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Teaching water conservation to teachers of fourth-sixth grade students

Kristine E. Copp

TEACHING WATER CONSERVATION TO TEACHERS OF FOURTH - SIXTH GRADE STUDENTS

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

in

Education:

Environmental Education

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by

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June 2002

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Approved by:

[redacted]

Darleen Stoner, Ph.D.,
First Reader

June 9, 2002
Date

[redacted]

Christina Allen, M.A.,
San Bernardino City Unified School District,
Second Reader

ABSTRACT

Teachers, grades fourth - sixth, were inserviced on water conservation activities that they could implement with their students. Project WET (Water Education for Teachers) was used as a basis for the workshops. The goal was to have fourth - sixth grade students acquire knowledge about water conservation and try new behaviors that would result in decreased water usage. Nine workshops were given, inservicing 95 fourth - sixth grade teachers. Thirty-three of these teachers completed the activities with their students. All of the class data submitted by the teachers indicated a decrease in water consumption over a 24-hour period, after students participated in water conservation lessons and activities.

Surveys completed by teachers at the start of each workshop asked about previous water instruction with students and whether they believed that knowledge about water is a standard to be met at their grade level. Responses were analyzed. Later, teachers responded to a question about the impact of Project WET on the attitudes and actions of their students. They also provided a list of Project WET activities used with students. Their list

of activities showed all selected lessons correlated with California State Content Standards for their grade level and were often different than those experienced at the workshop.

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CHAPTER ONE

INTRODUCTION

The focus of this project was acquisition of knowledge about water conservation and water conservation habits by fourth - sixth grade students. Workshops were presented to familiarize the students' teachers with water conservation resources and lessons. Water conservation lessons were then implemented in the classroom.

This project is of special significance to residents of Southern California. What do we know about water conservation? Do we need to conserve it? How do we conserve it? Water conservation should be an important issue in all communities.

The success of water conservation programs begins with education about the importance of water. Teachers need to understand the importance of water conservation and have resources available to them in order to educate students. Students are then able to gain knowledge and undertake personal actions to conserve water.

Very often, teachers feel that students are learning stewardship for Earth's resources at home. This may or may not be true for each individual student, but when students

are able to learn something together and support each other, it seems that the lesson has more relevance. Therefore, it would seem that the conservation of water, such an important issue, should be taught and discussed in the classroom. As noted later in this report, many Americans feel this same way (National Environmental Education & Training Foundation, Roper Starch Worldwide [NEETF & Roper], 2001).

Attitudes and beliefs about water conservation must change soon. A typically held belief in California, this author has heard expressed many times, is that there is plenty enough water, for everyone and every activity, all of the time. It is also believed that we have a right to the water, and we are able to use it in whatever way we so choose. The goal of this project was to help teachers and, ultimately, their students understand why water conservation is so important.

This project was funded by a grant from the United States Bureau of Reclamation to accomplish the following: 1) to introduce teachers of fourth - sixth grade students to the Project WET (Water Education for Teachers) Curriculum and Activity Guide (2000) and to other resources

related to water conservation through a series of interactive workshops; 2) to have these teachers introduce their students to water conservation activities through the use of Project WET in the classroom; 3) to ascertain which lessons were selected by teachers at each grade level; and 4) to document students' estimate of water saved through personal water conservation efforts.

Project WET is a national water education program published by The Watercourse at Montana State University and the Council for Environmental Education. It was originally published in 1995 and is now in its sixth printing, published in 2000. It contains 91 cross-curricular activities for kindergarten through twelfth grade students.

CHAPTER TWO

LITERATURE REVIEW

This literature review includes research on attitudes held about environmental education; the importance of implementing hands-on activities; survey information related to knowledge and feelings about water conservation held by adults; and the use of children's literature in teaching environmental science. All of these topics are relevant to the understanding about and implementation of Project WET and water conservation in the classroom.

Support for Environmental Education

Although there is a persistent and troubling lack of environmental knowledge among Americans today (Volk & McBeth, 1997; NEETF & Roper, 2001), there is a clear level of support for a possible solution. This solution is environmental education, with 95% of adult Americans believing it should be taught in our K-12 schools (NEETF & Roper, 2001). Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work

toward their solution (Stapp, et al., 1969). However, there are many varied perspectives on how environmental education should be approached in the schools, who should be learning it, and who should be teaching it (Disinger, 2001; Jesky-Smith, 2002; Levitt, 2002).

Unfortunately, some political organizations have viewed the implementation of environmental education in the schools as a way to advance their position, not as a way to positively educate students. This often leads to the development and publication of materials which may not always be grounded in scientific fact, well balanced, or academically leveled (Aram & Bradshaw, 2001; Disinger, 2001). Teachers' selection of materials is made more difficult when they must also question their available instructional choices (Disinger, 2001; Jesky-Smith, 2002).

In 1996, the North American Association for Environmental Education (NAAEE) developed a publication utilizing a rubric to identify instructional materials to aid teachers seeking quality materials for use in their classroom (Disinger, 2001). Concurrently, but not released until 1997, the Independent Commission on Environmental Education (ICEE) created a summary about available

environmental education curriculum materials for teachers (Disinger, 2001). These publications assist teachers in making choices about which materials to implement and which materials to avoid (Disinger, 2001).

In an effort to assist educators in selecting environmental curriculum, the California Department of Education, in cooperation with the California Department of Water Resources, created the Environmental Education Compendium for Water Resources (1996). This book lists the curricular resources for water education and includes both descriptive and evaluative information about each resource. Each resource is reviewed for discipline emphasis, ease of integration, and pertinent reviewer comments are noted. Sample pages from each resource are provided. The Compendium allows teachers to evaluate over 40 curricular choices prior to implementation. Project WET received an overall rating of "A" from this resource.

Student Learning

Students need teachers who are prepared and confident both in the materials to be presented and their own abilities to present them (Disinger, 2001; Jesky-Smith, 2002; Levitt, 2002). When students are interacting with

the lesson, not just reading a textbook, they are provided a foundation to "see" and experience what they are learning (Brune, 2002; Outlaw & Bell, 2001).

Children can begin to understand the importance of many environmental topics through the use of hands-on activities (Brune, 2002; Levitt, 2002; Outlaw & Bell, 2001). Hands-on activities are helpful to fourth - sixth grade students in connecting their existing knowledge about science and their environment to the class lesson (Aram & Bradshaw, 2001). Students are more readily interested in seeking alternative answers when given the chance to interact with the lesson, rather than seeking the easiest solution (Brune, 2002; Levitt, 2002; Mogensen & Nielsen, 2001; Outlaw & Bell, 2001).

Teachers believe that hands-on activities relate directly to improved student learning and retention of the material (Levitt, 2002). Teachers are also pleased to find an increased level of student involvement and participation when hands-on activities are employed (Brune, 2002; Outlaw & Bell, 2001). In many cases, new teachers are excited to find how easily they are able to integrate hands-on

learning cross-curricularly throughout their schedule (Levitt, 2002).

The use of the out-of-doors is an exciting way for students to experience hands-on activities in a non-traditional setting, allowing students to explore a topic from a different perspective (Brune, 2002; Levitt, 2002; Outlaw & Bell, 2001). Teachers who utilize hands-on environmental education activities, along with involving outside professionals in the classroom, are often able to form partnerships for their students with these other professionals, providing an alternative view for students to consider (Brune, 2002; Outlaw & Bell, 2001).

Many students have a "relatively high" belief in their own action possibilities when it comes to environmental issues (Aram & Bradshaw, 2001; Mogensen & Nielsen, 2001). Adults also have a strong belief that, with the right information, environmental education positively affects students, thus encouraging students to become involved in their communities through such endeavors as service work (Brune, 2002; NEETF & Roper, 2001).

Surveys conducted by NEETF & Roper provide insight into knowledge about water held by adult Americans. When

surveyed by NEETF & Roper (2001), 70% of Americans rated themselves as being fairly knowledgeable about the environment. However, when these same respondents were given a relatively basic quiz about environmental issues, only 32% of this group passed (scoring 9 correct or better). Results of this quiz were very similar to results of the same quiz given in 1997 and a similar quiz administered in 1998 (NEETF & Roper).

The National Report Card (NEETF & Roper, 2001) also found that the public, when asked to consider laws for the protection of five environmental issues, ranked the preservation of water as most important. The lesser ranked choices included fighting air pollution, protecting wild or natural areas, wetlands, and endangered species. Seventy percent of 1,505 adult Americans surveyed felt that current environmental laws and regulations regarding water do not go far enough. This same group felt that through environmental education, young people would better understand the environment and respect the people and places around them.

A national cross-section of 2,000 adults were surveyed by NEETF & Roper (1999) regarding safe drinking water.

Those surveyed indicated a lack of knowledge about the sources of their water. This same report also found that most respondents know more about identifying sources of pollution to their water supply, rather than knowledge about the source of their water. When asked about pollution threats to their water supplies, 86% of those surveyed expressed a moderate to high level of confidence in identifying those threats. Approximately 74% of those surveyed believed that they knew if the source of their water was a well, reservoir, or a river. Based upon this survey of adults, perspectives on improving this lack of knowledge focus on environmental education (NEETF & Roper, 1999, 2001).

Knowledge about water resources can be improved through enhanced ecological understanding (Hogan, 2002; Munson, 1994) and environmental literacy (Disinger, 2001; NEETF & Roper, 2001). The National Report Card (NEETF & Roper, 2001) showed 57% of those surveyed felt that environmental education would help students (children) to understand environmental issues more fully as they become adults.

Use of Children's Literature

Children's literature was suggested for use within the scope of many Project WET (2000) lessons. At the end of many lessons there is a resource listing of recommended children's literature to be used within the lesson.

The use of literature, within the science curriculum, is the "infusion" of various subject areas into an interactive format (Cobb, 1998; Eggerton, 1996; Larson & Miller, 1996). The integration of literature, with appropriate scientific explanations, allows students to further explore this knowledge, without fear of the unknown (Aram & Bradshaw, 2001; Eggerton, 1996; Ewert, 1986; Larson & Miller, 1996). Reading books aloud and discussing them, can help the student better understand difficult concepts, such as conservation and stewardship (Outlaw & Bell, 2001; Tiedt, 1999).

The interest created through the use of familiar children's literature is definitely an appealing reason to look at its use within the classroom, across the curriculum spectrum. Students are much more interested in hearing a story and discussing it, rather than hearing a lecture (Eggerton, 1996; Larson & Miller, 1996). The value of this

approach is the stimulation of interest in a topic. If a teacher can draw-out the facts and present these to the students through the use of literature and hands-on activities, a much higher level of retention can be reached (Bixler & Floyd, 1999; Larson & Miller, 1996).

CHAPTER THREE

DESIGN OF THE PROJECT

This project was designed to introduce teachers of fourth - sixth grade students to Project WET and other resources related to water conservation through a series of interactive workshops so that these teachers would provide water conservation lessons to their students. Flyers were prepared and distributed to school sites in San Bernardino and Riverside counties. A refundable $5 pre-registration deposit was requested to help ensure attendance at several workshops. Dinner was provided at four of the workshops.

At the start of each 4-hour workshop, participants were asked to complete a Water Workshop Survey rating their current use of water conservation lessons and activities in their classroom. The survey was divided into two sections. The first section had six questions, which teachers were to answer by utilizing a Likert scale of one - five (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always). The second section included two short answer type questions. The first question asked respondents to complete a sentence about the reason for wanting to teach water conservation. The second question addressed the

teacher's opinion about the most important information students need to learn about water (see Appendix A for sample of the Water Workshop Survey).

Teachers participated in six activities selected from the Project WET book (see Appendix A for sample of workshop agenda). Each activity was carefully selected from Project WET to be relevant to the fourth - sixth grade curricula and supportive of water conservation. Topics included the hydrologic cycle, protecting the quality of water, and personal water conservation actions. The activities also were representative of the integration of Project WET into different curricular areas, including language arts, science, social studies, and mathematics.

Activities selected to be introduced at the workshop were "Easy Street," wherein students compare the quantities of water used by a contemporary family to one in the late 1800s. Students also investigate changes in water use habits. In "Get the Ground Water Picture," students learn about ground water principles and create their own geologic cross section. "The Incredible Journey" has students simulate the movement of a water molecule through the water cycle. "Poison Pump" involves students as detectives to

solve a mystery involving water pollution. In "Sum of the Parts," students visually demonstrate how everyone contributes to the pollution of a river as it flows downstream through a watershed. The sixth activity chosen was "Water Meter" in which students make their own water meter to keep track of their water use.

As was noted earlier, these activities were selected to promote water conservation and to show the integration of Project WET into various areas of the curriculum. "Easy Street" is well suited for use in the areas of mathematics, language arts, history, and environmental science. "Get the Ground Water Picture" is easily integrated into mathematics, environmental science, and government. "The Incredible Journey" can be used during language arts as well as earth science. "Poison Pump" can be used in the areas of history, life science and health. "Sum of the Parts" can be integrated into the areas of government and environmental science. "Water Meter" is integrated with mathematics and environmental science.

Each participant was given a copy of Project WET, as well as handouts showing correlations between Project WET activities and the requirements for students in grades four

- six based on the Content Standards for California Public Schools (see Appendix A for a copy of the correlations). The correlations were provided for the areas of language arts, science, history and social science. Each attendee also had the opportunity to peruse a selection of relevant children's literature, well suited to the activities of Project WET, and to obtain a listing of the selections (see Appendix A for a list of the literature).

Teachers were taken on a "book walk" of the Project WET guide. This included a background of how Project WET lessons were developed, a discussion of the components of the lessons/activities and the various indexes at the back of the book. It was pointed out that the indexes could be used to find appropriate activities by grade level, subject, time limits, space available, or general topic.

Teachers were asked to select five lessons from Project WET, which would support water conservation, to be taught to their students. After completing these lessons with their students, they were instructed to list these on the Use Survey of Project WET (see Appendix A for a sample of the Use Survey). The second part of the Use Survey included a short answer follow-up question about the

teacher-perceived impact of Project WET activities on student attitudes and actions related to water conservation (see Appendix B for selected teacher comments).

The teachers were asked to have their students complete a two-part water audit (see Appendix A for a sample of Water Audit Data Sheets I and II and the Water Conservation Action Chart, along with the information and directions for completing these items). In the first part of this audit, the students were to estimate their present water usage by calculating approximately how many gallons of water they used daily without using any water conservation techniques (Water Audit Data Sheet I). After they completed this portion of the audit, they were to brainstorm ideas, as a class, on how they could conserve water (see Appendix B for a selection of student suggested ideas). Teachers were to record these ideas on the Water Conservation Action Chart. After implementing these water conservation techniques as possible, the students recalculated their usage and then estimated how much water they had saved in a day (Water Audit Data Sheet II). Teachers were then to use the Water Conservation Action Chart to record the number of students using or not using

each proposed conservation action. At the bottom of this chart, teachers were to record class totals from Water Audit Data Sheets I and II, and the total water saved in one day by the class through implementation of water conservation methods.

Teachers were asked to submit the Use Survey of Project WET, listing the five activities they used with their students, as well as results of the water conservation audit from their class. Upon completion, teachers would receive a $25 stipend. If a teacher was also able to include exemplary student essays pertaining to water conservation, the teacher would qualify for an additional $5, creating a $30 stipend (see Appendix B for selected comments from students' essays). Any teacher who submitted the five lessons plus water conservation information would also qualify for entry into a drawing for a Paul Cash Water Education Environmental Magic Show at their own school site.

The water education magic show was developed by eco-magician Paul Cash specifically to support water conservation and protecting water quality. The show was correlated to the Science Content Standards for California

Public Schools (1998) (see Appendix C for the science correlations to the Paul Cash Magic Show). The show entitled "Protecting Earth: Our Water Planet" was aimed at grades kindergarten - sixth. Teachers who qualified for the drawing for the magic show were notified by telephone and allowed to schedule two, 40-minute assemblies at their school, for the same date. The magic show was available for up to 600 students per school site, thus, in many cases, students other than those in fourth - sixth grade were able to attend the assembly. For example, if the assembly was held at an elementary K-6 school, one assembly would be held for kindergarten - third grade students, while the other assembly would reach the fourth - sixth grade students. Whereas, an assembly held at a middle school would be for sixth grade students only.

CHAPTER FOUR

RESULTS AND DISCUSSION

A total of 110 educators attended the nine Project WET workshops, given at various locations in Riverside and San Bernardino counties between February 2001 and February 2002. Of the 110 attendees, 15 did not meet the criteria of being a fourth - sixth grade teacher. Only the results of the fourth - sixth grade teachers were analyzed. Based upon the targeted fourth - sixth grade teachers, there were 48 fourth grade, 22 fifth grade, and 25 sixth grade teachers. These teachers had an average of 11 years of service, with a range from 0.5 - 41 years of service.

Of the 95 fourth - sixth grade teachers introduced to Project WET at the workshops, 33 teachers completed the six water education activities with their students and returned the results. The percent of teachers that completed the activities with their students differed by grade level. At the fourth grade level, 15 of the 48 teachers who attended a workshop (31%) completed the activities with their students. At the fifth grade level, 10 of the 22 teachers who attended a workshop (45%) completed the activities. Similar to fourth grade teachers, eight of the 25 sixth

grade teachers who attended a workshop (32%) completed the activities with their students.

Description of Subjects

Of the 33 teachers who completed the Project WET activities with students, the average number of years of teaching service was calculated. The average number of years of teaching service of the 15 fourth grade teachers was 8.4 years (range: 0.5 - 32 years), 4.7 years for the 10 fifth grade teachers (range: 0.5 - 12 years), and 11.8 years for the eight sixth grade teachers (range: 0.5 - 37 years). The responding teachers were affiliated with 28 different public schools in 13 different school districts in San Bernardino and Riverside counties. Two private schools in San Bernardino County had attendees.

The average number of years of teaching service was also calculated for the 62 teachers who did not complete the Project WET activities with their classes. The 33 fourth grade teachers had an average of 11.6 years (range: 1 - 30 years); the 12 fifth grade teachers had an average of 10.2 years (range: 0.5 - 23 years); and the 17 sixth grade teachers had an average of 13.2 years (range: 2 - 41 years) of service. Therefore, it would appear that the

teachers who completed the Project WET activities with their classes tended to have fewer years of teaching experience than those teachers who did not complete the activities. The most notable difference appears at the fifth grade level where the teachers who completed the Project WET activities with their classes had 5.5 fewer years of service, on average, than those fifth grade teachers who did not complete the activities.

Selection of Activities

Teachers could select any five appropriate lessons and/or activities found in Project WET. These lessons needed to support the idea of water conservation. The selected activities presented at the workshops were correlated to the science, language arts, and history-social science standards for the fourth - sixth grade level. It was expected that the teachers would tend to choose to utilize activities that they had experienced during the workshop. However, it was found that the fourth grade teachers utilized 39 different lessons with their classes. Of the lessons selected by the fourth grade teachers, 60% of the teachers chose activities that had not been presented at the workshop, 27% chose to use one of the

activities from the workshop, and 13% utilized two of the activities from the workshop.

The fifth grade teachers chose activities from 29 different lessons. The lessons selected showed 40% of fifth grade teachers used activities not presented at the workshop, 20% utilized one of the workshop activities, 20% chose to implement three of the activities, and 20% tried four of the activities.

The sixth grade teachers utilized 23 different lessons. Of the lessons chosen, 50% of sixth grade teachers did not use any of the activities experienced at the workshop, 12.5% chose to use one of the workshop activities, 25% utilized two of the activities, and 12.5% used three of the activities. From the selection of activities not presented at the workshops, it appears that teachers utilized the indexes to choose activities correlated to curricular areas and lessons they were currently involved with in their classrooms.

At each grade level, all lessons selected by the teachers correlated to the science or language arts or history-social science content standards for that grade level. Of the six activities introduced at the workshop,

33% of fourth, 70% of fifth, and 88% of sixth grade teachers used the same three activities. These were "Sum of the Parts," "Poison Pump," and "Water Meter." "Easy Street" and "The Incredible Journey" were used by 20% of fourth and 40% of fifth grade teachers, while "Get the Ground Water Picture" was only selected by one fifth grade teacher.

Water Workshop Survey

At the start of the workshops, each of the 95 fourth - sixth grade teachers completed a Water Workshop Survey rating their current usage of water conservation lessons and activities in their classrooms. The first section of this survey contained six questions and utilized a Likert scale of one - five to rate the frequency of such lessons and activities.

The Likert scale allowed teachers to select 1 for never, 2 for rarely, 3 for sometimes, 4 for often, or 5 for always. When reviewing the data, the scale was collapsed and responses of a 1, 2, and 3 were combined together. The 4 and 5 responses were also combined.

Question one of the survey asked teachers how often they had taught water conservation concepts to their

students in the past year. For all teachers who attended the workshops, the results showed that 19% of fourth grade teachers, 18% of fifth grade teachers, and 24% of sixth grade teachers responded that they had addressed water conservation with their students. This is an interesting finding when compared to the responses of the teachers who actually completed the Project WET activities with their students. Within this "completers" group, 21% of fourth grade teachers, 10% of fifth grade teachers, and 57% of sixth grade teachers responded that they had taught water conservation concepts during the past year. Thus, it appears that only for sixth grade teachers did previous teaching about water conservation indicate a possible predictor of the likelihood of these teachers completing the water conservation lessons with students.

Question two asked teachers to rate their emphasis on water conservation to students during the past school year. When looking at the results of the first question, it was not surprising to find, of the original workshop attendees, 30% of fourth grade teachers, 27% of fifth grade teachers, and 44% of sixth grade teachers reported emphasizing water conservation in their classroom. Of the teachers

completing the Project WET activities, 43% of fourth grade teachers, 20% of fifth grade teachers, and 86% of sixth grade teachers had emphasized water conservation. Therefore, it would again appear that the sixth grade teachers who previously emphasized water conservation were more likely to incorporate Project WET lessons into their curriculum.

In question three, teachers were asked if a unit about water was a part of their yearly curriculum. According to the responses of the original workshop attendees, 57% of fourth grade, 41% of fifth grade, and 60% of sixth grade teachers believed that it is a part of their yearly curriculum. Of the "completers," 71% of fourth grade, 40% of fifth grade, and 71% of sixth grade teachers believed that water is a part of the yearly curriculum at their grade level. Interestingly, some aspect of water (such as the water cycle, or the properties/states of water) is found in most of the currently adopted science texts at the fourth - sixth grade level.

Also, the Science Content Standards for California Public Schools (1998) indicates that an understanding of water, its effects, its properties, and/or the water cycle

must be taught at the fourth, fifth, and sixth grade levels within at least one of the three strands of Earth Science, Physical Science, and Life Science. The History/Social Science Content Standards for California Public Schools (1998) also indicates the necessity of water education at the fourth - sixth grade levels in conjunction with the westward expansion and California's development.

Question number four asked teachers how often they had used supplemental resources in the teaching of science to students. Of the original group of teachers at the workshops, 57% of the fourth grade teachers, 64% of the fifth grade teachers, and 72% of the sixth grade teachers responded that they have used supplemental resources. Within the group of teachers who completed the Project WET activities, 71% of fourth grade teachers and 50% of fifth grade teachers responded that they used supplemental materials, while 100% of the sixth grade teachers replied that they always employed supplemental resources in the teaching of science in their classroom. The data collected from this question shows the increased potential for sixth grade teachers to utilize Project WET with their students, based upon prior implementation of supplemental materials.

The fifth question asked teachers about using science to teach other subjects such as language arts, mathematics, history, or social studies. Of all fourth grade teachers who attended the workshops, 53% had tried the integration of science with other subjects, which is a very similar response to the 50% of fourth grade "completers." At the fifth grade level, 27% of the original group of attendees had tried to integrate science into other areas, while 40% of the "completers" had utilized science in various curricular areas. The original group response of the sixth grade teachers showed that 44% utilized science in other areas; however 71% of the sixth grade "completers" integrated science into other subject areas. Once more, the sixth grade teachers who completed the additional activities showed a likelihood of doing so through their response to the integration question.

Question six asked teachers to indicate how often they employ hands-on activities as a part of their teaching methods. Of the original workshop attendees, 77% of fourth, 55% of fifth, and 64% of sixth grade teachers indicated that they have implemented hands-on activities into their lessons. Of the "completers" group, 71% of the

fourth grade, 40% of the fifth grade, and 86% of the sixth grade teachers responded that they employed hands-on methods in their classrooms. Of the "completers," five wrote a note indicating the difficulty they have in employing hands-on activities with a large class, while keeping all students on-task and focused.

Water Conservation Data

Water conservation was the goal of these workshops; therefore the student/class data submitted by the 33 teachers were analyzed with regard to initial daily water usage compared with usage after brainstorming and implementing water conservation ideas. While reviewing the data, it was found that a few of the responses were not plausible. There were found to be mathematical errors in student calculations, therefore skewing the data at that grade level and overall. It was decided that the numerical data from the classes with mathematical errors would not be used in the calculations of water usage per class or per student.

Of the 15 fourth grade teachers responding, 13 of the classes provided useable data. They reported a combined initial water usage of 71,737 gallons per day by 389

participating students. This would be an average of 184 gallons per student, per day. After their students implemented water conservation ideas, they reported a usage of 44,233 gallons, which is an average usage of 113 gallons per student, per day. The fourth grade classes had an overall savings of 27,504 gallons in one day, which was calculated to an average savings of 71 gallons per student, per day.

The 10 fifth grade teachers reported a combined initial water usage of 62,383 gallons per day by 211 participating students. This is an average of 296 gallons of water per student, per day. After their students implemented water conservation ideas, they reported a usage of 33,185 gallons, which is an average usage of 157 gallons of water per student, per day. The fifth grade classes had an overall savings of 29,198 gallons in one day, which was calculated to an average savings per student of 139 gallons of water per day.

Of the eight sixth grade teachers, six provided viable results. These teachers reported a combined initial water usage of 39,009 gallons per day by 191 participating students. This is an average of 204 gallons of water per

student, per day. After their students implemented water conservation ideas, they reported a usage of 31,645 gallons, which is an average usage of 165 gallons of water per student, per day. The sixth grade classes had an overall savings of 7,364 gallons of water in one day, which was calculated to an average savings per student of 39 gallons of water per day.

A total of 791 students returned their completed data sheets to their teachers. There was an overall savings of 64,066 gallons of water in a 24-hour period. The average savings per student was calculated at 81 gallons per day.

Teachers were asked to comment on student attitudes and behaviors after completing the water conservation activities in their classrooms. Most teachers noticed a positive change in their students' attitudes toward water conservation through the use of Project WET and the water audit. Student comments were also collected from teachers who encouraged students to complete essays about their water conservation efforts and feelings (see Appendix B for selected teacher and student comments).

Follow-Up with Non-Completing Teachers

Since 62 of the 95 teachers (65%) did not complete the activities with their students, an effort was made to have follow-up contact with these teachers. Only 30 of these teachers were successfully contacted and they provided insight into the lack of response. The most frequently cited reasons were a lack of time to prepare lessons; science is currently not an accepted part of the curriculum at their school site; lack of time for teaching science because of parent/teacher conferences two to three times per year; already required teacher inservices; teaching required to be focused on preparing students for the California State Standards and the SAT9 test; and personal situations that occurred. Many of these teachers expressed a desire to complete the activities in their classroom in the future, but could not do so at this time.

Additionally, 10 of these 30 teachers said that they did not know the curriculum for their grade level. This was not limited to the science curriculum, but also language arts, mathematics, history and social science. Since Project WET is a supplemental program, teachers need to be familiar with the curriculum, at their grade level,

to be able to effectively select the supplemental activities. Teachers stated that this lack of knowledge of the curriculum was due to several reasons such as frequently changing grade level assignments (a different grade taught each of the last three years); being a first year teacher; and a belief that teaching should be limited to the required textbooks. Thus, due to various reasons, these teachers did not appear to have an understanding of how Project WET, a supplemental program, could effectively help them meet their students' learning objectives.

Paul Cash Environmental Magic Shows

The Paul Cash Environmental Magic Shows were available through a drawing to teachers who submitted the five Project WET lessons plus the water conservation information. Each school could schedule two, 40-minute assemblies at their site, reaching approximately 300 students per show.

The shows were presented at 15 school sites. Two of the sites chose to present the show to the participating classes only, for a total of 31 students per site. One middle school presented the show to two of its sixth grade

classes, for a total of 60 students. The remaining 12 elementary schools held two assemblies per site, reaching approximately 550 students per school. Based on these numbers, it would appear that the Paul Cash Water Education Environmental Magic Show was able to reach 6,722 students with information about water conservation. No follow-up was conducted about the impact of this show on students' water conservation habits.

APPENDIX A

PROJECT WET WORKSHOP INFORMATION

Project WET Workshop Agenda

Presented by the Network for Environmental Science Teaching (NEST)

Sign-In
Peruse children's literature books/Book list available

Introductions/Goal of workshop
Background of Project WET
Correlation to California content standards
Participants' introductions
Water Workshop Survey

Water Quality: _ _ _ t _ _ _ _ n _ i _!
Sum of the Parts

Activity _____

Break for Dinner

Book Walk through the Guide

Water Quality continued
Get the Water Picture/Handout

Hydrologic Cycle
Incredible Journey

Water Conservation
Water Meter

Easy Street

Water Fact Card

Personal Water Conservation Actions

Planning for Classroom Use

Wrap-up. Thank you for coming.

Major sponsorship for Project WET workshops provided by the U.S. Bureau of Reclamation. Additional sponsorship provided by CSUSB Water Resources Institute, San Bernardino Valley Municipal Water District, and NEST.

Water Workshop Survey

Name_____
Grade Level Taught_____
Number of Years Teaching_____

Part A

Please use the following scale to answer the following six questions.
1=never 2=rarely 3=sometimes 4=often 5=always

1) How often have you taught water conservation concepts to your students this year? 1 2 3 4 5

2) Have you emphasized water conservation to your students this year? 1 2 3 4 5

3) Is a unit about water (such as conservation, the water cycle, its properties) part of your yearly curriculum? 1 2 3 4 5

4) How often have you used supplemental resources (rather than your science text) in the teaching of science in your classroom? 1 2 3 4 5

5) How often have you used science as a way to teach language arts, math, social studies, etc.? 1 2 3 4 5

6) Hands-on activities are the focus of your teaching methods... 1 2 3 4 5

Part B

1) I am interested in teaching my students about water conservation because _____
_____
_____
_____
_____.

2) What, in your opinion, is the most important thing for your students to learn about water? Why? _____
_____
_____
_____
_____.

Information & Directions for completing the
Personal Water Conservation Action Data Sheet
(Water Audit Data Sheets I and II)

Materials

One copy per student of the following:
- Water Audit Data Sheet I
- Water Audit Data Sheet II

One copy of each of the following for overall class reference
- Water Audit Data Sheets I and II
- Water Conservation Action Chart

Part A – Objective: Students find actual amount of water use at home.

1) Have students estimate their daily at-home water use for a 24-hour period. They should record their estimates in Column A of the Water Audit Data Sheet I.
2) Students are to record their actual water usage over 24 hours at home in Column B of the Water Audit Data Sheet I.
3) Each student will then multiply Column B by Column C to find Column D.
4) The products in Column D are then added to produce a total individual daily usage in gallons.
5) Record the total daily at-home water use of the class for each of the activities listed on the Water Audit Data Sheet I. This information can be obtained by adding the student totals together and recording the total data in Column D of the class list.
6) Calculate the total daily at-home water use of the class. Add all of the totals in Column D to find this result.
7) Record this total amount on the Water Conservation Action Chart in the appropriate box.
8) Ask if students were surprised to find their actual use versus their estimated use.

Part B – Objective: Students find actions to conserve water at home.

1) Generate a class list of ways that students can conserve water at home.
2) Have students record these actions in the appropriate boxes in Column A on the Water Audit Data Sheet II.

Part C – Objective: Students try to implement water conservation actions at home.

1) Students are to record their actual water usage over a 24-hour period at home in Column B of the Water Audit Data Sheet II. They must be sure to indicate if the usage was with or without a water conservation action.
2) Each student will then multiply Column B by Column C to find Column D. They will need to pay special attention in Column C because the first number refers to no conservation action being employed, while the second number indicates a water conservation action was used.
3) The products in Column D are then added to produce a total individual daily usage in gallons.
4) Record the total daily at-home water use of the class for each of the activities listed on the Water Audit Data Sheet II. This information can be obtained by adding the student totals together and recording the total data in Column D of the class list.
5) Calculate the total daily at-home water use of the class. Add all of the totals in Column D to find this result.
6) Record this total amount on the Water Conservation Action Chart in the appropriate box.

Part D – Objective: Students calculate class results of implemented water conservation actions after one week.

After one week, for each water conservation action...

1) Using the Water Conservation Action Chart, record the number of students who report that they are continuing to use each conservation action.
2) Calculate the total amount of water saved by the class. Do this by subtracting the class total daily at-home water usage after implementation of water conservation actions from the class total daily at-home water usage prior to implementation of conservation actions. These amounts can be found on Water Audit Data Sheets II and I respectively. These amounts should also be entered on the Water Conservation Action Chart.
3) (Optional) Have students write essays about their personal water conservation efforts and results.
4) Return the completed Water Conservation Action Chart, class total versions of Water Audit Data Sheets I & II, Use Survey of Project WET, and student essays in the pre-addressed envelope. Remember, this must be postmarked no later than Nov. 14, 2001 to be considered for the stipend and drawing for the Paul Cash Environmental Magic Show.

Use the attached Water Conservation Action Chart for completion of Part D.

Remember: Please do not include any student names!

Water Audit Data Sheet I

Home Water Audit

Water use	Column A Predicted # of water uses per day	Column B Actual # of water uses per day	Column C # of gal. per use	Column D Actual # of gal. used per day (B x C = D)
Brush teeth for two minutes, water running			6 gallons	
One toilet flush			5 to 7 gallons	
Wash dishes by hand, rinse in running water			20 gallons	
Shower			5 gallons/minute	
One dishwasher cycle			12 to 15 gallons	
Bath			30 gallons	
Wash hands, water running			3 gallons	
One clothes-washing cycle			50 gallons	
Get a drink with water running			1/4 gallon	
Water lawn, 10 minutes			75 gallons	
Wash car with hose running			10 gallons/minute	
				TOTAL:

Water Audit Data Sheet II

Home Water Audit

Water use	Column A Water Conservation Action	Column B # of water uses per day	Column C Estimated # of gal. per use		Column D Actual # of gal. used per day B x C = D
			without conservation action	with conservation action	
Brushing teeth for two minutes, water running			6 gal.	$^1/_2$ gal.	
One toilet flush			5-7 gal.	3 gal.	
Wash dishes by hand, rinse in running water			20 gal.	5 gal.	
Shower, water running			*5 gal./min.	12 gal.	
One dishwasher cycle			12-15 gal.		
Bath			30 gal.		
Wash hands with water running			3 gal.	$^1/_2$ gal.	
One clothes-washing cycle			50 gal.	25 gal.	
Get a drink with water running			$^1/_4$ gal.	$^1/_{16}$ gal.	
Water lawn, 10 minutes			75 gal.		
Wash car with hose running			**10 gal./min.	5 gal. total	
					TOTAL:

*5 gal. x length of shower in minutes = total water use

**10 gal. x number of minutes hose is running = total

Water Conservation Action Chart

Name:_____

Total number of students in your class:_____

Water Use	Proposed Water Conservation Action	# of Students Using Conservation Action	# of Students Not Using Conservation Action
Brushing Teeth			
One Toilet Flush			
Washing Dishes by Hand			
Shower			
One Dishwasher Cycle			
Bath			
Washing Hands			
One Laundry Cycle			
Getting a Drink of Water			
Watering the Lawn			
Washing the Car			

Total Class Water Usage Chart

Total Daily At-Home Water Usage of Class from Water Audit Data Sheet I	Total Daily At-Home Water Usage of Class from Water Audit Data Sheet II	Total Water Saved by Class Through Implementation of Conservation Methods

1) After completing Water Audit Data Sheet I and finding the class total, record the total usage in the first box of the above Total Class Water Usage Chart.
2) After completing Water Audit Data Sheet II and finding the class total, record the total usage in the second box of the above Total Class Water Usage Chart.
3) To find the total amount of water saved by the class in gallons, subtract the total in the second box above from the total in the first box above. This will produce a total for the third box above. Congratulations on your water conservation efforts!

Use Survey of Project WET
(MUST BE RETURNED! Postmarked no later than November 14, 2001)

Name_____
Date:

Please answer the following questions. If you need additionqal space, Please use the back of this sheet or attach a separate sheet of paper.

1) Please list the titles of the five Project WET activities you've used with your class, in addition to the Personal Water Conservation activity.
   1_____
   2_____
   3_____
   4_____
   5_____

2) How have the Project WET activities impacted the attitudes and actions of your Students related to water? Please give examples.

Children's Literature on Display
at Project WET Workshop
(just a sample of the wealth of literature available)

Bellamy, David. The River.

Cherry, Lynne. A River Ran Wild.

Cole, Joanna. The Magic School Bus at the Waterworks.

Cole, Sheila. When the Rain Stops.

Heller, Ruth. How to Hide an Octopus.

Hoff, Mary and Rodgers, Mary. Our Endangered Planet: Oceans.

Hoff, Mary and Rodgers, Mary. Our Endangered Planet: Groundwater.

Lesser, Carolyn. Storm on the Desert.

Locker, Thomas. Water Dance.

Locker, Thomas. Where the River Begins.

Luenn, Nancy. Mother Earth.

Martin, Jacqueline Briggs. Washing the Willow Tree Loon.

Mendoza, George. Were You a Wild Duck, Where Would You Go?

Reef, Catherine. Jacques Cousteau, Champion of the Sea.

Robertson, Kayo. Signs Aong the River: Learning to Read the Natural Landscape.

Talen, Maria. Ocean Pollution.

Turner, Ann. Heron Street.

Wadsworth, Ginger. Rachel Carson, Voice for the Earth.

Williams, Terry Tempest. Between Cattails.

Correlation of Project WET 4-6 Curriculum & Activity Guide to English-Language Arts Content Standards for California Public Schools

GRADE FOUR

READING

2.0 Reading Comprehension

Students read and understand grade-level-appropriate material. They draw upon a variety of comprehension strategies as needed (e.g., generating and responding to essential questions, making predictions, comparing information from several sources). The selections in *Recommended Readings in Literature, Kindergarten Through Grade Eight* illustrate the quality and complexity of the materials to be read by students. In addition to their regular school reading, students read one-half million words annually, including a good representation of grade-level-appropriate narrative and expository text (e.g., classic and contemporary literature, magazines, newspapers, online information).

Comprehension and Analysis of Grade-Level-Appropriate Text

2.2 Use appropriate strategies when reading for different purposes (e.g., full comprehension, location of information, personal enjoyment).

Project WET Curriculum & Activity Guide
Poetic Precipitation, p. 182
Water Celebration, p. 446

2.4 Evaluate new information and hypotheses by testing them against known information and ideas.

Project WET Curriculum & Activity Guide
Water Address, p. 122
Piece It Together, p. 174

3.0 Literary Response and Analysis

Students read and respond to a wide variety of significant works of children's literature. They distinguish between the structural features of the text and the literary terms or elements (e.g., theme, plot, setting, characters). The selections in *Recommended Readings in Literature, Kindergarten Through Grade Eight* illustrate the quality and complexity of the materials to be read by students.

Narrative Analysis of Grade-Level-Appropriate Text

3.3 Use knowledge of the situation and setting and of a character's traits and motivations to determine the causes for that character's actions.

Project WET Curriculum & Activity Guide
Water Concentration, p. 407

WRITING

1.0 Writing Strategies

Students write clear, coherent sentences and paragraphs that develop a central idea. Their writing shows they consider the audience and purpose. Students progress through the stages of the writing process (e.g., prewriting, drafting, revising, editing successive versions).

Organization and Focus

1.1 Select a focus, an organizational structure, and a point of view based upon purpose, audience, length, and format requirements.

Project WET Curriculum & Activity Guide
Water Celebration, p. 446
Water Write, p. 457

1.2 Create multiple-paragraph compositions.

Project WET Curriculum & Activity Guide
Imagine!, p. 157
The Incredible Journey, p. 161
Water Concentration, p. 407
Water Crossings, p. 421

1.3 Use traditional structures for conveying information (e.g., chronological order, cause and effect, similarity and difference, and posing and answering a question).

Project WET Curriculum & Activity Guide
Imagine!, p. 157
The Incredible Journey, p. 161

Research and Technology

1.6 Locate information in reference texts by using organizational features (e.g., prefaces, appendixes).

Project WET Curriculum & Activity Guide
Water Celebration, p. 446

1.7 Use various reference materials (e.g., dictionary, thesaurus, card catalog, encyclopedia, online information) as an aid to writing.

Project WET Curriculum & Activity Guide
Water Celebration, p. 446

2.0 Writing Applications (Genres and Their Characteristics)

Students write compositions that describe and explain familiar objects, events, and experiences. Student writing demonstrates a command of standard American English and the drafting, research, and organizational strategies outlined in Writing Standard 1.0.

Using the writing strategies of grade four outlined in Writing Standard 1.0, students:

2.1 Write narratives.

Project WET Curriculum & Activity Guide
Salt Marsh Players, p. 99
Imagine!, p. 157
The Incredible Journey, p. 161
Poetic Precipitation, p. 182
The Thunderstorm, p. 196
Water Concentration, p. 407
(continued)

Water Crossings, p. 421
Water Write, p. 457

2.2 Write responses to literature.

Project WET Curriculum & Activity Guide
Water Write, p. 457

2.3 Write information reports.

Project WET Curriculum & Activity Guide
Water Celebration, p. 446

LISTENING AND SPEAKING

1.0 Listening and Speaking Strategies

Students listen critically and respond appropriately to oral communication. They speak in a manner that guides the listener to understand important ideas by using proper phrasing, pitch, and modulation.

Comprehension .

1.1 Ask thoughtful questions and respond to relevant questions with appropriate elaboration in oral settings.

Project WET Curriculum & Activity Guide
Imagine!, p. 157

1.2 Summarize major ideas and supporting evidence presented in spoken messages and formal presentations.

Project WET Curriculum & Activity Guide
Imagine!, p. 157

GRADE FIVE

READING

1.0 Word Analysis, Fluency, and Systematic Vocabulary Development
Students use their knowledge of word origins and word relationships, as well as historical and literary context clues, to determine the meaning of specialized vocabulary and to understand the precise meaning of grade-level-appropriate words.

Vocabulary and Concept Development

1.5 Understand and explain the figurative and metaphorical use of words in context.

Project WET Curriculum & Activity Guide
Raining Cats and Dogs, p. 435

2.0 Reading Comprehension (Focus on Informational Materials)
Students read and understand grade-level-appropriate material. They describe and connect the essential ideas, arguments, and perspectives of the text by using their knowledge of text structure, organization, and purpose. The selections in *Recommended Readings in Literature, Kindergarten Through Grade Eight* illustrate the quality and complexity of the materials to be read by students. In addition, by grade eight, students read one million words annually on their own, including a good representation of grade-level-appropriate narrative and expository text (e.g., classic and contemporary literature, magazines, newspapers, online information). In grade five, students make progress toward this goal.

Structural Features of Informational Materials

2.2 Analyze text that is organized in sequential or chronological order.

Project WET Curriculum & Activity Guide
Water Address, p. 122

Comprehension and Analysis of Grade-Level-Appropriate Text

2.3 Discern main ideas and concepts presented in texts, identifying and assessing evidence that supports those ideas.

Project WET Curriculum & Activity Guide
Poetic Precipitation, p. 182
Water Celebration, p. 446

2.4 Draw inferences, conclusions, or generalizations about text and support them with textual evidence and prior knowledge.

Project WET Curriculum & Activity Guide
Poetic Precipitation, p. 182

3.0 *Literary Response and Analysis*
Students read and respond to historically or culturally significant works of literature. They begin to find ways to clarify the ideas and make connections between literary works. The

selections in *Recommended Readings in Literature, Kindergarten through Grade Eight* illustrate the quality and complexity of the materials to be read by students.

Structural Features of Literature

3.1 Identify and analyze the characteristics of poetry, drama, fiction, and nonfiction and explain the appropriateness of the literary forms chosen by an author for a specific purpose.

Project WET Curriculum & Activity Guide
Poetic Precipitation, p. 182

WRITING

1.0 Writing Strategies

Students write clear, coherent, and focused essays. The writing exhibits the students' awareness of the audience and purpose. Essays contain formal introductions, supporting evidence, and conclusions. Students progress through the stages of the writing process as needed.

Organization and Focus

1.1 Create multiple-paragraph narrative compositions.

Project WET Curriculum & Activity Guide
The Incredible Journey, p. 161
Water Concentration, p. 407
Water Crossings, p. 421
Water Write, p. 457

1.2 Create multiple-paragraph expository compositions.

Project WET Curriculum & Activity Guide
Imagine!, p. 157
The Incredible Journey, p. 161
Water Celebration, p. 446

2.0 Writing Applications (Genres and Their Characteristics)

Students write narrative, expository, persuasive, and descriptive texts of at least 500 to 700 words in each genre. Student writing demonstrates a command of standard American English and the research, organizational, and drafting strategies outlined in Writing Standard 1.0.

Using the writing strategies of grade five outlined in Writing Standard 1.0, students:

2.1 Write narratives.

Project WET Curriculum & Activity Guide
Salt Marsh Players, p. 99
The Thunderstorm, p. 196
Water Concentration, p. 407
Water Crossings, p. 421
Water Write, p. 457

2.2 Write responses to literature.

Project WET Curriculum & Activity Guide
Water Write, p. 457

2.3 Write research reports about important ideas, issues, or events.

Project WET Curriculum & Activity Guide
Water Celebration, p. 446

LISTENING AND SPEAKING

1.0 Listening and Speaking Strategies

Students deliver focused, coherent presentations that convey ideas clearly and relate to the background and interests of the audience. They evaluate the content of oral communication.

Comprehension

1.2 Interpret a speaker's verbal and nonverbal messages, purposes, and perspectives.

Project WET Curriculum & Activity Guide
Imagine!, p. 157

GRADE SIX

READING

1.0 Word Analysis, Fluency, and Systematic Vocabulary Development
Students use their knowledge of word origins and word relationships, as well as historical and literary context clues, to determine the meaning of specialized vocabulary and to understand the precise meaning of grade-level-appropriate words.

Vocabulary and Concept Development

1.2 Identify and interpret figurative language and words with multiple meanings.

Project WET Curriculum & Activity Guide
Raining Cats and Dogs, p. 435

2.0 Reading Comprehension (Focus on Informational Materials)
Students read and understand grade-level-appropriate material. They describe and connect the essential ideas, arguments, and perspectives of the text by using their knowledge of text structure, organization, and purpose. The selections in *Recommended Readings in Literature, Kindergarten through Grade Eight* illustrate the quality and complexity of the materials to be read by students. In addition, by grade eight, students read one million words annually on their own, including a good representation of grade-level-appropriate narrative and expository text (e.g., classic and contemporary literature, magazines, newspapers, online information). In grade six, students continue to make progress toward this goal.

Structural Features of Informational Materials

2.1 Identify the structural features of popular media (e.g., newspapers, magazines, online information) and use the features to obtain information.

Project WET Curriculum & Activity Guide
Nature Rules!, p. 262
AfterMath, p. 289
Water: Read All About It!, p. 400

Comprehension and Analysis of Grade-Level-Appropriate Text

2.3 Connect and clarify main ideas by identifying their relationships to other sources and related topics.

Project WET Curriculum & Activity Guide
Adventures in Density, p. 25
Water Address, p. 122
Nature Rules!, p. 262
Easy Street, p. 382
Water: Read All About It!, p. 400

2.4 Clarify an understanding of texts by creating outlines, logical notes, summaries, or reports.

Project WET Curriculum & Activity Guide
Nature Rules!, p. 262

Expository Critique

2.7 Make reasonable assertions about a text through accurate, supporting citations.

Project WET Curriculum & Activity Guide
Water: Read All About It!, p. 400

2.8 Note instances of unsupported inferences, fallacious reasoning, persuasion, and propaganda in text.

Project WET Curriculum & Activity Guide
Water: Read All About It!, p. 400

3.0 Literary Response and Analysis

Students read and respond to historically or culturally significant works of literature that reflect and enhance their studies of history and social science. They clarify the ideas and connect them to other literary works. The selections in *Recommended Readings in Literature, Kindergarten Through Grade Eight* illustrate the quality and complexity of the materials to be read by students.

Narrative Analysis of Grade-Level-Appropriate Text

3.4 Define how tone or meaning is conveyed in poetry through word choice, figurative language, sentence structure, line length, punctuation, rhythm, repetition, and rhyme.

Project WET Curriculum & Activity Guide
Poetic Precipitation, p. 182

WRITING

1.0 Writing Strategies

Students write clear, coherent, and focused essays. The writing exhibits students' awareness of the audience and purpose. Essays contain formal introductions, supporting evidence, and conclusions. Students progress through the stages of the writing process as needed.

Organization and Focus

1.1 Choose the form of writing (e.g., personal letter, letter to the editor, review, poem, report, narrative) that best suits the intended purpose.

Project WET Curriculum & Activity Guide
Branching Out!, p. 129
The Incredible Journey, p. 161
Poetic Precipitation, p. 182
Wet Vacation, p. 206
Nature Rules!, p. 262

1.2 Create multiple-paragraph expository compositions.

Project WET Curriculum & Activity Guide
Branching Out!, p. 129
The Incredible Journey, p. 161
Nature Rules!, p. 262
Water: Read All About It!, p. 400
Water Write, p. 457

1.3 Use a variety of effective and coherent organizational patterns, including comparison and contrast; organization by categories; and arrangement by spatial order, order of importance, or climactic order.

Project WET Curriculum & Activity Guide
Nature Rules!, p. 262

Research and Technology

1.5 Compose documents with appropriate formatting by using word-processing skills and principles of design (e.g., margins, tabs, spacing, columns, page orientation).

Project WET Curriculum & Activity Guide
Water: Read All About It!, p. 400

Evaluation and Revision

1.6 Revise writing to improve the organization and consistency of ideas within and between paragraphs.

Project WET Curriculum & Activity Guide
Nature Rules!, p. 262
Water: Read All About It!, p. 400

2.0 Writing Applications (Genres and Their Characteristics)

Students write narrative, expository, persuasive, and descriptive texts of at least 500 to 700 words in each genre. Student writing demonstrates a command of standard American English and the research, organizational, and drafting strategies outlined in Writing Standard 1.0.

Using the writing strategies of grade six outlined in Writing Standard 1.0, students:

2.1 Write narratives.

Project WET Curriculum & Activity Guide
Water Crossings, p. 421
Water Write, p. 457

2.2 Write expository compositions (e.g., description, explanation, comparison and contrast, problem and solution).

Project WET Curriculum & Activity Guide
Branching Out!, p. 129
The Incredible Journey, p. 161
Nature Rules!, p. 262
Water: Read All About It!, p. 400

2.3 Write research reports.

Project WET Curriculum & Activity Guide
Water: Read All About It!, p. 400

2.4 Write responses to literature.

Project WET Curriculum & Activity Guide
Water Write, p. 457

2.5 Write persuasive compositions.

Project WET Curriculum & Activity Guide
Wet Vacation, p. 206

WRITTEN AND ORAL ENGLISH LANGUAGE CONVENTIONS

1.0 Written and Oral English Language Conventions
Students write and speak with a command of standard English conventions appropriate to this grade level.

Sentence Structure

1.1 Use simple, compound, and compound-complex sentences; use effective coordination and subordination of ideas to express complete thoughts.

Project WET Curriculum & Activity Guide
Nature Rules!, p. 262

Grammar

1.2 Identify and properly use indefinite pronouns and present perfect, past perfect, and future perfect verb tenses; ensure that verbs agree with compound subjects.

Project WET Curriculum & Activity Guide
Nature Rules!, p. 262

Punctuation

1.3 Use colons after the salutation in business letters, semicolons to connect independent clauses, and commas when linking two clauses with a conjunction in compound sentences.

Project WET Curriculum & Activity Guide
Nature Rules!, p. 262

Capitalization

1.4 Use correct capitalization.

Project WET Curriculum & Activity Guide
Nature Rules!, p. 262

Spelling

1.5 Spell frequently misspelled words correctly (e.g., *their, they're, there*).

Project WET Curriculum & Activity Guide
Nature Rules!, p. 262

LISTENING AND SPEAKING

1.0 Listening and Speaking Strategies
Students deliver focused, coherent presentations that convey ideas clearly and relate to the background and interests of the audience. They evaluate the content of oral communication.

Correlation of Project WET 4-6 Curriculum & Activity Guide to Science Content Standards for California Public Schools

GRADE 4

LIFE SCIENCES

2. All organisms need energy and matter to live and grow. As a basis for understanding this concept, students know:

   b. producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs, and may compete with each other for resources in an ecosystem.

   Project WET Curriculum & Activity Guide
   Life in the Fast Lane, p. 79

   c. decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.

   Project WET Curriculum & Activity Guide
   Salt Marsh Players, p. 99

3. Living organisms depend on one another and on their environment for survival. As a basis for understanding this concept, students know:

   a. ecosystems can be characterized in terms of their living and nonliving components.

   Project WET Curriculum & Activity Guide
   Life in the Fast Lane, p. 79
   Salt Marsh Players, p. 99
   Water Address, p. 122
   Imagine!, p. 157
   The Incredible Journey, p. 161
   Just Passing Through, p. 160
   Piece It Together, p. 174
   Stream Sense, p. 191
   Water Models, p. 201
   Sum of the Parts, p. 267
   Humpty Dumpty, p. 316
   Macroinvertebrate Mayhem, p. 322

   b. for any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.

   Project WET Curriculum & Activity Guide
   Life in the Fast Lane, p. 79
   Salt Marsh Players, p. 99
   Water Address, p. 122
   Water Models, p. 201

d. most microorganisms do not cause disease and many are beneficial.

Project WET Curriculum & Activity Guide
No Bellyachers, p. 85

EARTH SCIENCES

5. Waves, wind, water, and ice shape and reshape the Earth's land surface. As a basis for understanding this concept, students know:

a. some changes in the Earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.

Project WET Curriculum & Activity Guide
Just Passing Through, p. 166
Old Water, p. 171

c. moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and deposition).

Project WET Curriculum & Activity Guide
Imagine!, p. 157
Just Passing Through, p. 166
Old Water, p. 171
Rainy-Day Hike, p. 186

INVESTIGATION AND EXPERIMENTATION

6. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations. Students will:

a. differentiate observation from inference (interpretation), and know that scientists' explanations come partly from what they observe and partly from how they interpret their observations.

Project WET Curriculum & Activity Guide
Macroinvertebrate Mayhem, p. 322

c. formulate predictions and justify predictions based on cause and effect relationships.

Project WET Curriculum & Activity Guide
Rainy-Day Hike, p. 186
Energetic Water, p. 242

d. conduct multiple trials to test a prediction and draw conclusions about the relationships between results and predictions.

Project WET Curriculum & Activity Guide
Energetic Water, p. 242

f. follow a set of written instructions for a scientific investigation

Project WET Curriculum & Activity Guide
Water Models, p. 201

GRADE 5

PHYSICAL SCIENCES

1. Elements and their combinations account for all the varied types of matter in the world. As a basis for understanding this concept, students know:

   a. during chemical reactions, the atoms in the reactants rearrange to form products with different properties.

      Project WET Curriculum & Activity Guide
      Molecules in Motion, p. 47
      What's the Solution?, p. 54

   g. properties of solid, liquid, and gaseous substances, such as sugar ($C_6H_{12}O_6$), water (H_2O), helium (He), oxygen (O_2), nitrogen (N2),and carbon dioxide (CO_2).

      Project WET Curriculum & Activity Guide
      H_2Olympics, p. 30
      Molecules in Motion, p. 47
      What's the Solution?, p. 54
      Let's Even Things Out, p. 72
      Geyser Guts, p. 144
      Imagine!, p. 157
      The Incredible Journey, p. 161
      Poetic Precipitation, p. 182
      Water Models, p. 201
      A-maze-ing Water, p. 219
      wAteR in moTion, p. 450

   i. common properties of salts, such as sodium chloride (NaCl).

      Project WET Curriculum & Activity Guide
      Irrigation Interpretation, p. 254

LIFE SCIENCES

2. Plants and animals have structures for respiration, digestion, waste disposal, and transport of materials. As a basis for understanding this concept, students know:

   a. many multicellular organisms have specialized structures to support the transport of materials.

      Project WET Curriculum & Activity Guide
      Water Address, p. 122

   e. how sugar, water, and minerals are transported in a vascular plant.

Project WET Curriculum & Activity Guide
Thirsty Plants, p. 116
Water Address, p. 122
The Incredible Journey, p. 161

f. plants use carbon dioxide (CO_2) and energy from sunlight to build molecules of sugar and release oxygen.

Project WET Curriculum & Activity Guide
Salt Marsh Players, p. 99

g. plant and animal cells break down sugar to obtain energy, forming carbon dioxide (CO_2) and water (respiration).

Project WET Curriculum & Activity Guide
Salt Marsh Players, p. 99
The Incredible Journey, p. 161

EARTH SCIENCES

3. Water on Earth moves between the oceans and land through the processes of evaporation and condensation. As a basis for understanding this concept, students know:

a. most of the Earth's water is present as salt water in the oceans, which cover most of the Earth's surface.

Project WET Curriculum & Activity Guide
Old Water, p. 171

b. when liquid water evaporates, it turns into water vapor in the air and can reappear as a liquid when cooled, or as a solid if cooled below the freezing point of water.

Project WET Curriculum & Activity Guide
Molecules in Motion, p. 47
Geyser Guts, p. 144
Imagine!, p. 157
The Incredible Journey, p. 161
Poetic Precipitation, p. 182
Water Models, p. 201

c. water moves in the air from one place to another in the form of clouds or fog, which are tiny droplets of water or ice, and falls to the Earth as rain, hail, sleet, or snow.

Project WET Curriculum & Activity Guide
Thirsty Plants, p. 116
Imagine!, p. 157
The Incredible Journey, p. 161
Old Water, p. 171
Poetic Precipitation, p. 182
Water Models, p. 201

d. the amount of fresh water, located in rivers, lakes, underground sources, and glaciers, is limited, and its availability can be extended through recycling and decreased use.

Project WET Curriculum & Activity Guide
Imagine!, p. 157
Old Water, p. 171
Piece It Together, p. 174
The Long Haul, p. 260
Sum of the Parts, p. 267
Water Meter, p. 271
Water Works, p. 274
Every Drop Counts, p. 307
Money Down the Drain, p. 328
Water Concentration, p. 407

e. the origin of water used by their local communities.

Project WET Curriculum & Activity Guide
Irrigation Interpretation, p. 254
The Long Haul, p. 260
Water Meter, p. 271
Water Works, p. 274
Every Drop Counts, p. 307
Super Bowl Surge, p. 353
Water Concentration, p. 407

4. Energy from the sun heats the Earth unevenly, causing air movements resulting in changing weather patterns. As a basis for understanding this concept, students know:

a. uneven heating of the Earth causes air movements (convection currents).

Project WET Curriculum & Activity Guide
Piece It Together, p. 174

b. the influence of the ocean on weather, and the role of the water cycle in weather.

Project WET Curriculum & Activity Guide
Imagine!, p. 157
The Incredible Journey, p. 161
Old Water, p. 171

c. how to use weather maps and weather forecasts to predict local weather, and that prediction depends on many changing variables.

Project WET Curriculum & Activity Guide
Poetic Precipitation, p. 182

INVESTIGATION AND EXPERIMENTATION

6. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the

other three strands, students should develop their own questions and perform investigations. Students will:

b. develop a testable question.

Project WET Curriculum & Activity Guide
Energetic Water, p. 242

c. plan and conduct a simple investigation based on a student-developed question, and write instructions others can follow to carry out the procedure.

Project WET Curriculum & Activity Guide
Energetic Water, p. 242

g. record data using appropriate graphic representation (including charts, graphs, and labeled diagrams), and make inferences based on those data.

Project WET Curriculum & Activity Guide
The Thunderstorm, p. 196

h. draw conclusions based on scientific evidence and indicate whether further information is needed to support a specific conclusion.

Project WET Curriculum & Activity Guide
H_2Olympics, p. 30
Macroinvertebrate Mayhem, p. 322

i. write a report of an investigation that includes tests conducted, data collected or evidence examined, and conclusions drawn.

Project WET Curriculum & Activity Guide
Macroinvertebrate Mayhem, p. 322

GRADE 6
FOCUS ON EARTH SCIENCE

PLATE TECTONICS AND EARTH'S STRUCTURE

1. Plate tectonics explains important features of the Earth's surface and major geologic events. As the basis for understanding this concept, students know:

   b. the solid Earth is layered with cold, brittle lithosphere; hot, convecting mantle; and dense, metallic core.

   Project WET Curriculum & Activity Guide
   Geyser Guts, p. 144

SHAPING THE EARTH'S SURFACE

2. Topography is reshaped by weathering of rock and soil and by the transportation and deposition of sediment. As the basis for understanding this concept, students know:

   a. water running downhill is the dominant process in shaping the landscape, including California's landscape.

   Project WET Curriculum & Activity Guide
   Branching Out!, p. 129
   The Great Stony Book, p. 150
   Imagine!, p. 157
   The Incredible Journey, p. 161
   Just Passing Through, p. 166
   Old Water, p. 171
   Rainy-Day Hike, p. 186
   Wetland Soils in Living Color, p. 212
   Nature Rules!, p. 262

   b. rivers and streams are dynamic systems that erode and transport sediment, change course, and flood their banks in natural and recurring patterns.

   Project WET Curriculum & Activity Guide
   Branching Out!, p. 129
   The Great Stony Book, p. 150
   Imagine!, p. 157
   Just Passing Through, p. 166
   Old Water, p. 171
   Wetland Soils in Living Color, p. 212
   Nature Rules!, p. 262
   AfterMath, p. 289
   Back to the Future, p. 293

   c. beaches are dynamic systems in which sand is supplied by rivers and moved along the coast by wave action.

Project WET Curriculum & Activity Guide
Wetland Soils in Living Color, p. 212

d. earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats.

Project WET Curriculum & Activity Guide
Nature Rules!, p. 262
AfterMath, p. 289
Back to the Future, p. 293

HEAT (THERMAL ENERGY) (PHYSICAL SCIENCE)

3. Heat moves in a predictable flow from warmer objects to cooler objects until all objects are at the same temperature. As a basis for understanding this concept, students know:

a. energy can be carried from one place to another by heat flow, or by waves including water waves, light and sound, or by moving objects.

Project WET Curriculum & Activity Guide
Energetic Water, p. 242
Choices and Preferences, Water Index, p. 367

b. when fuel is consumed, most of the energy released becomes heat energy.

Project WET Curriculum & Activity Guide
The Incredible Journey, p. 161

ENERGY IN THE EARTH SYSTEM

4. Many phenomena on the Earth's surface are affected by the transfer of energy through radiation and convection currents. As a basis for understanding this concept, students know:

a. the sun is the major source of energy for phenomena on the Earth's surface, powering winds, ocean currents, and the water cycle.

Project WET Curriculum & Activity Guide
Imagine!, p. 157
The Incredible Journey, p. 161
Piece It Together, p. 174
Poetic Precipitation, p. 182
Water Models, p. 201

c. heat from Earth's interior reaches the surface primarily through convection.

Project WET Curriculum & Activity Guide
Geyser Guts, p. 144

e. differences in pressure, heat, air movement, and humidity result in changes of weather.

Project WET Curriculum & Activity Guide
Imagine!, p. 157
Piece It Together, p. 174
Wet Vacation, p. 206

ECOLOGY (LIFE SCIENCE)

5. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept, students know:

   a. energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis, and then from organism to organism in food webs.

      Project WET Curriculum & Activity Guide
      Water Works, p. 274

   b. over time, matter is transferred from one organism to others in the food web, and between organisms and the physical environment.

      Project WET Curriculum & Activity Guide
      The Incredible Journey, p. 161

   c. populations of organisms can be categorized by the functions they serve in an ecosystem.

      Project WET Curriculum & Activity Guide
      Macroinvertebrate Mayhem, p. 322

   d. different kinds of organisms may play similar ecological roles in similar biomes.

      Project WET Curriculum & Activity Guide
      Macroinvertebrate Mayhem, p. 322

   e. the number and types of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition.

      Project WET Curriculum & Activity Guide
      People of the Bog, p. 89
      Water Address, p. 122
      Piece It Together, p. 174
      Common Water, p. 232
      A Drop in the Bucket, p. 238
      Irrigation Interpretation, p. 254
      The Long Haul, p. 260
      Where Are the Frogs?, p. 279
      Macroinvertebrate Mayhem, p. 322
      Choices and Preferences, Water Index, p. 367
      Dilemma Derby, p. 377

RESOURCES

6. Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation. As a basis for understanding this concept, students know:

   a. the utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process.

      Project WET Curriculum & Activity Guide
      Energetic Water, p. 242
      Water Works, p. 274
      Dilemma Derby, p. 377
      Pass the Jug, p. 392
      Water Bill of Rights, p. 403
      Whose Problem Is It?, p. 429

   b. different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and classify them as renewable or nonrenewable.

      Project WET Curriculum & Activity Guide
      Common Water, p. 232
      A Drop in the Bucket, p. 238
      Energetic Water, p. 242
      The Long Haul, p. 260
      Water Meter, p. 271
      Water Works, p. 274
      Easy Street, p. 382
      Pass the Jug, p. 392

   c. natural origin of the materials used to make common objects.

      Project WET Curriculum & Activity Guide
      Old Water, p. 171
      Common Water, p. 232
      Energetic Water, p. 242
      The Long Haul, p. 260
      Water Meter, p. 271
      Water Works, p. 274
      Choices and Preferences, Water Index, p. 367

INVESTIGATION AND EXPERIMENTATION

7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations. Students will:

   a. develop a hypothesis.

Project WET Curriculum & Activity Guide
Branching Out!, p. 129
Wetland Soils in Living Color, p. 212
Where Are the Frogs?, p. 279

b. select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.

Project WET Curriculum & Activity Guide
People of the Bog, p. 89
Branching Out!, p. 129
Wetland Soils in Living Color, p. 212
Back to the Future, p. 293

c. construct appropriate graphs from data and develop qualitative statements about the relationships between variables.

Project WET Curriculum & Activity Guide
The Great Stony Book, p. 150
Water Models, p. 201
Back to the Future, p. 293
Choices and Preferences, Water Index, p. 367

d. communicate the steps and results from an investigation in written reports and verbal presentations.

Project WET Curriculum & Activity Guide
Water Models, p. 201
Where Are the Frogs?, p. 279
Macroinvertebrate Mayhem, p. 322

e. recognize whether evidence is consistent with a proposed explanation.

Project WET Curriculum & Activity Guide
What's the Solution?, p. 54
People of the Bog, p. 89
Poison Pump, p. 93
Branching Out!, p. 129
Rainy-Day Hike, p. 186
Wetland Soils in Living Color, p. 212
Where Are the Frogs?, p. 279
Macroinvertebrate Mayhem, p. 322

f. read a topographic map and a geologic map for evidence provided on the maps, and construct and interpret a simple scale map.

Project WET Curriculum & Activity Guide
Branching Out!, p. 129
Rainy-Day Hike, p. 186

g. interpret events by sequence and time from natural phenomena (e.g., relative ages of rocks and intrusions).

Project WET Curriculum & Activity Guide
Old Water, p. 171
Back to the Future, p. 293

Correlation of Project WET 4-6 Curriculum & Activity Guide to History/Social Science Content Standards for California Public Schools

GRADE 4
CALIFORNIA: A CHANGING STATE

Students learn the story of their home state, unique in American history in terms of its vast and varied geography, its many waves of immigration beginning with pre-Columbian societies, its continuous diversity, economic energy, and rapid growth. In addition to the specific treatment of milestones in California history, students examine the state in the context of the rest of the nation, with an emphasis on the U.S. Constitution and the relationship between state and federal government.

4.1 Students demonstrate an understanding of the physical and human geographic features that define places and regions in California by:

4. identifying the location of and explaining the reasons for the growth of towns in relation to the Pacific Ocean, rivers, valleys, and mountain passes

Project WET Curriculum & Activity Guide
Energetic Water, p. 242

4.3 Students explain the economic, social, and political life of California from the establishment of the Bear Flag Republic through the Mexican-American War, the Gold Rush and California statehood, in terms of:

2. comparisons of how and why people traveled to California and the routes they traveled (e.g., biographies and legends of James Beckwourth, Jedediah Smith, John C. Fremont, Juan Cabrillo)

Project WET Curriculum & Activity Guide
Water Crossings, p. 421

4.4 Students explain how California became an agricultural and industrial power by tracing the transformation of the California economy and its political and cultural development since the 1850's, in terms of:

6. California's water system and how it evolved over time into a network of dams, aqueducts and reservoirs

Project WET Curriculum & Activity Guide
Irrigation Interpretation, p. 254
Wet-Work Shuffle, p. 360
Water Concentration, p. 407

GRADE 5
UNITED STATES HISTORY AND GEOGRAPHY: MAKING A NEW NATION

Students in grade five study the development of the nation up to 1850 with an emphasis on the population: who was already here, when and from where others arrived, and why people came. Students learn about the colonial government founded on Judeo-Christian principles, the ideals of the Enlightenment, and the English traditions of self-government. They recognize that ours is a nation that has a constitution that derives its power from the people, that has gone through a revolution, that once sanctioned slavery, that experienced conflict over land with the original inhabitants, and that experienced a westward movement that took its people across the continent. Studying the cause, course and consequences of the early explorations through the War for Independence and western expansion is central to students' fundamental understanding of how the principles of the American republic form the basis of a pluralistic society in which individual rights are secured.

5.1 Students describe the major pre-Columbian settlements including the cliff dwellers and pueblo people of the desert Southwest, the American Indians of the Pacific Northwest, the nomadic nations of the Great Plains, and the woodland peoples east of the Mississippi River, in terms of:

1. how geography and climate influenced the way various nations lived and adjusted to the natural environment, including locations of villages, the distinct structures that were built, and how food, clothing, tools and utensils were obtained

Project WET Curriculum & Activity Guide
Great Water Journeys, p. 246
Irrigation Interpretation, p. 254
Water Crossings, p. 421

5.2 Students trace the routes and describe the early explorations of the Americas, in terms of:

1. the entrepreneurial characteristics of early explorers (e.g., biographies of Columbus, Coronado) and the technological developments that made sea exploration by latitude and longitude possible (e.g., compass, sextant, astrolabe, seaworthy ships, chronometers, gunpowder)

Project WET Curriculum & Activity Guide
Great Water Journeys, p. 246

3. the routes of the major land explorers of the United States; the distances traveled by early explorers; and the Atlantic trade routes that linked Africa, the West Indies, the British colonies, and Europe

Project WET Curriculum & Activity Guide
Great Water Journeys, p. 246
Water Crossings, p. 421

5.8 Students trace the colonization, immigration and settlement patterns of the American people from 1789 to the mid-1800's, with emphasis on the defining role of economic incentives and the effects of the physical and political geography and transportation systems, in terms of:

2. the states and territories in 1850, their regional locations and major geographical features (e.g., mountain ranges, principal rivers, dominant plant regions)

   Project WET Curriculum & Activity Guide
   Water Crossings, p. 421

3. the explorations of the trans-Mississippi West following the Louisiana Purchase (e.g., draw from maps, biographies and journals of Lewis & Clark, Zebulon Pike, John Fremont)

   Project WET Curriculum & Activity Guide
   Great Water Journeys, p. 246

4. experiences on the overland trails to the West (e.g., location of the routes, purpose of each journey; the influence of terrain, rivers, vegetation, and climate; life in the territories at the end of these trails)

   Project WET Curriculum & Activity Guide
   Water Crossings, p. 421

APPENDIX B

SELECTED TEACHER AND STUDENT COMMENTS

Selected Comments from Fourth Grade Teachers

"The students are more aware of how much water they used daily."

"My students are more concerned about leaky faucets, turning off taps, and water conservation."

"Project WET is a great way to integrate environmental science into the classroom. Many of the activities are very easy to do, but really impress upon the students how important water conservation is."

"I believe the students are much more aware about water challenges and this awareness has translated into at least one important conservation method for each student."

"My students respect water conservation much more now, and realize how much effort is involved in getting water into their homes."

Selected Comments from Fifth Grade Teachers

"The students learned that the water we have now is the same water we have had since the beginning of time. That really surprised them!"

"One parent told me that her water bill has gone down as a direct result of my lessons. Her sons are now more concerned about not wasting the water they use."

"We have even installed soaker hoses and timers at our school's garden to conserve water."

"My students and I really hadn't put too much emphasis on water conservation. We did all the things that we shouldn't have done. Project WET has helped us all realize the importance of this valuable resource."

"My students' attitudes about water are changing for the better."

"We have learned about the issues we have related to water, and who is involved in these problems and solutions."

Selected Comments from Sixth Grade Teachers

"The activities have helped my students see water in a whole different way."

"These activities created an awareness about water misuse that was never before present."

"The personal water conservation activity had the greatest impact. It really hit home how water is so important in our everyday lives. The students realized that they need to conserve more to make a difference."

"The students became more aware of the true amount of water they use, and are trying to reduce their daily amounts."

Selected Student Ideas for Water Conservation

❖ Brushing Teeth
- Turn off the water when brushing your teeth.
- Don't use so much water to rinse your toothbrush.
- Brush your teeth while you are in the shower.

❖ Toilet Flushes
- Lower the water level in the toilet tank to create a lower flushing volume.
- Flush the toilet only when needed.
- Install a low-flush toilet.
- Don't flush the toilet multiple times.
- Put a bottle in the tank to displace the water.

❖ Washing Dishes by Hand
- Fill the sink with water to wash dishes by hand, instead of leaving the water running.
- Wash all dishes first, then rinse them together.

❖ Taking Showers
- Take quicker showers.
- Turn off the water when shampooing your hair, then turn on water to rinse.
- Use a low-flow showerhead.
- Turn off the shower to soap-up body.

❖ Using the Dishwasher
- Make sure the dishwasher is completely full before running it.
- Talk with your family about saving water so they will fill-up the dishwasher.
- Use a shorter cycle.

❖ Taking Baths
- Take a shower instead of a bath.
- Don't fill the bathtub all the way to the top when you take a bath.
- Share your bath with your little brother or sister.

❖ Washing Hands

- Use antibacterial hand gel instead of water sometimes.
- Turn off the water when soaping-up your hands.

❖ Doing the Laundry

- Limit the number of loads.
- Remember to adjust the water level control, if you have one.
- Wash only large loads of clothes when doing the laundry.

❖ Getting a Drink of Water

- Use a cup to get a drink of water.
- Fill a container and leave it in the refrigerator to use later.
- Turn off the water while getting a drink.

❖ Watering the Lawn

- Use timers to water your lawn for the right amount of time and water.
- Use a water nozzle when watering the lawn or washing the car.
- Only water the lawn when it is needed.

❖ Washing the Car

- Let the car get dirty before you wash it.
- Have somebody water the lawn at the same time, so the water can be used for both.
- Take your car to a car wash that uses recycled (non-potable) water.
- Don't leave the hose running.

Selected Comments from Student Essays

"My beliefs for conservation are stronger now. I know that it is necessary in order to assure that there is enough fresh, clean water to go around for everyone."

"I think water conservation is very important."

"Water conservation is extremely important. Although the majority of the planet is water, that water is not useable for our survival. So it is very important that we don't take or use for granted the water that we do have."

"I think water conservation is necessary to have water for the future, and good, drinkable water is a must for mankind."

"Since my mom is a General Manager of a water district, she is very happy with the conservation lessons I get at school. She has always made me aware of conserving water, but now my whole class should understand, too."

"I can now see that we really need to conserve our water and I can do some things myself to help conserve water at my house and at my school."

"Make sure you turn off the water when you are not using the water."

"Many people take our natural resources for granted. Water is one of our most valuable resources. What I can do to help conserve is not to take long showers, or leave the water running while I brush my teeth."

"I now tell my family to take showers instead of baths. I also tell them to take short showers and not long ones."

"The reason why I conserve water is because I want to help everyone else."

"I like to remind my family to save the water, but sometimes my brother is mean and takes a long shower just to make me mad!"

"I like to conserve water because it makes me and the Earth feel good."

"I now take showers more quick. I know how much water they take because we had to write it down for an assignment."

"I feel happy to know that I can conserve water and my class does, too. Even when nobody else wants to conserve, I know I can do something about it for myself."

APPENDIX C

CORRELATIONS TO CALIFORNIA STANDARDS

Paul Cash Environmental Magic Show
"Protecting Earth: Our Water Planet"

Water Related California Science Standards for Grades K-6 Included in Magic Show

K Physical Science:
- Observe properties of materials: ex. water.
- Water can be solid or a liquid – change back and forth.

Earth Science:
- Earth is composed of land, air and water.
- Earth's resources – ex. water. Can be used and conserved.

1st Physical Science:
- Materials come in different forms: solids, liquids, and gases.

Life Science:
- Plants and animals both need water.

Earth Science:
- Weather changes day to day – ex. rain, snow.

2nd Earth Science:
- Rocks, water, plants and soil provide many resources.

4th Life Science:
- Living organisms depend on one another and on their environment for survival (water is key component in the environment).

5th Physical Science:
- Properties of solid, liquid and gaseous substances, such as . . . water.

Earth Science:
- Water on Earth moves between the oceans and land through the processes of evaporation and condensation.
- Most of the Earth's water is present as salt water in the oceans, which cover most of the Earth's surfaces.
- When liquid water evaporates, it turns into water vapor in the air and can reappear as a liquid when cooled, or as a solid if cooled below the freezing point of water.
- Water moves in the air form one place to another in the form of clouds or fog, which are tiny droplets of water or ice, and falls to the Earth as rain, hail, sleet, or snow.
- The amount of fresh water, located in rivers, lakes, underground sources, and glaciers, is limited, and its availability can be extended through recycling and decreased use.
- The origin of water used by their local communities.

6th Earth Science:
- The sun is the major source of energy for phenomena on the Earth' surface, powering winds, ocean currents, and the water cycle.

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