CAL WATER H2O CHALLENGE

Handbook for 4th Grade

2018-2019

Handbook

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Foreword

The Cal Water H_2O Challenge is a whole-class project-based, environmentally-focused competition for grade 4-6 students. **Cal Water H_2O Challenge** offers a unique opportunity for teachers to facilitate their students' learning of standards-based content, while developing the core understanding of environmental principles necessary to becoming science-literate citizens. Research indicates that interactive, collaborative, student-centered learning provides a meaningful way to make STEM come alive for students.

The program emphasizes Common Core State Standards-ELA (CCSS-ELA) and Mathematics (CCSS-M) and the Next Generation Science Standards (NGSS). It incorporates 21st century skills including the ability to identify problems connected with human activity, propose solutions based on research and evidence, and apply science in a local context to help solve both local and global concerns. As such **Cal Water H_2O Challenge** is a unique way to blend science, technology, engineering and mathematics (STEM) with English Language Arts and the Visual and Performing Arts.

Learning Goals

The Cal Water H_2O Challenge has three student goals. These goals are for students to:

1. Identify and focus on **one** water issue in their local area, learn about and investigate ways to address the issue, and develop and take action to improve the issue. This water issue must focus on caring for water (water conservation, water quality, protecting the water supply, etc.) in the local context.

2. Develop content understanding, through project-based learning, that align with CaCCSS in English-language arts, mathematics (and literacy in science and history/social science), science in the California Next Generation Science Standards (CaNGSS), and visual and performing arts.

3. Develop confidence and self-esteem in developing and completing a long-term project as informed problem solvers and decision makers.

The following CaCCSS, CaNGSS, and Visual and Performing Arts standards are strongly suggested as a starting point for identifying grade 4-6 student learning goals for **Cal Water H_2O Challenge**:

- Science: life, Earth and space, physical science and engineering performance expectations
- Mathematics: mathematical practices, number and quantity, statistics and probability, represent and interpret data, graphing

- English-Language Arts: writing, reading, speaking, and listening
- Visual and Performing Arts--creative expression and web-based technology Some examples of possible Cal Water H_2O Challenges include:
- Organize a water conservation program, which will continue in the future.
- Develop a way to protect the water quality in the community, your school or in your local area.
- Develop a water conservation program for families to use at home.
- Start a native plant garden, designed to be drought resistant, at your school to encourage schools, families and businesses to plant drought resistant plants.

Using the Cal Water H_2O Challenge Handbook

The Cal Water H_2O Challenge is a **student-driven project** in which the student's role is to plan, design, implement, publicize, and evaluate the impact of their Cal Water H_2O Challenge. Your role as the teacher is to facilitate the Challenge process. The **Cal Water** H_2O **Challenge Handbook** provides Teacher Outlines to facilitate the Challenge Process and Student Pages to guide student thinking, planning, activities and evaluation.

Challenge Process Flow

The following Teacher Outlines and Student Pages are suggested as a guide to complete **Cal Water** H_2O **Challenge**. The actual time for each part will vary depending on the topic and the complexity of the question the students are investigating:

Part 1 Brainstorm Topics

Students brainstorm possible topics for the Cal Water H_2O Challenge. Students will refine their Cal Water H_2O Challenge and questions after further content input in Part 2 and additional research in Part 3.
Estimated Teaching Time: 1 class period

Part 2 Do Some Science

When students have selected a preliminary topic, the teacher selects appropriate science standards to address as a foundation for students to begin their challenge. For example, if the Cal Water H_2O Challenge is about water quality, the students should understand the specific grade science content standards that address water quality.

In addition, if the students are doing an Engineering Problem, the teacher should select science concepts that are related to the problem. For example, if students will solve a problem about getting water out of a well, students should experience concepts from physical science (e.g., energy) in addition to concepts from life, earth or physical science that support understanding water quality.

It is important for students to understand science concepts before engaging on engineering problems.
Estimated Teaching Time: 1-3 class periods

Part 3 Select Topic and Refine Questions

Students use their knowledge from Part 2, their ideas from Part 1, and further investigation to refine their topic and Cal Water H_2O Challenge's investigation questions.
Estimated Teaching Time: 2-5 class periods spread over a couple of weeks

Part 4 Write Goals and Action Plan

With a refined topic and questions, students now determine the actual goal(s) of their Cal Water H_2O Challenge and describe their action plan to reach these goals.

Estimated Teaching Time: 1-3 class periods

Part 5 Conduct Research

During this part, students use many means of "research" to gather information about their Cal Water H_2O Challenge. This includes reading, internet searches, conducting interviews, having guest speakers, etc. It also includes learning about special components of the Cal Water H_2O Challenge. For example, if students are making community booklets, they would investigate how to design, print, and distribute the booklets.

Estimated Teaching Time: Many class periods spread over a few weeks depending on the complexity of the Cal Water H_2O Challenge

Part 6 Conduct Science Experiment

If the Cal Water H_2O Challenge lends itself to scientific experimentation where students can discover cause-and-effect relationships, Part 6 helps students learn the skills to conduct an experiment with controls and variables. Not all Cal Water H_2O Challenges have a testable question for experimentation. However, Cal Water H_2O Challenges with an experimental component are desirable.

Estimated Teaching Time: Several to many class periods depending on the complexity of the experiment(s)

Part 7 Do Engineering

Engaging in an Engineering Problem offers students the opportunity in engage in the Engineering Design Process and solve a real world problem.

Estimated Teaching Time: 1-3 class periods

Part 8 Synthesize Learning and Reflect on the Process

Students have been involved in many activities and investigations. Part 8 helps students summarize their findings and make conclusions about the effectiveness of their actions. This part also allows students to reflect on their efforts.

Estimated Teaching Time: 3-8 class periods spread over several weeks

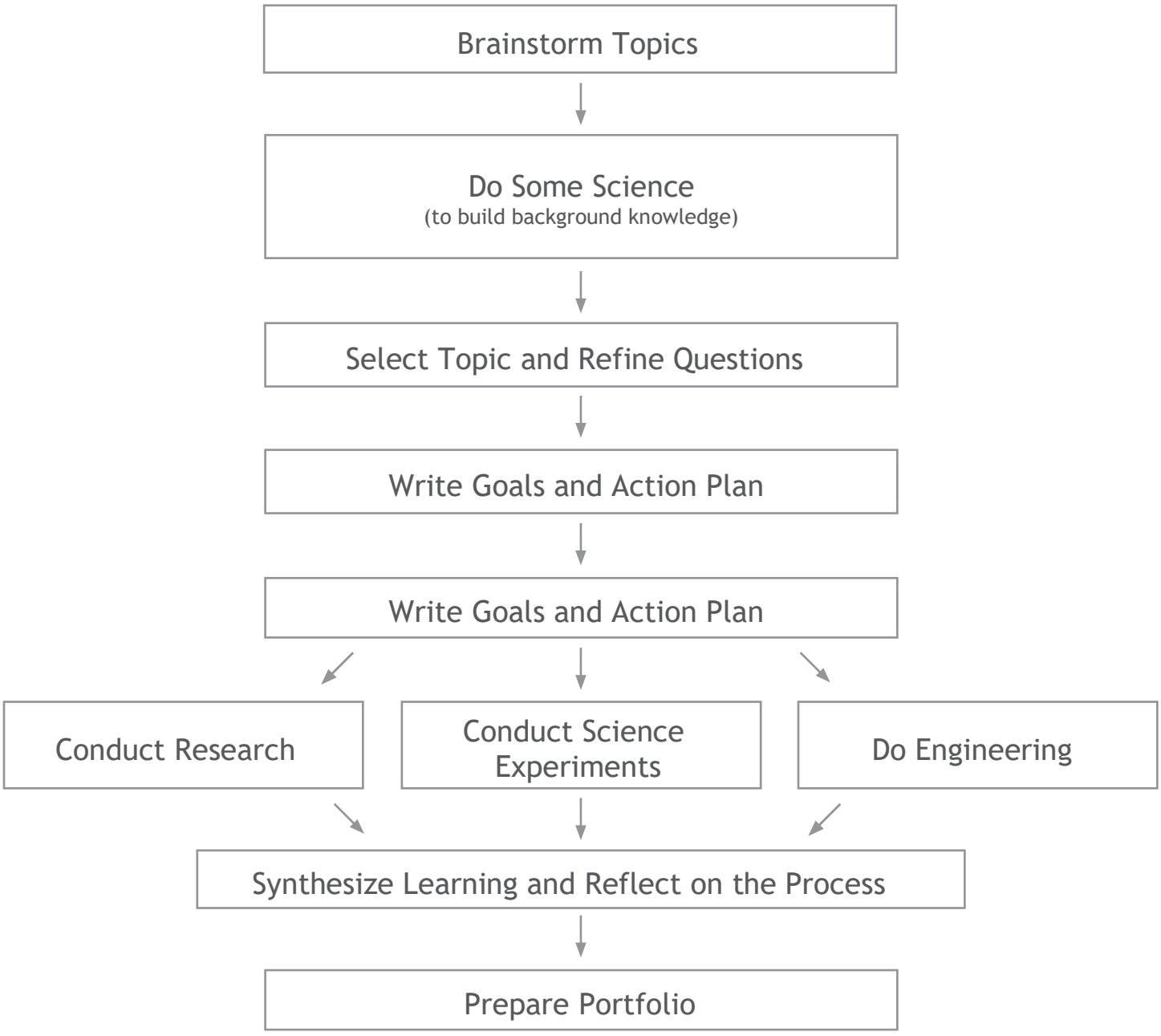
Part 9 Prepare Portfolio

The Cal Water H_2O Challenge is complete when it is displayed in a portfolio and submitted to the Cal Water H_2O Challenge. This part helps students think creatively about the best way to display their question(s), action plan, and findings as well as their hard work.

Estimated Teaching Time: 4-6 class periods spread over several weeks

Cal Water H_2O Challenge Flow

The Handbook provides a suggested "flow" of activities for students to complete their Cal Water H_2O Challenge. This graphic represents that flow. One of the three grey-scaled boxes must be part of the Cal Water H_2O Challenge. If possible, incorporate all three.



Part 1: Brainstorm Topics

Teacher Role: Facilitate student brainstorm of local water environmental issues (e.g., water usage, water conversation) as possible topics to research for the Cal Water H_2O Challenge.

Student Outcome: Students will select a preliminary topic to research for the Cal Water H_2O Challenge

Time: 40-60 minutes

Standards: CCSS ELA that help students clarify and support spoken ideas with evidence and examples.

Advance Preparation: Have students gather information about local water issues (e.g., newspaper, state agencies, local agencies, discuss with parents)

Outline

- Explain the Cal Water H_2O Challenge
- Ask students to discuss what is meant by an environmental issue, and then think about environmental issues that involve water.
- Divide the class into small working groups. Use **Student Page** for students to brainstorm their ideas and then star their top two choices. Ask groups to share their top two choices with the whole class. Tally student choices.
- Tally choices and have class vote for their top choice.
- Discuss how class might gather more information about the topic: Who can be called to come and give a talk? What local agencies should be contacted? Who might be an expert in this area? What books might be helpful?
- Make a class list of the suggestions.
- For homework, direct students to share the topic with their parents and get suggestions from them regarding a possible Cal Water H_2O Challenge project, information needed, and possible contacts. Add these suggestions to the class list.

Teacher Note: Retain the list of suggestions to use in Part 3.

CAL WATER H2O CHALLENGE TOPIC LIST

When choosing a topic for your Cal Water H_2O Challenge, you may decide on any local water issue for your class project, focusing around caring for water and studying water as a local and global resource. To help you brainstorm ideas, you can find a list of possible topics with sample project ideas below. You are by no means limited to this list, and may choose to tackle any local water issue even if it is not listed below.

- Water Conservation
  - Implementation of School/Community Wide Water Conservation Practices

- *Water Quality*
  - Drain Labeling
  - Informing Community About Safe Oil Disposal
  - Composting Instead of Usage of Garbage Disposals
  - Water Quality Testing as Research into Reclamation of Local Body of Water

- *Water Reliability*
  - Installing School/Community Water Catchment and Low Flow Devices for Water Preservation
  - Installation of a Tank Banks (Bricks or Bottles in Toilet Tanks to Reduce Water Usage) in School/Community Toilets

- *Alternative Water Sources*
  - Outreach on Waterless Car Washing
  - Outreach on Drought Tolerant and Xeriscape Planting
  - Replacement of Traditional Gardens with Drought Tolerant/Native Gardens

- *Water Cleanup*
  - Water Quality Testing as Research into Reclamation of Local Body of Water
  - Community Education around Where Drain Water Goes
  - Shore Clean Up of Water Body
  - Creation of a Water Garden in and around a Wetland Area

- *Protecting the Watershed*
  - Education and Outreach on Watershed Issues
  - Creation of Water Gardens in and around a Wetland Area

- *Other*
  - Any local issue involving caring for water within your community

Student Page

Brainstorming Your Cal Water H2O Challenge

What water topics would you like to investigate? In a brainstorm, list all your ideas.
Remember, in brainstorming, all ideas are IMPORTANT.
Think of as many as you can…
*STAR your top 2 ideas to share with the class!

Part 2: Do Some Science

Teacher Role: Facilitate student brainstorm of local water environmental issues (e.g., water usage, water conversation) as possible topics to research for the Cal Water H_2O Challenge.

Student Outcome: Students will understand the science behind their water issue.

Teacher Note: In the Appendix is a sample science lesson that a teacher might use to build science background for students before they get too far into the Cal Water H_2O Challenge. The actual lesson(s) will depend on the topic the students select, the NGSS the teacher has selected, and the amount of science background students will need to refine their Cal Water H_2O Challenge and questions in Part 3.

We provide one example of a background science lesson; however, it may be necessary to provide additional background science lessons to help students to fully understand the science learning to be gained through the Cal Water H_2O Challenge.

Part 3: Select Topic and Refine Questions

Teacher Role: Using student knowledge of science and their ideas from Part 1, facilitate students' discussions to refine their topic and the Cal Water H_2O Challenge's investigation questions.

Student Outcome: Students will select a topic to research for the Cal Water H_2O Challenge

Time: 40-60 minutes

Standards: CCSS-ELA
Speaking and Listening: Clarify and support spoken ideas with evidence and examples.

Reading Comprehension: Discern main ideas and concepts presented in texts; identify and assess evidence that supports those ideas. Draw inferences, conclusions, or generalizations about text and support them with textual evidence and prior knowledge.

Writing Strategies: Use argumentative or informational writing. Establish a topic, important ideas, or events in chronological order. Provide details and transitional expressions that link one paragraph to another in a clear line of thought. Offer a concluding paragraph that summarizes important ideas and details.

NGSS, CCSS-Mathematics and History Social Science
Depends on the content of the research

Advance Preparation: Determine who can be called to give a talk, what local agencies should be contacted who might be an expert in this area, what books might be helpful. Schedule speakers and gather materials.

Outline

- Have students refer to the topics that were brainstormed in Part 1.
- Of those topics, which ones might be useful or helpful for the community or school?
- Facilitate a discussion with the following questions: What could be the goal for the project? How will the project impact the community or school?
- Choose the topic for the Cal Water H_2O Challenge.

- Make a KWL chart and have students discuss what they know about the selected topic.
- Have groups research and report on possible questions they could address in the Cal Water H_2O Challenge.
- Have students record class questions on the Student Page.
- Share questions and select the most appropriate questions for the Cal Water H_2O Challenge. Write the questions in the "W" part of the KWL chart.
- Have students record the final questions in the next section of the Student Page.
- Have speakers address the students and questions in the KWL chart.
- Have students research questions generated in the "W" part of the KWL chart and share their findings. Fill in the "L" part of the KWL chart.
- Have students record their findings in the last section of the Student Page, "Here is what we found out".

Student Page

Selecting Questions for our Cal Water H2O Challenge

Do your RESEARCH and use your imagination to determine questions you would like to INVESTIGATE.

Here are our questions:

These are the questions our class decided to investigate:

Here is what we found out:

Part 4: Write Goals and Action Plan

Teacher Role: With a refined topic and questions, facilitate students to determine the actual goal(s) of their Cal Water H_2O Challenge, develop an action plan and a timeline that includes sustainability beyond the school year.

Student Outcome: Students will determine goals and develop an action plan

Time: 40-60 minutes

Standards: CCSS ELA that help students clarify and support spoken ideas with evidence and examples.

Advance Preparation: Determine resources necessary for doing the challenge and secure those resources and materials, pre-think some specific project goals to help guide the students (if necessary), consider ways to share the Cal Water H_2O Challenge with the community, plan for student reflections throughout the Cal Water H_2O Challenge.

Outline

- Help students determine the goals for the challenge. Make sure the goal is realistic and meaningful to the students.
- Facilitate discussion to determine goal(s).
- Have students record the goal(s) under number one on Student Page #1,
- Determine ways to analyze the impact of the challenge. How will we know our project did what we intended? How will this project impact the issue we selected?
- Have students record the evidence they will use to see if their project is successful under number two on Student Page #1.
- Have students' complete prompts 3 & 4 on Student Page #1
- Provide tools and resources for students to plan and conduct their project. Facilitate a discussion of needs for completion of the project and use Student Page #2 to help facilitate discussion and have students record ideas.
- Form student action committees such as publicity, funding, research, historian, materials and artwork.

- Help students develop an action plan (who/ does what/ by when): things to do, resources to use, people to contact, other. Use Student Page #3, and have students fill in as discussion proceeds.

- Make a large class chart of Student Page #4. As a class, determine what needs to be done and by when, the timeline. Have students fill in Student page #4 individually.

Student Page #1

Our Goal

1. Our Water quality or water conservation goal(s) is…

2. The evidence we will use to know that we me our goal is…

3. Our goal is important because…

Student Page #2

Planning the Cal Water H2O Challenge

Things to do:

Resources to use:

Equipment:

People to contact:

Other:

Student Page #3

Planning the Cal Water H2O Challenge

Activity	Persons Responsible	Materials Needed	Due Date

Student Page #4

Planning the Cal Water H2O Challenge Personal, Group or Class Timeline

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Part 5: Conduct Research

Teacher Role: Facilitate students conducting additional research on the selected topic/issue.

Student Outcome: Students will read, research, and record information related to the Cal Water H_2O Challenge; they will implement the action plan

Time: Over multiple class periods

Standards: Review standards for English-language arts, science, social studies and mathematics to align with actions for this part of the Cal Water H_2O Challenge.

Advance Preparation:

- Help students gather reliable sources (e.g., books, Internet, newspapers/magazines, field trips, interviews, local, state, and federal agencies).
- Consider having different groups monitor different activities, or completing a large class chart of the activities

Outline

- Review goals and action plan from Part 4 and remind students to record activities as they do them on Student Page Activity Record Log.

- Explain that students will be spending several class periods conducting additional research on their Cal Water H_2O Challenge and implementing their action plan.

- Have students conduct a pre-project observation to collect base-line data. Encourage students to sketch/write about the issue before it is addressed in the Cal Water H_2O Challenge. Have students record on Student Page: Pre Project Observations

- Display collected resources for students to use, determine the best ways to divide the information for student to research and have students record their notes on the Student Page.

- Help students decide on work groups (e.g. tour leaders, publicity committee, letter writing)

- Periodically provide time for students or groups to share information with the class.

- Display information for others to see and to have available during the course of implementing the Cal Water H_2O Challenge.

Student Page

Activity Record Log

Activity	Projected Outcome	Actual Outcome

Student Page

(Pre-Project Observations)

* Pre-project observations (include sketches)
Explain the problem and use diagrams to help with your explanation

Student Page

(Information you want to REMEMBER!!!)

* This is a place to keep your notes from your Cal Water H_2O Challenge RESEARCH, SURVEYS, ETC…

Part 6 Conduct Science Experiment

Teacher Note. One of the activities related to the Cal Water H_2O Challenge may include an experiment with variables and controls. If so, use Part 6

Teacher Role: Provide a series of activities to help students understand and apply each stage of the experimental design process to the Cal Water H_2O Challenge question(s).

Student Outcome: Conduct an experiment related to their Cal Water H_2O Challenge

Time: Several days.

Standards: NGSS Science and Engineering Practices

Advance Preparation: Collect all hands-on materials related to investigation.

Outline

- Review the Challenge questions. Discuss which could be answered by conducting an experiment. Choose those that are testable and indicate a cause-and-effect relationship.
- Discuss controls and variables. Have them identify possible manipulated (independent) and responding (dependent) variables.
- Ask students to develop a testable question by completing this prompt: "How will changing (the type of soil) affect (the amount of soil and water run-off)?" and record the question on the Student Page.
- Help students develop a hypothesis (a cause-and-effect relationship) by changing their testable question into an "if/then" statement.
- Help students plan (develop a procedure for the experiment) and carry out the investigation
- Help students graphically display their data, then analyze and interpret it on the Student Page
- Help students construct a scientific explanation that includes a claim (answer to the question being investigated), evidence that is appropriate and sufficient to supports the claim and scientific reasoning that backs up the evidence and record it on the Student Page
- Have students add their findings to the K-W-L chart AND the Activity Log.

Student Page

Conducting Water-Related Experiments (A)

Testable Question:

Observations:

Construct a data table and enter your data

Conducting Water-Related Experiments (b)

Construct a graph to display the data from your experiment.

Use the data from the experiment to make a claims and evidence statement.

I claim _____

My evidence is:

Part 7 Do Engineering

Teacher Role: Facilitate students engaging in the Engineering Design Process on a solution related to their Cal Water H_2O Challenge.

Student Outcome: Students will understand how engineers solve problems

Teacher Note: In the Appendix is a sample engineering lesson that a teacher might use. The actual lesson(s) will depend on the topic the students select, the NGSS the teacher has selected, and how the engineering problem relates to or builds on the science the students learned in Part 2.

Part 8: Synthesize Learning and Reflect on the Process

Teacher Role: Facilitate student discussions to summarize the findings from the Cal Water H_2O Challenge and reflect and evaluate the Cal Water H_2O Challenge's impact-and long-term benefit

Student Outcome: Students will summarize their findings and reflect and evaluate the goals at the completion of Cal Water H_2O Challenge

Time: Several class periods over a couple of weeks Part
I: Drawing Conclusions
Part II: Evaluating Impact

Standards: Review standards for English-language arts, science, social studies and mathematics to align with actions for this part of the Cal Water H_2O Challenge.

Advance Preparation: Have students gather their explanations (e.g., comments/learning from all parts), as well as from their Activity Logs, previous reflections, and any other prompts that were used to synthesize information.

Outline

Part I: Drawing Conclusions:

- Congratulate student for their hard work and perseverance. Explain the next step is to synthesize what they learned and reflect on the Cal Water H_2O Challenge.
- Help students review and organize their data from the Cal Water H_2O Challenge in a manner others can understand.
- Help students document their results (e.g., amount of water saved, how the water was saved, or potential water savings over time), using the Activity Logs, notes from research, preliminary conclusion sentence strips, reflections etc. Record on the Student Page.
- When the class has had an opportunity to review the information from all groups, divide the class into small groups (preferably that worked on different parts of the Challenge) and ask them to brainstorm 3-5 major things they learned that they think others would want to know.
- Have each group share their ideas, then build consensus for the 3-5 major findings that will be used in the portfolio. Record on the Student Page.

Part II Evaluating the Impact of the Cal Water H_2O Challenge

- Have students reflect on their learning. One way to do this is to have small groups of students discuss the following prompts, and then have them complete their individual reflection (Student Page).

    - What was the overall effect of the Cal Water H_2O Challenge?
    - What were some of the issues and successes observed through this Cal Water H_2O Challenge?
    - What were some of the educational benefits of doing this Cal Water H_2O Challenge?
    - What is the long-term water environmental benefit for students, parents, and/or the community as result of doing this Cal Water H_2O Challenge?
    - How have students grown/changed as a result of their participation? What responsible actions did they do, will continue to do now?
    - What are some possible next steps?

- Ask students how they would like to publicize their results to the school and to the community.

Teacher Note: Spread the word about your Cal Water H_2O Challenge! Invite the local press and the media to share your class's accomplishments. Involve the entire school, family members, friends and the community. Consider sharing your Cal Water H_2O Challenge with another school, at a board meeting, or other district professional development events.

Student Page

Evaluate the Cal Water H2O Challenge Group Reflection

Work in groups to review all your data, notes, and research.
Compare and contrast your Cal Water H_2O Challenge pre-observations with your post observations.

Evaluate your work:

- What are the 3-5 major things you learned about water that you think others would want to know?
- Brainstorm ideas with your group and list them on this page.
- Why was your Cal Water H_2O Challenge project important?

Student Page

Individual Reflections

Student Name _____

School _____

Teachers: Your students may continue their comments on a new page, if necessary.

1. What were the different activities you did to learn about and to understand the water issue your class chose?

2. What things did you do to participate in the Cal Water H_2O Challenge project?

3. What are the major accomplishments of your Cal Water H_2O Challenge project?

4. How has your thinking changed about water conservation?

5. What did you learn that you think others should know?

6. What personal actions will you change or what personal actions will you take as a result of this Cal Water H_2O Challenge?

Teacher Page

Teacher Reflection

Write a 1-2 page reflection on the project. Include the following:

- Describe the Cal Water H_2O Challenge project goal(s) and the overall EFFECTS.

- What were some of the CHALLENGES and SUCCESSES that you observed through your project?

- What were the educational benefits of the Cal Water H_2O Challenge for the students?

- What are some possible "next steps" for continuation of the Cal Water H_2O Challenge project?

- How has your Cal Water H_2O Challenge project impacted your targeted audience?

Part 9: Prepare Portfolio

Teacher Role: To facilitate and guide students in putting the class portfolio together; to generate other ideas for sharing their Cal Water H_2O Challenge.

Student Outcome: Students will compile artifacts and information to produce a completed portfolio.

Time: 4-6 Class periods over a period of several weeks.

Standards: Review standards for English-language arts and visual and performing arts to align with actions for this part of the Cal Water H_2O Challenge.

Advance Preparation:

- Collect all pictures and artifacts taken/created during the Cal Water H_2O Challenge.
- Complete Student Reflections and Teacher Reflection
- Make copies of the rubric (in Appendix) for each work group of students.

Teacher Note: The Cal Water H_2O Challenge judges are classroom teachers, selected individuals from the different environmental agencies, and science professional development providers. They are trained to use the rubric to objectively score the Cal Water H_2O Challenges. Thus it is important to help your students follow the rubric in assembling their portfolio.

Keep in mind that you and your students know your work best. Help your students tell their story clearly and concisely by making sure that all information included in the portfolio is linked to the Challenge's goals and action plan.

Outline

- Explain to students it is time for the whole class to put together a portfolio that shows the work that has been accomplished. Explain that they will work in groups to create the portfolio.

- Facilitate students selecting a work group: Who will do the "write-up" and explanation of how the Cal Water H_2O Challenge was selected? Who will do the goal and what did the class hoped to accomplish? Who will summarize the findings?

- Review the Portfolio Checklist (Student Page).

- Distribute the copy of the rubric to each work group. Ask students to review and discuss in their group what they think needs to be included for a high score. Make sure their discussion includes what photos, articles, and student communications would be important to include?

- As students work, make sure students are aware of the guiding questions for their portion and make sure those questions are addressed in their information.

- Have each work group share the information they have gathered and explain how each piece is important to be included in the portfolio.

- Ask students how they want to address the rubric for the portfolio presentation Chart students' ideas and have them decide how the portfolio is going to be finalized.

- Have work groups work on their portion of the portfolio and then assemble the whole portfolio. As a class, re-check the checklist to make sure that the portfolio is complete.

- Make copies. Hard copy portfolios will not be returned. Scan or take photographs of your portfolio for your records.

- Submit your portfolio to Cal Water by the deadline.

Student Page

Portfolio Checklist

Be sure to review this list prior to submitting your portfolio to Cal Water H_2O Challenge. Projects must be submitted or arrive by – **Thursday, February 28, 2019**

Portfolio Basics

Every project concludes with the creation and submission of a portfolio. In that portfolio the competing classroom's students must explain the following:

- The Goals of Cal Water H_2O Challenge Project
- Their Research
- Their Science and/or Engineering Experimentation/Application
- Their Actions to Solve a Local Water Issue
- Their Public/Community Outreach Efforts

Cal Water H_2O Challenge Portfolio Specifications

- Must be created in PowerPoint, Keynote, Presenter, or Prezi software (see the Cal Water H_2O Challenge website for version details).
- Digital Portfolio must be no more than 16 pages.
- Digital Pages must be at PowerPoint standard 10" x 7.5" in dimension.
- Hard Copy Portfolio may be no more than 16 pages, 8 pages front and back.
- Hard Copy pages may be no larger than 11" x 17".
- Must include 5-10 student reflections and a teacher reflection (student and teacher reflections are not counted as part of the 16 pages).
- The cover pages must be included and are not counted as part of the 16 pages. (Points will be docked if any of the documentation is missing).
- May include no more than 5 minutes of video.
- May include links but to no more than one class-created website.
- May include as many photographs as fit within the page constraints.

Your classroom portfolio should provide a clear description of your Cal Water H_2O Challenge. When creating your portfolio, be sure to think through the following criteria our judges will be looking for:

- How was your Cal Water H_2O Challenge project selected?
- What was the project goal and what did the class hope to accomplish?
- How was the Cal Water H_2O Challenge project implemented?
- Why was this Cal Water H_2O Challenge important?
- Evaluation of the Cal Water H_2O Challenge's impact?

Be sure to review **the scoring rubric** and judging criteria for detailed information on how your Cal Water H_2O Challenge portfolio will be evaluated and to understand the scoring process. The rubric can be found at the back of this handbook or on the Cal Water H_2O Challenge website.

Email Portfolios or Fileshare links to your portfolio to CalWaterChallenge@gmail.com
Hard Copy Portfolios can be mailed to: Cal Water H_2O Challenge
ATTN: Conservation Department
2632 West 237th Street
Torrance, CA 90505

2018-2019
Cal Water H2O Challenge Cover Sheet
PAGE 1

School Name: _____

District: _____ County: _____

School Mailing Address: _____

City: _____ State: _____ Zip Code: _____ Phone: _____

Teacher's Name: _____ Best Time to Call: _____

Teacher's e-mail: _____ Class Grade Level: _____

Number of Students in Class: _____ Last Day of School _____

Principal's Name: _____ Spring Break Dates: _____

Did you reach out to your entire school? ☐ Yes ☐ No

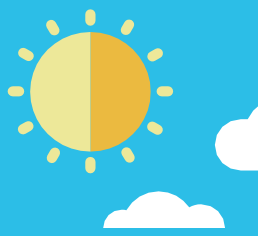
If yes, how many students attend your school? _____ If no, how many students did you reach? _____

Number of Community members reached by the Cal Water H_2O Challenge: _____

Cal Water H_2O Challenge Title: _____

Cal Water H_2O Challenge Summary:

2018-2019
Cal Water H2O Challenge Cover Sheet
PAGE 2

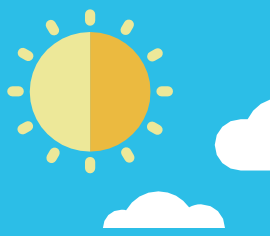


Project Goal(s):

Explain the significance, impact, or benefit of your Cal Water H_2O Challenge:

Unique school characteristics:

2018-2019
Cal Water H2O Challenge Cover Sheet
PAGE 3



Please list your class roster below with t-shirt sizes for yourself and each student

Appendices

Appendix A Science Lesson

Appendix B Engineering Lesson

Appendix C 8-Week Project Timeline

Appendix D Submission Guidelines

Appendix E Rubric

Appendix A: Science Lesson

4th Grade Vignette

An Example of How a Cal Water H_2O Challenge Might Unfold

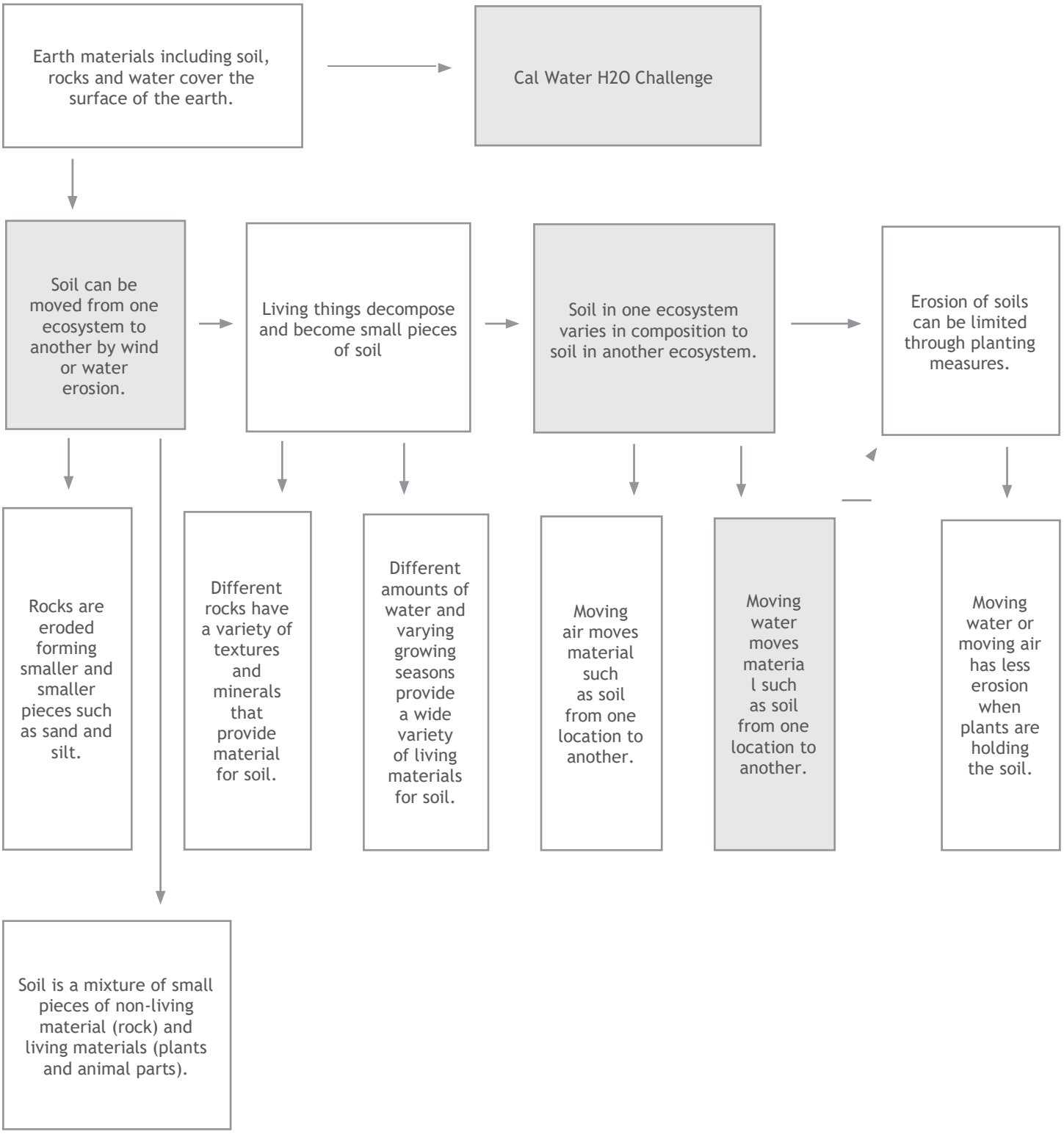
Sandy Waters, a 4th grade teacher in District USA, was excited about providing her students with a project- based learning experience that would integrate CCSS and NGSS and allow her students to use their creativity to demonstrate their learning. She read about the Cal Water H_2O Challenge, decided it was the perfect opportunity to meet her learning goals, and meet her and her students interest in water quality and conversation! She was unsure of exactly where to begin.

She knew that project-based learning takes time and she knew the importance of planning for student learning over time. So she decided to get a "jump start" by doing a little investigation of her own. Sandy realized that if she knew more about common water issues in her community, she would be able to help his students become more aware of local environmental issues. Sandy consulted the Cal Water H_2O Challenge web site https://www.calwater.com/conservation/conservation-resources/ to get a list of agencies and organizations that address water-related environmental issues.

Sandy reviewed the California CCSS for ELA and Mathematics
CCSS ELA - http://www.cde.ca.gov/be/st/ss/documents/finalelaccsstandards.pdf
and Math - http://www.cde.ca.gov/be/st/ss/documents/ccssmathstandardaug2013.pdf,
and CaNGSS - http://www.cde.ca.gov/pd/ca/sc/ngssintrod.asp that she thought might best be addressed in a project-based learning experience. She knew that this kind of learning would require English language arts (reading, writing, speaking and listening), mathematical practices as well as scientific and engineering practices. She knew the topic her students selected should resonate with one of the NGSS performance expectations for her grade level.
Sandy also recognized that she could incorporate the Visual and Performing Arts standards in how her students decided to design and display their portfolio. She consulted the Cal Water H_2O Challenge Handbook for handy hints on how to manage the Cal Water H_2O Challenge.

Sandy was now ready to prepare for teaching and facilitating the students' thinking and selection of a topic for their Cal Water H_2O Challenge. She used Lesson 1 to help students brainstorm possible topics. The students selected the broad topic of soil and erosion and its effects on local water quality.

With the students' topic as a foundation, Sandy identified the appropriate Next Generation Science Standards and developed a conceptual flow. This is Sandy's conceptual flow. The grey-shaded boxes represent the science content embedded in the students' topic. The language arts, math, and science and engineering practices will be addressed throughout the Cal Water H_2O Challenge.



Science and Engineering Practices: Ask questions; plan and conduct an investigation; analyze and interpret data; construct a scientific explanation or find a solution; obtain, evaluate and communicate information

Knowing what science concepts have to be reviewed or explored, Sandy is ready for Part 2 (which may be many Parts, depending on the science concepts necessary to build student understanding). The entire Cal Water H_2O Challenge addresses the understanding that "soil and erosion and its effects on local water quality." Part 2 addresses "moving water moves material such as soil from one location to another" from Sandy's conceptual flow.

Sandy continues to facilitate her class as they use their language arts skills and understanding to research and refine their questions in Part 3. Sandy's class found out that different soils erode differently and when they erode they carry other materials and contaminants that could impact the water quality in their community. They discovered that the community was unaware that new homes were planned in an area where flooding occurs during years of particularly high rainfall. They refined their questions to include: What makes the soil in certain areas more conducive to flooding than others? How often and when has flooding occurred? Are there contaminants in eroding soil? Homes that are flooded, are there contaminants from sewage in the flood runoff?

In Part 4, Sandy's class determines their Cal Water H_2O Challenge goals and action plan. The class wants to inform the community that flooding in certain areas of their community can affect the quality of the community's drinking water.

In Part 5 and 6 students combine their science and engineering practices, mathematical practices, and language skills as they investigate their selected Cal Water H_2O Challenge through research and experimentation. Sandy's class used the library, Internet and local environmental agencies to determine the impact. Students worked with the local agencies to collect data on where new homes and community buildings were being built and researched if any of the building was in known flood zones. The students charted and graphed the data, comparing it with other data released by the agency.

The class invited a local building inspector and someone from the planning department to share their work in regards to new building and the impacts on the local water. They even had a councilman explain how the city council was trying to be careful in their planning for new buildings in the community. The students asked questions in regards to flood zones in the area and the effects past flooding has had on the water quality in the community.

Through their research, students realized that if the local water was contaminated, they might need to find another source of water. In their community, well water is available, but they would have to use engineering to solve the problem of moving the water.

In Part 7, the students use the engineering design process (ask, imagine, plan, create, improve) to design a way to move well water.

In Part 8 and 9, the students synthesize their learning and think about ways in which to communicate what they have learned. Sandy's class prepared their findings, backed with evidence from their research and experimentation, and made a portfolio to submit

as their **Cal Water** H_2O **Challenge project.** They practiced their presentation, and shared their learning with other classes and at a PTA meeting. Sandy made sure that they also sent a copy of their findings to the city council. And, lastly, they celebrated their hard work!

Part 2:
Background Science Lesson(s) Based on Learning Goals

Teacher Note: This is a sample lesson that a teacher might use to build science background for students before they get too far into the Cal Water H_2O Challenge. The actual lesson(s) will be dependent on the topic the students select, the NGSS the teacher has selected, and the amount of science background students will need to refine their Cal Water H_2O Challenge and questions in Part 3.

We provide one example of a background science lesson; however, it may be necessary to provide additional background science lessons to help students to fully understand the science learning to be gained through the Cal Water H_2O Challenge.

This example is based on sandy Water's vignette. Sandy's students selected how different soils erode and the contaminants carried by soil erosion as their topic. sandy then selected the NGSS that addressed the importance of understanding the possible relationship between soil erosion and water quality.

Purpose: To connect student's prior knowledge of different types of soil.

Outcome: Students will identify which type of soil is best for not eroding in a strong rainstorm.

Time: 1-2 class periods

Materials:

- Science Notebooks (1 for each student)
- Large map of local region
- 5 different soils (sand, clay, potting mix, potting mix and pea gravel, sand and potting mix), each in a 1-gallon bucket
- Red food coloring for water contaminant (sewage) (Mix 1 small bottle red food coloring with 2 cups water)
- Syringe for depositing "sewage" into the soil
- 1 cup of contaminants (very small bits of Styrofoam, paper, cardboard, plastic pieces)
- 5 stream tables, or table-top stream set-ups

For each table group of students:

- 5 cups (8 oz.)
- 1/3 cup measuring cup (plastic or metal)
- 1 tablespoon
- Plastic spray bottle with 2 cups of water (this is the "rain")

Standards: 4-ESS2-1. Make observations and or/measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

DCI – ESS2.A: Earth Materials and Systems

- Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.

Advance Preparation:

1. Gather materials
2. Make enough copies of the data sheet for each student to have copies
3. Make a large class data table like the one below:

Sand	Clay	Potting Mix	50/50 gravel & potting mix	50/50 sand & potting mix
Contaminants: Yes/no What/How much:	Yes/no What/How much:	Contaminants: Yes/no What/How much:	Contaminants: Yes/no What/How much:	Contaminants: Yes/no What/How much:

Procedure:

1. Ask students, in a think-pair-share to recall what they remember about soil. List the various types of soil students suggest.
2. Ask partners to recall examples of erosion they have seen in the community or elsewhere. What did you notice about the soil where you have observed erosion? Ask, "Why do you think that erosion occurs? Does it have anything to do with the soil?" Have students share their responses at their table groups and then share with the whole class.
3. Introduce the importance of flood zones and the building of homes. Show students a large map of the local region. Ask the class, "Where are the flood zones in our region?" Mark the areas that are flood zones. Ask students what type of soil they think are in these zones. Chart their ideas and post for use at the end of the lesson.
4. Explain that today, each table group will investigate how different types of soil affect the rate of erosion and the amounts of contaminants in the soil. They will then discuss how their findings help them know more about the soils and how they erode.

5. Explain that when doing a scientific investigation, there are some important factors to keep in mind and procedures to be followed.
6. Introduce the word "variable" and explain that a variable is something that can be changed. So when setting up a scientific investigation it is important to keep everything constant and to have only one variable, only one thing that changes.
7. Explain that since the investigation is about different soils, the soils will be the variable in this investigation. The things that need to constant, or consistent, are: the amount of soil, the amount of water, and the incline. Make a chart of the constants and the variable to keep displayed in the room.

Constants	Variables
Amount of soil Amount of water Incline	Manipulated (independent) variable: Type of soil Responding (dependent) variable: Amount of soil and contaminants deposited

8. Distribute materials. Explain that each table group will have different soil and will put water on their soil and then measure how much soil eroded and if there are any contaminants in the water and soil that eroded.
9. Give each group of students their soil type and 1 tablespoon of solid contaminants to mix into their soil.
10. Have students set the stream table incline and put the allotted amount of soil at the top of the incline. Make sure all groups have their soil arranged the same.
11. Walk around the room and insert syringe into each soil set up and deposit 1 ounce of the "sewage" halfway down into the soil.
12. Distribute an observation data sheet to each student. Explain that they are going to record today's date in the appropriate box, then observe the soil.
13. Explain that scientific observations include measuring the soil area (e.g., height, width and depth), and the general look of the soil (rocks, plant material, etc.)
14. Ask students to do their first observation and record their data. Walk around the room and observe the other soils and record observations.
15. Ask groups to predict which soils they think will have the least erosion and why they think that. Have each group rank order their predictions from the best to the worst.

As a table group, write on a piece of paper their name and prediction order. Collect the papers and explain that they will get them back at the end of the investigation.

16. Remind the class that they need to control the amount of water that is dispersed at a time. Determine how fast the water will be sprayed on the soil. Use all the water.
17. Distribute "soil erosion data" sheet. Have students spray their soil. Then record their observations, including a picture, in the first box. Have students use the tablespoon to calculate the amount of soil that eroded and the amount of water run-off. Have students complete the whole data table.
18. Display class data recording chart.
19. Have students review their data on their given soil. Each group shares their data and record on class data table.
20. What are the trends they notice (e.g., how much soil was eroded)? Record the trends noticed on the class chart. Were there any contaminants in the run-off? How much? Repeat for all the other types of soil.
21. After all the data is recorded, ask "What trends do you notice?" "Which soil eroded the least?" "What is the evidence?" "What about contamination in the run-off?"

Teacher Note: Trends should show that soil that was clay or had rocks, eroded less. Ask students to review the data on the class charts and discuss in their table groups: "Which soil eroded the least?" "What is your evidence?"

Use the stem: Erosion is less in _____ soil. Our evidence is _____. Each table group shares.

22. Have students record their personal response to the above prompts.

23. Relate this activity to the placement of homes built in the area. Why are homes are located where they are. Using their data, ask students what type of soil is most likely found where there are no homes. How does this compare to prior their ideas?
24. Explain that flood zones are a result of not only the soil but also low points. Water always flows to the lowest point. Explain that water can be redirected or channeled in other directions, only as long as it keeps moving to a lower point.

Teacher Note: before teaching this lesson, Ms. Waters had students reviewed what they knew about the composition of soils. she then had students investigate the placement of new homes. she now felt that students had science background on which she could build to help them narrow their topic and refine their question in Part 3.

Date:_____

Soil Observations

Soil Type	Observations
Sand	
Clay	
Potting Mix	
50/50 Sand and Gravel	
50/50 Sand and Potting Mix	

Predictions on soil Erosion

Soil type

1. Least erosion	
2.	
3.	
4.	
5. Most erosion	

Name:_____

Date:_____

Soil Erosion Data

Erosion Observations:
Amount of soil that eroded:
Amount of water run-off: Contamination in the run-off? How do you know?
Contamination: What and how much:

Part 7: Engineering Lesson(s) based on Learning Goals

The following learning sequence is adapted from the Engineering is Elementary curriculum developed by the Museum of Science, Boston, Massachusetts

Teacher Note: This is a sample lesson that a teacher might use to build engineering background for students. The actual lesson(s) is dependent on the topic the students select, the NGSS that supports those concepts, and the amount of science background students need to investigate their Cal Water H_2O Challenge.

In Part 2, students learned about how different soils erode and the contaminants carried by soil erosion. In lessons 3-5 students refined their Cal Water H_2O Challenge, identified goals and an action plan and conducted research. Through those efforts, the students realized that they could use engineering to solve a problem.

The Engineering Problem is: if the community's water is contaminated, how can they get uncontaminated drinking water? The community discovered that they could obtain uncontaminated water is they drilled a well 10 miles from their present well. The problem is how to get the water up, with no access to electricity!

Ms. Waters added a few lessons to address science concepts about energy so that her students could proceed with their engineering design to construct windmills to generate electricity to pump the water out of the well.

Purpose: To test various materials to be used in solving an engineering design challenge.

Outcome: Students will describe the properties of various materials and test them for possible use in the engineering design challenge.

Time:

- Part 1: 1 class period
- Part 2: 1-2 class periods

Materials:

Part 1

- Chart paper
- Marking pens
- Large box fan

Materials for making a "raft" for testing sails (2 pieces of fishing line 8ft each, 1 foam tray 4"x6", 2 plastic drinking straws, duct tape)

For each set of partners:
- 1 Craft stick
- 1 Coffee stirrer
- 1 3x5 Index card
- 1 Sheet of copy paper (8 1/2x11)
- 1 Sheet tissue paper (12”x12”)
- 1 Sheet aluminum foil (12”x12”)
- 1 Sheet wax paper (12”x12”)
- 1 Piece of felt (12”x12”)
- 1 Plastic grocery bag
- 1 Paper cup (3 or 5 oz.)
- Roll of cellophane tape

Part 2
Science notebooks (1 per student)

For the windmill testing:
- Box fan
- 2-3 Two-quart juice cartons
- 2-3 Dowels 12” x ¼”
- 3 oz. Cups for hold weights
- String for attaching cup to dowel
- Bendable metal wire to attach cup to string
- Washers or pennies for weights

For each table group of students: Materials from Part 1
1 Foam ball, hard, 3” diameter

At a side table - More materials available for use: coffee stirrers, craft sticks, tape, 3 oz. cups, index cards, foil, copy paper

Standards: Common Core Language Arts Standards that help students clarify and support spoken ideas with evidence and examples.

4-Ps3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

DCI – Ps3.b: Conservation of Energy and Energy Transfer

- Energy can also be transferred from place to place by electrical currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.

3-5 NGSS Engineering Standards:

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.

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.

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.

Advance Preparation:

1. Gather materials for testing and put into baggies for each set of partners.
2. Make the raft for testing sail designs, see R1
3. Set up the raft between two chairs and in front of the box fan
4. Make windmill base, see R2
5. Review R3 Engineering Design Process

Procedure:

Part 1 Testing Materials

1. Have students think about their answer to the following prompt: "There is an issue in a neighboring community that does not have access to enough fresh drinking water". Have students share their response with a partner. Have partner groups share their responses with the entire class. Chart student responses. Facilitate a discussion to help students think about the issue and what might be some ways to resolve their problem. Allow 10 minutes.

Teacher Note: Possible student responses may include: problems of dehydration, problems with bathing and cleanliness, lack of water, lack of water to grow food.

2. Brainstorm some specific ideas of ways to solve the problem:

- Have students do a think-pair-share of possible ways to get water to the community.
- Ask students to do a quick-write on a possible way to get water to the community. Ask students to include a rationale for their choice.

3. Inform students that one way to get water to the community is to dig a well and pump the water up. There is a company who is willing to dig the well, but what they need is for someone to design a windmill that can bring the water up from the bottom of the well.

4. Explain that sailboats use the wind to move the boat. What are the properties of a sail affect how well it catches the wind? Chart student responses.
   - What are some properties of a sail?
   - Which properties are most important for catching the wind?
   - How do you think we could test our predictions?
5. Explain to students that today they will be testing the properties of different materials they will be able to use for making sails.

Teacher Note: Make a class chart like the following:

Materials and their Properties	
Material	Properties
Felt Wax paper Alum foil Index card Tissue paper Plastic grocery bag Copy paper Paper cup	

6. Distribute baggies of materials to each set of partners. For each item, ask students to list some of their properties. If students have difficulty listing properties, ask the following questions:
   - Is the material heavy or light?
   - What color is it?
   - Is it stiff or floppy?
   - Is it clear or opaque?
   - Is it malleable (easily bended)?
   - Does it hold its shape if it is bended?
7. Ask, which properties do you think will be important when making a sail? Why?
8. Using materials in the baggie, have students work in partners to design and create sails to test. Explain that the sail must be attached to the flat side of the craft stick so it can be tested. Have students test several sail designs.
9. As students design a sail, test it on the raft on medium speed of the fan.
   - Does the raft move?
   - How fast does the raft move?
   - How far does the raft move?
   - How would you re-design your sail? And why?

10. After testing, ask, “What properties of a sail affect how well it catches the wind?”
    - Which materials made the best sails?
    - What properties do those materials have in common?
    - What do you think is the most important property to think about when designing a sail?
11. Explain that in the next session, students will take their knowledge of materials and their properties to design windmill blades to bring water up from the bottom of a well.

Part 2 Engineering Design

12. Ask students, in a think-pair-share to recall what they remember about materials that catch the wind. What properties were important for catching the wind? Chart responses.
13. Explain to students that their challenge is to make windmill blades that when turning, will pick up the most weights (water).

Teacher Note: The Engineering Design Process has five major components (see R2 for details)- Ask, Imagine, Plan, Create, Improve.

14. ASK! – What questions do you have before we start? Chart all the students’ questions. Facilitate the discussion with students by prompting so they ask questions like:
    - What materials can we use to make our windmill?
    - How much time do we have to build the windmill?
    - How will we know if our windmill works?
15. Explain the “criteria” for a successful windmill is that their windmill must raise a cup filled with 10 washers. They may use any materials that they tested and materials on the side table. Give each set of partners a foam ball for attaching their windmill blades. Give the students a set amount of time for building their windmill blades for testing (suggestion 10-15 minutes).
16. IMAGINE! - Have students work in pairs to brainstorm and design windmill blades.
17. PLAN! - Students should draw pictures of their blade designs, label the parts, and list the materials they will use.
18. CREATE! - Students should first attach each blade to a craft stick using tape, then secure each blade to the hub (foam ball) by gently pushing the craft sticks or coffee stirrers into the foam ball. Once students have designed their blades and attached them to the hub, they are ready for testing.
19. First, ask students to test the windmill blades without any weights in the small paper cup. If the rotor successfully spins, then add weights, one at a time, to see how many weights the windmill can lift. Keep a chart of student names and how many weights their windmill blades lifted.

20. After everyone has tested their windmill blades, direct the class to discuss testing results. Which windmill blades lifted the most weights
21. Review and compare the windmill blade designs – why do you think this design lifted the most weights? What materials were used? What is the shape of the blades? Why do you think this design worked well?
22. IMPROVE! – Have students write on a piece of paper or in their notebooks how they would improve their windmill design and explain why this improvement would be better than their original design.
23. Have students write a letter to the community who needs a windmill to retrieve the water out of a well explaining how their windmill design can solve their problem.

R1

Making the Raft

Materials:

- Foam meat tray that has a flat inside at least 4” x 6”
- Tape
- 2 plastic straws (not flexible)

1. Cut a 4” x 6” rectangle from a foam tray.

2. Use cellophane tape to attach each straw to the bottom or edge on the 6” side of the tray. The straws need to be straight and parallel.

3. Reinforce the middle part of the raft by taping two 1” square scraps from the foam tray, one on the top and one on the underside, in the middle of the tray.

4. Cut a slit through the center of the raft (through all three foam pieces) creating a space where the masts will be inserted. Make the slit just large enough to firmly hold a craft stick.

5. To make the fishing line track, first place two rulers parallel to one another. Make two marks on each ruler, making sure the distance apart is equal to the distance between the two straws on the raft. These lines will be the guide for attaching the fishing line tracks.

6. For the track, cut two 8’ to 10’ pieces of fishing line. Tie one end of each piece directly on top of the lines on the ruler. Secure the fishing line to the ruler with masking tape or duct tape. Run each piece of fishing line through one of the straws attached to the bottom/side of the raft, then tie to the other ruler and attach with masking tape or duct tape.

7. Have two chairs; secure each ruler to the back of a chair and pull the chairs apart so that the fishing line track is taut. It is important that the track is level and taut in order to properly function.

8. Place the fan at one end of the track, aligning one edge of the track with the edge of the fan, not the center, the center of the fan produces too much turbulence.

R2

Making the Windmill base

Materials:

- Clean 2-quart juice carton
- 12’ dowel (1/4” diameter)
- 1 washer (large enough hole to fit over the dowel)
- 15” string
- 3 oz. or 5 oz. cup
- pennies or washers for weights

1. Use a clean juice carton. Make 2 holes, one each on both the front and back of the carton, to send the main driveshaft (dowel) through the windmill base (juice carton). The holes must precisely align, or the driveshaft (dowel) will not spin correctly. Make the holes slightly larger than the dowel so that it spins freely.

2. Put weights (e.g., sand, water, gravel) inside the carton so that the carton will not tip over during the testing.

4. Insert the dowel through the holes and test to make sure it spins freely.

5. Tie the string to the dowel where it emerges from the back of the carton. Use masking tape to secure the string on the dowel. Attach the small cup to this string so that students can add weights during the test process. The cup should hang approximately 12” below the dowel.

Teacher Resource

Engineering Design Processes Notes

Engineering designs are usually documented in a formal report that details the process. Often, the report makes references to "raw" notes that were kept in an engineering log. Although the steps of engineering design process are not necessarily sequential, the report is usually written with these components:

Process	Activity
Ask	What's the problem? What have others done? What are the constraints?
Imagine	What could be some solutions? Brainstorm ideas. Choose the best idea
Plan	Draw diagrams. Make a list of needed materials.
Create	Follow your plan and create it. Test it out.
Improve	Make your design even better.

CAL WATER H2O CHALLENGE
8-WEEK PROJECT TIMELINE

The following timeline uses an 8-week schedule but can be compressed into 4 weeks or expanded into 16 weeks or more at your discretion.

Week 1: Choose a Topic
Students brainstorm possible water-related topics for the class project.

Week 1-2: Background Science Lessons, & Project Selection
Select and teach appropriate science standards to support chosen water-related topic. Students can refine their selected topic and draft investigative questions.

Week 2-3: Develop Project Goals and Plan
Students draft project goals and a plan to meet those goals.

Week 3-6: Conduct Research and implement Plan
Students research their selected project using various sources and methods and take action based on their plan.

Week 5-6: Conduct an Experiment
If applicable, students conduct an experiment around their water-related issue.

Week 6-7: Reflections
The classroom, both students and teachers, summarize findings and reflect upon their project actions and outcomes.

Week 7-8: Create Portfolio
Students design and develop their portfolio to best illustrate the questions, plan, and findings of the water-related project.

https://challenge.calwater.com

Submissions Guidelines

Overview

You've finished your project and now you're ready to submit it to the Cal Water H_2O Challenge! Congratulations! Follow our guide below to find out what your submission must entail, how to package your files, and how to submit your project to the competition. You will also find our contact information; in case you have any trouble with the submission process. All documents referenced can be found at: https://challenge.calwater.com/resources.htm Remember that final submissions must be submitted or postmarked by 11:59 PM PST, February 28, 2019.

We hope that you have fun creating your portfolio, and we look forward to reading your classroom's submission.

Step-by-Step

1. **Review the Checklist:** Before getting started, please review the Cal Water H_2O Challenge Portfolio Checklist. This PDF explains the basic subject matter covered by a portfolio and its specifications.
2. **Review the Rubric:** This document provides detailed information on how your Cal Water H_2O Challenge portfolio will be evaluated.
3. **Create Your Portfolio:** Students should create the classroom portfolio to the specifications found in the Portfolio Checklist. For an example of how you might format your portfolio, please see the Portfolio Sample.
4. **Save Your Portfolio:** If you created your portfolio digitally in PowerPoint, Keynote, Presenter, or Prezi, you need to save it as the proper file type. We accept native files for the programs listed below. If you have an older version of the software, please save the file as a PDF or contact us at CalWaterChallenge@gmail.com if you are having trouble saving as an accepted format.
    a. Microsoft PowerPoint: Version 12+
    b. Keynote: Version 5+
    c. Adobe Presenter: Version 8+
    d. Prezi: Export as PDF.
5. **Save / Submit Your Supplementary Materials:** With your portfolio submission you must include:
    a. Coversheet (pages 1-3)
    b. Teacher reflection
    c. 5-10 student reflections

    If working digitally, these files may be saved within your portfolio or as separate PDF files. If submitting a hard copy, these documents should be attached to your portfolio, and will not count against your page count.

6. **Submit Your Files:** Final submissions must be submitted or postmarked by 11:59 PM PST, February 28, 2017.
   Digital Submission
   a. Either attach all files to an email or a fileshare program of your choice (such as DropBox). They should include:
      i. Portfolio file or PDF (if this includes your supplementary materials, it will be the only file)
      ii. Cover Sheet PDF (pages 1 & 2)
      iii. Teacher Reflection PDF
      iv. 5-10 Student Reflections PDFs

      Note: No additional files may be included in your submission package -- all supporting media (photos, videos, articles, etc.) must be included within the portfolio itself or the one allowed, class-created website. The link to any supporting website must also be contained within the portfolio.

   b. Email Cal Water the files and/or a link to the fileshare where we can download the files.
      Send all emails to CalWaterChallenge@gmail.com
   c. If you have trouble uploading your files, email us CalWaterChallenge@gmail.com and we will help you with your submission.

   Hard Copy Submission
   a Check that all required documents are included.
      i. Portfolio
      ii. Cover Sheet (pages 1 & 2)
      iii. Teacher Reflection
      iv.5-10 Student Reflections Note: No additional files may be included in your submission package -- all supporting media (photos, videos, articles, etc.) must be included within the portfolio itself or the one allowed, class-created website. The link to any supporting website must also be contained within the portfolio.

   b. Mail the documents to the following address with a postmark no later than February 28, 2018.
      Cal Water H_2O Challenge
      ATTN: Conservation Department
      2632 West 237th Street
      Torrance, CA 90505

7. **Follow-Up:** We will contact you after we receive your submission. If you do not hear from us within two business days please contact us at CalWaterChallenge@gmail.com.
8. **Having Trouble:** If you are having trouble with any portion of this submission process, please reach out using the contact information above. We are happy to help.

Cal Water H2O Challenge Rubric

School Name	School District	Grade Level	Evaluator Name and Number

Teacher Name	Cal Water H2O Challenge Project Name	Total Score

	POSSIBLE POINTS	SCORE
1. Cal Water H2O Challenge Impact (40 Points)		
A. Importance of Cal Water H2O Challenge Topic	15	
B. Action Plan	10	
C. Long Term Environmental Impact	15	
2. Impact ON STUDENT Learning (45 Points)		
A. Integral to Student Learning	15	
B. Student Participation	15	
C. Student Reflection	15	
3. Presentation (10 Points)		
A. Overall Quality of the Presentation of the Portfolio	10	
4. Impact ON Teacher Practice (5 Points)		
A. Teacher Reflection	5	

Grand Total

COMPONENT #1:
Cal Water H2O Challenge Impact
(Total possible points: 40)

A. Importance of Cal Water H2O Challenge Topic
(Total possible points: 15)

Guiding Questions:

- Why did the class choose to do this Cal Water H_2O Challenge?
- Why would this Cal Water H_2O Challenge be important to the school and community?

15 Points	10 Points	5 Points	1 Point
Cal Water H2O Challenge **FULLY DEMONSTRATES** student understanding of **ONE** key water issue or concern in the school AND local community based on science concepts with evidence that the topic of the Cal Water H2O Challenge is important to the community and school and addresses California's water supply.	Cal Water H2O Challenge **FULLY DEMONSTRATES** student understanding of **ONE** key water issue or concern in school OR local community based on science concepts with limited evidence that the topic of the Cal Water H2O Challenge is important to the community OR school and addresses California's water supply.	Cal Water H2O Challenge **DEMONSTRATES LIMITED** student understanding of **ONE** key water issue or concern in school and/or local community based on science concepts with some or little evidence that that topic of the Cal Water H2O Challenge is important to the community/school and may or may not address California's water supply.	Cal Water H2O Challenge includes **MORE THAN ONE** key water issues with multiple activities that may or may not connect to one another with some or little evidence that that topic of the Cal Water H2O Challenge is important to the community/ school and may or may not address California's water supply.

Use specific evidence from the portfolio to support your score.

POINTS

COMPONENT #1:
Cal Water H2O Challenge Impact
(Total possible points: 40)

B. action Plan
(Total possible points: 10)

Guiding Questions:
- What is the relationship between the goals, action plan and outcomes?
- How were results communicated to the school and community?

10 Points	5 Points	1 Point
There is a **Clear LINK** from the goals to the action plan and to the outcomes to address the identified water issue and Actions/activities of the Cal Water H2O Challenge **Are Based** on sound scientific principles related to the topic and Findings and applications from actions/activities **are Communicated to** school **and** community	There is a **Clear OR Moderate LINK** from the goals to the action plan and to the outcomes to address the identified water issue and Actions/activities of the Cal Water H2O Challenge **Are Based** on sound scientific principles related to the topic and Findings and applications from actions/activities **May or May NOT BE Communicated** to school	There is a **Moderate OR NO LINK** from the goals to the action plan and to the outcomes to address the identified water issue and Actions/activities of Cal Water H2O Challenge **May OR May NOT BE Based** on sound scientific principles related to the topic and Findings and applications from actions/activities **May OR May NOT BE Communicated** to school and/or community **OR** There is a **Clear OR Moderate LINK** from the goals to the action plan and to the outcomes to address the identified water issue **BUT** The Cal Water H2O Challenge Action Plan was **NOT COMPLETED**

Use specific evidence from the portfolio to support your score.

POINTS

COMPONENT #1:
Cal Water H2O Challenge Impact
(Total possible points: 40)

C. Long Term Environmental Impact
(Total possible points: 15)

Guiding Questions:

- How was this Cal Water H_2O Challenge important to students, the school and/or community?
- Will we see the effects of this Challenge in 5 years? What is (are) the enduring aspect(s) of this Cal Water H_2O Challenge?

15 Points	10 Points	5 Points	1 Point
There is **Clear EVIDENCE** that the Cal Water H2O Challenge resulted in a change in student thinking about short- and long-term responsible actions related to the goal(s) of the Cal Water H2O Challenge. and **Potential LONG-TERM** impact of the Cal Water H2O Challenge on water conservation within the school AND community are **Clearly EVIDENT**.	There is **Clear EVIDENCE** that the Cal Water H2O Challenge resulted in a change in student thinking about short- and long-term responsible actions related to the goal(s) of the Cal Water H2O Challenge. and **Potential LONG-TERM** impact of the Cal Water H2O Challenge on water conservation within the school OR community is **Clearly EVIDENT**.	There is **Clear OR SOME EVIDENCE** that the Cal Water H2O Challenge resulted in a change in student thinking about short- and long-term responsible actions related to the goal(s) of the Cal Water H2O Challenge and **Potential LONG-TERM** impact of the Cal Water H2O Challenge on water conservation within the school or community is **Somewhat EVIDENT**.	A change in student thinking that may lead to short- and long-term responsible actions related to the goal(s) of the Cal Water H2O Challenge **IS NOT EVIDENT**. **OR** Only **SHORT-TERM** impact is **EVIDENT**.

Use specific evidence from the portfolio to support your score.

POINTS

COMPONENT #2:
Impact on Student Learning
(Total possible points: 45)

A. Integral to Student Learning
(Total possible points: 15)

Guiding Questions:

- How did this Cal Water H_2O Challenge improve upon or enhance student learning beyond the regular classroom curriculum?
- In what ways did the Cal Water H_2O Challenge help students use science and engineering practices, mathematical practices and English language arts skills to understand the issues and work collaboratively to address the issues?

15 Points	10 Points	5 Points	1 Point
Student work from the Cal Water H2O Challenge Clearly **Demonstrates it** is an integral part of the regular classroom curriculum as defined by the NGSS and CCSS with an emphasis on students using the practices to build understanding. and CLEARLY connects classroom learning with real world applications	Student work from the Cal Water H2O Challenge Clearly **Demonstrates it** is an integral part of the regular classroom curriculum as defined by the NGSS and CCSS with an emphasis on students using the practices to build understanding. and SOMEWHAT connects classroom learning with real world applications	Student work from the Cal Water H2O Challenge Clearly **Demonstrates it** is an integral part of the regular classroom curriculum. and HAS LIMITED OR NO connections with real world applications	Student work from the Cal Water H2O Challenge **DOES NOT Indicate That IT IS an Integral Part** of the regular classroom curriculum. and HAS LIMITED OR NO connections with real world applications

Use specific evidence from the portfolio to support your score.

POINTS

COMPONENT #2:
Impact on Student Learning
(Total possible points: 45)

B. Student Participation
(Total possible points: 15)

Guiding Questions:

- In what ways were students actively involved in the selection, research, investigation and evaluation of the Cal Water H_2O Challenge?
- In what ways did student thinking change because of their direct involvement in the Cal Water H_2O Challenge?

15 Points	10 Points	5 Points	1 Point
Student work from the Cal Water H2O Challenge demonstrates **Clear EVIDENCE** that students were involved in **all** of the following: inquiry, design, research, implementation, evaluation and documentation.	Student work from the Cal Water H2O Challenge demonstrates **SOME EVIDENCE that** students were involved in **all** of the following: inquiry, design, research, implementation, evaluation and documentation.	Student work from the Cal Water H2O Challenge demonstrates **Clear OR SOME EVIDENCE** that students were involved in **SOME** of the following: inquiry, design, research, implementation, evaluation and documentation.	Student work from the Cal Water H2O Challenge demonstrates that students were involved in **FEW OR NONE** of the following: inquiry, design, research, implementation, evaluation and documentation.

Use specific evidence from the portfolio to support your score.

POINTS

COMPONENT #2:
Impact on Student Learning
(Total possible points: 45)

C. Student Reflection
(Total possible points: 15)

Guiding Questions:

- What evidence of student learning do I have? How will that learning be sustained?
- How did students move from awareness, to stewardship and possible long-term, responsible action?
- In what ways did the Cal Water H_2O Challenge help students use critical thinking skills to evaluate water issues and make informed decisions to address those issues?

15 Points	10 Points	5 Points	1 Point
Student reflection indicates: **Quality Learning** (i.e., multiple opportunities to develop and demonstrate critical thinking to evaluate WATER ISSUES addressed in the Cal Water H2O Challenge and make informed decisions) and **Quality Learning** (i.e., multiple opportunities to develop and demonstrate skills and knowledge) **about OTHER aspects** of the Cal Water H2O Challenge (e.g., using technology, writing, art, working as a team, etc.) and Identifies appropriate personal action to sustain **BOTH** learnings.	Student reflection indicates: **Quality Learning** (i.e., multiple opportunities to develop and demonstrate critical thinking to evaluate WATER ISSUES addressed in the Cal Water H2O Challenge and make informed decisions) **and Quality** **Learning** (i.e., multiple opportunities to develop and demonstrate skills and knowledge) **about OTHER aspects** of the Cal Water H2O Challenge (e.g., using technology, writing, art, working as a team, etc.) and Identifies appropriate personal action to sustain **EITHER** learning.	Student reflection indicates: **Quality Learning** (i.e., multiple opportunities to develop and demonstrate critical thinking to evaluate WATER ISSUES addressed in the Cal Water H2O Challenge and make informed decisions) **OR** **Quality Learning** (i.e., multiple opportunities to develop and demonstrate skills and knowledge) **about OTHER aspects** of the Cal Water H2O Challenge (e.g., using technology, writing, art, working as a team, etc.) and **May OR May NOT** identify appropriate personal action to sustain **EITHER** learning.	Student reflection indicates **LITTLE OR NO** meaningful learning or personal action.

Use specific evidence from the portfolio to support your score.

POINTS

COMPONENT #3:
Presentation
(Total possible points: 10)

A. Overall Quality of the Presentation of the Portfolio
(Total possible points: 10)

Guiding Questions:

- Can the reader understand the goals and outcomes of Cal Water H_2O Challenge from the presentation?
- How does the presentation demonstrate originality and creative efforts by the students and teacher?
- How were students involved in completing the presentation of the Challenge?

10 Points	5 Points	1 Point
Portfolio **IS COMPLETE** and displays all Challenge components, linking goals with Cal Water H2O Challenge activities. and Overall presentation of Cal Water H2O Challenge is original, creative, and artistic, showing **Sustained EFFORT** and **Quality attention** to detail. and There is **Clear EVIDENCE** that students were involved in the preparation of the portfolio.	Portfolio **IS COMPLETE** and displays all Cal Water H2O Challenge components, linking goals with Cal Water H2O Challenge activities. and Overall presentation of Cal Water H2O Challenge is **Moderately** creative, showing **SOME EFFORT** and attention to detail. and There is **Clear EVIDENCE** that students were involved in the preparation of the portfolio.	Portfolio **IS NOT COMPLETE**. and/or Overall presentation of Cal Water H2O Challenge shows **LITTLE EFFORT** and attention to detail. and/or There is **SOME OR LITTLE EVIDENCE** that students were involved in the preparation of the portfolio.

Use specific evidence from the portfolio to support your score.

POINTS

COMPONENT #4:
Impact On Teacher Practice
(Total possible points: 5)

A. Teacher Reflection
(Total possible points: 5)

Guiding Questions:

- How do I know this Cal Water H_2O Challenge was successful and is making a difference?
- What evidence of student learning do I have? How will that learning be sustained?
- How did this Cal Water H_2O Challenge change my teaching practices to engage all students in meaningful learning experiences?
- How did this Cal Water H_2O Challenge improve upon or enhance student learning beyond the regular classroom curriculum?

5 Points	1 Point
Teacher Reflection indicates **IN DEPTH REFLECTION** on topics such as: challenges and success; educational benefits such as changes in student learning, interactions, and classroom culture; next steps for sustainability; social responsibility for water conservation.	No teacher reflection included with Cal Water H2O Challenge. **OR** Teacher Reflection **Overall Lacks DEPTH** of reflection on topics such as: challenges and success; educational benefits such as changes in student learning, interactions, and classroom culture; next steps for sustainability; social responsibility for water conservation.

Use specific evidence from the portfolio to support your score.

POINTS