structure for compare and contrast, ask students to discuss in groups. Have groups fill out the Compare and Contrast Worksheet with the Picture Word Bank for support.

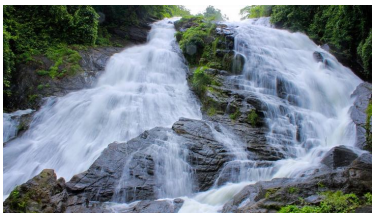
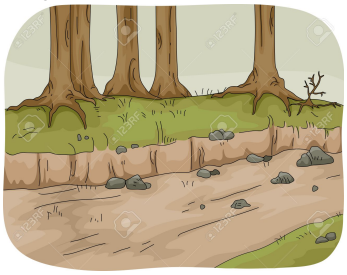
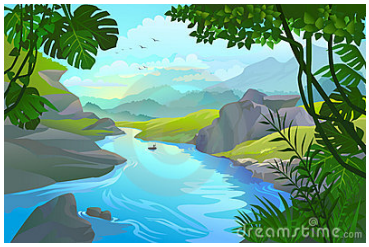
  Facilitate groups to share what they notice with questions:
    - How are the pictures same/different?
    - Why are the pictures different?
- Have students write a new entry in their individual science journals with the prompt, "Write 3 things you learned. Write 2 questions you have."

Credits

Presentation Slides pictures and definitions:
http://polkacafe.s3.amazonaws.com/articles/thumbs/ti_725_76858061187151.jpg
https://en.oxforddictionaries.com/definition/abundance
https://c402277.ssl.cf1.rackcdn.com/photos/1484/images/portrait_overview/Water_Scarcity_8.7.2012_Overview_Image_HI_53628.jpg?1345546370
http://www.eschooltoday.com/global-water-scarcity/water-shortage-terms.html
http://www.hidropolitikakademi.org/en/south-africa-faces-water-crisis.html
http://www.weatherwizkids.com/wp-content/uploads/2015/02/drought10.jpg
https://www.organics.org/13-shocking-before-and-after-images-of-california-drought/

Picture Word Bank pictures:
https://www.spigotmc.org/attachments/no-rain-jpg.29063/
https://cdn.pixabay.com/photo/2013/04/01/09/22/rain-98538_960_720.png
https://img00.deviantart.net/5702/i/2017/041/6/7/california_flag_outline_hi_res_by_tempest790-dayin81.png
http://photos3.fotosearch.com/bthumb/CSP/CSP992/burning-forest-trees-in-fire-flames-clip-art__k13068049.jpg
https://previews.123rf.com/images/lenm/lenm1405/lenm140500409/28753059-illustration-featuring-a-dry-river-with-the-riverbed-exposed.jpg
http://worldartsme.com/images/river-scene-clipart-1.jpg
http://worldartsme.com/images/river-scene-clipart-1.jpg

Picture Word Bank

Lake Oroville, CA 	drought 	water abundance 
caused by sufficient precipitation 	caused by too little precipitation 	contributes to wildfires 
rivers and streams run dry 	rivers and streams flow 	**<u>hydro</u>**sphere
plants and animals live 	loss of plant and animal life 	**<u>bio</u>**sphere

Individual KWL Chart

Date: _____

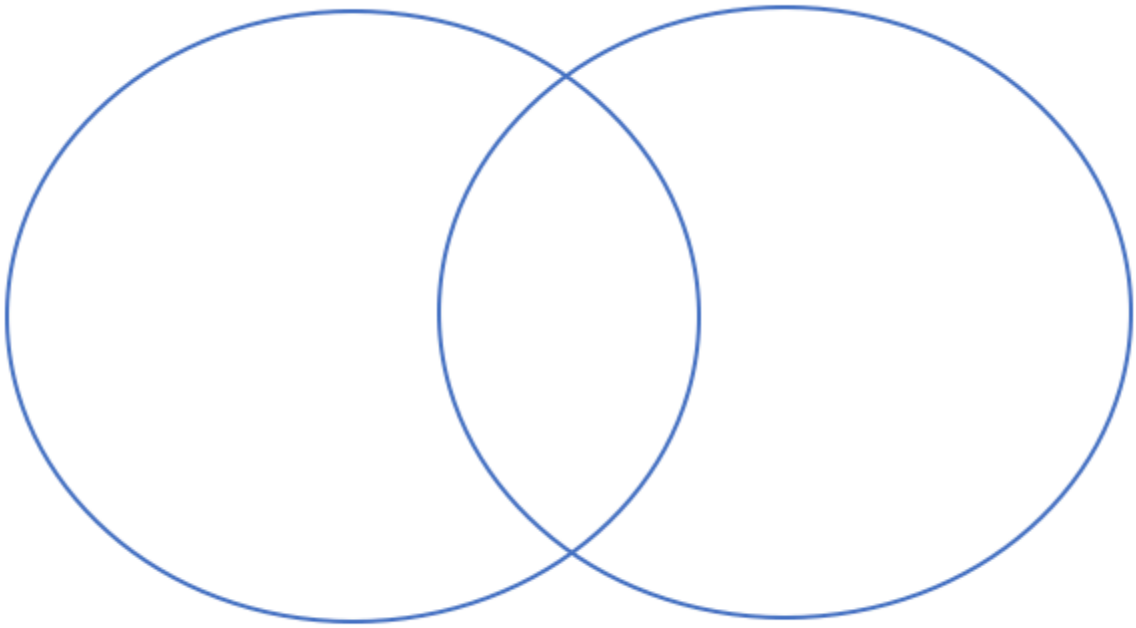
Water

What I **K**now	What I **W**ant to Know	What I **L**earned

Compare and Contrast Worksheet

Date: _____

Compare and contrast these two images from Lake Oroville, California.



Lesson 1.1 Why Do We Need Water?
Agenda

- ✘ KWL Chart
- ✘ Map Ball Activity
- ✘ Drought: Compare and Contrast

Water

What I **K**now	What I **W**ant to Know	What I **L**earned

Water

What I **K**now	What I **W**ant to Know	What I **L**earned
Water is _____. Water is important because ____. _____ use water for _____.	? ?	

Put the KWL chart in your science journals.

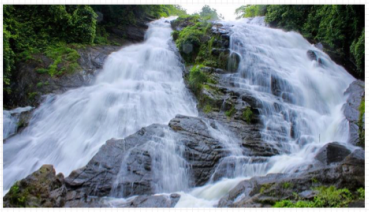
Where can water be found in the hydrosphere?

Catch the ball and tell us!

- Oceans
- Rivers
- Lakes
- Groundwater
- Ice

This water is _____.
Salt water or fresh water?

Water Abundance

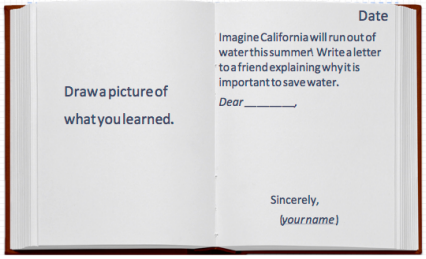


The state of having plenty of water, enough quantity for daily use and needs.

Water Scarcity / Drought

The absence of (lack of) water, in any geographic area for human, animal and environmental use. In many places, there may be water not far off, but there is simple very little resources (money and ability) to bring it home, and makes it very expensive.

Reflect in Science Journal



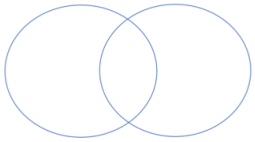
Lake Oroville, California

Compare and contrast with a partner.

- body shifting
- Use space

How are these two pictures the same? How are they different?

Compare and contrast these two images from Lake Oroville, California.



Reflect in Science Journal

Date

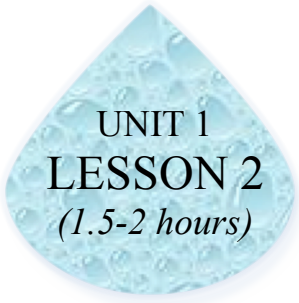
Draw a picture of what you learned.

Write 3 things you learned

- ✘
- ✘
- ✘

Write 2 questions you have.

- ✘
- ✘



How Much Water Is There on Earth?

Bilingual Science/Engineering Goals
To utilize inquiry
To develop academic language in ASL and English
To increase awareness of responsibility for resources

Standards
Next Generation Science Standards, Environmental Science
5 –ESS2-: Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

5- ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

ASL Content Standards, Grade 5

DISCOURSE AND PRESENTATION STANDARDS.1: Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; sign clearly at an understandable pace.

CA English Language Development (ELD) Standards, Grade 5

COLLABORATIVE.1: Exchanging information and ideas with others through oral collaborative discussions on a range of social and academic topics.

Content Objectives
Given the task prompt, students will measure out water to model water distribution on Earth, as measured by entries in student science journals and checklist of in-class discussion.

Language Objectives
ASL: Given the water distribution model and teacher modeling, students will use ASL compare and contrast structure to evaluate estimates and observations, as measured by a checklist for teacher observation.

ENGLISH: Given the water distribution model and class discussion, students will create a written description of the distribution of water on Earth, as measured by reflection entries in student science journals.

Formative Assessment

The students will be formatively assessed during discussion and the creation of the water distribution model for participation in partner talk and discussion, and students stating their ideas about water, as measured by teacher observation notes.

Questions to ask:
What is the distribution of water on earth? How much water do we have? Why is it important to conserve what water we currently have available?
(Enduring questions from previous lesson) What do you know about water? How do you know? Why do we need water? What do we use water for?

Summative Assessment

The students will be summatively assessed by a written description of the distribution of water on Earth in student science journals and signing in class discussion using ASL compare and contrast structure to justify why water is a limited resource.

Preparation

- Print academic vocabulary used in lesson from the slides (water distribution and usable water) and post on the Science wall**.**
- Print bar graph worksheets and paste in each science journal
- Print pie chart worksheets for Estimate and Observation

Materials

- Academic Vocabulary printouts
- PowerPoint slides
- Computer and projector

For each small group of students

- Estimate Pie Chart Worksheet
- Observation Pie Chart Worksheet
- Red and blue markers
- Water
- Clear container to hold 1 Liter of water
- Graduated cylinders
- Salt
- Small dish

For each student:

- Science Journal with Bar Graph worksheet on next blank page

Differentiation

- Some students may need additional support in spelling or identifying English words for signs.
- Students may need varied support throughout the lesson.

Teaching Strategies for English Language Learners:

- Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas. (W.9-10.4-5; WHST.9-10.4-5; SL.9-10.4, 6; L.910.1, 3, 5-6. CA CCSS for ELA/Literacy).
- Pair shares, wait time
- ELD standards in line with the lesson
- Reminder about what vocabulary to use and how to communicate ideas throughout the activity and group discussion.

Teaching Strategies for BLA-ASL Requirements:

- Role shifting
- Be Explicit and Elaborate (state the unstated)
- Fingerspelling

Use eye gaze to elicit participation (IMPORTANT).

Instructions

Launch

- Hold up the map ball. Tell students they will estimate how much usable water is on Earth and compare it to the rest of the water on Earth in groups. Show the class one liter of colored liquid and tell them it represents all the water in the world. Introduce the vocabulary words "water distribution" and "usable water".
- Tell students that they will divide the world's supply of water based of kinds of water. Each group will have one source of water that must provide for all their needs.
- Pass out Estimate pie chart worksheet to each group. Ask them to estimate and draw the slice the represents the world's usable water. Have students hold up estimates for the class to see.

Explore

- Display the measurements on the board,
    - glaciers: 19 mL

    - groundwater: 9.0 mL
    - lakes & rivers: 2 mL
    - ocean: 970 mL (ADD SALT)
- Distribute the measuring supplies to each group have them measure out water into various containers.
- Circulate the room and add salt in each group's ocean container.
- Have students fill out the bar graph representing water distribution in their science journals.
- Discuss the distribution. What water can we drink? Were you surprised at how little water is available for human use? Why can't we drink saltwater? Why is it important to conserve water? Facilitate partner talk and class discussion in which students to explain why water is a limited resource.
- Pass out Observation pie chart worksheet to each group. Ask them to draw the slice the represents the world's usable water. Have students hold up Observations for the class to see.

Summarize

- Have students turn to a new page in their science journals, label it "Water Distribution" and date it. Students will draw on the left side and write on the right side 3 things they learned today and 2 questions they still have.

Credits

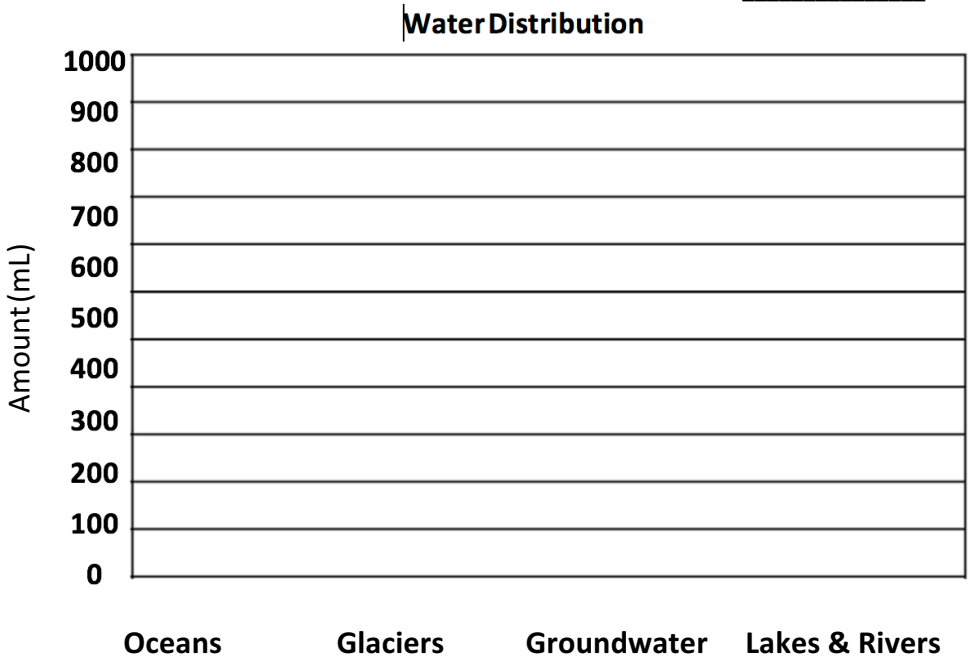
Lesson adapted from the book: Project WET, lesson "A Drop in the Bucket", and from https://www.calacademy.org/educators/lesson-plans/earths-water-a-drop-in-your-cup

Presentation Slides pictures and definitions:

- http://www.distilledwaterassociation.org/wp-content/uploads/2013/08/Fotolia_49532769_Subscription_Monthly_M.jpg
- https://www.coastalstudiesinstitute.org/wp-content/uploads/2016/07/iceberg.jpg
- https://app.acceleratelearning.com/scopes/11278/elements/646235
- Stemscopes

Bar Graph

Date: _____



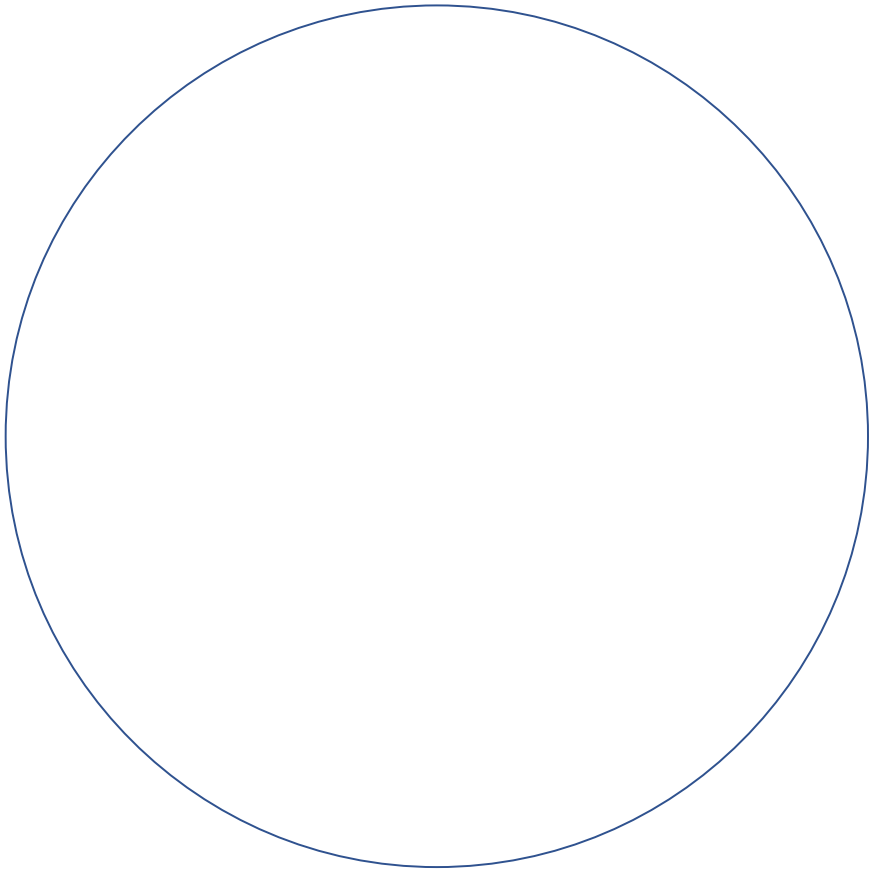
Most of the water on Earth is in _____.

The largest supply of freshwater is in _____.

Estimate Pie Chart

Names: _____

Estimate of Water Distribution on Earth

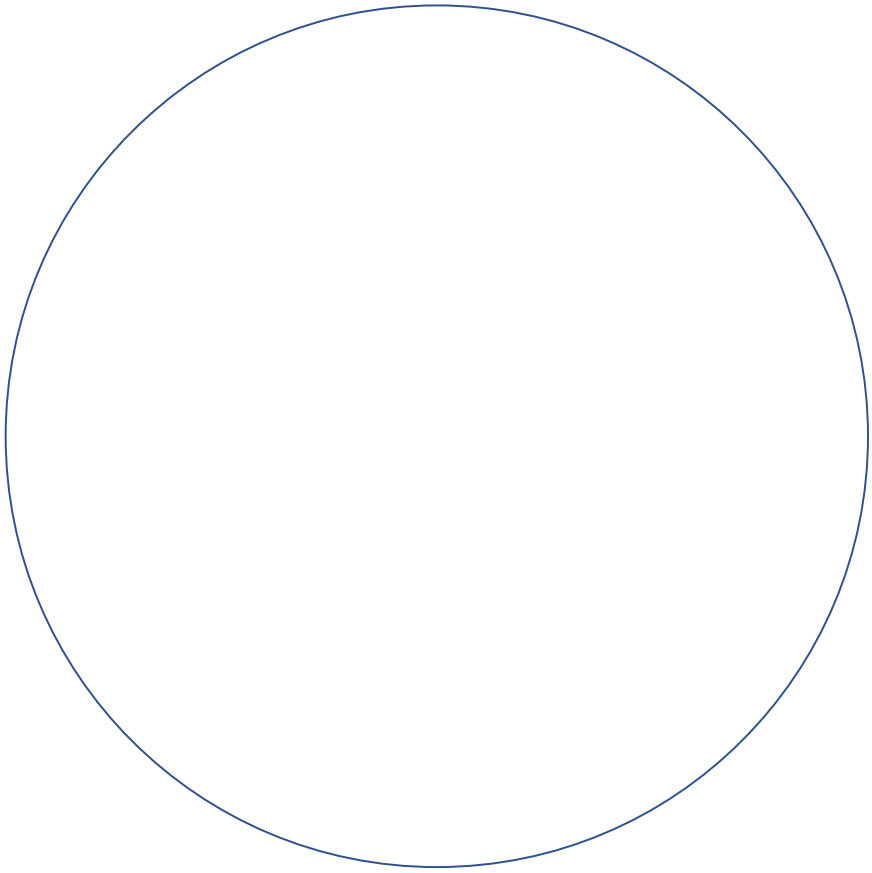


We hypothesize that _____% of the water on Earth is usable.

Observation Pie Chart

Names: _____

Observation of Water Distribution on Earth



We conclude that _____% of the water on Earth is usable.

Lesson 1.2 How Much Water Is On Earth?

Agenda

- ✘ Estimate
- ✘ Measure
- ✘ Discuss Results

Today, you will measure the amount of usable water on the Earth!

- ✘ **Water Distribution:** how different kinds of water is spread out across the Earth
- ✘ **Usable Water:** water we can use to drink, cook with, shower…

Usable Water

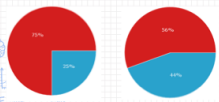
Water we can use to drink, cook with, shower, etc…

Water Distribution

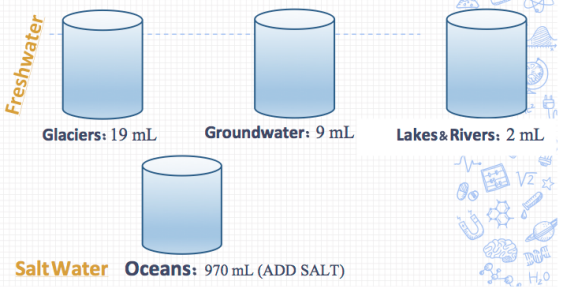
How different kinds of water is spread across the Earth.

Estimate the amount of usable water on Earth.

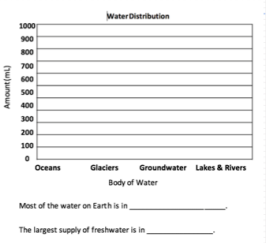
- Draw in pencil first\
- Color blue for "usable" water
- Color red for "unusable" water.
- We "hypothesize that ____% of water on Earth is usable".



Measure amounts of water into cups.



Create a Bar Graph



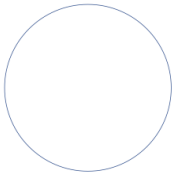
Most of the water on Earth is in _____.

The largest supply of freshwater is in _____.

Create a Pie Chart

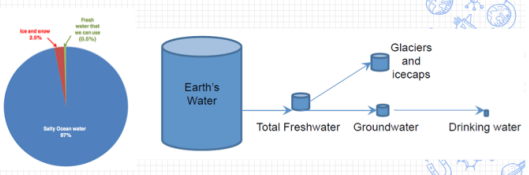
Names: _____

Observation of Water Distribution on Earth



We conclude that _____% of the water on Earth is usable.

Discuss with a partner: Compare and Contrast Water Distribution



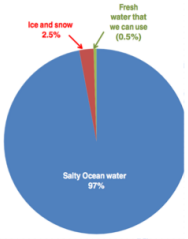
Do the results match your estimate?

Discuss: Water Distribution

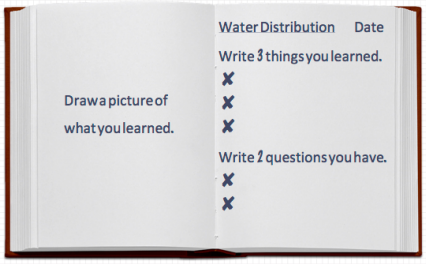
Oceans cover about 71 percent of Earth's surface, but if all the water on Earth were gathered into a sphere, it would be only about 1/16th the size of the moon. Of all known water reserves, 96.5 percent is salt water. Water in the atmosphere accounts for only 0.001 percent of Earth's water. The rest is fresh water, of which 68.7 percent is found in glaciers and ice caps, 30.1 percent in groundwater, and only 1.2 percent in surface water. **(NGConnect p. 103)**

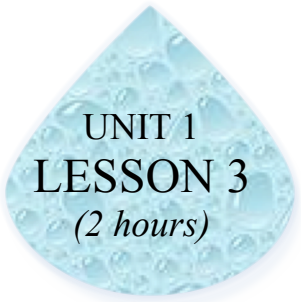
Water Distribution on Earth

- ✘ Were you surprised?
- ✘ **Why are California and South Africa close to the ocean but have droughts?**
- ✘ How is water a limited resource?
- ✘ Why is it important to save water?



Reflect in Science Journal





How Do We Use Water?

Bilingual Science/Engineering Goals
To utilize inquiry
To develop academic language in ASL and English
To increase awareness of responsibility for resources

Standards
Next Generation Science Standards, Environmental Science
5 –ESS2-: Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

5- ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

ASL Content Standards, Grade 5

VIEWING STANDARDS FOR INFORMATIONAL TEXT.1: Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

Common Core State Standards, Grade 5

CCSS.ELA-LITERACY.W.5.8: Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

CA English Language Development (ELD) Standards, Grade 5

PRODUCTIVE.10: Selecting and applying varied and precise vocabulary and language structures to effectively convey ideas.

Content Objectives
Given viewing of articles and videos, students will record their findings and identify direct and indirect usage of water, as measured by a science journal entry.

Language Objectives
ASL: Given prompting and partner talk, students will justify how water use can be direct or indirect using American Sign Language structure of showing quotations

and citing evidence, as measured by field notes.

ENGLISH:
Given prompting and sentence frames, students will use academic language to summarize main ideas about indirect and direct water use, as measured by entries in individual science journals, "Ways We Use Water".

Formative Assessment

The students will be formatively assessed during discussion and reading, for ASL structure of citing quotes from the text, participation in partner talk and discussion, and students stating their ideas about water as measured by teacher observation notes.

Questions to ask:
How do we use water? What is the difference between indirect and direct water use? What is a water footprint? Why is it important to conserve what water we currently have available?
(Enduring questions from previous lesson) What do you know about water? How do you know? Why do we need water? What do we use water for?

Summative Assessment

The students will be summatively assessed by entries in individual science journals about direct and indirect water use and their use of ASL in discussion.

Preparation

- Print academic vocabulary used in lesson from the slides (direct use and indirect use) and post on the Science wall**.**
- Print "Ways We Use Water" worksheets and paste one in each science journal.
- Print the "Water Footprint of Beef" article.
- Print the last 4 slides of the PowerPoint (instructions for water use centers)
- Set up 4 Water Use Centers in the room, with instructions on each center.
    - Products – 1 iPad
    - Vlogs – 4 iPads
    - Community – 1 iPad
    - Agriculture – "Water Footprint of Beef" and paper

Materials

- Academic Vocabulary printouts
- PowerPoint slides
- Computer and projector
- 6 iPads
- "Water Footprint of Beef" article

- Instructions for Water Use Centers
- Several large sheets of paper
- Ways We Use Water Worksheets

For each student:

- Science Journal

Differentiation

- Some students may need additional support in spelling or identifying English words for signs.
- Students may need varied support throughout the lesson.

Teaching Strategies for English Language Learners:

- Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas. (W.9-10.4-5; WHST.9-10.4-5; SL.9-10.4, 6; L.910.1, 3, 5-6. CA CCSS for ELA/Literacy).
- Pair shares, wait time
- ELD standards in line with the lesson
- Reminder about what vocabulary to use and how to communicate ideas throughout the activity and group discussion.

Teaching Strategies for BLA-ASL Requirements:

- Role shifting
- Be Explicit and Elaborate (state the unstated)
- Fingerspelling

Use eye gaze to elicit participation (IMPORTANT).

Instructions

<u>Launch</u>

- Introduce the vocabulary words “direct use” and “indirect use”. Ask students how much water they think they use a day directly or indirectly
- Tell class they will research different uses of water today.

<u>Explore</u>

- Display PowerPoint slide, “Water Use Centers” and explain each center.
    - Products: Watch videos of how things are made! Draw to show how water is used in the process of creating the product.
    - Community: Play an online game to identify water use and water waste.
    - Create Vlogs: Sign your answer: Earth Day was on Sunday. Why is it important to be responsible for the environment all year?

    - Agriculture: Read about water use in the production of a hamburger. Create a poster to inform In-N-Out customers.
- Have students rotate between centers in small groups.

Summarize

- Facilitate a class discussion in which students share what they learned and were surprised about during rotations. Model and emphasize ASL structure to compare and contrast. Prompt: what are the different categories of water use? Discussion about direct and indirect uses of water (direct = water you can see, indirect = water you can't see but goes into the production of what you use).
- Have students turn to the page in their science journals with the "Ways We Use Water" worksheet and complete it.

Credits

Lesson adapted from the book: Project WET

Presentation Slides pictures and definitions:

- http://sncyear7geography.weebly.com/virtual-water.html
- https://i1.wp.com/www.yournurturingnook.com/wp-content/uploads/2016/07/Shower-1024x680.jpeg?resize=565%2C375
- http://www.watereducation.org/post/water-use-virtual-water
- http://d2r5da613aq50s.cloudfront.net/wp-content/uploads/197043.image0.jpg
- http://d2r5da613aq50s.cloudfront.net/wp-content/uploads/194998.image19.jpg
- https://www.sciencenews.org/sites/default/files/main/articles/bm_chemicalsplants_feat_free.jpg
- https://lovebackyard.com/wp-content/uploads/2017/04/fedding-herb-with-hay.jpg
- http://www.meatlessmonday.com/articles/meatless-monday-one-many-ways-celebrate-world-water-day/

Water Centers Articles & Links:

- www.discoverwater.org/use-water-wisely/
- https://www.youtube.com/watch?v=Gq7L9-0XdVw
- https://www.youtube.com/watch?v=GBgB7Tbc9rA
- http://www.gracelinks.org/blog/7858/beef-has-a-big-water-footprint-here-s-why

Water Footprint of Beef Article

Beef Has a Big Water Footprint. Here's Why

By Kai Olson-Sawyer | 03.14.2017

Water is in everything, but it only gets the public's attention when there is a drought or water issues on media.

While water is in everything, you'll find most of it in your food. In fact, your water footprint is mostly made up of the water it takes to produce food. Meat and animal products generally have much larger water footprints than fruits, vegetables or grains and beef is the "king" of the big water footprints.

To see the average water footprints for different kinds of meat, take a look at the information below:

Water required to produce one pound (1 lb.) of:

Beef - 1,799 gallons of water

Lamb - 1,250 gallons of water

Pork - 576 gallons of water

Chicken - 468 gallons of water

Tofu (soy) - 303 gallons of water

The most choice that uses the least amount of water is pasture-raised beef that relies on feed produced using rainfall rather than irrigation.

Since beef is the second most popular meat in the United States, it has impacts on the water needed to produce it. According to the United Nations, water demand will be more than water supply by 40 percent by the year 2030, affecting the world's agricultural regions, like California and the US Great Plains. We need to produce more food with the same or even less water.

Beef's Big Water Footprint

There are a few reasons why beef has such a big water footprint compared to other meats. What it comes down to is the huge amount of **indirect water** - that goes into the food that cows eat. As with other animals raised for meat, the water needed to grow cow feed is a huge amount.

Because cows are so big they must eat huge amounts of feed, mainly grass and grain. To get beef cows up to weight takes a lot of feed and a long time; more than a year. The longer it takes to get cows to full weight, the more food cows eat. More feed (grass and grain) means more water.

Because of cows' large size, big appetite, and long life, beef has more

water use than other meats. Beef uses up a lot of water and other resources.

Eat Less Meat, Better Meat

Since meat - and especially beef - has such a big water footprint, does that mean banning meat entirely to conserve water? For some, vegetarianism might be an option, but you don't have to go completely cold turkey on beef. What's another strategy? Try less meat, but better meat. This can reduce your overall meat consumption while focusing on more sustainable, humanely-raised meat, because not all meat is the same.

What does less meat, better meat mean in practice? For starters, limiting the amount of meat. That could mean trying Meatless Monday, eating smaller portions of meat or simply avoiding sausage on your breakfast sandwich. There are many ways to go and flexibility is key.

The grass they eat depends on rain instead of irrigation water that could go towards other uses. Also, factory farms, which provide the majority of US meat, are heavy polluters with giant manure areas that can leak into water and groundwater.

Water is just one thing among others to consider when choosing pasture-raised over factory farmed meat, including air pollution and healthiness of the animals.

Beef certainly has a big water footprint but that's not the end of the story. There are many ways to be aware, eat smart and shrink your water footprint.

Ways We Use Water Worksheet

Name: _____ Date: _____

Ways We Use Water

My direct water use is _____

_____.

My indirect water use is _____

_____.

I was surprised about _____

_____!

I wonder,_____

_____?

1.3 Water Users

Agenda

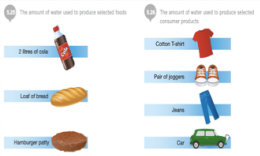
- ✘ Vocabulary
- ✘ Centers
- ✘ Activity
- ✘ Journal Entry

Direct Use

(what you can see)

Use of water for purposes such as: bathing, drinking, and cooking,

Indirect Use



(what you can't see)

Use of water in the **production** of goods and services that people need and enjoy.

Water Use Centers

Products

Watch **videos** of how things are made! **Draw** to show how water is used in the process of creating the product.

Community

Play an online **game** to identify water use and water waste.

Create Vlogs

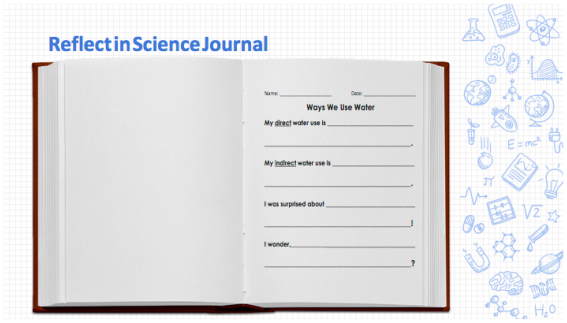
Sign your answer: Earth Day was on Sunday. Why is it important to be responsible for the environment all year?

Agriculture

Read about water use in the production of a **hamburger**. Create a **poster** to inform In-N-Out customers.

Discuss: Direct or Indirect Use?

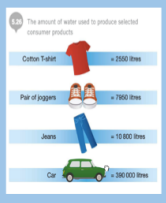
Use ASL structure to compare and contrast.



Community

1. Open www.discoverwater.org/use-water-wisely/ on 1 - 2 iPads.
2. Water Detectives Activity (find all the **wise** water users and water **wasters**)
3. Watch **Video**
4. What Did I Learn? **Quiz**
5. **Discuss:** What are indirect and indirect water uses in the community?

Products



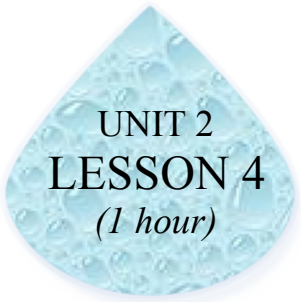
1. Watch how paper is made https://www.youtube.com/watch?v=Gq7L9-0XdVw
2. Draw to show how water is used in creating the product.
3. **Discuss:** What are indirect and indirect water uses in products?
4. More time? Watch how steel is made https://www.youtube.com/watch?v=GBgB7Tbc9rA

Create Vlogs

1. Each student gets their own iPad.
2. **Discuss** in your group: Earth Day was on Sunday. Why is it important to be responsible for the environment all year?
3. Use vocabulary we have learned so far.
4. Create **Vlog.**
5. Watch each other's vlogs.

Agriculture

1. **Read** article about how water goes into production of a hamburger.
2. **Discuss:** What are indirect water uses in a hamburger?
3. **Create:** a poster for In N Out customers to educate them about water use.



What is Our Food's Water Footprint?

Bilingual Science/Engineering Goals
To utilize inquiry
To develop academic language in ASL and English
To increase awareness of responsibility for resources

Standards
Next Generation Science Standards, Environmental Science
5 –ESS2-: Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

5- ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

ASL Content Standards, Grade 5

LANGUAGE: VOCABULARY ACQUISITON AND USE.3: Acquire and use accurately grade-appropriate general academic and domain-specific signs, fingerspelled words, and phrases, including those that signal contrast, addition, and other logical relationships (e.g., UNDERSTAND++, BUT, B-U-T, #BUT, CAN, RESULT-WHAT-Q).

Common Core State Standards, Grade 5

CCSS.ELA-LITERACY.W.5.8: Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

CA English Language Development (ELD) Standards, Grade 5

PRODUCTIVE.10: Selecting and applying varied and precise vocabulary and language structures to effectively convey ideas.

Content Objectives
Given worksheet, food cards and plates, students will calculate the water footprint of a meal and create a healthy meal with a low water footprint, as measured by their plates and group worksheets.

Language Objectives

ASL: Given class data of water footprints of meals, students will use body shifting and spatial arrangement to compare and contrast water footprints, as measured by field notes.

ENGLISH: Given water footprint calculation worksheet, students will plan for a meal with a low water footprint, as measured by group worksheets.

Formative Assessment

The students will be formatively assessed during discussion, and creation of plates, for ASL structure of compare and contrast, participation in group discussion, and students stating their ideas about water as measured by teacher observation notes.

Questions to ask:
How do we use water? What is a water footprint? Why is it important to conserve what water we currently have available?
(Enduring questions from previous lesson) What do you know about water? How do you know? Why do we need water? What do we use water for?

Summative Assessment

The students will be summatively assessed by group worksheets for planning a meal with a low water footprint and signing in class discussion using to compare and contrast water footprints.

Preparation

- Print academic vocabulary used in lesson from the slides (water footprint) and post on the Science wall**.**
- Print and cut a set of food cards for each small group. (downloaded from https://www.calacademy.org/educators/lesson-plans/how-much-water-do-you-eat)
- Print "Create A Meal" worksheet for each small group

Materials

- Academic Vocabulary printouts
- PowerPoint slides
- Computer and projector

For each small group:

- "Create A Meal" worksheet
- Styrofoam plates
- Set of food cards

Differentiation

- Some students may need additional support in spelling or identifying English words for signs.

- Students may need varied support throughout the lesson.

Teaching Strategies for English Language Learners:

- Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas. (W.9-10.4-5; WHST.9-10.4-5; SL.9-10.4, 6; L.910.1, 3, 5-6. CA CCSS for ELA/Literacy).
- Pair shares, wait time
- ELD standards in line with the lesson
- Reminder about what vocabulary to use and how to communicate ideas throughout the activity and group discussion.

Teaching Strategies for BLA-ASL Requirements:

- Role shifting
- Be Explicit and Elaborate (state the unstated)
- Fingerspelling

Use eye gaze to elicit participation (IMPORTANT).

Instructions

Launch

- Tell class they will calculate water footprints of food.
- Introduce vocabulary word "Water Footprint".
- Hold up the gallon of water. Ask students to estimate how much water a person uses in a day. Show students an infographic that breaks down average water use of Americans (2000 gallons a day).

Explore

- Explain and support for the "Create A Meal" Activity. Tell students that in small groups, they will pick four cards to create one balanced meal, including a main dish, side, beverage, and dessert. Groups will put their chosen cards on their plate.
- Have students flip over the cards on their plate and fill out the table on the worksheet, writing down types of food and corresponding water footprints in gallons, then adding up the total water footprint at the bottom of the chart.
- Fill out the class data chart. Have group share with the class the food they chose and total water footprints, writing this on the board. Ask students which group had the most water footprint and what patterns they notice.
- Have students use ASL structure of body shifting and spatial arrangement to

compare and contrast their and other groups' water footprints.

Summarize

- Students now have the opportunity to create a balanced meal with a low water footprint and tape their four final cards on their plates.
- As a group, students fill out the question at the bottom of their worksheet: "How do you make a balanced, nutritious meal that has a low water footprint?"

Credits

Lesson adapted from https://www.calacademy.org/educators/lesson-plans/how-much-water-do-you-eat

Presentation Slides pictures and definitions:

- https://www.calacademy.org/sites/default/files/styles/manual_crop_standard_960x540/public/assets/images/Education_Images/TYE_Images/hamburger_howmuchwater_pamelagraham.jpg?itok=45-qOy86&c=ab59ec4d3dfe239efa0317772ff3716a
- https://naturalgourmetinstitute.com/wp-content/uploads/waterDrops.gif
- https://www.calacademy.org/sites/default/files/assets/docs/pdf/ee_howmuchwaterdoyoueat_updated_1.pdf

Create A Meal Worksheet

	Food	Gallons of water
Main dish		
Side dish		
Drink		
Dessert		
Total Water use:		_____gallons

Lesson 2.1 How Much Water Do We Eat?
Agenda

- 12:20–12:35 ✘ Vocabulary & Discussion
- 12:35–12:40 ✘ Plate Activity
- 12:45–12:55 ✘ Share Plates & Discussion
- 12:55–1:00 ✘ Revise plates
- 1:00–1:10 ✘ Discussion

Water Footprint

The total amount of fresh water used by that person every day.
This includes direct and indirect water footprint.

Water Footprint Discussion

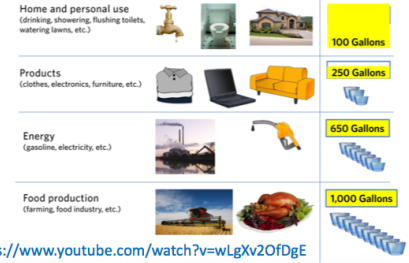
- ✘ How much water do you think a person uses in a day?

  _____ **liters** a day

  _____ **gallons** a day

- ✘ https://www.youtube.com/watch?v=fBu0nWY__lYw

How much water does the average American use per day?



https://www.youtube.com/watch?v=wLgXv2OfDgE

Create A Meal Activity (3 minutes)

- ✘ Together, pick 4 cards to create one balanced dinner.
  (one main dish, one side, one beverage, and one dessert)
- ✘ Put 4 cards on your plate.

Create A Meal Activity (2 minutes)

- ✘ Flip over the cards on your plate.
- ✘ Fill out the table on your worksheet.

	Food	Gallons of water
Main dish		
Side dish		
Drink		
Dessert		
Total Water use:		_____gallons

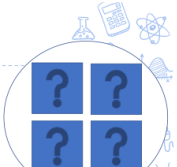
Create A Meal Activity

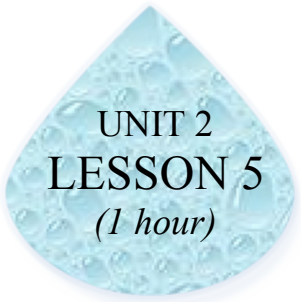
*Use ASL Structure to compare and contrast!

Group	Entree	Side Dish	Drink	Dessert	TOTAL
Ice					
Rain					
Cloud					
Wave					

Revise Your Plate Activity (5 minutes)

- ✘ Explore making different meals
- ✘ **Answer on your worksheet: How do you make a balanced, nutritious meal that has a <u>low water footprint</u>?**





Reflecting on What We Learned

Bilingual Science/Engineering Goals
To utilize inquiry
To develop academic language in ASL and English
To increase awareness of responsibility for resources

Standards

Next Generation Science Standards, Environmental Science

5 –ESS2-: Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

5- ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

ASL Content Standards, Grade 5

LANGUAGE: VOCABULARY ACQUISITON AND USE.3: Acquire and use accurately grade-appropriate general academic and domain-specific signs, fingerspelled words, and phrases, including those that signal contrast, addition, and other logical relationships (e.g., UNDERSTAND++, BUT, B-U-T, #BUT, CAN, RESULT-WHAT-Q).

COMPREHENSION AND COLLABORATION.1**:** Engage effectively in a range of collaborative discussions (e.g., one-on-one, in groups, teacher- led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

Common Core State Standards, Grade 5

CCSS.ELA-LITERACY.W.5.8: Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

CA English Language Development (ELD) Standards, Grade 5

PRODUCTIVE.10: Selecting and applying varied and precise vocabulary and language structures to effectively convey ideas.

Content Objectives
Given previous student work, students will synthesize what they learned about water use, as measured by the "Learned" column of entries in individual KWL charts and in class discussion.

Language Objectives
ASL: Given modeling, students will sign academic vocabulary to explain what they learned about water use, as measured by a rubric in class discussion.

ENGLISH: Given previous work, students will create a written description of main ideas about water footprints and conservation, as measured by individual KWL charts.

Formative Assessment
The students will be formatively assessed during the formation of the KWL for ASL structure of narration, participation, and students reflecting about water use and conservation, as measured by teacher observation notes.

Questions to ask:
How do you communicate about water conservation?
What is a water footprint? Why is it important to conserve what water we currently have available? How will you conserve water? Will that affect your indirect or direct water footprint? How much water will you save?
(Enduring questions from previous lesson) What do you know about water? How do you know? Why do we need water? What do we use water for?

Summative Assessment
The students will be summatively assessed by completed individual KWL charts and class discussion for ASL structure of narration.

Preparation
- Bring the Class KWL to the front of the room.

Materials
- Class KWL
- Student science journals

Differentiation
- Some students may need additional support in spelling or identifying English words for signs.
- Students may need varied support throughout the lesson.

Teaching Strategies for English Language Learners:
- Selecting and applying varied and precise vocabulary and other language

resources to effectively convey ideas. (W.9-10.4-5; WHST.9-10.4-5; SL.9-10.4, 6; L.910.1, 3, 5-6. CA CCSS for ELA/Literacy).
- Pair shares, wait time
- ELD standards in line with the lesson
- Reminder about what vocabulary to use and how to communicate ideas throughout the activity and group discussion.

Teaching Strategies for BLA-ASL Requirements:
- Role shifting
- Be Explicit and Elaborate (state the unstated)
- Fingerspelling

Use eye gaze to elicit participation (IMPORTANT).

Instructions

Launch
- Have students fill out the "Learned" column of their individual KWL charts.

Explore
- Facilitate a class discussion about what students learned, using ASL structure for narration
- Write student answers on Class KWL.

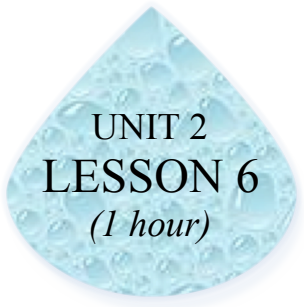
Summarize
- Discuss how students feel about what they learned so far and if they have any more questions.

Extension: Creating ASL/English Academic Word Wall
- (5 minutes) Tell students they will build a vocabulary wall for words they learn to keep track of scientific ideas. One side will have English words and drawings. The other side will have photos of American Sign Language. Notice how "Water" is organized. MODEL CREATING "WATER": Write the word Water on a piece of paper and draw blue waves next to it. Ask a volunteer student to sign "water" and take a photo using the Polaroid camera. Think aloud: since water is the topic of our project, I think this information will go on the top. Tape the photo on the top of the ASL Wall and tape the drawing and word on top of the English

Wall.

- (15 min) Review definitions of "water footprint" and "water crisis". Split class in half and each half chooses one vocabulary word. Each group will draw meaning, write the word, and sign in ASL [water footprint, water crisis]. An adult will take a Polaroid of student(s) signing.

(5-10 min) Ask the class to notice and discuss how the placements of the vocabulary words should be organized and have students tape on wall. Predict what other words may be on the wall.



How Can We Change Our Water Footprint?

Bilingual Science/Engineering Goals
To utilize inquiry
To develop academic language in ASL and English
To increase awareness of responsibility for resources

Standards
Next Generation Science Standards, Environmental Science
5 –ESS2-: Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

5- ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

ASL Content Standards, Grade 5

PUBLISHED SIGNING: TEXT TYPES AND PURPOSES.3(A): Sign narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences. (A) Orient the viewer by establishing a situation and introducing a narrator and/or characters; organize an event sequence that unfolds naturally.

Common Core State Standards, Grade 5

CCSS.ELA-LITERACY.W.5.8: Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

CA English Language Development (ELD) Standards, Grade 5

PRODUCTIVE.10: Selecting and applying varied and precise vocabulary and language structures to effectively convey ideas.

Content Objectives
Given reading about conservation strategies, students will plan to reduce their water footprint, as measured by pledges and vlogs.

Language Objectives
ASL: Given reflection, students will sign their solution in which they reduce their water footprint using American Sign Language structure of compare and contrast,

as measured by a vlog.

ENGLISH: Given reflection about conservation strategies and sentence frames, students will create a written description in which they apply one strategy to their water footprint, as measured by pledges.

Formative Assessment

The students will be formatively assessed during discussion, reading, and partner talk, for ASL structure of narration, participation in partner talk and discussion, and students stating their ideas about conservation, as measured by teacher observation notes.

Questions to ask:
What is a water footprint? Why is it important to conserve what water we currently have available? How will you conserve water? Will that affect your indirect or direct water footprint? How much water will you save?
(Enduring questions from previous lesson) What do you know about water? How do you know? Why do we need water? What do we use water for?

Summative Assessment

The students will be summatively assessed by conservation pledges and a vlog of a narrative in which students reduce their water footprint.

Preparation

- Print academic vocabulary used in lesson from the slides (water conservation) and post on the Science wall**.**
- Print and cut Conservation Pledges for each student.

Materials

- Academic Vocabulary printouts
- PowerPoint slides
- Computer and projector

For each student:

- iPad
- Conservation Pledge

Differentiation

- Some students may need additional support in spelling or identifying English words for signs.
- Students may need varied support throughout the lesson.

Teaching Strategies for English Language Learners:

- Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas. (W.9-10.4-5; WHST.9-10.4-5; SL.9-

10.4, 6; L.910.1, 3, 5-6. CA CCSS for ELA/Literacy).

- Pair shares, wait time
- ELD standards in line with the lesson
- Reminder about what vocabulary to use and how to communicate ideas throughout the activity and group discussion.

Teaching Strategies for BLA-ASL Requirements:

- Role shifting
- Be Explicit and Elaborate (state the unstated)
- Fingerspelling

Use eye gaze to elicit participation (IMPORTANT).

Instructions

Launch

- Discuss the word "conservation" and point to it on the PowerPoint slide. Ask students to think of as many ways we can conserve water they can think of then share with a partner.
- Tell the class they will discuss how to reduce their water footprints today and create pledge for conservation. Model the activity with my example (Read about switching from baths to showers to conserve water, write this on the board and complete the sentence frame: I can help conserve water in my direct / indirect footprint by taking shorter showers.

Explore

- Introduce several infographics about water conservation. Tell students that they read the infographics then choose one strategy and write about it on their pledge.
- Tell students they will make a vlog about their water conservation strategy. Ask students how you tell a story in ASL (set up the scene and characters, tell about chronological events). Model and use ASL structure to quote from the text. (Title: Dirty Solution. Me at home, dirty and need to clean myself. I think I like baths, tend to take bath three times a week. But I want to conserve water. How? If shower, use 100 gallons less water! From now on, I dirty? Take shower.). Discuss requirements for the vlog: must have a title, use "before and after" structure, tell a story what you do to change water use.

Summarize

- When students are done, they can watch each other's vlogs and comment.

Credits

Presentation Slides pictures and definitions:

- https://thumbs.dreamstime.com/b/water-conservation-europe-environment-concept-48008311.jpg
- https://stats.oecd.org/glossary/detail.asp?ID=2903
- http://cowichanbaywater.com/images/images_rwi/rwi_342_water_conservation_1__1352902479_3934.png
- https://slcgreen.files.wordpress.com/2013/02/waterinfographic.jpg
- https://trulyjuly.wordpress.com/2017/11/13/drought-crisis-in-cape-town/
- https://i0.wp.com/orangectlive.com/wp-content/uploads/2014/05/th.jpg
- http://d2r5da613aq50s.cloudfront.net/wp-content/uploads/197043.image0.jpg
- http://d2r5da613aq50s.cloudfront.net/wp-content/uploads/194998.image19.jpg

Conservation Pledge

I can help conserve water in my direct / indirect footprint by

_____

_____

_____.

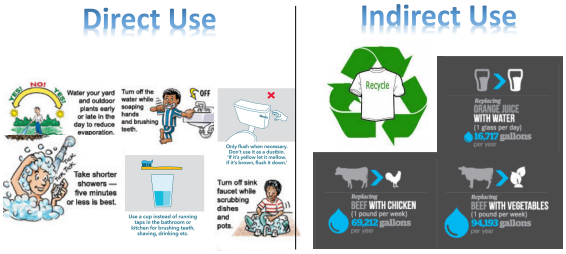
Lesson 5 Water Conservation Agenda

- ✘ Vocabulary & Discussion
- ✘ Write Water Conservation Pledge
- ✘ Vlogs about Conservation

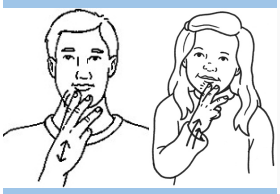
Water Conservation

The preservation, control and development of water resources.

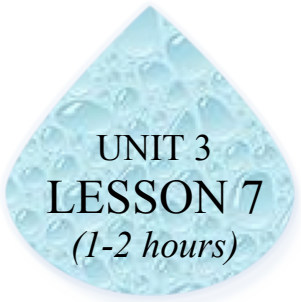
Water Conservation



Create Vlogs



1. Each student gets their own iPad.
2. Compare and contrast water use with and without your conservation strategy.
   - Explain how to save water
   - Use vocabulary
   - Compare and contrast
3. Create **Vlog.**
4. If there is time left…
   1. www.watercalculator.com
   2. www.thewaterweeat.com
   3. https://youtu.be/VIaw5mCjHPI



How Can We Conceptualize Design for Conservation?

Bilingual Science/Engineering Goals
To utilize inquiry
To develop academic language in ASL and English
To increase awareness of responsibility for resources

Standards

Next Generation Science Standards, Engineering Design

3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved

ASL Content Standards, Grade 5

LANGUAGE.STRUCTURE.1.B: Demonstrate command of the structure of standard ASL grammar and usage when signing (live and published). Use frequently occurring descriptive classifiers and other adjectives (e.g. BPCL, LCL, MCL).

Common Core State Standards, Grade 5

CCSS.ELA-LITERACY.W.5.8: Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

CA English Language Development (ELD) Standards, Grade 5

COLLABORATIVE.1: Exchanging information and ideas with others through oral collaborative discussions on a range of social and academic topics.

Content Objectives
Given task prompt, students will design a water filter, as measured by group worksheets.

Language Objectives
ASL: Given discussion, students will sign using classifiers to show ideas for design, as measured by teacher observation.

ENGLISH: Given group discussion and task prompt, students will draw and write a description of their design, as measured by group worksheets.

Formative Assessment
The students will be formatively assessed during group discussion and building, for ASL structure of using classifiers to show ideas and participation, as measured by teacher observation notes.

Questions to ask:
What is your design? What will it look like?
Why is it important to conserve what water we currently have available? How will you conserve water? Will that affect your indirect or direct water footprint? How much water will you save?
(Enduring questions from previous lesson) What do you know about water? Why do we need water? What do we use water for?

Summative Assessment
The students will be summatively assessed by group worksheets and usage of ASL classifiers to show.

Preparation
- Print Design Worksheet for each small group.
- Create simulated waste water by mixing ingredients.
- Cut the bottom 2 inches off of all water bottles with scissors.

Materials
- Paper towels (for spill cleanup)

Simulated waste water:
- 1 gallon container
- salt
- dirt/dust from outside
- 2 cups white vinegar
- several drops red/yellow food coloring
- enough water to fill the gallon container

For each small group:

- Design worksheet
- 2 empty 0.5 L plastic water bottles
- 1 yard of masking tape
- several coffee filters
- bin with cups of filter media (cotton balls, clean aquarium gravel, sand)
- rubber bands
- 1 pair of scissors

Differentiation

- Some students may need additional support in spelling or identifying English words for signs.
- Students may need varied support throughout the lesson.

Teaching Strategies for English Language Learners:

- Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas. (W.9-10.4-5; WHST.9-10.4-5; SL.9-10.4, 6; L.910.1, 3, 5-6. CA CCSS for ELA/Literacy).
- Pair shares, wait time
- ELD standards in line with the lesson
- Reminder about what vocabulary to use and how to communicate ideas throughout the activity and group discussion.

Teaching Strategies for BLA-ASL Requirements:

- Role shifting
- Be Explicit and Elaborate (state the unstated)
- Fingerspelling

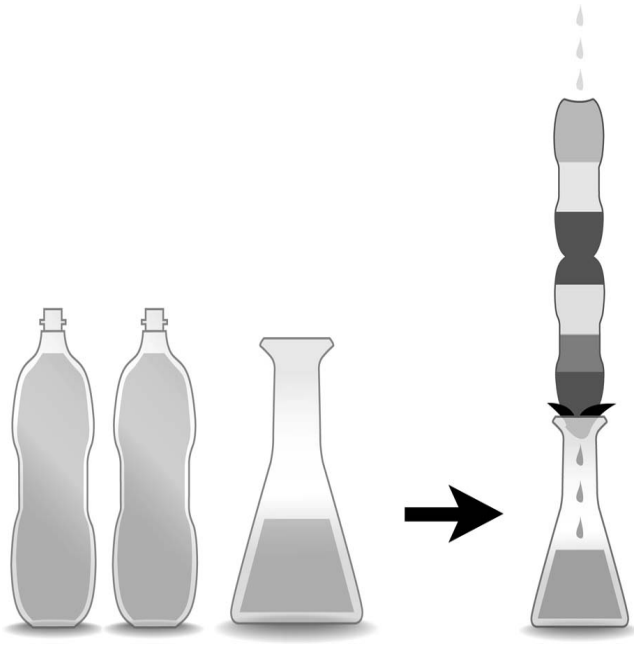
Use eye gaze to elicit participation (IMPORTANT).

Instructions

<u>Launch</u>

- Discussion about conservation
    - Show infographic and YouTube video about drought & water pollution <u>https://www.youtube.com/watch?v=wX4Cfu3Dd2E</u>
    - Ask kids questions: Why can water be dirty? Why is there global scarcity? Why do we have to engineer solutions?
- Introduce the challenge to design a water filtration device that will yield the purest water.

- Model creating a water filter by stacking two water bottles both opening-facing down with coffee filters in between, a rubber band securing the connection. Only the close off the bottom water bottle with a cap. Discuss media available for filtering and model layering media.



(NASA – JPL)

- Have students smell waste water.
- Expectation: Learn from each other. The entire class is like an engineering team trying different things and learning from each other's successes and failures to engineer the most effective water filtration design.

Explore

- Organize students into groups
- Distribute yard of measuring tape and worksheets
- Distribute boxes of materials to each team. Have them look and predict which will work best.
- Teams draw layering plans and complete group worksheet.

Summarize

- Ask each group to justify why they chose their filter design.

Credits

Heavily adapted from Water Filtration Activity – JPL
https://www.jpl.nasa.gov/edu/teach/activity/water-filtration-challenge/

Design Worksheet

Water Filter Design and Evaluation Sheet

Team Members: _____ **Date:** _____

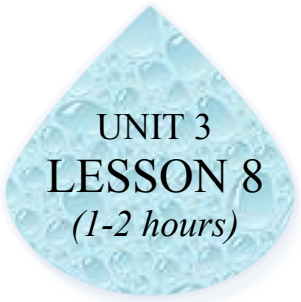
1. Design Phase	*3. Revision Phase*
Draw the layers of filter media to build.	**Draw the layers of filter media for your REVISED filter.**
Why did you select the above filter media and why was it placed in that order? _____ _____ _____ _____	**What did you change and why?** _____ _____ _____ _____ _____

2. Test Observations

	Before	After
Clarity ***How did the water look?***		
Smell ***How did the water smell?***		

Water Conservation

The preservation, control and development of water resources.



How Can We Construct Sustainable Design?

Bilingual Science/Engineering Goals
To utilize inquiry
To develop academic language in ASL and English
To increase awareness of responsibility for resources

Standards

Next Generation Science Standards, Engineering Design

3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved

ASL Content Standards, Grade 5

LANGUAGE.STRUCTURE.1.B: Demonstrate command of the structure of standard ASL grammar and usage when signing (live and published). Use frequently occurring descriptive classifiers and other adjectives (e.g. BPCL, LCL, MCL).

Common Core State Standards, Grade 5

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CA English Language Development (ELD) Standards, Grade 5

COLLABORATIVE.1: Exchanging information and ideas with others through oral collaborative discussions on a range of social and academic topics.

Content Objectives
Given task prompt, students will engineer and test a filter, as measured by presentations and worksheets.

Language Objectives
ASL: Given discussion, students will sign using classifiers to show ideas for design and describe their results in a presentation, as measured by a video and rubric.

ENGLISH: Given group discussion and task prompt, students will describe the results of the test, as measured by group worksheets.

Formative Assessment
The students will be formatively assessed during group discussion and building, for ASL structure of using classifiers to show ideas and participation, as measured by teacher observation notes.

Questions to ask:
What is your design? What will it look like?
Why is it important to conserve what water we currently have available? How will you conserve water? Will that affect your indirect or direct water footprint? How much water will you save?
(Enduring questions from previous lesson) What do you know about water? Why do we need water? What do we use water for?

Summative Assessment
The students will be summatively assessed by group worksheets and usage of academic language and ASL classifiers in group presentations.

Materials
- **(**from previous lesson 7)
    - simulated waste water
    - filter materials
    - group worksheets

Differentiation
- Some students may need additional support in spelling or identifying English words for signs.
- Students may need varied support throughout the lesson.

Teaching Strategies for English Language Learners:
- Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas. (W.9-10.4-5; WHST.9-10.4-5; SL.9-

10.4, 6; L.910.1, 3, 5-6. CA CCSS for ELA/Literacy).

- Pair shares, wait time
- ELD standards in line with the lesson
- Reminder about what vocabulary to use and how to communicate ideas throughout the activity and group discussion.

Teaching Strategies for BLA-ASL Requirements:

- Role shifting
- Be Explicit and Elaborate (state the unstated)
- Fingerspelling

Use eye gaze to elicit participation (IMPORTANT).

Instructions

Launch

- Review what happened last class and review individual science journal designs.
- Tell class they will build a prototype of their designs today and test for effectiveness. Explain class materials and procedure. Set behavior expectations for safety.
- Teams assemble water filters according to their worksheet plans from Lesson 2.
- As a class, discuss and record the clarity and smell of the simulated wastewater on the board and group worksheets.

Explore

- Test with wastewater **(15 min)**
- Have a representative from each team hold the filter for all students to watch.
- Teacher slowly pours 200 mL of simulated wastewater through each water filter.
- Have students discuss the results: what they see and smell.

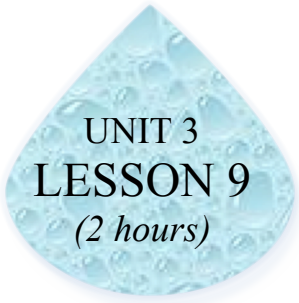
Summarize

- Class discussion: Compare the results (color, odor) among student groups, add to class chart.
    - ***Which filter media were most effective at filtering the water?***
    - ***How might you further improve upon the water filter design?***

- Groups complete worksheets and write what they learned and draw a revision of the filter.
- Presentations: Teacher model first with ASL classifiers. Test and refine solutions (what worked, what could be improved, ? questions, ! ideas).

Credits

Heavily adapted from Water Filtration Activity – JPL
https://www.jpl.nasa.gov/edu/teach/activity/water-filtration-challenge/



How Can We Improve Sustainable Design?

Bilingual Science/Engineering Goals
To utilize inquiry
To develop academic language in ASL and English
To increase awareness of responsibility for resources

Standards

Next Generation Science Standards, Engineering Design

3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

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ASL Content Standards, Grade 5

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CA English Language Development (ELD) Standards, Grade 5

COLLABORATIVE.1: Exchanging information and ideas with others through oral collaborative discussions on a range of social and academic topics.

Content Objectives
Given task prompt, students will revise their water filters, as measured by evaluation papers and vlog.

Language Objectives
ASL: Given discussion and worksheet, students will sign narratives using classifiers in which they will reflect about what they learned in creating a solution, as measured by a vlog.

ENGLISH: Given activities, students will draw and write using descriptive language about their learning and reflection, as measured by journal entries.

Formative Assessment
The students will be formatively assessed during group discussion and building, for ASL structure of using classifiers to show ideas and participation, as measured by teacher observation notes.

Questions to ask:
What is your design? What will it look like?
Why is it important to conserve what water we currently have available? How will you conserve water? Will that affect your indirect or direct water footprint? How much water will you save?
(Enduring questions from previous lesson) What do you know about water? Why do we need water? What do we use water for?

Summative Assessment
The students will be summatively assessed by journal entries for reflection and vlogs for using classifiers.

Materials
- **(**from previous lesson 7 & 8)
    - simulated waste water
    - filter materials
    - built filter models
    - group worksheets

For each student
- iPad
- science journal

Differentiation
- Some students may need additional support in spelling or identifying English words for signs.

- Students may need varied support throughout the lesson.

Teaching Strategies for English Language Learners:

- Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas. (W.9-10.4-5; WHST.9-10.4-5; SL.9-10.4, 6; L.910.1, 3, 5-6. CA CCSS for ELA/Literacy).
- Pair shares, wait time
- ELD standards in line with the lesson
- Reminder about what vocabulary to use and how to communicate ideas throughout the activity and group discussion.

Teaching Strategies for BLA-ASL Requirements:

- Role shifting
- Be Explicit and Elaborate (state the unstated)
- Fingerspelling

Use eye gaze to elicit participation (IMPORTANT).

Instructions

Launch

- Review what happened last class and review individual science journal designs and whether they were effective and what needs to be improved.
- Tell class they will redesign and rebuild their designs today. Review class materials and procedure. Review behavior expectations for safety.
- Teams redesign and rebuild filters.

Explore

Repeat the process of Lesson 8 of testing and discussing results, as follows:

- Test with wastewater.
- Have a representative from each team hold the filter for all students to watch.
- Teacher slowly pours 200 mL of simulated wastewater through each water filter.
- Have students discuss the results: what they see and smell.
- Class discussion: Compare the results (color, odor) among student groups, add to class chart.
    - ***Which filter media were most effective at filtering the water?***
    - ***How might you further improve upon the water filter design?***

Summarize (these two steps can be done in either order)

- Have students make reflection vlogs describing their engineering process and what they learned.
- Have students turn to a new page in their science journals, label it "Engineering Water Filters" and date it. Students will draw on the left side and write on the right side 3 things they learned today and 2 questions they still have.

Credits

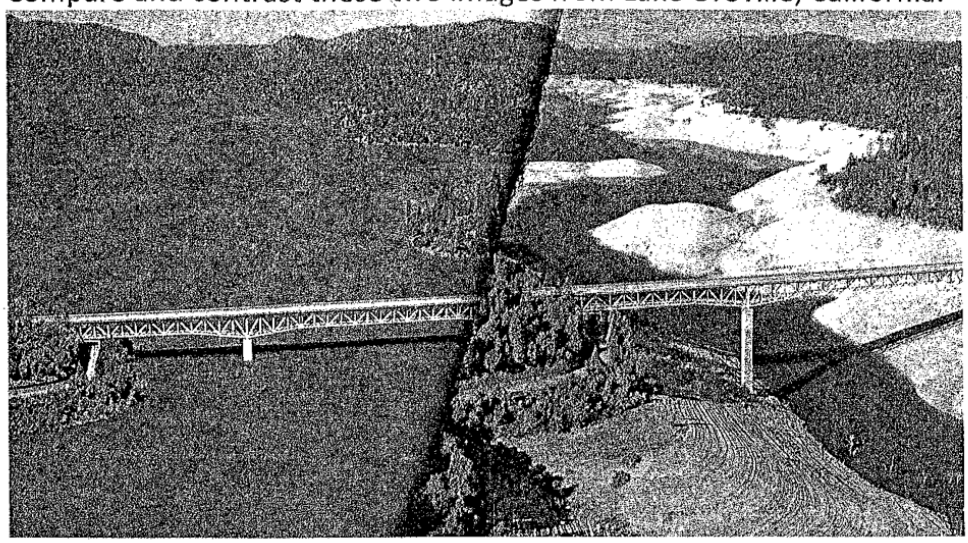
Heavily adapted from Water Filtration Activity – JPL
https://www.jpl.nasa.gov/edu/teach/activity/water-filtration-challenge/

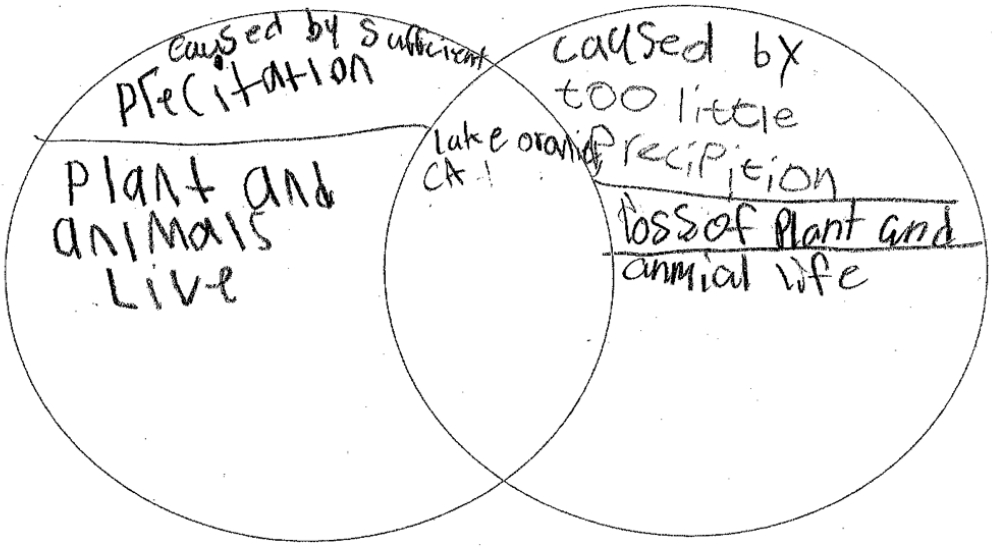
Appendix B: Student Work

Name: **Student L, Student N, Student A, Student I**

Date: 4-18-18

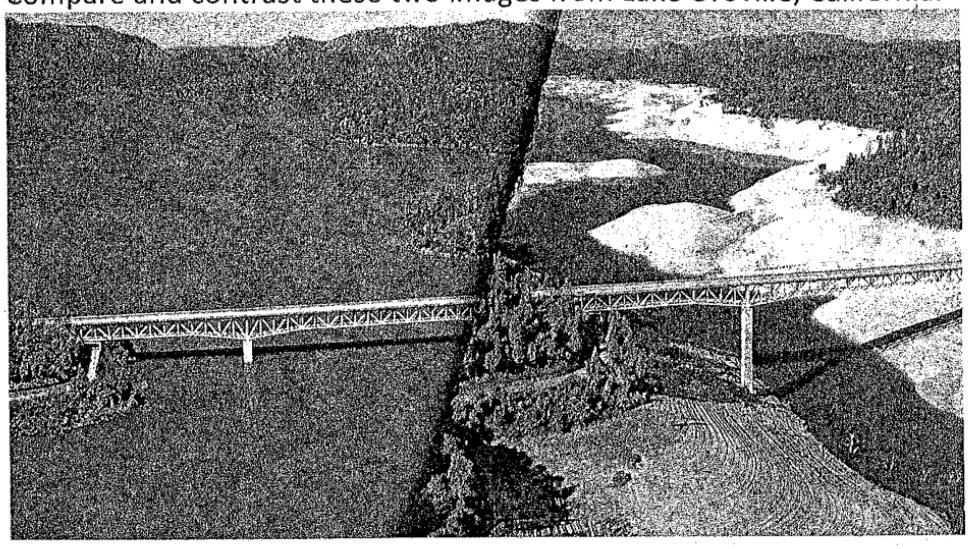
Compare and contrast these two images from Lake Oroville, California.

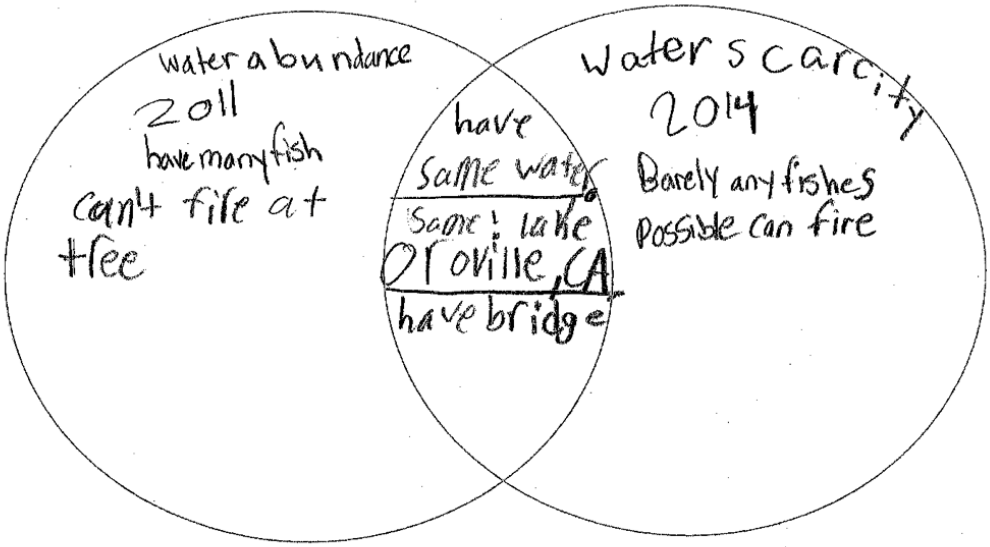




Name: **Student C, Student F, Student K** Date: 4/18/18

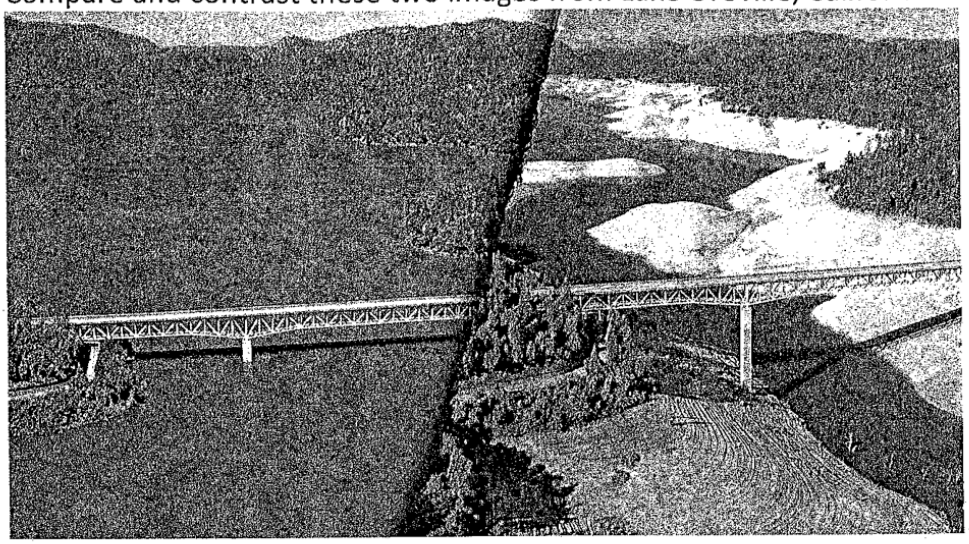
Compare and contrast these two images from Lake Oroville, California.

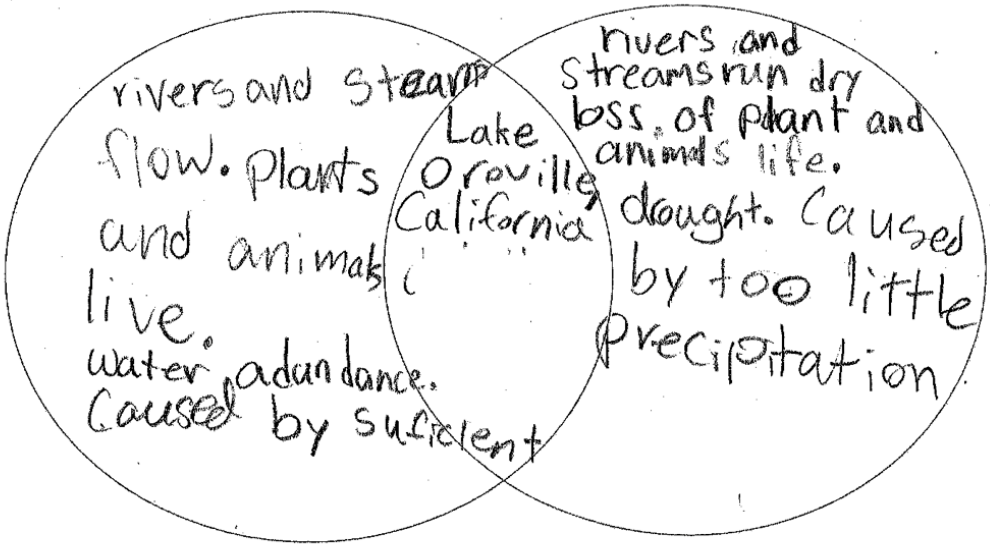




Name: **Student M, Student J, Student D** Date: 4-18-18

Compare and contrast these two images from Lake Oroville, California.

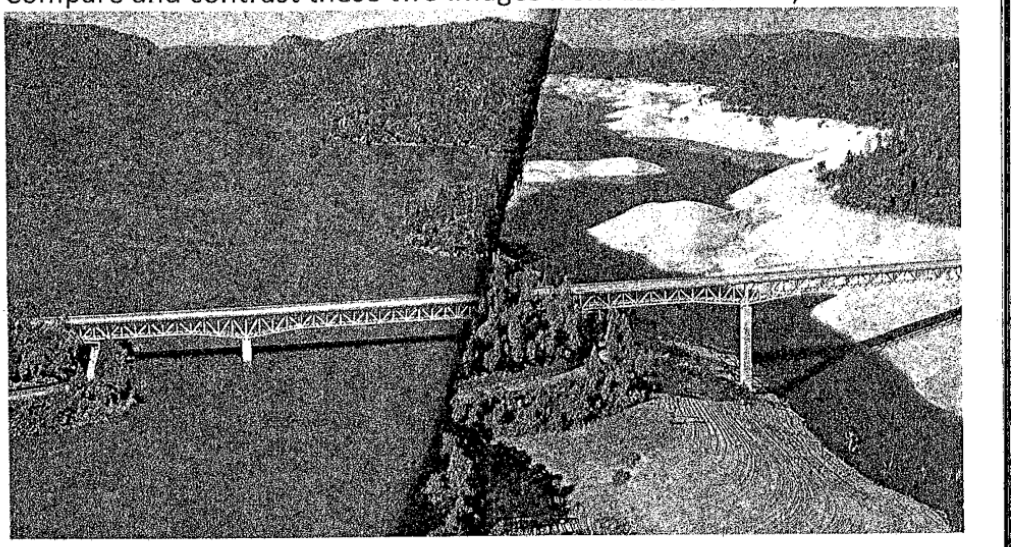


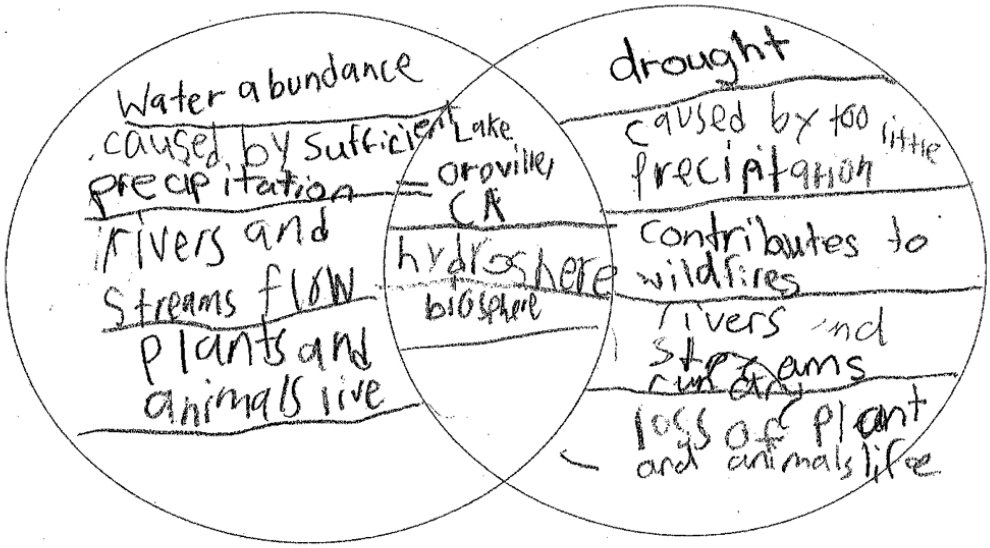


Name: **Student B, Student H, Student E**

Date: 4/16/18

Compare and contrast these two images from Lake Oroville, California.





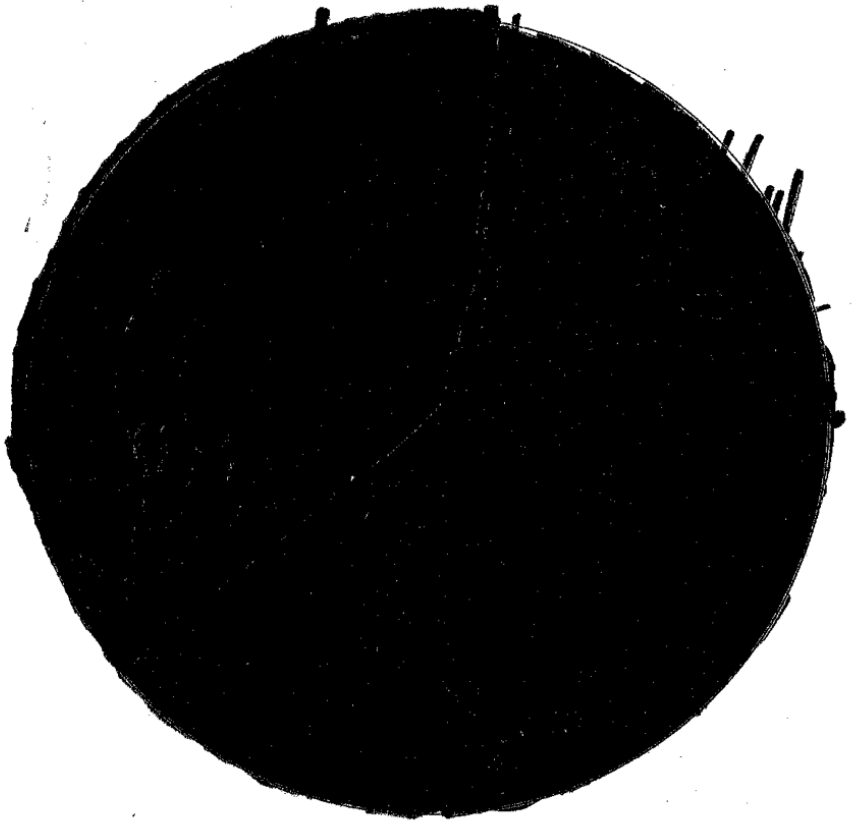
Names: **Student L, Student N, Student I, Student A**

Estimate of Water Distribution on Earth

We hypothesize that 63 % of the water on Earth is usable.

Names: **Student L, Student N, Student I, Student A**

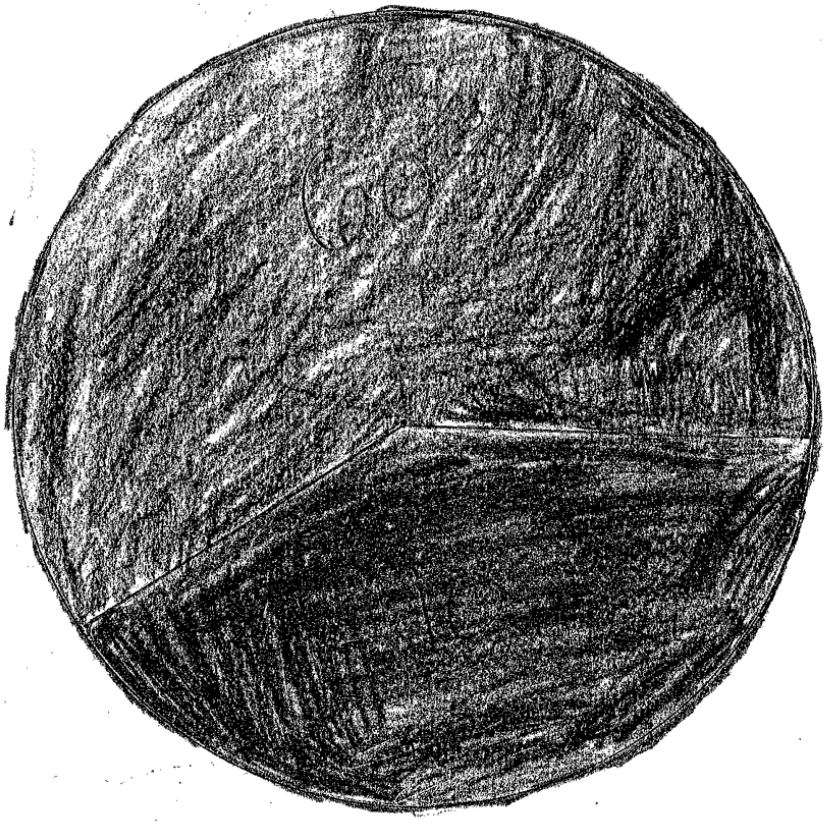
Observation of Water Distribution on Earth



We conclude that 0.03 % of the water on Earth is usable.

Names: **Student F, Student C, Student K**

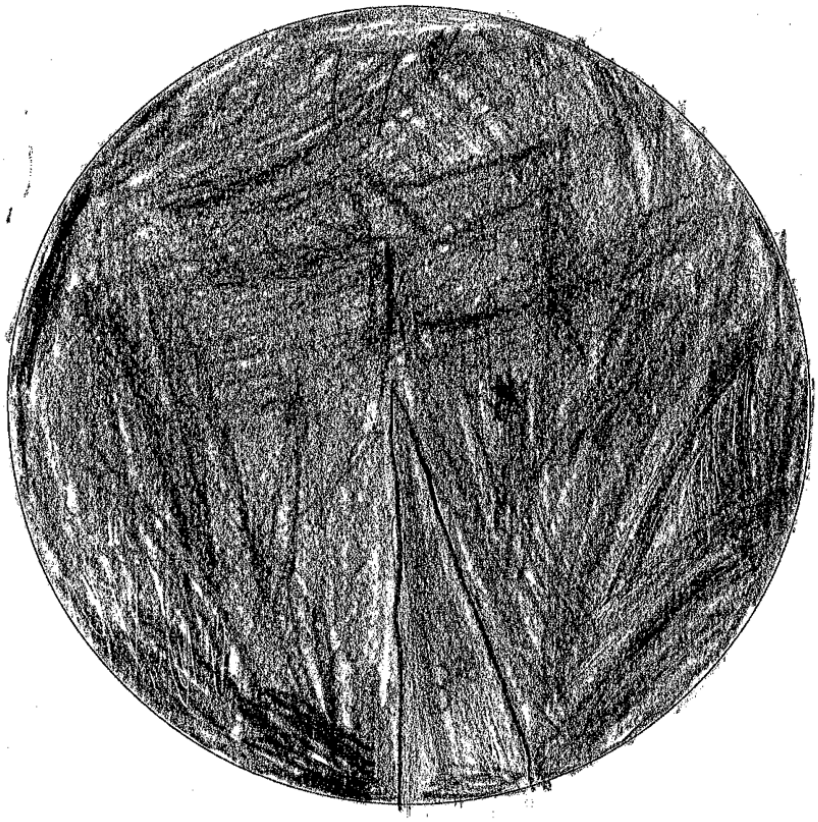
Estimate of Water Distribution on Earth



We hypothesize that 40 % of the water on Earth is usable.

Names: **Student F, Student C, Student K**

Observation of Water Distribution on Earth



We conclude that 3 % of the water on Earth is usable.

Names: **Student M, Student D, Student J**

Estimate of Water Distribution on Earth

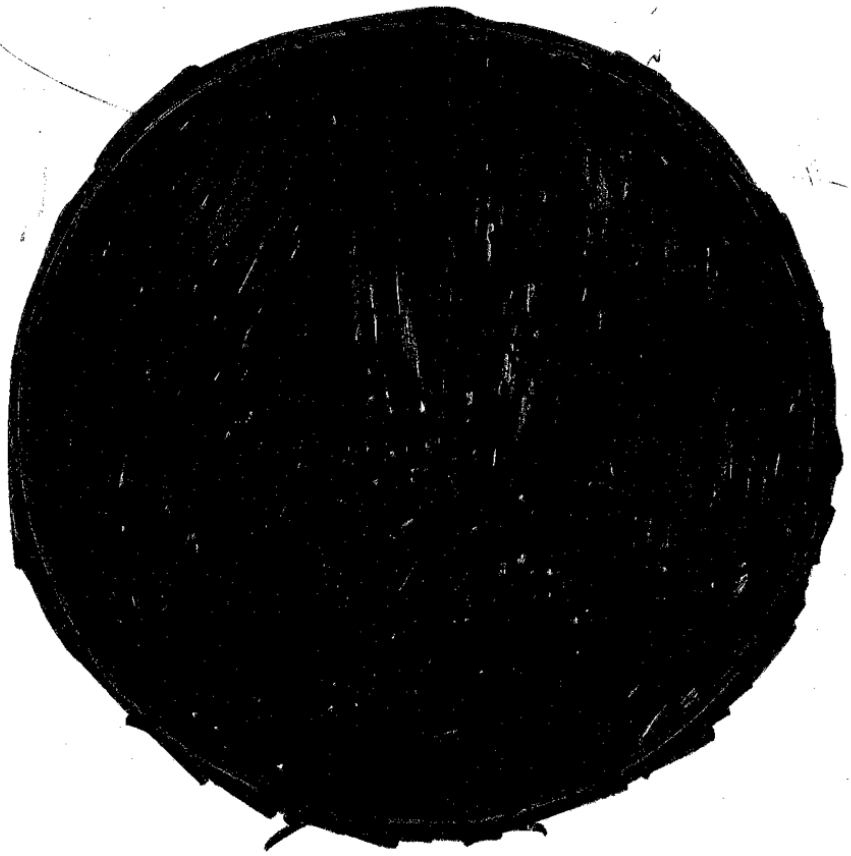
95%

We hypothesize that ~~42~~ 75 % of the water on Earth is usable.

75%

Names: Student M, Student D, Student J

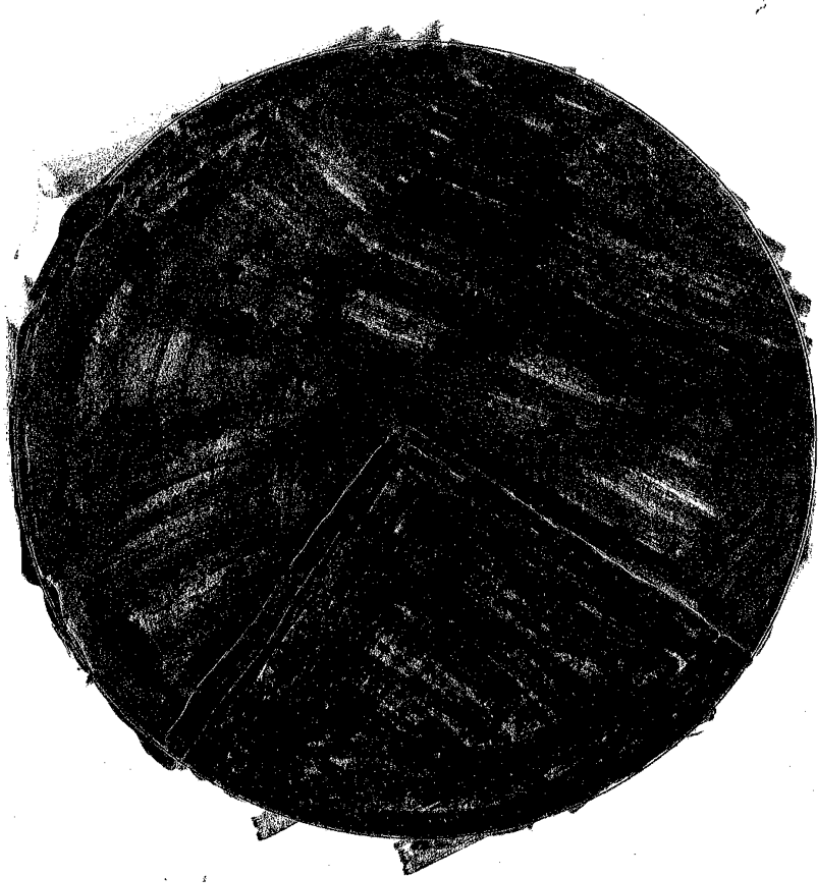
Observation of Water Distribution on Earth



We conclude that 3% % of the water on Earth is usable.

Names **Student B, Student E, Student G, Student H**

Estimate of Water Distribution on Earth



We hypothesize that 30 % of the water on Earth is usable.

Names **Student B, Student E, Student G, Student H**

Observation of Water Distribution on Earth

We conclude that 3 % of the water on Earth is usable.

Names: **Student E, Student B, Student H, Student G** Date: 4/30/18

11
670
62
45
14
791

Create A Meal Activity

In your group, pick 4 cards to create one balanced dinner.

Once you have decided what your meal will be, flip over the food cards to find out how much water it took to produce each food item.

	Food	Gallons of water
Main dish	Pepperoni Pizza	670
Side dish	fries	62
Drink	orange juice	45
Dessert	Icecream	14
Total Water use:		791 gallons

Explore making different meals.

How do you make a balanced, nutritious meal that has a low water footprint?

we should use less meat and eat some more vegetables and fruit. we should eat vegetables and fruit with lesser water.

Names Student L, Student A, Student N Student I

4-30-18

Create A Meal Activity

In your group, pick 4 cards to create one balanced dinner.

Once you have decided what your meal will be, flip over the food cards to find out how much water it took to produce each food item.

	Food	Gallons of water
Main dish	Spinach	6 gallons
Side dish	Banana	10 Gallons
Drink	Apple juice	20 Gallons
Dessert	Ice cream	14 Gallons
Total Water use:		50 gallons

Explore making different meals.

How do you make a balanced, nutritious meal that has a low water footprint?

Eat healthy food for example fruit or vegtables drink 1 liter each hour. We live healthy. We eat healthy food. My Banana

16
10
20
+14
50

1 6
1 0
2 0
1 4
5 0

Nam Student D, Student J, Student M te: 4-30-18

Create A Meal Activity

In your group, pick 4 cards to create one balanced dinner.

Once you have decided what your meal will be, flip over the food cards to find out how much water it took to produce each food item.

	Food	Gallons of water
Main dish	Spinach	19
Side dish	rice	29
Drink	apple juice	20
Dessert	Fruit Salad	20
Total Water use:		78 gallons

Explore making different meals.

How do you make a balanced, nutritious meal that has a low water footprint?

Food good, low need meat, milk Care water Become like.

Names: Student C, Student F, Student K 4/30/18

Create A Meal Activity

In your group, pick 4 cards to create one balanced dinner.

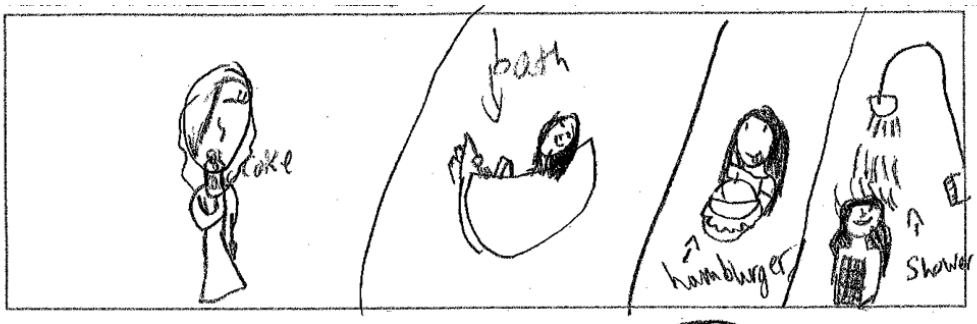
Once you have decided what your meal will be, flip over the food cards to find out how much water it took to produce each food item.

	Food	Gallons of water
Main dish	Pasta with meatballs	285
Side dish	Fries	162
Drink	Apple juice	42
Dessert	Ice cream	14
Total Water use: 910		405 gallons

Explore making different meals.

How do you make a balanced, nutritious meal that has a low water footprint?

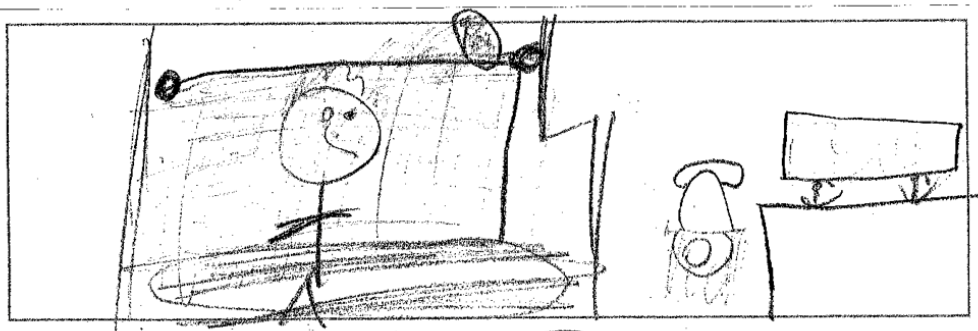
how to lessen water is to eat more healthy food like bell peppers, Salad, bannanas, Strawberry, grape, tomato, Spinach, Pickles, olives,



I can help conserve water in my direct / indirect footprint by

Reducing My bath and Shower time.
Reducing drinking and eating coke and hamburgers.

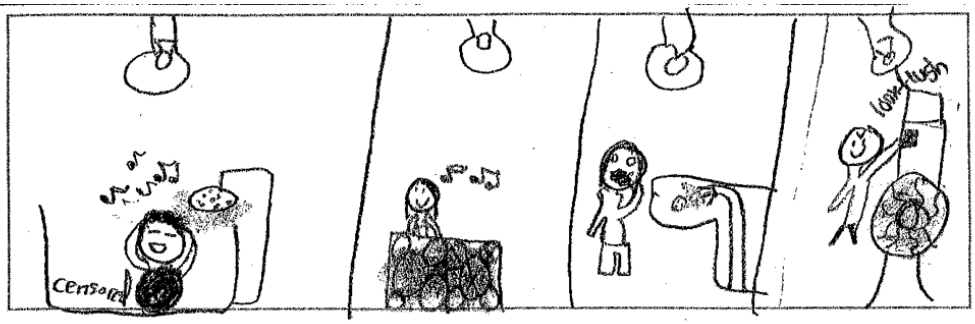
Name: **Student A** Date: 5-3-18



I can help conserve water in my ~~direct~~ / ~~indirect~~ footprint by

Before I'm was shorted the shavers.
and Then I now doing too long
Shower and bath! Now I'm still.

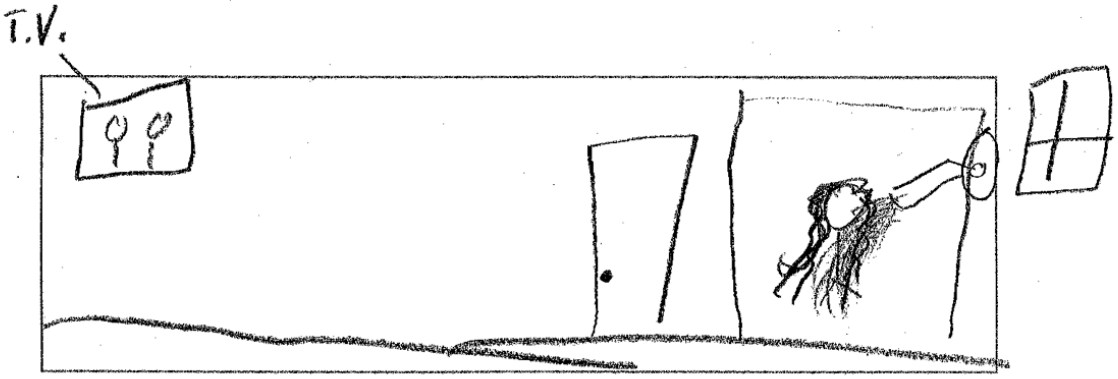
Name: **Student B** Date: 5-3-18



I can help conserve water in my direct / indirect footprint by

I will 3 min shower, turn off water during dishes, turn off faucet when brushing your teeth, do not flush toilet a lot.

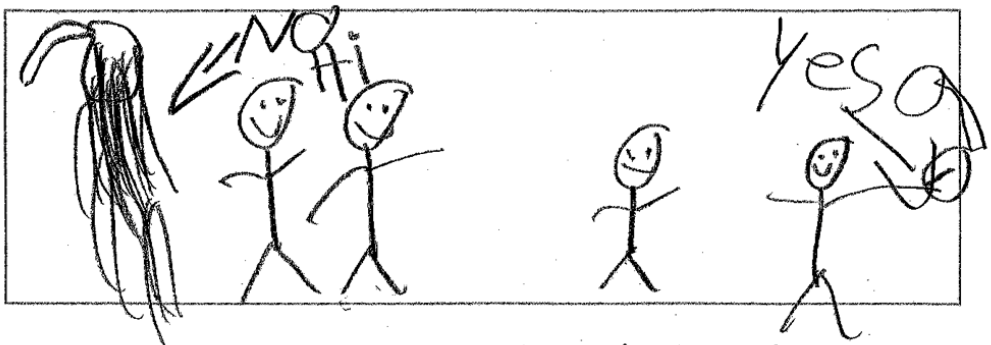
Name: **Student F** Date: 5-3-18



I can help conserve water in my direct / indirect footprint by

take shorter showers five minutes

Name: **Student K** Date: 5/31/18

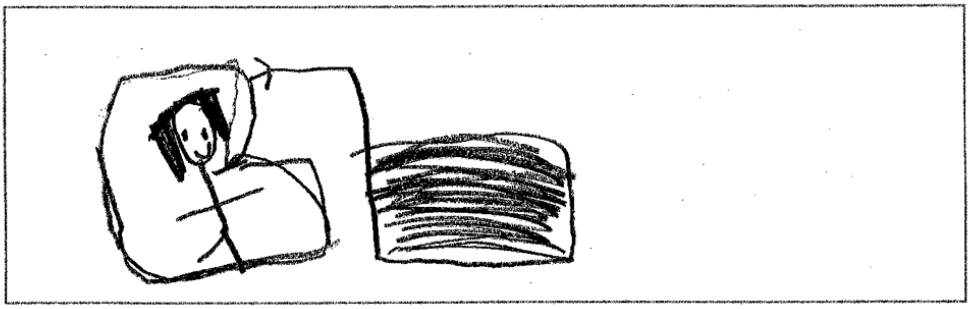


I can help conserve water in my direct / indirect footprint by

too Long shower no
turn off water yes

Name: **Student O**

Date: 5/3/18

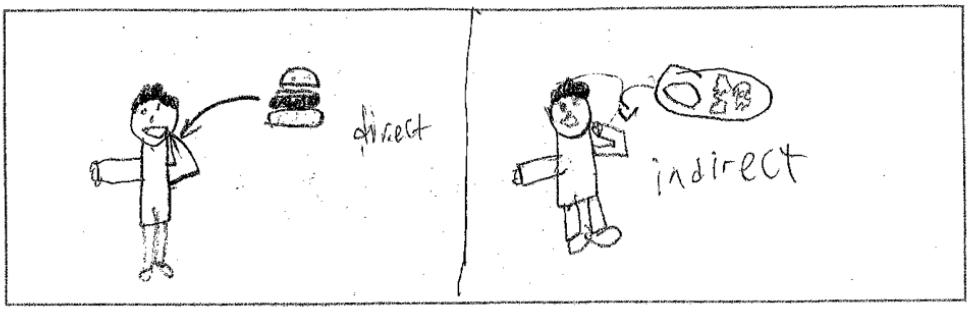


I can help conserve water in my direct / indirect footprint by

Peolpe Need Watr to
Save Sorws

Name: **Student I**

Date: 5-3-18

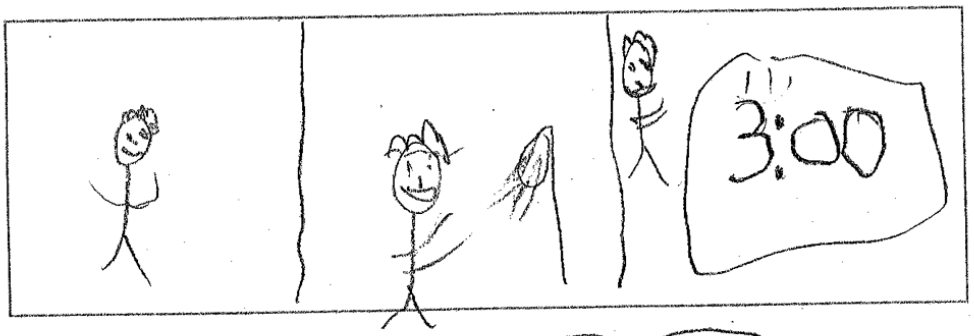


I can help conserve water in my direct / indirect footprint by

I eat too much meat like cheeseburger or pasta with meats
I should start eating chicken and vegetables/fruit
that has lesser water.

Student E

Name: _____ Date: 5/3/18

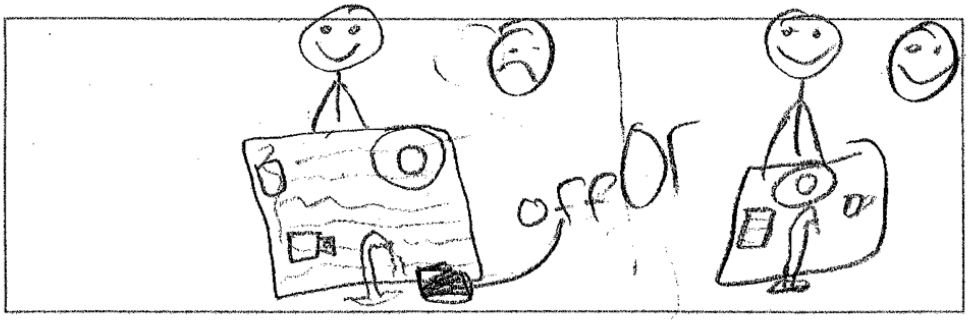


I can help conserve water in my direct / indirect footprint by

I can water went shower
indirect waste short 3:00.

Student H

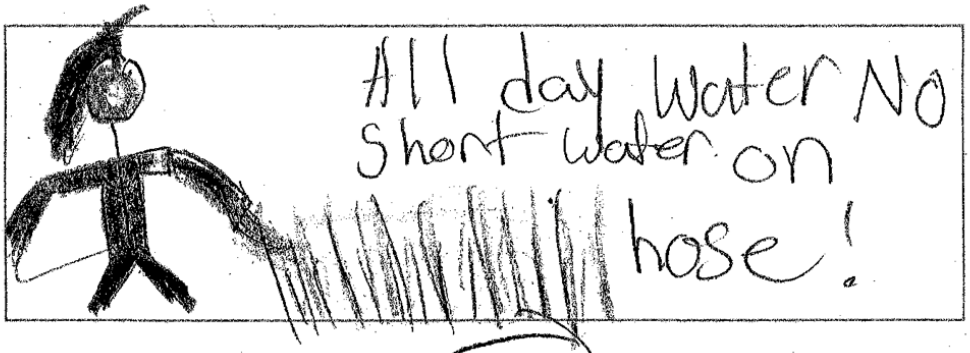
Name: _____ Date: 5/3/18



I can help conserve water in my direct / indirect footprint by

I will wash dishes and if I wash dishes, on water. but off water while wash dishes.

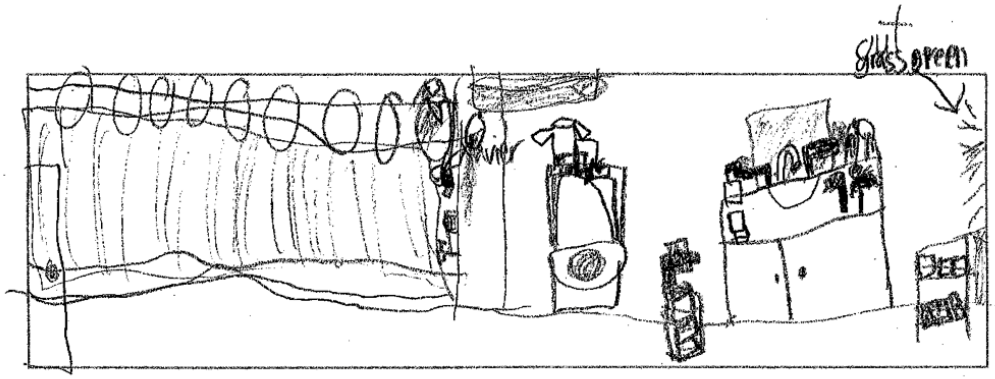
Name: **Student B** Date: 5-3-18



I can help conserve water in my direct / indirect footprint by

No day all on hose. Why lots water ~~why~~ run out Shoulder Short water: run out

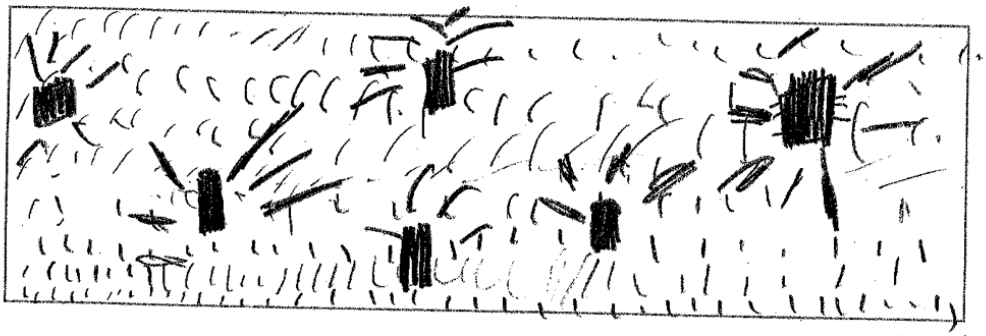
Name: **Student L** Date: 5-3-18



I can help conserve water in my direct / indirect footprint by

1 for clean Shower body wash Xavier hair wash and teeht brush with toothpaste and toilet Heavy Flush all bathroom!

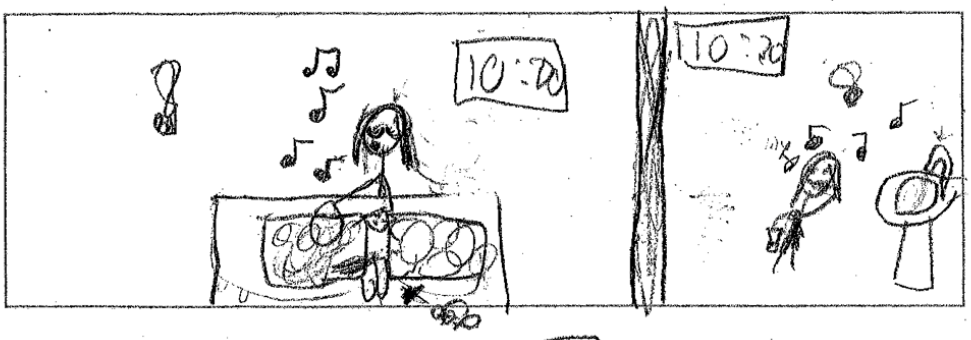
Name: **Student G** Date: 5/3/18



I can help conserve water in my direct / indirect footprint by

All water waste Lnag on

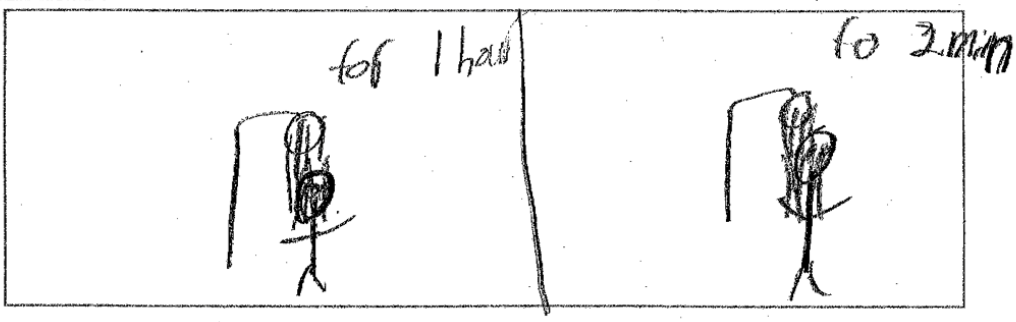
Name: **Student N** Date: May 2, 2018



I can help conserve water in my direct / indirect footprint by

wash plate long time ten.
Brushieth long time need 10:20.

Name: **Student J** Date: 5-3-18



I can help conserve water in my direct / indirect footprint by

not stay long shower
Because we need caring about water

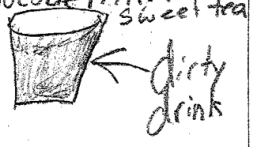
Name: **Student C** Date: 5-3-18

Water Filter Design and Evaluation Sheet

Team Members: Student D, Student E, Student F Date: 5/4/18

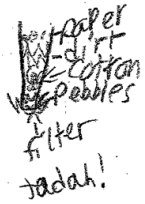
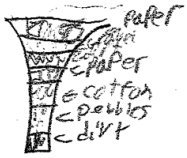
1. Design Phase	*3. Revision Phase*
Draw the layers of filter media to build. 	Draw the layers of filter media for your REVISED filter. We should have more paper 
Why did you select the above filter media and why was it placed in that order? We agreed to first Cotton, Second dirt then last gravel and We also put 3 papers.	What did you change and why? We changed that we need more paper and less dirt and more cotton & more gravel for

2. *Test Observations*

	Before	After
Clarity *How did the water look?*	Water looks TOXIC dark Brown Chocolate milk sweet tea 	light x3 brown
Smell *How did the water smell?*	Water smells AWFUL!!	Water have NO SMELL?!?!

Water Filter Design and Evaluation Sheet

Team Members: **Student A, Student G, Student K** Date: 5-4-18

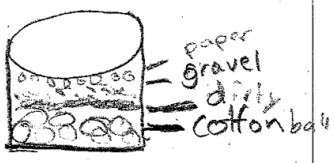
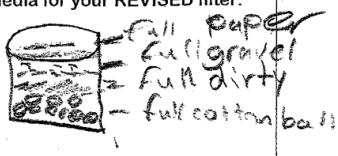
1. Design Phase	*3. Revision Phase*
Draw the layers of filter media to build. 	Draw the layers of filter media for your REVISED filter. 
Why did you select the above filter media and why was it placed in that order? We have seen a vedio doing that and it worked so we tried to do the same	What did you change and why? I changed nothing just add one more layer to get it clean :)

2. Test Observations

	Before	After
Clarity *How did the water look?*	Looks toxic  Reddish Brown dirty :)	Looks better Less red Lesser Brown :)
Smell *How did the water smell?*	Chorolide, Bleach and Vingear YUCK!	The water Smelled Better It smells of Light vingear :)

Water Filter Design and Evaluation Sheet

Team Members: Student B, Student M, Student I-ink Date: 5-4-18

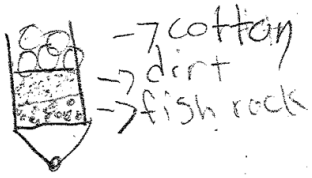
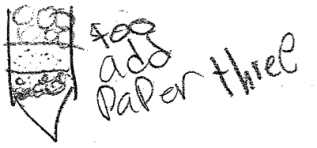
1. Design Phase	*3. Revision Phase*
Draw the layers of filter media to build. 	Draw the layers of filter media for your REVISED filter. 
Why did you select the above filter media and why was it placed in that order? The water can go though cotton ball, if water can't go though gravel.	What did you change and why? We need more paper and more gravel Because we has lot dirty water and most dirty water. We want nice fresh water.

2. Test Observations

	Before	After
Clarity *How did the water look?*	The water looks toxic. it is reddish-dark, look like sweet tea, and had dirt on the bottom.	The water look ora
Smell *How did the water smell?*	The water smell awful.	The water smell vinger

Water Filter Design and Evaluation Sheet

Team Members: Student L, Student C, Student H Date: 5-4-18

1. Design Phase	3. Revision Phase
Draw the layers of filter media to build. 	Draw the layers of filter media for your REVISED filter. 
Why did you select the above filter media and why was it placed in that order? why I stalt fish rock is not heavy and I not want dirt ~~Break~~ Paper that why.	What did you change and why? Nothing change and and we need paper in ~~water~~ bottom also

2. *Test Observations*

	Before	After
Clarity *How did the water look?*	The water looks toxic. His reddish dark brown looks like sweet tea and herb dirt on the button	The water like few dirt water
Smell *How did the water smell?*	The water Smells awful.	We look like smell egg and Dye.

Student A

Date: 4-16-18

Water

What I **K**now	What I **W**ant to Know	What I **L**earned
Water comes from Clouds. Water is usally at beach, Lake, Pond, our salvia, river, the whole world! we Need Water to survive droughts.	how did water first appear. how does water freeze up?	I Learned 7 Vocabury related with water. We all use up the wa for paper Clothes and etc etc.

Student A

Imagine California will run out of water this summer! Write a letter to a friend explaining why it is important to save water.

4-17-18

Dear Selina

You might have not noticed but We are running out of water! We need water to be alive because water keeps us hydrated and alive If we run out of water everything will be utter Chaos! Lets find a way to Stop the water from running out!

Sincerely

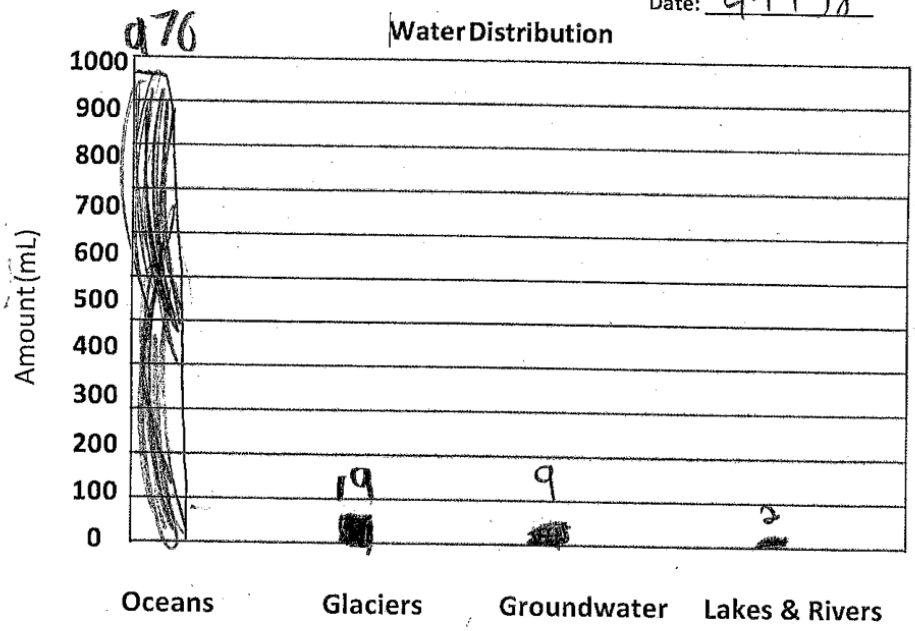
Student A

Love your use of "utter chaos"!
What do you think is a way to stop the water from running out?

Student A

Date: 4-19-18

Water Distribution



Most of the water on Earth is in ocean.

The largest supply of freshwater is in lake & river

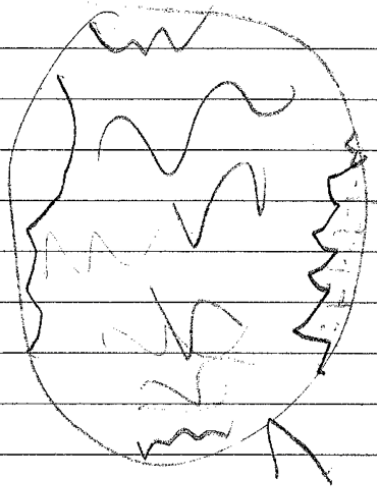
Student A

4-23-18

X I learned
X The Ocean has more water
X We need water
X the World will Shortage If We Not
water

Xhow do water even
melt?!?!
X how do water even melt!?!?

Student A



mostly saltwater

Name: *Student A* Date: 4-26-18

Ways We Use Water

My **direct** water use is drinking Water, Shower, hand washing Water.

My **indirect** water use is Meat, Bubblegum bread paper books.

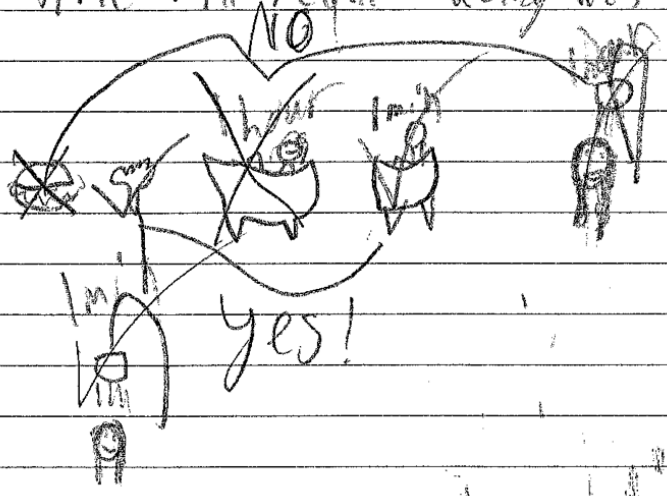
I was surprised about the paper actually being a sorce of water!

I wonder, about nothing because TV I cannot everything?

Student A

Now it is the month of May and getting closer to summer, when there are often more droughts! How can you change your water footprint and eating habits to conserve water? Why do these actions reduce use of water?

I (will / would) do is Eat mor Veggies instead meat and reduce (Bath / Shower) time Because vegtables use less watter and Shorter (Bath / Shower) time will reduce using water.



Student B

Date: 4-16-18

Water

What I Know	What I Want to Know	What I Learned
Water [illegible] [illegible] [illegible] and [illegible]. Water is [illegible] [illegible] becose [illegible] dishes, bath, and wash hand. I use [illegible] [illegible] [illegible] [illegible] is important.	I wonder, how [illegible] water and water animals.	I learned, I um [illegible] the [illegible]. I learn the water asable, but some-time, run out water in the [illegible]. But I learn asable, it real unuable is 97% and usable is 3%.

Student B

...ne California will run out of water this summer! Write a letter to a friend explaining why it is important to save water.

4-17-18

Dear, **Student C**

I will tell you. Not do water leak any time, because I not want run out water. Do you want run out water. I WARNING you!

Sincerely,

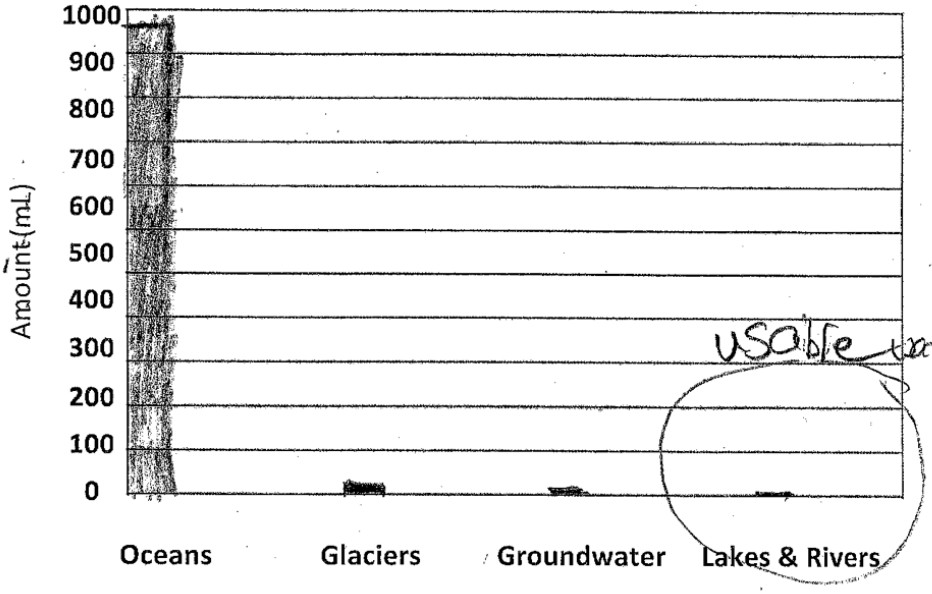
Student B

Great use of "WARNING" to show your friend how important it is!

Student B

Date: 4-19-18

Water Distribution



Most of the water on Earth is in Ocean.

The largest supply of freshwater is in lake and river

Water Distribution
4-23-16

Student B

Write 3 thing you learned-

- Water Abundance is lot water.
- I did learn the asable because how many 2.0.
- I did learn the water Distribution is fun and scien

Write 2 questions you have

- I am wonder, how appear earth and water.
- I wonder, They know about water.

Name: *Student B* Date: [illegible]

Ways We Use Water

My direct water use is washing [illegible].

My indirect water use is food (meat), paper, and product.

I was surprised about how make paper.!

I wonder, how appear, water animal and he [illegible], eat meat?

Student B 5-2-18

Now it is the month of May and getting closer to summer, when there are often more droughts! How can you change your water footprint and eating habits to conserve water? Why do these actions reduce use of water?

Why, need reduce meat, because lot water. The person lot feed the cow because cow have body is meat, from ground, but you need little feed to cow because reduce the water meat. My mom did, my mom wash the car and water run. I know it, I will told my mom.

J

Student C

Date: 4-16-18

Water

What I **K**now	What I **W**ant to Know	What I **L**earned
People depend at water. water is importain why water keep I life. water use for people	if water disappear, and People will Dead. how get water?	how get water from river / lake. and People use water how many 3%. I um shark meat is it- dilege why water at meat why people feed water to cow Then get meat.

Imagine California will run out of water this summer! Write a letter to a friend explaining why it is important to save water.

Student C

Dear **Student B** 4-17-18

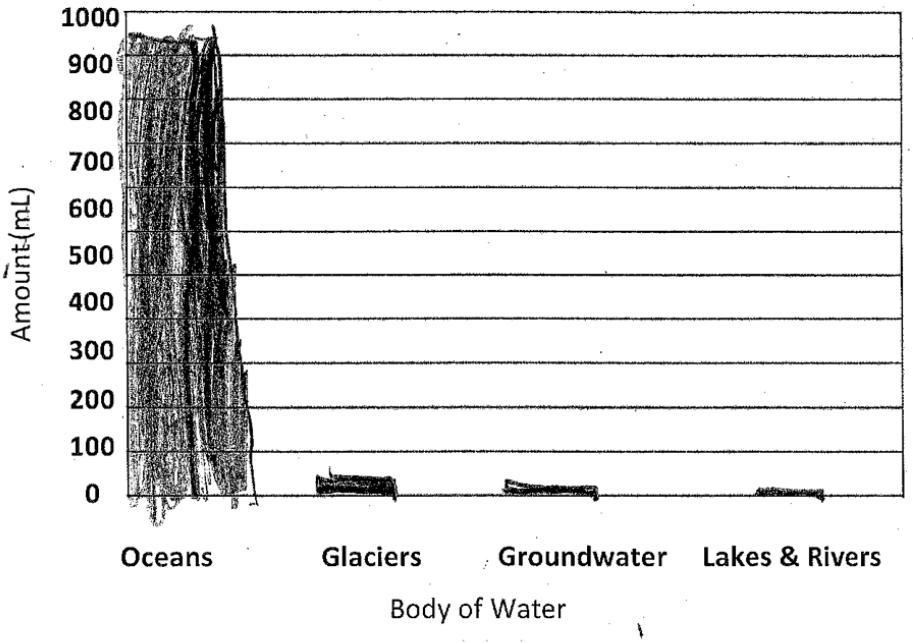
why important to save water why we need drink keep I life and you want die? I not want to, and important off water BY you fished wash your hand, and I not want live south a(

great idea to turn off the water when you don't need it so we don't waste.

Student C

Date: 4-11-18

Water Distribution



Most of the water on Earth is in oceans.

The largest supply of freshwater is in Yukon River

4-23-18

Student C

"Water Distribution"

X teacher teach about

We can use water

My groud guess People

can use water, 40%, &

X result People can use

water what 3%, 97% can't

usewater.

? People use water to

mean water will disaster

in 2050?

Name: Student C Date: 1/26/18

Ways We Use Water

My **direct** water use is showering, water plants washing hands drinking water.

My **indirect** water use is food (meat) paper bought plants products.

I was surprised about meat is have in water. ☹!

I wonder, how get cow's stomach 's Beef ?

Student C

Now it is the month of May and getting closer to summer when there are often more droughts! How can you change your water footprint and eating habits to conserve water? Why do these actions reduce use of water?

do not stay shower long
Because caring water, not eat meat
everyday because people feed water
to cow so then they must! veg,
fruits, we must caring
about water is important
why I need to drink water!

√ **Student D**

Name: [redacted] Date: 4-16-18

Water

What I Know	What I Want to Know	What I Learned
I know the world Earth has water. And how has water from Hydrosphere.	I wonder if have water in the world Earth How People can be dead Without water?	It's 3% water fresh! Paper from water. How to make are cutshirts white, put water, soggy some put paper, then get paper wet put the c and became paper.

Student D 4-17-18

gine California will run out of water this summer! Write a r to a friend explaining why it is important to save water.

Dear Grandpa Tom and Grandma ——,

We really poor the water in California! We really need your help! Or you can pick up left to California then become live in your house? Please? We're very thirsty!

Thank you!

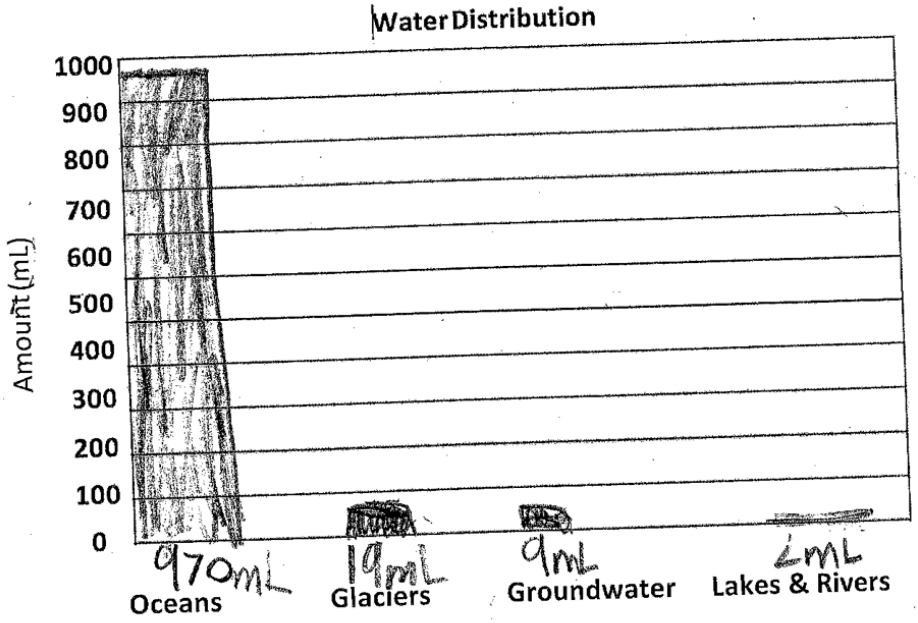
Love,
Family!

In Maryland

where do your grandparents live? Do they have a draught! Wonderful letter ☺

Student D

Date: 4-19-18



Most of the water on Earth is in Oceans.

The largest supply of freshwater is in Lake & Rivers

Student D

"Water Distribution"

I learn about water:

1. Not many fresh water only 3% fresh water.
2. In Africa very poor water!
3. In Africa people always must limit 2 mins for shower.

I wonder:

1. Some house was no water?
2.

Name: Student D Date: 4-26-18

Ways We Use Water

My direct water use is water drink, bath or shower, and washing hands

My indirect water use is paper, clothing, Plant, and food (meat).

I was surprised about gum, easer, and paper we are form water!

I wonder, how has ocean, Lake, and rain?

Student D

Now it is the month of May and getting closer to summer, when there are often more droughts! How can you change your water footprint and eating habits to conserve water? Why do these actions reduce use of water?

I'll drink in big rivers. Andwellmove live in Maryland and with my grandpa and grandma. Or eat watermoles, onrage, and rivers Why eat onrage, wactemoles, rivers. Because medt most lots water gallons.

Student E

ate: 4/16/18

Water

What I **K**now	What I **W**ant to Know	What I **L**earned
Water is very Important because it healthy and also for Surving. Some for the animals who drink water too and also can we Swim or Swimming or Water ballon fight.	I wonder why the Ocean water is Salt and now we get fresh water.	I learned that Some product that we don't see is acqua IIX made of water like paper, Erasers, Bubble gum, Steel, and Hotdog. I learned that meat is Water too. and I learned new Science words like water abundance.

Imagine California will run out of water this summer! Write a letter to a friend explaining why it is important to save water.

4/17/18

Dear **Student C**

wee need to save water because
it I mrortant to all people in the
world. weneedit for living and
it healtiy. it keep us hydrated.
if we dont have water we cant
die, if we playing recess and
we are tired we usally drink
water to hyrdated ourself and that
make ourselves feel good.
we should save water.

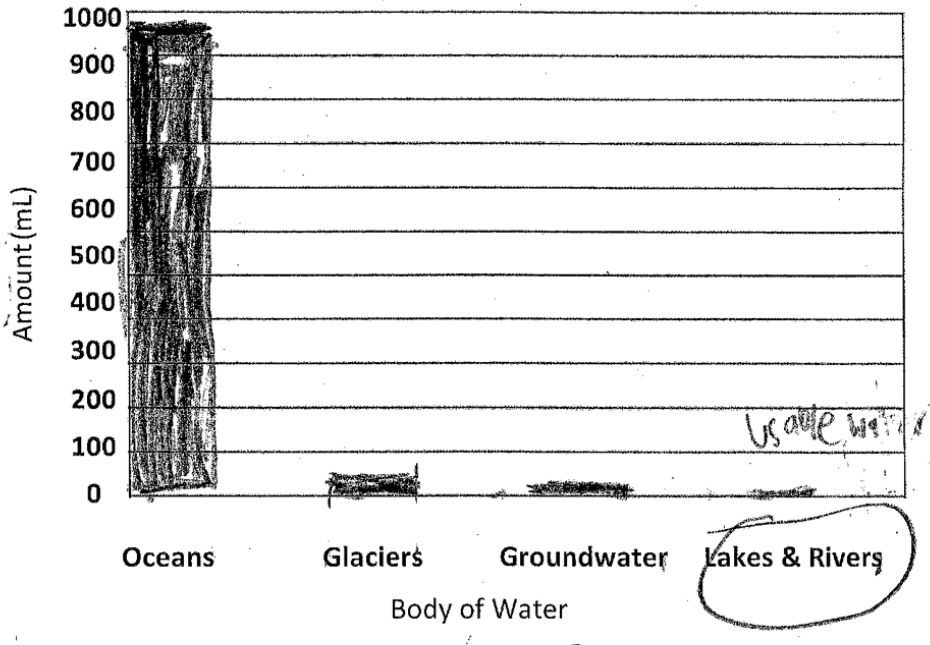
Sincelry, **Student E**

Great connection to keeping hydrated during recess!

Student E

Date: 4/10/18

Water Distribution



Most of the water on Earth is in Oceans.

The largest supply of freshwater is in lakes + rivers.

Water Distribution
4/23/18

Student E

I learned

1. I learned that most fresh water is lakes and rivers
2. I learned that Underground have water in it.
3. I learned that ice can form into water

I wonder...!

1. how water pool [illegible] it.
2. how water appear in earth. it.

Name: *Student E* Date: _____

Ways We Use Water

My **direct** water use is Showering, drinking water washing hands, and swimming.

My **indirect** water use is eating food from earth, paper glue, products, Eraser and cloth.

I was surprised about paper, ~~ham~~ hamburger or cheese burger beging water!

I wonder, Is ketchup made out of [illegible]?

Student E

Now it is the month of May and getting closer to summer, when there are often more droughts! How can you change your water footprint and eating habits to conserve water? Why do these actions reduce use of water? 5/1/18

Eat less meat and eat more vegetables and fruit. because meat IS had some water while Veg tables or fruit had lesser water and heatier and NOT turn out of water. like a hamburger had bunch of meat that had water so it takes a lot of water. still -vegetabes and fruit it heatier.

✓ **Student F**

Date: 4-16-18

Water

What I **K**now	What I **W**ant to Know	What I **L**earned
You need water to survive or else you will become dehydrated and We need water to clean ourself. Animals also need water to survive. Water is liquid, hydrosphere the earth	I want to know why we can't live without water. If we can drink water why can't we breath under water? Why is water liquid?	I learned what to save and what is waste. I also learned that we need water for planting and human and animals. Paper and meat has water. only 3 percent of usable water and 97 is NOT USABLE

Need water because the trees's root will not survive without water, and grass needs water

Why do we drool and it self is salina-water

Imagine California will run out of water this summer! Write a letter to a friend explaining why it is important to save water.

4-17-18

Student F

Dear, **Student M** I want to tell you a lot of reasons why we need water in California, ok.

What if there was a fire what would you do to get the fire out.

We could die of dehydration without Water your body will become a bone fast.

We definitely need water for plant's especially trees if we had no trees cause of water there will be NO AIR so everything will die.

Animals will die also with no Water means no pets ahhhhhh.

that is why we need WATER

sincerly,

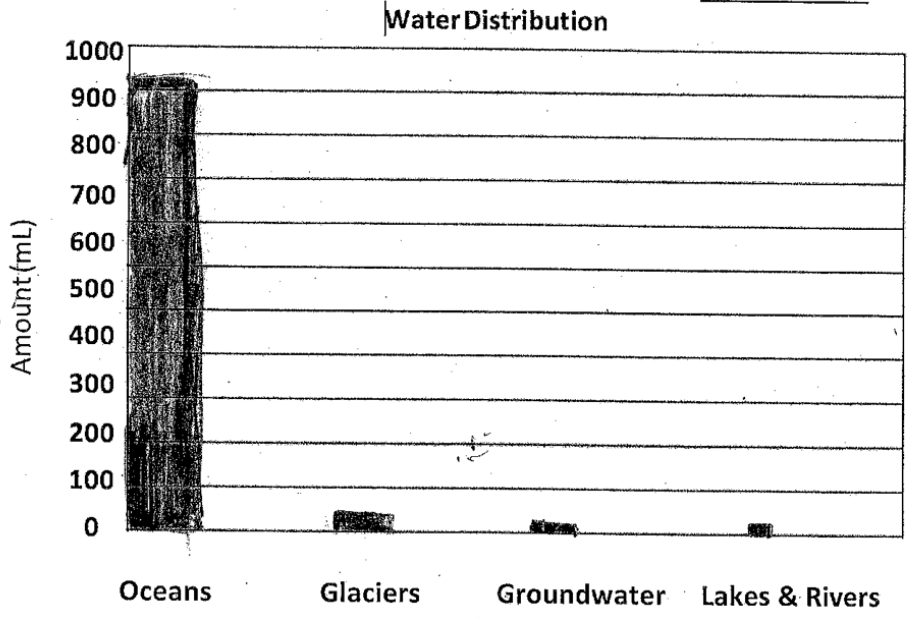
Student F

ok thank yous

great list of reasons why we need water!!

Student F

Date: 4/19/18



Most of the water on Earth is in Ocean.

The largest supply of freshwater is in lake & rivers.

Student F

Water distribution 4-23-18

"I learned"

X. I learned that there is 97 percent non-usable water and 3 percent of usable water!

X. I also learned that there was ground-water and I never knew that.

X. I have learned that Oceans have 980ml, glaciers have 19ml, groundwater has 9ml and lakes and river have 2mL.

"I wonder"

1. I wonder if we didn't need water at all

2. I wonder if there was no water at all not even glaciers

3. I wonder If We never had rain ever

Name: **Student F** Date: 26-18

Ways We Use Water

My **direct** water use is Watering plants every 3 days, filling up a bucket with rain water and use it for baths.

My **indirect** water use is food like for example, burgers, bubblegum, and bread. x

I was surprised about that Paper has Water in their ingredients !

I wonder, if Socks have water in their ingredients? ?

Student F 5-1-18

Now it is the month of May and getting closer to summer, when there are often more droughts! How can you change your water footprint and eating habits to conserve water? Why do these actions reduce use of water?

I could Stop eating meat and eat more fruits, vegatble.

I could Stop using a lot of papers for weird reasons and use my shinging.

I could take a 3 minut shower to save time and if it rains I'll get a big bucket to fill it up and put it in my bathtub.

I could water my plants 3x a day instead every day.

Lastly I would wash my pet 2x a month instead of 3x a week!! ♡

Student G

Date: 4/16/18

Water

What I Know	What I Want to Know	What I Learned
Water is hydrosphere. Water is important drink. ran use water for out. water can hot or cold. I swim in water. Live fish	I Wonder all water clear	I is cov off meat blood clean water hose off blood end fire drought eat meat e nd.

Imagine California will run out of water this summer! Write a letter to a friend explaining why it is important to save water.

Student G

Date: 4/17/18

Dear Elena

I for save. Why water not have run out need water more all people water pause not yet wait start drink all save good more all water very very Good successful WATER big

Sincerely,

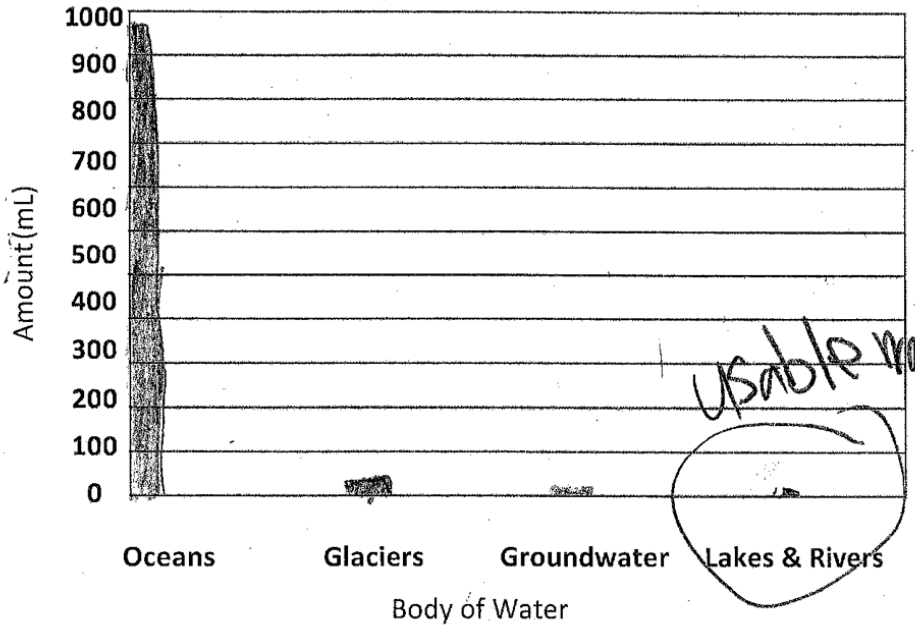
Student G

Nice writing! Do you think people should stop drinking water?

Student G

Date: 4/19/18

Water Distribution



Most of the water on Earth is in Oceans.

The largest supply of freshwater is in Lakes & River

Student G

Water Distribution
Date: 4/24/18

I learned

1. I water all oceans many water.
2. The water learned good Drink.
3. how to water are Hydrosphere too many

I Wonder.

1.
2.

Name: **Student G** Date:

Ways We Use Water

My direct water use is drinking water nice ice.

My indirect water use is ~~paper~~ wet dirty.

I was surprised about how to feed cow water!

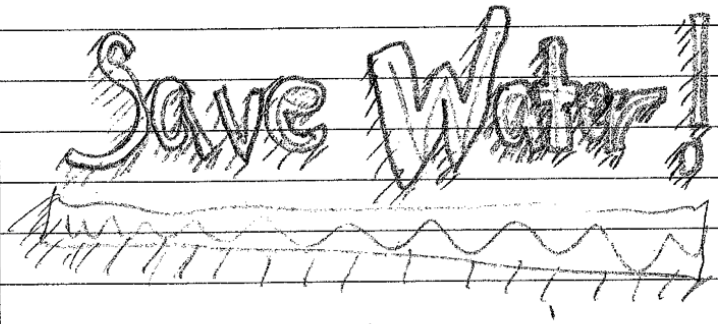
I wonder, how to water swin pool cold cly summer?

Student G

When there are more droughts, we need to save water! What are different ways you can save water and why?

The for right but water save good

drink droughts dirty need water
cold better can drink ok right
so many water save better all more
people good now happy save water



Student H

Date: 4/16/18

Water

What I **K**now	What I **W**ant to Know	What I **L**earned
I iS water SWim. I Water healthy.	What later mix Do the Poeple use chem to clean the water?	Cows Waste alot water becaqse of the food they eat.

Imagine California will run out of water this summer! Write a letter to a friend explaining why it is important to save water.

Student H

Dear Date 4/17/18

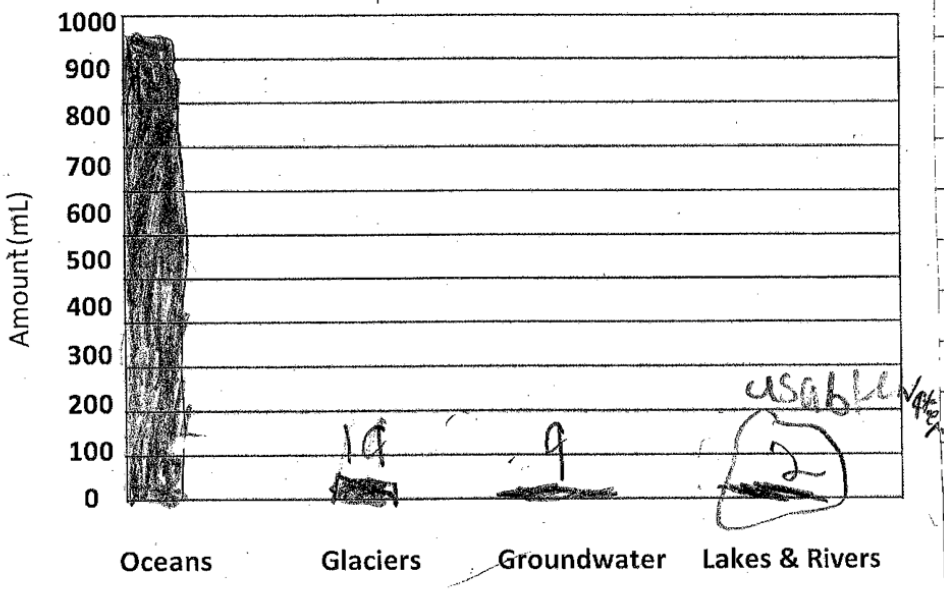
animal water summer
do sun water dry culd.

Yes, many things need water! How can we save water?

Student H

Date: _____

Water Distribution



Most of the water on Earth is in Oceans.

The largest supply of freshwater is in lakes + Rivers

4-23-18 Water Distribution

Student H

x I like to oceanswater.

x I to Sun Scarcty Water.

x

Name: Student H Date: 4-26-18

Ways We Use Water

My direct water use is showering.

My indirect water use is Water Plants

I lik can Waterplants.

I was surprised about drinking wat

I lik can Peaple!

I wonder, sick rain food C meat

I can water rain?

Student H

When there are more droughts, we need to save water! What are different ways you can save water and why?

Water the lawn less often.
Turn off the faucet while washing dishes.

Student I

Date: 4-16-18

Water

What I **K**now	What I **W**ant to Know	What I **L**earned
I Use water For Swim water is In The River water is important because For wash dishes	water in the Shower water for Dinking	water Connect to Oceans

Student I

Imagine California will run out of water this summer! Write a letter to a friend explaining why it is important to save water.

5/1/18

all The People, PLants, and animals Need water. to Live and Grow.

we Need to Learn about Safe water for our Benefits

We Close The faucet to not waste water.

Student I

Water Distribution

Date 4-23-18

I learned

1. you Drink water.
2. water for Swim.
3.

I wonder...?

1.
2.

Name: Student I , Date: _____

Ways We Use Water

My direct water use is for Dinking all Water.

My indirect water use is washing hands.

I was surprised about Water.

!

I wonder, Dinking water. I can ?

kids grow.

J

Student J

Date: 4-16-18

Water

What I Know	What I Want to Know	What I Learned
Water use Wash hand. Water use thirsty. Water use rain. Water use fountain. Water use Swim. Water use tired	Car wash Water drink Balloon Water	Ways we use Water Water Dis for write book oceans I fun enjoy. Cow body milk in cold get ice Cream

J

Student J

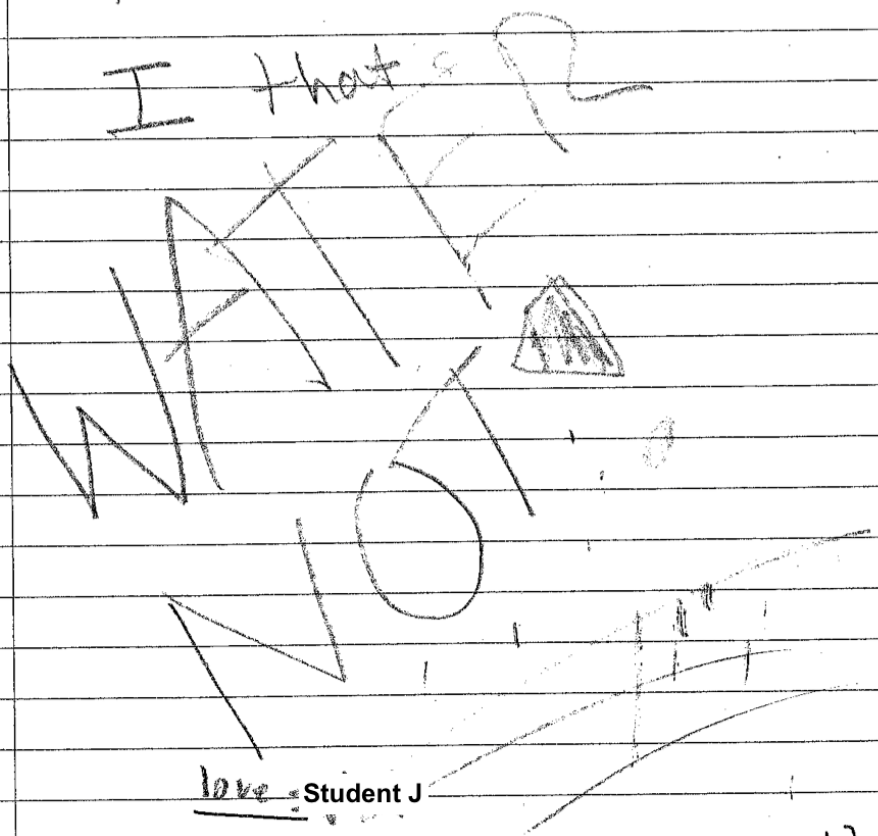
Imagine California will run out of water this summer! Write a letter to a friend explaining why it is important to save water.

love mom

4-18-13

I why happen water floor drought other I perfect water floor not drought Why Sun hot dry that water not have

I that



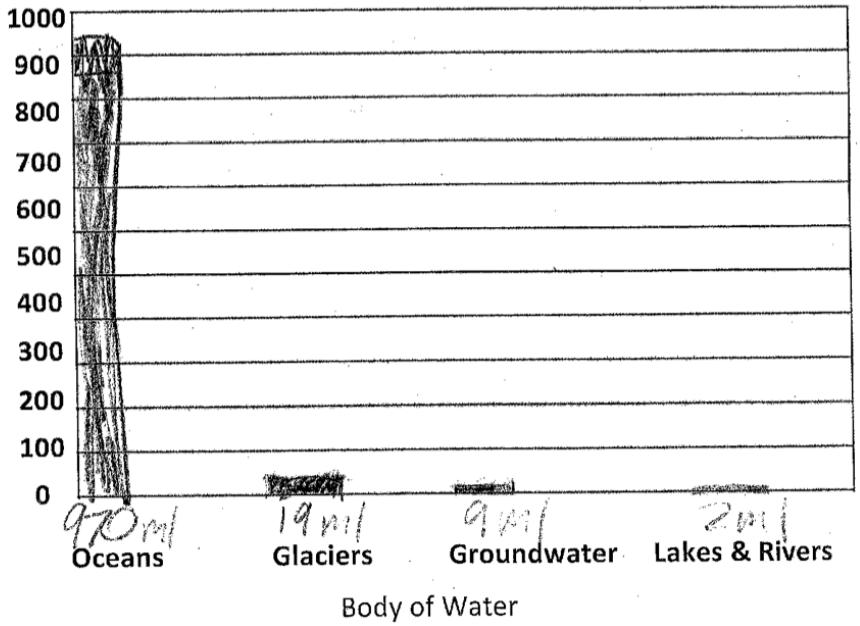
love Student J

Good description of drought. What should we do?

Student J

Date: 4-19-18

Water Distribution



Most of the water on Earth is in Oceans.

The largest supply of freshwater is in lake rivers

Student J

Water Distribution

4-23-18

Dear. play Swim.

I Learned.

- Why Ocean will cold
- I run ten want water drink.
- my play and time dinner my hand
- Mud need wash.

I Wonder ...?

- From Why all earth
- many water?

Name: Student J Date: 4-20-18

Ways We Use Water

My **direct** water use is Showering, Water plants, Wash hands, drink water.

My **indirect** water use is Food (meat), paper, bought plants, products.

I was surprised about for ipad video. talk Why happen vlogs !

I wonder, go I want water. pe I could play Water.

Student J

When there are more droughts, we need to save water! What are different ways you can save water and why?

I why Sunny hard I hot droughts every one Save Water floor up perfect were is Water caring to and happen Water down drought not is Save I don't know why Sunny more every. Water need eat meal, apple juice, rice.

Student K

Water

Date: 4/16/18

Water

What I **K**now	What I **W**ant to Know	What I **L**earned
Water is thirsty. tired. have water earth. have animals tired. rain have in water ice melt.	Can People drink Water is earth all	Paper. in have Water meat in Water.

Student K

Imagine California will run out of water this summer! Write a letter to a friend explaining why it is important to save water.

Date: 4/15

√

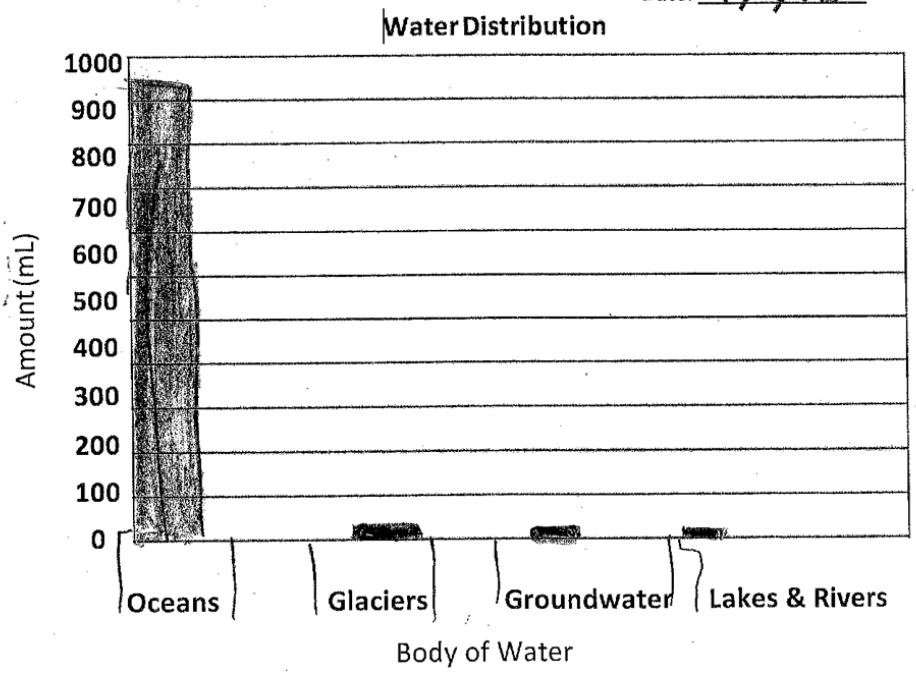
Dear friend.

It is important to save water. There are three reasons why to save water. First, if you be are thirsty, you will have plenty to drink and be satisfied. Next, you need water to wash dishes, take a shower and be clean. Last, the water is needed to irrigate fruit trees, plants, vegetables

Wonderful reasons why we need water! Yes, lots of water is needed to irrigate agriculture here in California.

Student K

Date: 4/19/18



Most of the water on Earth is in oceans.

The largest supply of freshwater is in Lakes&Rivers.

Student K

Date
4/27/18

Water Distribution

X my favorite Science equiments
X I go Play touch go class finish
go water need dehydraled

Student K

5/3/18

When there are more droughts, ~~We~~ we need to save water. What are different ways you can save water ~~and why?~~

We need to save water by different ways. You can save water turn off the tap. while brushing your teeth and washing your hands, don't leave the water running. Saves up to 20 litres per day. You can save water. take a shower of 5 minutes or less. Saves up to 70 litres per shower. You can save water. use a bucket of water to wash your car without a hosepipe. Saves more than 200 litres with each wash.

The End

Student L

Date: 4-16-18

Water

What I **K**now	What I **W**ant to Know	What I **L**earned
We need drink and help water. Some people not have water. Can help give at the on People and animals need use water. We need not and wash hand.	I wonder not have water. They can people ideas! And nothing? water need help water food bcst. need water without.	learn fun meat for learn how water many % and team learn about water can food meat has inside water and food about 3 did it 5mg why no meat.

Imagine California will run out of water this summer! Write a letter to a friend explaining why it is important to save water.

Student L

dent C; 4-17-18

Dear, Hello all people

All people care keep for water. We not want won't dead. Please not want less people. We need help drink water feel breathe help feel best water and need Shower because smell bad need good Shower. We care people big world care!

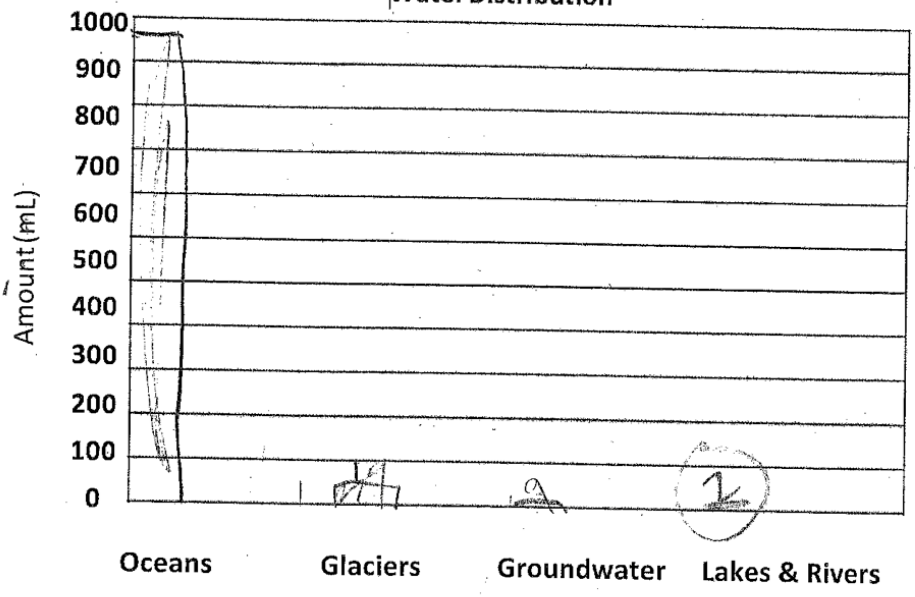
Sincerely,

Student L

Great message to all people! It is important to care for our world.

Student L

Date: 4-13-18



Most of the water on Earth is in Oceans.

The largest supply of freshwater is in Lake Rivers

Student L

Water distribution 4-23-18 // date:

Other big water abundance beause People drink feel help best and if People help for fire house.

I learn

1. help fire house
2. Need live animals
3. Need bastroom.

I wonder?

1 Ocean big other freshwater litter,
2 How People nothing water can de,
3. How start come water?

Name: Student L Date: 4-26-18

Ways We Use Water

My direct water use is Rain help water on the Plant.

My indirect water use is food Meat and Paper Gym. bread..

I was surprised about I like on the iPad Youtube how Paper!

I wonder, I wonder just die People wonder.?

Student L

When there are more droughts, we need to save water! What are different ways you can save water and why?

4-31-18

#1 we save beause wata can't stay on bath shoulder not lots, we short bath fast. And

#2 Not lots on wash box water wash redce can water can't wate.

#3 we can dead not good Shoalder wofer heAthey feel best Shoulder/ short for water.

Student M

Date: 4-16-18

Water

What I **K**now	What I **W**ant to Know	What I **L**earned
what is river. water is important Because live use water for Bath.	I wonder Want to live? need water Save. If no water not live.	Food need LOW meat. revir and Lake many what 2ml that wow. meat many will NO water. Pie chart that learned

Peper make that learned.

Student M

Imagine California will run out of water this summer! Write a letter to a friend explaining why it is important to save water.

4-17-18

Dear: **Student F**

if not Water can dead people.

I will water Buy Bottle 0 ten.

Tree no one water can dead.

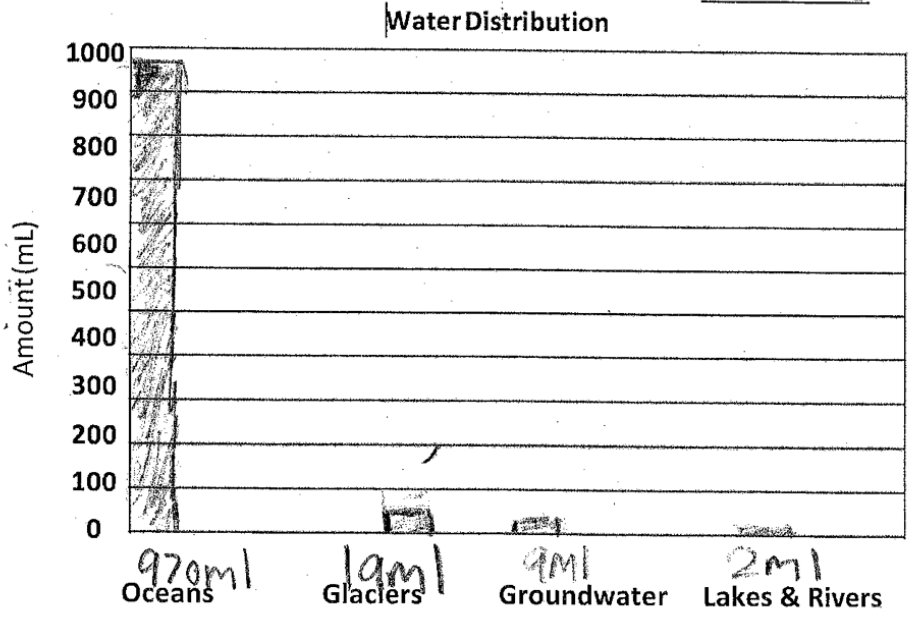
firend,

Student M

How long will ten water bottles last you?
Great work!

Student M

Date: 4-19-18



Most of the water on Earth is in Oceans.

The largest supply of freshwater is in Lakes and Rivers

Student M

Water Distribution

Date: 4-23-18

learned:

X learn. piechart that cool.
X oceans water abundance.
X

wonder

Why Water less Frash water

Student M

When there are more droughts, we need to save water! What are different ways you can save water and why?

1. If no water will die. it Keep.
2. Need it/ Keep water.
3. Low meat, Bath short and water care.
4. People save forver live.
5. People need good food. Need Low meat.