

**Jordan Water Conservation Education Project  
Final Evaluation Report**

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## EXECUTIVE SUMMARY

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### **Background**

Water scarcity is an increasingly serious problem in the desert country of Jordan. Currently, all known sources of water have been tapped. Management of existing water sources and promotion of water rationing programs are vital to ensuring adequate water resources exist for citizens. Yet, many Jordanian citizens perceive the problem as beyond their control, to be solved only by the government in negotiation with countries such as Syria and Israel who share the use of the Jordan River, one of Jordan's major water sources.

In an effort to instill a sense of personal control over water usage and spur Jordanian students and parents to action, Royal Society for the Conservation of Nature (RSCN), with technical assistance from the Environmental Education and Communication (GreenCOM) Project, developed a water conservation curriculum. The curriculum focused on influencing the attitudes, beliefs and practices of teachers, students and students' family members pertaining to water conservation issues, through the promotion of interactive teaching methodologies. Teachers of extracurricular environmental clubs (eco-clubs) implemented the curriculum in boys and girls single-sex secondary schools between January 1995 and April 1995. The curriculum consisted of five units which addressed the following general topics: 1) The water cycle in nature and water sources in Jordan, 2) Reduction of household water use, 3) Ground and surface water, 4) Ground and surface water pollution, and 5) Home gardens and irrigation.

### **Curriculum Development Process**

The water conservation curriculum was adapted from existing curricula and incorporated interactive teaching techniques. The development of a water conservation curriculum for Jordanian high school eco-clubs was undertaken in October 1994 by a group representing concerned stakeholders, including teachers, experts and officials from the Jordanian Ministry of Education, in the context of a participatory materials development workshop. The materials were finalized within two months.

RSCN staff were trained and conducted a series of two-day teacher training workshops in the water conservation curriculum. The participants were walked through the use of the prepared manual; following the instructions step-by-step to ensure appropriate use and teacher understanding of the lesson. The RSCN training staff demonstrated the introductory unit and had participants prepare and demonstrate activities from other curriculum units. Two teachers from each of the participating schools were invited to attend these training workshops, held in January 1995. This was done to ensure that participating schools would have a trained teacher available, even if the eco-club teacher at the time left his position during the period of the curriculum

implementation. For many teachers, this constituted the first time that they had come into contact with a non-lecture oriented methodology for providing instruction. The water conservation curriculum was implemented in the eco-clubs between February and May, 1995.

## **Study Description**

This report provides an evaluation of the impact of the water conservation curriculum on participating teachers and students. A post-only experimental design was used, which entails a comparison of participating eco-club teachers and students (experimental groups) with teachers and students from eco-clubs that did not participate in the project (control groups). After presenting the background leading up to the project, the report presents major findings and addresses gender, curriculum implementation, and participation differences. Results include both separate teacher and student findings as well as the impact of teacher participation on students. Specifically, the results describe the impact of the curriculum on teachers' and students' attitudes, beliefs and practices pertaining to water conservation. The evaluation also assesses the level of student knowledge about water conservation issues.

## **Results**

Results of the analysis show that approximately 60% of the participating teachers implemented the majority of activities from all five units, including some activities which were optional. Teachers who did not implement most activities may have only used the curriculum as a guide for their lectures. Some teachers experienced time constraints, such as the Ramadan holidays which fell midway through the semester, that hindered their ability to complete all recommended activities. The overwhelming majority of participating teachers indicated that they would like to implement the curriculum again in the future, irrespective of their implementation behavior during the semester under evaluation here.

Participation in the curriculum caused teachers to implement a greater variety of water activities. A breakdown of results by gender suggested that this finding may be attributable to the greater number of different water activities done by participating female teachers. However, both male and female participating teachers implemented a greater number of different interactive water activities than non-participating teachers.

The curriculum had little impact on teachers' beliefs about the advantages of interactive teaching methods and their self-efficacy to implement these methods. The lack of influence on teachers' beliefs may be partially due to an inability of the survey measures used to discern changes in this area. Furthermore, the relatively short implementation time frame of a single semester may have been too brief to effect changes in such a deeply entrenched area. Another possible explanation is that the necessary skills to use the interactive teaching methods suggested by the manual for the water conservation curriculum were not fully developed during the two-day workshop that

was held to train eco-club leaders.

Participation in the curriculum had a strong impact on students, with some differential effects by gender. Students who participated in the curriculum have higher mean scores on an aggregate scale of social behaviors, which involved making suggestions about water conservation techniques to their mothers and fathers. This impact is significantly greater for boys than for girls. Students exposed to the curriculum also have higher mean scores on an aggregate scale of knowledge. This increase is also significantly greater for boys than for girls. The curriculum further positively impacted several household water conservation behaviors, including whether or not students looked for ways to reduce water consumption in their households during the last month and their household garden watering practices.

Students' attitudes and outcome beliefs about water conservation were also positively influenced by participating in the curriculum when the effect of rural/urban residence was held constant. Students' normative beliefs about whether others around them wished them to perform water conserving behaviors were also positively impacted by participation when the influence of area of residence was held constant.

## **Conclusions**

Several overarching conclusions can be drawn about the project. The curriculum had a positive effect on teachers' implementation practices and students' knowledge, attitudes and beliefs and behaviors. Eco-club activities were further demonstrated to have the potential to strengthen school-community linkages and motivate both parents and students to actively participate in conserving Jordan's diminishing water resources. This finding has important implications for targeting future environmental conservation efforts in the country. The curriculum evaluated here could effectively serve as a guide for the design of new curricula to address other crucial environmental issues.

The water conservation project also played an important role in enhancing RSCN's institutional capacities in several areas, including: teacher training; use of participatory teaching methodologies; material development; and social science research and evaluation skills. Lastly, RSCN improved its capacity to effectively design and implement gender sensitive programs in the future.

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## I. BACKGROUND

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In 1994 and 1995, RSCN developed, implemented and evaluated a water conservation curriculum (Water Conservation Education Project) in secondary school environmental youth clubs (eco-clubs) in Jordan. Technical assistance was provided by the Environmental Education and Communication (GreenCOM) Project. GreenCOM assisted RSCN with the design of a curriculum using interactive teaching methodologies in order to promote water conservation by teachers, students and their families. RSCN trained participating teachers and provided them with a self-instructing manual on the use of these participatory teaching methods. Three specific objectives of the curriculum were:

1. to increase the knowledge and influence the behaviors and practices of teachers and students regarding water conservation,
2. to provide a mechanism for the dissemination of information about water conservation to the general public, and
3. to build capacity of RSCN for the creation of other curricula on conservation issues in Jordan.

An integral component of the Water Conservation Education Project was an impact evaluation of the water conservation curriculum. Consistent with the GreenCOM mandate to assess gender differences in the interventions it supports, the evaluation studied the differential impact of the curriculum on male and female teachers and students. Since Jordan has a separate-sex school system, with females teaching in girls' schools and males teaching in boys' schools, a ready data source existed for gender comparisons of differential curriculum and participation effects. After presenting the background leading up to the project, this report describes generalized findings and addresses gender, curriculum implementation, and participation differences. The presentation of results is divided into three sections: 1) teacher results; 2) student results; and 3) the impact of differing degrees of curriculum implementation on student outcomes.

### **Problem: Water Conservation in Jordan**

Jordan is in southwest Asia with an approximate population of 2.6 million. It borders Israel, Syria, Iraq and Saudi Arabia. At this point in time, all known natural sources of water in Jordan have been tapped. The major source of water now is rainwater feeding the Jordan River and the Zarqa River. Just over five percent of the border is on the Gulf of Aqaba and, over the years, Syria and Israel have built hydroelectric dams on the Jordan river. Jordan has a highly developed agricultural sector which is the largest consumer of water. Industrial and household water usage has increased in recent years. For these reasons, combined with the fact that Jordan has one of the highest population growth rates in the world due to large-scale immigration as well as high fertility, the water supply in Jordan is no longer sufficient to meet the needs of the population

without rationing. Current conservation efforts focus on more efficient management of existing water resources and rationing of water has become a way of life. Legislation has recently been passed that requires construction of new homes and apartment buildings to include water storage tanks fed by runoff rain water as well as piped water. However, many Jordanian teachers and students, based on preliminary focus groups by project staff, reportedly believe that the country's water problem was caused by political action on the part of Jordan's neighboring countries, and that they, as private citizens, have no control over resolution of the problem.

This combination of external circumstances, along with public attitudes and beliefs, create a significant challenge for promoting water conservation behavior in Jordan. The signing of the Peace Treaty between Israel and Jordan, and mass media publicity highlighting the terms of the agreement, which included Jordanian water rights, helped to focus the nation's population on the issue. RSCN and the GreenCOM Project sought to demonstrate that an educational intervention such as this project could positively impact public attitudes and beliefs.

### **RSCN and Eco-Clubs**

The Royal Society for the Conservation of Nature (RSCN) in Jordan is a non-governmental organization endowed with royal patronage and with a staff of approximately thirty persons. Five divisions support RSCN's varied activities. These include a Division for Conservation, which manages the country's wildlife park systems and includes an internationally known ibex breeding program; a Research Division; a Public Relations Division, responsible for ensuring the sustainability of the organization by recruiting and maintaining membership of organizations and individuals; an Administrative Division, responsible for management and financial matters; and a Public Awareness Division. The latter division was primarily responsible for implementing the project described here. At the time of the evaluation, this division was composed of five educators and a Division Head, all of whom hold bachelor degrees from Jordanian universities in fields other than education or communication. None of the five individuals working on this project had received training in either discipline prior to the onset of this project.

RSCN initiated a loosely structured, school-based eco-club system several years ago. RSCN supported clubs with staff visits twice a year to provide education in the form of lectures and slide shows to students. As the number of participating schools increased, these visits became difficult to maintain, and it became evident that a decentralized system, focusing on teacher leaders as the principal source of environmental information, was necessary as well as more efficient. Currently, RSCN supports over 300 eco-clubs in many of the country's public primary and secondary schools. The public schools in Jordan are all single sex and two-thirds of the clubs in the eco-club system are in girls schools. According to sources in the RSCN, this may be due to the clubs' focus on animals, as well as the types of activities developed by teachers and RSCN, such as drawing competitions, the development of physical models representing habitats, etc. RSCN currently assumes that these activities appeal more to girls than to boys. One-third of the clubs are in high schools. Most of the clubs were founded in schools clustered

geographically in the central area of the country, around the principal cities of Amman, Zarqa and Irbid, with a few in the Red Sea port of Aqaba.

The Water Conservation Education Project evaluated in this report offered an opportunity for RSCN to experiment with a number of new initiatives. The first opportunity was moving from offering conservation-related information, focusing exclusively on biodiversity, to providing information about a range of environmental themes, including water, Jordan's most pressing environmental issue. Several initial visits by GreenCOM and RSCN staff to schools in preparation for the project suggested that interest in improving the eco-clubs was high among both students and teachers. While most students volunteered to participate in eco-club activities, a few students were assigned to the eco-clubs by their teachers. Clubs meet during class periods rather than after school, so that all developed activities had to fit within a single class period. In addition, materials necessary to perform the new eco-club activities had to be physically present within the school as the financial resources for procuring additional materials are uncertain and variable.

Teachers were generally assigned to the eco-clubs by principals. No criteria for selection were suggested to the schools by RSCN, so teacher backgrounds varied from science, to language arts, to mathematics, to religious instruction and art. Teacher training initiated through the project suggested that teachers without a science background had difficulty comprehending the material, even though the curriculum was designed at a 9th grade level. Among other things, RSCN intends to use the results of this study to prepare a list of criteria principals can use to select teachers for eco-club leadership.

RSCN study-material development activities were limited in scope prior to inception of the Water Conservation Education Project. Certain internationally prepared materials were adapted and translated for local use, but often did not reflect local issues and concerns. Brochures were prepared on specific themes by the Division Head. An extensive library was available for walk-in clients and school groups. National Environmental days were commemorated with tree-plantings, mass media publicity and student poster awards. While the Public Relations Division produced a magazine that was professionally printed, the Public Awareness Division produced no materials. As part of the Water Conservation Education Project, USAID purchased computer desk-top publishing systems which were used to prepare the teacher's manual for the curriculum and newsletters for schools.

The project provided initial training, through guided practice, in formative and descriptive research with ten schools. Schools were selected to participate in the project based on several criteria; eco-clubs had to be at least two years old, and were stratified regionally to ensure an urban/rural and gender mix. Because of Jordan's high literacy rate, high schools were selected over primary schools for this initial phase, the testing of the efficacy of the water conservation curriculum. It was hoped that in the second phase, high school eco-clubs would adopt elementary school eco-clubs and nurture them, further decentralizing the educational process, taking the responsibility out of the hands of the RSCN, and empowering all schools, both within

and outside of the eco-club network. Implementation of the new eco-club curriculum needed to be completed prior to administration of the annual examinations in May, which all students are required to take.

### **Intervention: Water Conservation Education Project**

Prior to development of a curriculum, RSCN staff received training in qualitative and quantitative research methodology as well as guided practice in obtaining baseline data and formative data necessary for development of a curriculum. Subject matter for the curriculum was based on these data and existing curricula. RSCN, with technical assistance from GreenCOM and in conjunction with teachers, the Ministry of Education, water officials in Jordan, and other technical experts, developed a five-unit curriculum to address the major issues of water resources and water conservation. Because the goal of RSCN's efforts was **active participation** in water conservation among citizens, the curriculum stressed interactive learning activities.

A participatory materials development workshop was held where a group of concerned stakeholders, including teachers and experts, were brought together to develop a water conservation curriculum. GreenCOM provided technical assistance in conducting the workshop, soliciting the input of several exceptional teachers identified by the Ministry of Education as well as other experts and representatives from the Ministry of Education. Because not all of these teachers were science teachers, the development process was complex. Their contributions, however, were vital because many teachers who coordinate eco-clubs have non-science backgrounds. RSCN staff from other projects participated to further institutionalize the participatory process in the organization.

The curriculum design team studied water issues in Jordan, principles of pedagogy, and designed a draft curriculum with interactive activities. The water conservation curriculum was adapted from existing curricula and incorporated interactive teaching techniques. During the next few months, the materials were refined and finalized. First, the curriculum was pre-tested in six schools, three for girls and three for boys. After the initial pretest, the team revised the curriculum, pretested it again in two schools, and subsequently drafted the final curriculum. The curriculum was developed in Arabic; an English synopsis of the Teacher's Manual is included as Appendix A.

The curriculum development team members participated in a series of "train the trainers" sessions, so that they could train other eco-club teachers at a special series of training workshops held in January 1995. Teachers from 79 participating schools were randomly selected by RSCN, along with an alternate teacher from each school, and invited to attend one of the two-day teacher-training workshops. This was to ensure a back-up information bank existed in each school in the event that one teacher was transferred or withdrew from the project. At the training, teachers received the curriculum and a teaching manual which stressed the use of interactive learning techniques such as student discussions, group projects, etc., rather than

reliance on traditional lectures. The participants were walked through the use of the prepared manual; following the instructions step-by-step to ensure appropriate use and teacher understanding of the lesson. The RSCN training staff demonstrated the introductory unit and had participants prepare and demonstrate activities from other curriculum units. For many teachers, this training constituted the first time that they had come into contact with a non-lecture oriented methodology for providing instruction. In February of 1995 teachers began implementation of the curriculum in their eco-clubs.

Units in the curriculum are:

- Unit 1: The water cycle in nature and water sources in Jordan;
- Unit 2: Conservation of water in domestic use;
- Unit 3: Ground and surface water;
- Unit 4: Ground and surface water pollution; and
- Unit 5: Home gardens and irrigation.

Units 1 through 4 required one club session, and Unit 5 required two club sessions. Each unit included an information section (facts), questions to facilitate discussion, activities for the club, and a pre-test and post-test for the unit. Unit 2 also included a survey and water bill assignment. The survey included a section for the student to fill in and sections for the student to give to each parent to complete. The student was to compare household water bills at the beginning and end of the exercise so that reduction in water use could be measured. Unfortunately, this information was not systematically collected. When it was collected, it tended not to be retained by the club and was therefore not available for use in this analysis.

Because leadership of eco-club is a voluntary activity, teachers could not be required to use the curriculum. Some of the teachers selected for implementation only used the curriculum as a guide for their lectures. Because of the Ramadan holiday, and the feeling by some that six weeks was too long to devote to a single issue (water conservation), some teachers only taught Units 1 and 2.

### **Evaluation: Hypotheses and Objectives**

RSCN, in cooperation with the GreenCOM research staff, conducted a post-intervention evaluation in May 1995. The goal of the evaluation study was to determine whether the curriculum achieved specific project objectives. The study was based on three main hypotheses:

- < Teachers who participated in the project express more support for interactive teaching methods and perform a greater variety of interactive water-related activities in the eco-club sessions than teachers who did not participate (were not trained to use the new curriculum);

- < Students in eco-clubs in which the curriculum was implemented know more about, and have more positive attitudes and beliefs towards water conservation than students in eco-clubs where the water conservation curriculum was not implemented;
- < Participating students performed more water conserving behaviors than students in eco-clubs where the curriculum was not implemented.

Based on these initial hypotheses, a set of more specific objectives for the evaluation was developed. The study sought:

- < to assess teachers' attitudes and beliefs about interactive teaching methods by gender and participation;
- < to determine whether participating teachers used the interactive classroom activities and what impact these activities had on students;
- < to assess the curriculum's effect on students' knowledge, attitudes, beliefs, and practices regarding water conservation by gender;
- < to determine if water conservation information was disseminated to the families and peers of those eco-club members participating in the curriculum, and the extent to which it influenced family practices;
- < to determine the usefulness of the curriculum development and evaluation processes as models for the design of curricula on other topics concerning the environment.

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## II. RESEARCH METHODOLOGY

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### Research Design

The evaluation was based on a post-only design with random selection of participants in experimental and control groups. Four study groups were used in this study: an experimental and a control group for eco-club teachers, and an experimental and a control group for eco-club students. Experimental groups consisted of teachers who received the curriculum and their eco-club students, or participating teachers and students. Control groups consisted of eco-club teachers who did not have access to the curriculum and their students, or “non-participating” teachers and students. The experimental group for teachers included the universe of teachers in central Jordan who participated in the program. The rest of the study groups in this investigation were randomly selected.

### Sampling Framework

The sample selection was limited to eco-clubs that had been in operation for at least two years at the outset of the project. The sample was also limited to eco-clubs in central Jordan in order to hold constant two factors that influence water conservation practices: climatic conditions and water availability. This region, where most of the eco-clubs exist, includes both rural and urban areas. Thus, the evaluation could assess the differential effects of the curriculum on these populations as well as evaluate gender differences. All public schools in Jordan are single sex; both students and their teachers are either male or female. Because the schools participating in this study were high schools, the students surveyed were in grades 7 through 11.

The teacher survey was administered to 90 eco-club teachers from 79 schools in central Jordan, including 61 teachers in the experimental group and 29 teachers in the control group.

The student survey was administered to eco-club students from 38 secondary schools. Twenty-one schools where teachers participated in the curriculum, whether or not the teacher implemented it, were randomly chosen and their students surveyed. Students from a random sample of 17 schools where teachers did not participate in the curriculum were also surveyed. The student sample consisted of a total of 671 students, 424 from the experimental group and 247 from the control group. Table 1 shows the distribution of schools from which the student data were collected.

**Table 1: Distribution of Schools From Which Student Data Were Collected**

Type of School	Location of School	Schools Exposed to RSCN Curriculum	Schools Not Exposed to RSCN Curriculum
BOYS	Rural	5	5
	Urban middle	1	---
	Urban poor	3	---
GIRLS	Rural	4	4
	Urban middle	4	4
	Urban poor	4	4
TOTAL		21	17

The table reveals that the distribution of schools is unbalanced as it does not include any control schools for boys in urban areas. All urban boys schools from central Jordan were either experimental schools or could not be visited at the time this evaluation was conducted. The lack of balance was accounted for in the analysis of the data. Statistical procedures used are described in the section on results.

### **Procedure**

Six teams of one RSCN staff member and one trained volunteer went to 38 selected schools during the environmental club meeting time to administer the surveys. Teachers completed their survey at the same time as the students. An average of eighteen students per eco-club completed questionnaires at each school.

Teachers whose eco-clubs were not included as part of the student sample were invited to come to one of three meetings where they completed the survey. Afterwards, the teachers participated in a group discussion facilitated by RSCN staff that focused on the interactive aspect of the curriculum and problems teachers experienced with implementation.

### **Comparability of the Study Groups**

The socio-demographic information of both teachers and students was examined by gender and participation status to determine: (1) if the information was similar for both sexes, and (2) if the experimental and control groups differed with respect to socio-demographic characteristics, and professional profiles for teachers and academic profiles for students. Socio-demographic variables for teachers and students include rural/urban residence, age, and grade. Professional profile variables for teachers refer to subject of teaching certification, years teaching school and years teaching eco-club. Academic variables for students include academic orientation, overall academic average, and science average.

Because the teachers and their students were randomly selected to participate in the project, background characteristics of teachers and students, when stratified by participation status, would not be expected to exhibit significant differences if the randomization procedure were successful. Results of the analyses for teachers and students are provided in Appendix D.

Overall, the sample of teachers included more females than males and more rural schools than urban schools. Male teachers were significantly more likely to work in rural schools than were female teachers, reflecting the unbalanced design of the sample. No other gender or participation differences with respect to socio-demographic characteristics were detected.

The same socio-demographic characteristics and eco-club information were compared for non-participating and participating teachers, but no significant differences emerged. Thus, the experimental and control groups appear to be statistically comparable regarding the background characteristics considered.

An examination of the socio-demographic characteristics and an academic profile of the eco-club student sample revealed that boys included in the sample were significantly more likely to reside in rural areas than were girls, reflecting again the unbalanced design of the sample. No statistically different socio-demographic difference emerged between experimental and control group students.

## Survey Measures

The theoretical basis for the survey design and subsequent analytical approach utilized concepts from the Theory of Reasoned Action<sup>1</sup> and the Social Learning Theory<sup>2</sup> which provide models of the pathways of behavioral change. The Theory of Reasoned Action asserts that human behavior is under voluntary control and thus the best predictor of a behavior is the intention to perform it. Intentions are determined by attitudes and subjective norms. Attitudes are, in turn, influenced by outcome beliefs and subjective normative beliefs by norms. Social learning theory suggests that the perception of self-competence to perform a behavior will determine whether an individual carries out that behavior when appropriate circumstances are present. This conceptualization of behavioral determinants provided a basis for the design of the survey instruments and the subsequent analytical plan. The following definitions apply:

- < Outcome belief: perceived consequence of performing a behavior
- < Subjective norm: a person's perception of the social pressure put on him/her to perform or not perform a specific behavior;

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<sup>1</sup> Ajzen, I. & Fishbein, M. [1980] Understanding Attitudes and Predicting Behavior. New Jersey: Prentice-Hall, Inc.

<sup>2</sup> Bandura, A. [1986] Social Foundations of Thought and Action. New Jersey: Prentice-Hall, Inc.

- < Norm: socially agreed upon rule or definition of what is right and proper;
- < Self-efficacy belief: the perception that one is capable of carrying out a specific behavior.

### **Teacher Survey Instrument**

The teacher survey instrument measured: 1) attitudes and outcome beliefs about water conservation and personal hygiene behavior; 2) beliefs about the advantages of interactive teaching techniques; 3) beliefs about self-efficacy for implementing participatory teaching methods; and 4) extent of implementation of the curriculum. A copy of the teacher survey is provided in Appendix B.

To determine teachers' beliefs about the advantages of interactive teaching methods, the evaluation instrument used a five-point agree/disagree scale to determine the level of agreement with the following statements:

- < students learn more by discovering answers on their own
- < students learn more by seeing results with their own eyes
- < students learn better through discussions
- < students need to practice what they learn
- < involving students in discussions does not take away from valuable teaching time
- < learning should be fun
- < hands-on activities where all students participate does not require too much preparation
- < parents should be involved in eco-club activities to increase their effectiveness.

Desired beliefs were considered to be those in agreement with the benefits to be derived by students through the use of the different interactive teaching methods described above.

Using the same agree/disagree scaled response format, follow-up questions then asked whether teachers felt they could prepare, and assist students in carrying out, the different interactive teaching methods described above. The more strongly teachers felt they could successfully carry out the method, meaning their beliefs were consistent with the intent of the intervention, the higher their beliefs were scored.

### **Student Survey Instrument**

The student survey instrument contained items to measure: 1) attitudes about water conservation; 2) outcome beliefs about suggesting water conservation techniques to their mothers and fathers, and personally engaging in water conservation behaviors; 3) normative beliefs about

whether different persons thought they should suggest water conservation techniques to their parents and/or perform water conservation activities themselves (turn the tap off while brushing their teeth); 4) social behaviors, including making suggestions about water conservation practices to family members; 5) household water conservation behaviors; 6) impact of suggestions about water conservation on the behavior of their mothers and fathers, and; 7) knowledge of water conservation issues and practices. The student survey is provided in Appendix C.

Beneficial, or desired water conservation behaviors advocated in the curriculum can be divided into personal, household and parental behaviors. Examples of personal behaviors students could perform include:

- < take a bath instead of a shower
- < save cold water that runs out while waiting for the water to heat up
- < brush teeth with the tap off
- < look for ways to reduce household water consumption
- < drink cold water from the refrigerator instead of letting the water run to get colder

Examples of positive general household water conservation behaviors suggested by the curriculum include:

- < place a water bottle in the toilet tank so it uses less water to flush
- < water the home garden in the early morning or evening as opposed to the middle of the day when water evaporates more quickly

Desired parental water conservation behaviors consist of:

- < turn the tap off while washing dishes (mother), or shaving (father);
- < doing full loads of wash instead of doing many small washes (mother);
- < wash a full load in automatic washing machine instead of multiple small loads (mother).

Student social behaviors were defined as making suggestions about specific water conservation behaviors, such as those described above, to family members. Suggestions also included turning off the tap while brushing teeth.

The resulting impact of exposure to ideas from the curriculum on students' family members was determined by asking students whether or not:

- < In the last 24 hours their mothers washed the dishes with the tap running
- < In the last 24 hours, their mothers had a bottle of water in the refrigerator
- < In the past week, their mothers gathered the clothes together to wash
- < In the past week, their mothers followed their water consumption reduction requests
- < In the last 24 hours, their fathers shaved without letting the tap run

Knowledge about major household sources of water of students is included in Appendix E.

### Scale Construction

A number of scales were constructed from the teacher and student data and tested for reliability.

Scales for measuring teachers' attitudes and beliefs were created by summing teachers' responses to three different groups of related questions about:

- < attitudes and beliefs toward water conservation and personal hygiene
- < beliefs about interactive teaching methods
- < beliefs about skill at implementing interactive teaching techniques

In order to test the internal consistency of teachers' responses to questions which were grouped together to form the summed scales, Cronbach's alpha was used. A score of .7 or above was considered to be sufficiently reliable in this analysis. The three scales of teacher attitudes and beliefs are presented in Table 2, accompanied by their alpha reliability scores.

**Table 2: Scales for Teachers**

Scale	Number of Items in Scale	Cronbach's Alpha
1. Attitudes about water conservation and personal hygiene	8	.83
2. Beliefs about interactive teaching techniques	9	.33
3. Perceived skill at implementing interactive teaching techniques	7	.72

The alpha scores for the first and third summed scales which measured teachers' attitudes and beliefs about personal hygiene and self-efficacy at implementing participatory teaching methods, respectively, are acceptable. However, the alpha score for the summed scale which measured teachers' beliefs about interactive teaching techniques is only .3, too low to be considered reliable. Thus, each question that was initially included in this scale was analyzed separately in this evaluation.

Summed scales were also created to measure attitudes, beliefs and behaviors of students. They were constructed by grouping and summing presumably associated questions from the student survey regarding:

- < attitudes and beliefs about water conservation in the home
- < normative beliefs about water conservation
- < social behaviors

< household conservation behaviors

All summed scales were tested for internal consistency using Cronbach's alpha. Table 3 provides the internal consistency values for the seven summed scales constructed.

**Table 3: Student Scales**

Scale	Number of Items in Scale	Cronbach's Alpha
1. Social behaviors	5	.77
2. Household conservation behaviors	15	.48
3. Attitudes toward and outcome beliefs about water conservation	6	.75
4. Combined normative beliefs	20	.95
5. Normative beliefs: suggesting water conservation techniques to mother	6	.84
6. Normative beliefs: suggesting water conservation techniques to father	6	.86
7. Normative beliefs: regarding letting the tap run while brushing teeth	8	.88

Of the scales tested in Table 6, only the scale on household water conservation behaviors could not be considered reliable since it is below the .7 cut-off point. As a result, questions pertaining to household behaviors were analyzed separately.

A detailed explanation of scale construction methods is provided in Appendix F.

### **Analytical Techniques**

Analysis of variance (ANOVA) and Analysis of Co-variance (ANCOVA) were used to study the impact of the intervention on different dependent variables for teachers and students, including attitudes, beliefs and behaviors. The procedures used permitted statistical tests to be performed which adjusted for the impact of having different numbers of participating and non-participating teachers; and, in general, for having different numbers of people in the groups being examined. A unique model, which employed the regression method to calculate the sums of squares, was used so that all effects were adjusted for all other effects in the ANOVA and ANCOVA analyses. This meant that it was possible to hold constant the impact of gender and/or the rural/urban location of a school in the analyses.

In addition, homogeneity of variance tests were performed for each ANOVA and ANCOVA model in order to check the assumption that, for each cell, the data are a random sample from a normal population with cell variances that are equal. Results were rejected if this assumption

was not met; if either of the two most commonly used tests, the Cochran's C or Bartlett-Box tests, were significant. Non-parametric analyses, using the Kruskal-Wallis test, were then performed for those data which did not meet the homogeneity of variance standards. Chi square and t-test were utilized for some individual items.

The analysis of the data is divided into three parts: 1) results pertaining to an analysis of teachers; 2) results pertaining to an analysis of students; and 3) results for teacher impacts upon students. Each of the three parts of the Results section, corresponding to the structure outlined above, is organized around specific research questions that the evaluation was designed to address. The question is first stated, then the answer summarized, and then supporting evidence given. Statistically significant results are provided in tables in the body of the report. Results that are not significant are included as Appendices.

In the first section, teacher implementation behavior is examined. The number and type, meaning interactive or non-interactive, of water activities implemented by participating and non-participating teachers were compared using t-tests. Socio-demographic variables which may have impacted teachers' beliefs; the effects of participation in the curriculum, gender and urban/rural residence on teachers' beliefs about the interactive teaching techniques, and teachers' self-efficacy to implement these techniques were analyzed using the ANOVA and ANCOVA procedures.

In the second section, the effects of students' exposure to the curriculum, gender, and rural/urban residence on their knowledge, attitudes, social behaviors, and household water conservation behaviors were examined using the ANOVA and ANCOVA procedures. Separate analyses were conducted for rural students only, in an effort to eliminate the potentially confounding influence of residence. Analyses using chi-square tests to determine the strength of statistical relationships were performed for the individual item analyses.

Lastly, student data were linked to teacher data in order to explore the impact of teachers' level of curriculum implementation, divided into partial versus full implementation, on students' attitudes, outcome beliefs, and behaviors. This analysis used the ANOVA procedure.

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### III. SUMMARY OF FINDINGS AND DISCUSSION

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Findings in this report indicate that participation in the curriculum had a positive impact on both teachers and students. Participation changed how teachers conducted eco-clubs, both in the content and in the format. Participating teachers implemented a greater number and variety of activities devoted to water use, conservation and pollution, and used more interactive teaching methods, compared with non-participating teachers.

Compared with students from non-participating clubs, participating students had greater knowledge about selected aspects of the water conservation curriculum and expressed more positive attitudes and beliefs about household water conservation behaviors. They performed more water conservation behaviors and more social behaviors to encourage others to reduce water consumption in the home. The curriculum had some differential impact by gender on students' knowledge and social behaviors; the effects were more positive for boys than for girls. Overall, an interactive teaching approach to water conservation education, and perhaps ecology education in general, appears to be an effective way to impact students' attitudes, beliefs and behaviors, as well as influence the behaviors of their parents.

Importantly, the project also developed a set of water conservation education materials which can serve as an important resource for eco-club students and teachers in the future.

Lastly, and very importantly for the sustenance and expansion of environmental education, the project increased a range of skills and experience of the RSCN staff and provided them with valuable experience that they will be able to use to maintain the success of this project and to address other venues in environmental education.

#### **Teachers**

A summary of important results is provided below:

- < Sixty percent of teachers who participated in the curriculum implemented the majority of activities from all five units. More female teachers implemented the majority of activities associated with Unit 2, on household water conservation, than male teachers.
- < Female teachers who participated in the curriculum used a greater variety of water activities in their eco-clubs in comparison with females who did not participate. Exposure to the curriculum increased the number of activities used by female teachers to equal that of male teachers.
- < Participating teachers, males and females, used more, different types of interactive water

activities when compared with non-participating teachers.

- < Participation had little influence on teachers' beliefs about the advantages of interactive teaching methods and their feelings of comfort in being able to teach using these methods.
- < Ninety percent of participating teachers, whether or not they implemented the curriculum, would like to implement the curriculum again with new eco-club students. Barriers to initial implementation were identified as time, not curriculum content.

Participation in the curriculum had a strong positive influence on teachers' behavior in terms of the number and types of water activities implemented in their eco-clubs. Most teachers who received the curriculum implemented the majority of the recommended activities. Female teachers were more strongly effected by the curriculum than male teachers as they increased the number and variety of water activities used in their eco-clubs.

Furthermore, teachers' reactions to the using the curriculum in the future were overwhelmingly positive. The majority responded that they would like to use the curriculum again with new eco-club students. The disparity between the percentage of participating teachers who implemented the majority of activities in the curriculum (60%) and the percentage who would like to use it again (90%) may be partially explained by the fact that some teachers experienced major time constraints during the semester as a result of the Ramadan holidays and were therefore unable to fully implement the curriculum.

The lack of influence of the curriculum on teaching philosophy, or teachers' perceived benefits of using participatory teaching methods, may be attributable to a combination of factors. First, the measures used in the survey instrument may not have been sensitive enough to detect small changes in beliefs. Second, overcoming the barrier of something as ingrained as personal teaching philosophy is, at best, an extremely difficult task, especially in the short time frame of one semester.

While it is true that teachers in Jordan have not traditionally used interactive teaching methods, a situation which posed a significant obstacle for the project, the Ministry of Education had already begun the process of introducing interactive teaching methods to teachers prior to the development of the water conservation curriculum. The lack of difference between participating teachers and non-participating teachers in their level of acceptance of, and comfort with, interactive teaching methods may reflect that while, at the cognitive level teachers knew that the newer methods were preferred by the Ministry, many may not yet be personally convinced.

Very little training was given to teachers in interactive teaching techniques. The training workshops for this curriculum had to balance the presentation of new scientific information, for many of the teachers, with a new approach to student learning. It is likely that the two day training was not sufficient to teach new material, a new teaching approach, and overcome

pedagogic barriers. The fact that this report documents significant changes in teacher implementation behavior, which became more interactive, represents significant progress. Consequently, there is strong reason to believe that the use of interactive teaching methods can eventually work to change teacher philosophies about how student best learn, given sufficient time.

## **Students**

A summary of major findings follows:

- < Students from eco-clubs that participated in the project had more positive scores on an aggregate scale of knowledge in comparison with students from non-participating eco-clubs (when controlling for location of residence (urban/rural)).
- < Participating students had marginally higher scores on an aggregate scale of attitudes and outcome beliefs pertaining to water conservation (when controlling for location of residence (urban/rural)).
- < Participating students had more positive perceptions, on an aggregate scale of normative beliefs, about whether persons close to them wished them to perform water conservation behaviors.
- < Students who participated in the project had more positive scores on an aggregate scale of social behaviors compared with students who did not participate. This effect was stronger for boys than for girls (when controlling for location of residence (urban/rural)).
- < Participating students had more positive scores for several household water conservation behaviors, including: “I looked for ways to reduce household water consumption”; “someone watered the garden in the daytime”; “my mother gathered clothes together to wash”; and “my mother put a full load in the automatic washer”.
- < Participating students in eco-clubs where the curriculum was fully implemented were more likely to make suggestions to their parents about reducing household water consumption than participating students in eco-clubs where it was only partially implemented.

Initial data gathered by the project through focus group discussions with students, teachers and principals suggested that Jordanians believe that girls care more about and are more responsible for safeguarding the environment than boys. This belief is particularly interesting in light of the fact that the curriculum evaluated here more strongly impacted boys’ knowledge and behavior than girls’. Schools volunteer to join RSCN’s club system, with the majority consisting of girls’ schools. This fact further highlights the link between environment and gender. The finding that

boys were more strongly impacted by the curriculum suggests that when the practice of water conservation is presented as an issue within the male domain, boys are receptive to the subject matter. It should be noted here that, as a result of the initial findings, a deliberate effort was made to include exercises and activities that would affect both genders, male teachers/boy students and as well as female teachers/girl students. Thus, the curriculum, when advocating behavior change in the home, included examples that showed men closing faucets while they shaved, men using drip irrigation rather than hoses in family gardens, and men washing cars with buckets rather than a hose. In other words, water conservation activities deliberately focused on changing male behavior.

However, it is also important to note that immediately following development of the curriculum, political events in Jordan related to the Peace initiative catapulted water issues into the media spotlight and substantially raised awareness in the general population about water issues and the need for conservation. These issues remain prominent in the press. This is reflected in the evaluation research which shows similar base knowledge levels for students in eco-clubs whether or not they participated in the curriculum. Despite this fact, after implementation of the curriculum, participating students' knowledge increased significantly.

Remarkably, students appear to have served as a conduit for changing their parents' behaviors with respect to water conservation in the home. The curriculum had a slightly greater effect on the students' households' conservation behavior rather than on their personal conservation behavior. Participating students positively influenced the clothes washing behavior of their mothers as well as their households' garden watering practices. Among students in eco-clubs where the curriculum was fully implemented, their mothers were more likely to gather a full load to wash in the automatic washing machine. The results noted here indicate that eco-club activities are successfully extending their influence beyond individual students to their families and eventually may serve to strengthen school-community linkages. This diffusion of ideas and information is creating a grassroots understanding of water issues while concomitantly laying the foundation for changing social norms.

## **Resource Materials**

The Water Conservation Education project resulted in the production of valuable educational materials that can serve as a continuing resource bank for teachers and students, including:

- < A water conservation curriculum containing:
  - teacher manual with resource information
  - student activity information
- < The first edition of an eco-club newsletter for schools
- < A series of posters on water conservation themes
- < A teacher-training materials folder
- < Monograph of expert lectures on water conservation issues

- < Family survey on water conservation in the home

## **Royal Society for the Conservation of Nature**

RSCN has gained a wealth of knowledge about teacher behavior, eco-club student behavior and implementation of a club program, with impacts effected by gender. More broadly, RSCN has greatly enhanced its institutional capacity in several salient ways and acquired basic skills that are of great importance to Jordanian society as a whole. RSCN's Division of Public Awareness has developed skills in five key areas that will contribute to the organization's objectives:

- < *Social Science Research Methodology*  
Any division or activity that involves public interaction (e.g., Community Development, Public Relations, Interpretation) could benefit from basic quantitative and/or qualitative research to determine target audience knowledge, attitudes and beliefs and behavior.
- < *Materials Development*  
Any division that needs an educational or informational brochure, video, slide show, handbook, guide or other educational or interpretive materials will benefit from preliminary qualitative research.
- < *Participatory Approach*  
RSCN staff have now had wide experience in including target audiences in all stages of decision-making, planning and design, training, and evaluation. Research shows that participation increases a project's chances of success.
- < *Training*  
RSCN Public Awareness Division staff has had experience in preparing and evaluating a training program, including the intermediate steps of "Trainer of Trainer" education. They have had exposure to both pedagogy (how children learn) as well as andragogy (how adults learn).
- < *Computer Skills*  
RSCN staff have developed desk-top publishing skills, data base management, and data analysis skills through professional statistical software programs such as Epi-Info and SPSS. They have also learned the considerations and activities necessary to successfully use their computer tools.

## Implications

The extensive knowledge regarding teacher and eco-club student behavior and implementation of an ecology club program with gender-based considerations which RSCN has gained through working with the Water Conservation Education Project has important implications for future work by the Public Awareness Division. This experience will assist the Division in improving its school-based program by:

- < Becoming more sensitive to teacher needs;
- < Developing a list of criteria for selecting appropriate teachers for future training and activities;
- < Developing a network of regional supervisors to monitor club activities;
- < Developing additional materials for other environmental topics of interest to RSCN and school clubs;
- < Institutionalizing resources and knowledge of environmental issues by investing in teacher training;
- < Developing, designing and implementing gender sensitive programs.

The basic skills RSCN acquired in the areas of social science research methodology; materials development; participatory skills; training; and data analysis and use of computer software, previously described, are all very marketable skills that RSCN can offer to other organizations. At the close of the project other divisions within RSCN had already made contact with the education staff for assistance in the preparation of surveys in support of ongoing public relations activities of RSCN, and in support of tourism promotion at RSCN park sites. They had been contacted for material development assistance by park personnel, and the World Bank was preparing to expand its support to RSCN for the program and responsibilities of the Division. It can be said that capacity building by the project has been eminently successful. USAID, Amman states that the participatory methods introduced by the project have now become an industry standard and are being copied in other programs and projects.

Furthermore, RSCN, with its newly honed research and analysis capabilities, should be well-equipped to effectively carry out a longitudinal study to determine the impact of the curriculum on teachers' beliefs about interactive teaching methods, and any other items of interest, over an extended period of time.

But most importantly, the curriculum evaluated here represents a vital contribution to efforts in Jordan to create a dialogue about water conservation among citizens and evoke a degree of perceived personal control over and responsibility for dealing with the serious water shortage problem faced by the country in a gender- sensitive fashion.

Although participating teachers' beliefs about the advantages of interactive activities were not significantly altered, their implementation of the interactive activities in the curriculum and favorable response when asked about using the curriculum in the future attest to their support for

the curriculum. Findings in this report further confirm that interactive teaching methods are an effective way to change students' attitudes and beliefs, and motivate them and their family members to actively participate in solving the problem. Eco-clubs are shown to be an effective point of intervention for environmental education projects. The underlying principles and methods promoted in the curriculum should serve as a foundation for the development of new curricula designed to address other pressing environmental concerns.

#### IV. DETAILED RESULTS FOR TEACHERS

**Q. To what extent did participating eco-club teachers implement the water conservation curriculum?**

Teachers were trained with the expectation that they would implement, or try to implement the water conservation education curriculum. Because of a number of circumstances described earlier in this report, and because of individual differences in proclivity to implement and comfort with the interactive teaching techniques, not all participating teachers implemented all of the curriculum units. When implementing a unit, different teachers implemented the unit to differing degrees. The units were made up of several activities, some were mandatory and others were optional.

Participating teachers were asked in the survey whether or not they implemented each of the different activities suggested by the curriculum for each of the units; how well each activity, if done, was accomplished; and would they do the activity again in the future. Sixty percent of the participating teachers reported that they implemented all of the 21 activities that were assessed in the survey. For the purpose of comparison, activities were classified by unit and a calculation was made of whether or not the teacher completed the majority (i.e., 50% or more) of the activities for each unit. Table 1 shows the percentage of participating teachers who completed the majority of activities per unit by gender.

**Table 1: Percent of Participating Teachers Who Implemented the Majority of Activities by Unit and Gender**

Implemented majority of activities from:	All Participating Teachers (n=61)	Breakdown by Gender		
		Participating Male Teachers (n=26)	Participating Female Teachers (n=35)	<i>p</i>
Unit 1: Water Cycle	80%	73%	86%	.21
Unit 2: Household Water Conservation	75%	62%	86%	.03
Unit 3: Ground and Surface Water	74%	62%	83%	.06
Unit 4: Water Pollution	87%	89%	86%	.75
Unit 5: Home Gardens and Irrigation	69%	69%	69%	.96

From the data it is clear that most teachers implemented the majority of activities from all of the

curriculum units. A cross tabulation analysis using the chi square statistic revealed different levels of implementation of the majority of Unit 2 activities by gender. Female teachers were significantly more likely to have implemented the majority of Unit 2 activities than male teachers. It is possible that this difference is related to the differences in household based responsibilities faced by males and females and that the female teachers, teaching female students, found the topics and exercises more compelling and relevant.

When asked if they wish to do the curriculum again in the future, 90% of the teachers responded affirmatively. This did not vary by gender or between teachers who implemented the majority of activities or only some of the activities suggested by the curriculum.

**Q. Did teachers who participated in the water conservation curriculum implement more eco-club activities related to water conservation than non-participating teachers? Did participants do more interactive water activities than other teachers?**

Results of the analysis indicate that participating teachers implemented more water conservation activities in their eco-clubs when compared with their non-participating counterparts. It was also found that participating teachers used a greater number of different interactive water activities in comparison to teachers who did not participate.

This question was answered using the information from several questions on the teacher survey. Teachers were asked if, during the last semester, they had done any activities on:

- < water resources in Jordan;
- < water use and conservation in the household;
- < water pollution.

Follow-up questions for each topic asked them to describe what they had done.

A content analysis of responses to the three questions was conducted and teachers were scored as to whether or not they mentioned the following items:

- < lecture
- < materials on resources (leaflets, posters)
- < activity on resources
- < discussions
- < activity on conservation
- < activity on pollution
- < actions (clean tank, etc)
- < water bills
- < field trips
- < general reference to water project and/or RSCN training

To assess the degree of water-related teaching activity of both participating and non-participating eco-club teachers, activities they mentioned were grouped into two categories: “interactive” and “non-interactive”. Mentioning lectures, books, and other passive presentation formats were considered to be non-interactive. Activities such as field trips, experiments, drama presentations and the like were classified as being interactive. A cumulative index was then constructed. T-tests were conducted to compare the mean number of activities done overall and the mean number of interactive activities done by participating and non-participating teachers. Table 2 summarizes the results.

**Table 2: Different Types of Water Activities and Different Types of Interactive Water Activities Implemented by Teachers**

Water Activities	Non-participating Teachers (means)			Participating Teachers (means)			Key for tests of difference
	Male	Female	Both n=29	Male	Female	Both n=61	
Different Types of Water Activities Last Semester	2.1	1.8	1.9	2.2	2.8	2.5	1,3
Types of Interactive Water Activities Last Semester	.6	.6	.6	1.6	1.7	1.7	1,2,3

Tests of Difference

- 1 Among all teachers, participants are different from non-participants (p<.05)
- 2 Among male teachers, participants are different from non-participants (p<.05)
- 3 Among female teachers, participants are different from non-participants (p<.05)
- 4 Among non-participants, male teachers are different from female teachers (p<.05)
- 5 Among participants, male teachers are different from female teachers (p<.05)

With respect to the number activities on water conducted, there seems to be an impact of participation in the project on the female teachers. More specifically, the female teachers who participated reported more water activities than those who did not participate. There was no effect of participation on male teachers.

Teachers who were participants used a greater number of interactive water activities when compared to teachers who did not participate. This is true for both male and female teachers.

**Q. In what ways do teachers’ beliefs about interactive teaching techniques differ according to their professional backgrounds?**

An analysis was done to determine the extent to which teachers’ professional backgrounds had an impact on their beliefs about interactive teaching techniques and their self-efficacy at

implementing these techniques. The assumption behind this was that if such variables proved to have an impact, they would have to be held constant in order to understand the net effect of participation in the program.

Findings show that teachers who were certified in a non-science subject, and those who had more years of eco-club teaching experience (4-9 years), more strongly believe that lectures are not the best teaching method. In addition, teachers with more experience teaching eco-club more strongly favored involving parents in learning activities for students. On the other hand, professional background had no impact on teachers' beliefs about their self-competency to implement interactive teaching approaches in the eco-clubs.

Professional background was defined by:

- < years of teaching experience
- < teacher certification
- < years of eco-club teaching experience

Teacher certification was divided into non-science and science subject areas. The non-science classification includes teachers certified in language arts, psychology, and vocational studies. The science classification includes teachers certified in biology and other natural science disciplines. Both years of teaching experience and years of eco-club teaching experience were divided into "high" and "low" at the median value.

Nine beliefs about the advantages of interactive teaching methodologies were examined as dependent variables in an ANOVA procedure. Results of the analysis showed that statistically significant differences exist between the groups considered regarding two of the beliefs examined. Table 3 highlights mean differences in teachers' beliefs about interactive teaching techniques by teaching experience, teaching certification and eco-club experience. Results about the effects of the same variables on self-efficacy beliefs, which showed no impact, are presented in Appendix G.

**Table 3: Beliefs About Interactive Teaching Techniques Compared by Teaching Experience, Teaching Certification and Eco-club Teaching Experience**

Beliefs About Teaching Technique	Teaching Experience (means)			Teaching Certification (means)			Eco-Club Teaching Experience (means)		
	Low 1-10yrs (n=52)	High 11-26 yrs (n=37)	<i>p</i>	Non-Science (n=35)	Science (n=53)	<i>p</i>	Low 1-3 yrs (n=50)	High 4-9yrs (n=40)	<i>p</i>
ANOVA ANALYSIS									
Discovering answers							1.1	1.0	.66
Discussions are better	1.4	1.4	.80						
Practice what they learn	1.7	1.7	.72	1.7	1.7	.84	1.7	1.7	.82
Discussions too much time	1.7	1.7	.67	1.7	1.7	.81	1.7	1.7	.79
Learning should be fun	1.3	1.2	.47	1.3	1.2	.65			
Lectures not best method	-0.4	-0.2	.58	0	-0.5	.04	-0.5	0	.04
Hands-on activities	0.7	0.5	.32	0.5	0.7	.40	0.6	0.7	.50
Parents should be involved	-0.9	-0.8	.36	-0.8	-0.9	.48	-1.1	-0.5	.01
NON-PARAMETRIC KRUSKAL-WALLIS ANALYSIS <sup>^</sup>									
Discovering answers	1.0	1.0	.06	.7	1.2	.03			
See results with own eyes	1.7	1.8	.21	1.8	1.7	.89	1.7	1.7	.59
Discussions are better				1.7	1.2	.0004	1.4	1.4	.59
Learning should be fun							1.7	1.6	.20

<sup>^</sup> Means reported for information purposes only, not used in Kruskal-Wallis Test

Results in the table indicate that teachers who were certified in a non-science subject, and those who had more years of eco-club teaching experience (4-9 years), were significantly more inclined to believe that lectures are not the best teaching method. In addition, teachers with more experience teaching eco-club were significantly more in favor of involving parents in learning activities for students. Comparisons by area of teacher certification revealed that teachers certified to teach science more strongly favored students discovering answers on their own but placed less importance on discussions that teachers certified in other subjects.

**Q. Did participation in the curriculum, gender and rural/urban residence impact teachers' beliefs about interactive teaching techniques and self-efficacy to use them?**

The effects of participation in the curriculum and gender and rural/urban residence on teachers' beliefs and self-efficacy were assessed. Overall, the analyses revealed that participation did not

have a significant impact on teachers' beliefs about the advantages of interactive teaching methods or their self-efficacy with respect to being able to implement interactive teaching methods. This was true for both male and female teachers. Yet residence did exert an influence on teachers' beliefs about the value of interactive activities. Some beliefs measured were more strongly held in rural areas than in urban areas.

ANOVA was used in this analysis. This procedure explored the main effects and interaction effects of three pairs of independent variables:

- < participation and gender
- < participation and rural/urban residence
- < participation and gender with residence as a covariate

on the two sets of dependent variables:

- < beliefs about interactive teaching methods
- < self-efficacy beliefs.

### **Participation and Gender Effects**

The results of the analysis of the effects of participation and gender on teachers' beliefs about interactive teaching techniques and perceived ability, or self-efficacy, to implement them were not significant and are included in Appendix H.

### **Participation and Rural/Urban Residence Effects**

The results of the analysis of the effects of participation and residence on teachers' beliefs on the same dependent variables are presented in Table 4 below.



## Participation and Gender Effects with Teacher Certification and Eco-club Teaching Experience

Given that teachers beliefs about the value of interactive teaching methods were found in some instances in a previous analysis to differ significantly by subject of teacher certification and years of experience teaching eco-club, these two variables were held constant in order to examine the net effects of participation in the curriculum and gender on these beliefs. Results are provided below in Table 5.

**Table 5: The Effect of Participation and Gender, with Teacher Certification and Eco-club Teaching Experience as Covariates, on Teachers' Beliefs about Interactive Teaching Techniques**

Interactive Teaching Technique	Males (n=33)		Females (n=57)		Effects		
	Non-Participants	Participants	Non-Participants	Participants	Participation	Gender	Participation by Gender
GENERAL FACTORIAL ANCOVA ANALYSIS							
Discussions are not too time consuming	1.4	1.7	1.7	1.6	.39	.43	.14
Learning should be fun	1.5	1.3	1.1	1.1	.62	.12	.79
Lectures are worst	-.26	-.10	-.28	-.56	.85	.42	.46
Hands-on activities	.76	.94	.31	.45	.51	.05	.93
Parents should be involved	-1.1	-1.1	-.76	-.79	.88	.16	.99

Male teachers, both those who participated in the curriculum and those who did not, expressed significantly greater support for the use of hands-on activities to teach students than female teachers.

Those beliefs that did not pass the homogeneity of variance test were analyzed using non-parametric methods to determine the effect of participation in the curriculum. Due to the limitations of this type of analysis, the potentially confounding influences of teacher certification and eco-club teaching experience on the effect of participation on teachers' beliefs were explored separately by creating two four-part variables. Findings are included in Table 6.

**Table 6: The Effect of Participation, by Teacher Certification and Eco-club Teaching Experience, on Teachers' Beliefs about Interactive Teaching Techniques**

Interactive Teaching Technique	Non-Science Certification (n=35)		Science Certification (n=53)		<i>p</i>
	Non-Participants	Participants	Non-Participants	Participants	Participation by Certification
NON-PARAMETRIC KRUSKAL-WALLIS ANALYSIS WITH TEACHER CERTIFICATION ^					
Discovering answers	.78	.73	1.2	1.2	.21
See results with own eyes	1.8	1.7	1.4	1.8	.05
Discussions are better	1.8	1.7	1.4	1.1	.002
Practice what they learn	1.8	1.7	1.5	1.7	.34
Interactive Teaching Technique	Less Eco-club Experience, 1-3years (n=50)		More Eco-club Experience, 4-9 years (n=40)		<i>p</i>
	Non-Participants	Participants	Non-Participants	Participants	Participation by Certification
NON-PARAMETRIC KRUSKAL-WALLIS ANALYSIS WITH ECO-CLUB TEACHING EXPERIENCE^					
Discovering answers	1.1	1.0	1.0	1.0	.86
See results with own eyes	1.4	1.8	1.7	1.8	.06
Discussions are better	1.4	1.4	1.7	1.2	.34
Practice what they learn	1.6	1.7	1.6	1.7	.71

^ Means reported for information purposes only, not used in Kruskal-Wallis Test

Among teachers certified in a science subject, those who participated in the curriculum were significantly more supportive of the need for students to see results with their own eyes, but less convinced of the value of discussions, than those teachers certified in other disciplines.

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#### IV. DETAILED RESULTS FOR STUDENTS

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The examination of student data was undertaken to determine the effects of teacher training, gender, and rural/urban residence on student knowledge, attitudes, beliefs, and behaviors. Summed scales were developed to examine, in a general fashion, the impact of these independent factors on these outcomes. These scales were also examined on an item-by-item basis in order to identify specific areas of impact. Analysis of variance (ANOVA) was used to determine the effect of teacher training, gender and rural/urban residence. Analysis of covariance (ANCOVA) was used to hold area of residence constant. Analyses using chi-square tests to determine the strength of statistical relationships were performed for the individual item analyses for rural students only in order to remove the potentially confounding influence of residence.

Overall, the analyses revealed that the participation of teachers and the implementation of the water conservation curriculum with the student eco-club members had a positive impact on those students. When compared to eco-club students from schools not participating in the program, eco-club students from participating schools had:

- < higher scores on a scale of knowledge;
- < higher scores on a scale social behaviors; and
- < higher scores on certain individual household water conservation behaviors.

There were gender differences identified in the impact of the water conservation curriculum on students. Boys obtained higher scores than girls in participating schools for the scale of social behaviors.

Because of the analytic difficulties presented by the absence of any male, urban, non-participating schools available for the study, the analysis has also been broken down as follows:

- < interaction effects of participation and gender for rural eco-club students
- < effects of participation for rural eco-club students
- < effects of gender for rural eco-club students

This breakdown enables comparisons between participants and non-participants to be made without consideration of the confounding impact of school location.

**Q. What impact did the interaction between participation and gender, controlling for the impact of rural/urban location, have on composite measurements of student knowledge, attitudes and beliefs, social behaviors, household water conservation behaviors and normative beliefs?**

Differences in knowledge about selected aspects of the curriculum exist by teacher participation and by gender when residence is held constant. Both male and female eco-club students of participating eco-club teachers had higher knowledge scores than did their counterparts in non-participating schools. Boys had higher knowledge scores than girls. However, there was no interaction effect between participation and gender, meaning the observed gender difference was not significant. In other words, even though students of both sexes improved their knowledge scores through exposure to the curriculum, participating boys continued to score higher than participating girls. This reflects a persistent relative advantage of boys over girls also observed in non-participating schools. Results of this analysis are presented in Table 1.

**Table 1: Effects of Participation and Gender for Aggregate Student Scales**

Student Scales	Boys (means)		Girls (means)		Effects		
	Non-Partici-pants	Partici-pants	Non-Partici-pants	Partici-pants	Partici-pation	Gender	Participa-tion by Gender
ANOVA WITH RESIDENCE AS A COVARIATE							
Knowledge	9.3	10.8	8.8	9.7	.001	.001	.10
Attitudes and Outcome Beliefs	8.9	9.0	8.5	9.3	.08	.89	.19
Social Behaviors	-1.3	1.2	-0.5	0.9	.001	.41	.03
Household Water Conservation Behaviors	1.7	3.2	2.1	2.8	.01	.98	.34
NON-PARAMETRIC KRUSKAL-WALLIS FOR RESIDENTS OF RURAL AREAS <sup>^</sup>							
Normative Beliefs	23.0	26.1	19.8	24.4			.001

<sup>^</sup> Means reported for information purposes only, not used in Kruskal-Wallis Test

There was a difference based on school participation in the water conservation curriculum for the social behaviors scale (results also displayed in Table 1). Participants had higher scores than eco-club students in schools that were not participating. Furthermore, the difference observed among boys was larger than that observed among girls.

A significant difference based on school participation was also identified for reported household water conservation behaviors. Students in participating schools had higher scores for these behaviors than did eco-club students in schools that were not taking part. This finding indicates that the curriculum was performing as hoped for by modifying reported behaviors in the expected

direction.

Because the test for homogeneity of variance failed when the analysis for the aggregate scale for normative beliefs was performed, a non-parametric test was used to investigate the relationships between gender and participation with regard to this variable. The test was performed for rural eco-club students only. A four-level variable was constructed; the categories were male participant, male non-participant, female participant, and female non-participant. A difference was identified, indicating that there was a difference in test scores by gender and participation. An examination of the means indicates that boys in eco-clubs in participating schools have the highest mean scores, next are participating girls, non-participating boys and then non-participating girls.

**Q. What impact did the interaction between participation and gender have on individual items pertaining to knowledge, attitudes, outcome and normative beliefs, social behaviors, and household water conservation behaviors of rural students?**

Individual items were analyzed for rural students only to take into account the unbalanced study design and potentially biasing influence of residence on the results. An examination of individual knowledge items on the surveys of rural students yields some surprising results. For several items where the results are significant, items pertaining to the importance of puddles, tap water, bottled water and groundwater as sources of water in Jordan, a higher percent of the non-participating students knew the correct answer than did the students in participating eco-clubs. It may well be that in rural society, where knowledge of sources of water is more essential, the standard presentations in eco-clubs include the presentation of facts, a methodology not stressed in this new curriculum. Students participating in the eco-club water conservation curriculum project were more likely than non-participating students to know information that was more esoteric and less day-to-day oriented, such as 1% of the earth's water is suitable for human consumption. Tables for this and other portions of the analysis are included in Appendix K.

“Suggesting to father the use of water conservation techniques is good,” “...techniques to lower the water bill are good,” and personally shutting off the tap while brushing ones teeth is good are attitudes that were differentially impacted by participation and gender for rural eco-club members. Non-participant boys and participant boys were more both likely than non-participant girls to approve of suggesting water conservation techniques to their father. Because participating girls approved of making suggestions to fathers almost as strongly as boys did, the curriculum does appear to have had an impact on them.

When compared to their counterparts in non-participating schools, a greater proportion of boys and girls in participating schools believed that the water bill can be lowered by making suggestions to their fathers about water conservation. However, boys in non-participating schools were still more likely than girls in participating schools to believe this outcome was

possible. This indicates that gender-based barriers to speaking to opposite-sex parents exist even for socially responsible activities, such as water conservation. The same response pattern is present for shutting off the tap water while brushing one’s teeth to lower the water bill.

Normative belief results followed the same general trend as the water conservation attitudes and outcome beliefs. There were significant differences for most of the individual belief variables and the prevalent pattern was that participating eco-club students felt more social pressure to conserve water, than did non-participating eco-club students. More boys, however, both participating and non-participating tended to feel social pressure than did girls.

With respect to social behaviors, a significantly higher percentage of eco-club students in participating schools reported talking to their parents about water pollution and water conservation techniques than did students in non-participating eco-clubs. This finding was stronger for boys than for girls. Results are presented in Table 2.

**Table 2: Effect of Participation and Gender on Social Behaviors of Rural Students (Percent Reporting Performance of Behavior)**

Social Behavior Items	Boys		Girls		χ <sup>2</sup> p-value
	Non-Participants	Participants	Non-Participants	Participants	
In last month, talked with father about water pollution	16%	45%	20%	35%	.00
In last month, talked with mother about water pollution	21%	45%	19%	44%	.00
In last month, suggested water conservation techniques to father	29%	64%	32%	51%	.00
In last month, suggested water conservation techniques to mother	25%	68%	42%	68%	.00

The water conservation curriculum impacted various types of household water conservation behaviors of rural eco-club students. There were significant differences in these behaviors for all but drinking water from a refrigerator, a variable for which there was almost universal support. Most differences appear to be based on participation/non-participation status of the students, with those who had the water conservation curriculum endorsing the desired behaviors. Only “washed dishes with tap off” appeared to have a strong gender component, being more common among girls, and no participation component. Table 3 provides results for this analysis.

**Table 3: Effect of Participation and Gender on Household Water Conservation Behaviors**

**of Rural Students (Percent Reporting Performance of Behavior)**

Household Water Conservation Behavior Items		Boys		Girls		χ <sup>2</sup> p-value
		Non-Participants	Participants	Non-Participants	Participants	
p e r s o n a l	Bathing behavior	11%	46%	27%	25%	.00
	Saved cold water as it heated	21%	17%	36%	25%	.01
	Brushed teeth	66%	84%	79%	84%	.01
	Looked for ways to reduce	37%	66%	39%	63%	.00
	Washed dishes with tap off	36%	28%	75%	67%	.00
	Drank water from refrigerator	90%	86%	78%	82%	.14
h o u s e h o l d	Water bottle in toilet tank	52%	42%	48%	60%	.03
	Watered household garden in morning	45%	44%	49%	55%	.31
	Household garden not watered in daytime	33%	62%	39%	57%	.00
	Watered household garden in evening	37%	61%	34%	43%	.00
p a r e n t a l	Mother had refrigerator water bottle	82%	83%	87%	77%	.30
	Father shaved with tap off	79%	82%	79%	70%	.08
	Mother washed dishes	76%	75%	75%	77%	.98
	Mother washed clothes together	60%	77%	67%	70%	.08
	Mother washed full load in machine	24%	24%	20%	24%	.90

Female participants adopted more recommended practices than any other group, including placing a filled water bottle in the toilet tank. Both males and females who participated in the curriculum more frequently practiced proper garden watering techniques.

**Q. What impact did differences in participation have on the knowledge, attitudes, outcome and normative beliefs, social behaviors, and household water conservation behaviors of rural students?**

In order to isolate exactly what was responsible for the differences identified in the previous analysis, an analysis only examining the effects of participation was performed. An examination of individual knowledge items on the surveys of rural students by participation status indicated that when there was a significant relationship, the students participating in the curriculum usually

were more knowledgeable than their non-participating counterparts. The exceptions were knowledge about puddles, and sprinklers versus irrigation, about which non-participating students were more knowledgeable. Items for which there were significant differences included:

- < puddles as a source of water
- < rainfall as a source of water
- < springs as a source of water
- < ground water as a source of water
- < treated sewage water as a source of water
- < water with sprinkler more expensive than drip irrigation

The tables associated with this analysis are included as Appendix L.

Attitude and outcome belief differences were not a function of participation. The only significant difference for this set of variables is for the outcome belief “shutting the tap off when brushing the teeth lowers the water bill.” A greater proportion of participating students believed this to be true.

Subjective normative beliefs about shutting off the tap while brushing your teeth and making conservation technique suggestions to parents are different for eco-club students who participated and for those who did not: those who participated were more likely than those did not to feel social pressure from others, including their teacher, friends, female relatives and classmates, to conserve water.

The differences in social behaviors were all attributable to participation differences. For all items in this set, students participating in the water conservation curriculum were more likely to have talked about water pollution and water conservation with their parents than students whose eco-clubs had not participated. Differences in the following household water conservation behaviors were found to be associated with program participation:

- < bathing behavior
- < teeth brushing
- < looking for ways to reduce water consumption
- < garden watering behaviors
- < mother’s clothing washing behavior

Results are provided in Table 4.

**Table 4: Effect of Participation on Social Behaviors of Rural Students  
(Percent Reporting Performance of Behavior)**

<b>Social Behavior Items</b>	<b>Non-Participants (%)</b>	<b>Participants (%)</b>	<b><math>\chi^2</math> p-value</b>
In last month, talked with father about water pollution	18	39	.00
In last month, talked with mother about water pollution	19	44	.00
In last month, suggested water conservation techniques to father	30	57	.00
In last month, suggested water conservation techniques to mother	34	68	.00

Participation in the curriculum appears to account for most of the differences in household water conservation behaviors presented in Table 3, including bathing behavior, turning off the tap while brushing teeth, looking for ways to reduce water consumption, mother’s clothes washing behavior and garden watering practices. Table 5 provides results of the effect of participation on these behaviors.

**Table 5: Effect of Participation on Household Water Conservation Behaviors of Rural Students (Percent Reporting Performance of Behavior)**

Household Water Conservation Behavior Items		Non-Participants (%)	Participants (%)	$\chi^2$ p-value
p e r s o n a l	Bathing behavior	19	34	.00
	Saved cold water as it heated	29	22	.10
	Brushed teeth	73	84	.01
	Looked for ways to reduce	38	64	.00
	Washed dishes with tap off	56	50	.22
	Drank water from refrigerator	84	84	1.00
h o u s e h o l d	Water bottle in toilet tank	50	52	.62
	Watered household garden in morning	47	50	.49
	Household garden not watered in daytime	36	59	.00
	Watered household garden in evening	36	51	.00
p a r e n t a l	Mother had refrigerator water bottle	85	80	.18
	Father shaved with tap off	79	75	.31
	Mother washed dishes	75	76	.88
	Mother washed clothes together	64	73	.04
	Mother washed full load in machine	22	24	.66

**Q. What impact did differences in gender have on the knowledge, attitudes, outcome and normative beliefs, social behaviors and household water conservation behaviors of rural students?**

Again, in order to isolate exactly what was responsible for the differences identified in the analysis including both gender and participation, an analysis to examine the main effects of gender on the individual items making up the different composite scales was performed. The complete results of this analysis are included as Appendix M. An examination of individual knowledge items on the surveys of rural students by student sex indicated that there were essentially no gender difference for knowledge. The only three exceptions were:

- < puddles as a source of water
- < 1% of the earth's water is suitable for human consumption

< main reason Azraq Oasis dried up

for which boys scored significantly higher than girls. These results indicate that boys and girls are learning, for the most part, the same factual information.

Boys were more likely than girls to have more positive attitudes and outcome beliefs about making suggestions to their parents, both mothers and fathers, concerning water conservation techniques. Boys were also more likely than girls to feel social pressure to perform the behaviors promoted by the water conservation curriculum, indicating that they are receiving and/or retaining more consistent messages approving of water conservation measures.

There were no gender-based differences exhibited for social behaviors. With respect to household water conservation behaviors, girls were more likely than boys to indicate that they had saved cold water after it had been heated and to have washed dishes with the tap off, both of these associated with traditionally female activities. Boys were more likely than girls to indicate that they used refrigerated water and that they watered the garden in the evening, the latter being associated with a more traditionally male responsibility. Results are included in Table 6.

**Table 6: Effect of Gender on Household Water Conservation Behaviors of Rural Students  
(Percent Reporting Performance of Behavior)**

Household Water Conservation Behavior Items		Boys (%)	Girls (%)	$\chi^2$ p-value
p e r s o n a l	Bathing behavior	31	26	.23
	Saved cold water as it heated	18	29	.01
	Brushed teeth	76	82	.16
	Looked for ways to reduce	54	54	.96
	Washed dishes with tap off	32	70	.00
	Drank water from refrigerator	88	81	.04
h o u s e h o l d	Water bottle in toilet tank	46	55	.06
	Watered household garden in morning	44	53	.09
	Household garden not watered in daytime	50	50	.96
	Watered household garden in evening	51	40	.02
p a r e n t a l	Mother had refrigerator water bottle	82	81	.74
	Father shaved with tap off	81	73	.06
	Mother washed dishes	75	76	.82
	Mother washed clothes together	70	69	.78
	Mother washed full load in machine	24	22	.71

Overall, it appears that the differences seen in impacts on students are largely the function of participation in the water conservation program and less a function of gender. Where there were gender differences, they seemed associated with traditional roles: less outspoken for females than males and more home-oriented for females than males and more garden oriented for males than females.

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## V. RESULTS FOR DEGREE OF TEACHER IMPLEMENTATION

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The previous section described the results of the comparison of students from eco-clubs where teachers were participating in comparison to those students from eco-clubs where teachers were not participating. For that series of analyses, participation was defined as having received the curriculum materials and having participated in the regional orientation workshop. While this group of teachers was selected for participation, their level of curriculum implementation varied from not at all to having their eco-club students perform all activities within all five units of the curriculum.

This section of the evaluation examines the effects of participating teachers' level of curriculum implementation on students' attitudes, outcome beliefs, behavior and results on other family members. What is of particular interest is the differential impact of full versus partial implementation on these outcomes. Full implementation was defined as having done a majority of activities from each of the five units and having done between 17-21 activities overall. A little over half of the participating teachers (n=36), reported completing the majority of activities from all 5 units. Thirty teachers were identified as full implementors, and thirty-one as partial implementors. The analyses were performed using ANOVAs.

**Q. What are the effects of partial versus full implementation of the water conservation curriculum by participating teachers on students' knowledge, attitudes & beliefs, behavior, and students' parents water conservation behavior?**

Level of implementation, either partial or full, did not have a significant effect on student attitudes toward water conservation or outcome beliefs about water conservation. Results are provided in Appendix N.

However, there were implementation-associated impacts on students' behavior and the behavior of members of their families. Students whose teachers fully implemented the curriculum were more likely to make suggestions about specific water conservation techniques to their mothers and fathers. In addition, full implementation was associated with the students' mothers keeping a water bottle in the refrigerator and gathering a full load of clothes to wash in an automatic washing machine. Surprisingly, students whose teachers only partially implemented the curriculum were more likely to endorse that their fathers shaved with the tap off. Table 1 summarizes the effect of partial versus full implementation of the curriculum on students' behavior related to water conservation.

**Table 1: Effect of Curriculum Implementation by Teachers on Student Behaviors**

Behaviors	Partial Implementors (means)	Full Implementors (means)	df	F value	Significance of F
Past month- suggested mother reduce consumption	0.2	0.5	1	7.7	.01
Past month-suggested dad reduce consumption	-0.1	0.2	1	12.8	.001
Last 24 hours- teeth brushing behavior	1.5	1.4	1	0.2	.66

Implementation had a significant effect on whether or not students suggested to both their mothers and fathers that they reduce water consumption. Those students from eco-clubs with teachers who fully implemented the curriculum more frequently made these types of suggestions. Table 2 presents other significant effects of implementation on the students' mothers and fathers.

**Table 2: Effect of Curriculum Implementation by Teachers on Behaviors of Students' Relatives**

Results	Partial Implementors (means)	Full Implementors (means)	df	F value	Significance of F
Last 24 hours- mother washed dishes with tap running	1.2	1.3	1	0.2	.66
Last 24 hours- mother had water bottle in the refrigerator	1.5	1.2	1	3.9	.05
Past week- mother washed clothes together	1.1	1.0	1	0.5	.49
Past week- mother washed full load in automatic washer	-0.4	-0.02	1	5.0	.05
Mother followed water consumption reduction request	0.4	0.5	1	2.3	.13
Last 24 hours- father shaved with tap off	1.5	1.1	1	8.9	.01

The degree of teacher implementation of the water conservation curriculum may have had an effect on subsequent behaviors by other family members in the student households. The behavior "mother washed full load in automatic washer" was more positively impacted when the curriculum was fully implemented. Surprisingly, "mother had water bottle in refrigerator" and "father shaved with tap off" were found to be more frequent among students in eco-clubs where teachers only partially implemented the curriculum.

However, it is possible that variables other than level of curriculum implementation determined

these two behaviors. Given that the behaviors that were found to be significantly different have different time references, this may have biased the results. For the behavior where the difference detected is in the expected direction, the time period is one week. For the other two, where the significant differences are in the opposite direction, the time reference is 24-hours. For example, it is easier to wash a full load of laundry in the washing machine after a week has elapsed. In other words, the time bias introduced by the question increases the chances of the behavior being performed merely by chance. This may be in part supported by the fact that when clothes are washed through another mechanism that does not require the use of a machine, there are no changes between the students of partial and full implementors. Therefore, the significant differences noted here could be spurious or due to the influence of other factors for which this analysis did not control. It is also possible this analysis serves simply as a measure of awareness among students of what their mothers are doing as opposed to behavior change resulting from full curriculum implementation.

**Guide Series of the Royal Society for the Conservation of Nature  
1- Water Conservation  
Summary of the Teacher's Manual**

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**Introduction and Acknowledgments**

The introduction discusses the importance of water as a natural resource and the decision by the Royal Society for the Conservation of Nature (RSCN) to address the water issue with GreenCOM. This section reports that students have knowledge and awareness of water problems in Jordan, but don't feel that they can contribute to any solutions. Therefore, this guide aims to instill an appreciation of natural resources in students and a sense that they can play a part in conserving these resources.

The acknowledgments make special mention of the contributions of USAID, Amman.

**Educational Theory**

This section provides teachers with a brief overview of current educational theory, stressing the importance of interactive discussions and hands-on experiments and discovery to student learning. The section notes the importance of making the topic relevant to teenagers. Teachers should make the students feel they are doing worthwhile work in a fun but serious environment,

particularly since the curriculum is a voluntary activity.

### **Methodology/General Directions**

These next two sections discuss how to present the curriculum to the students. Each of the five units includes background information for a lecture, a topic and questions for discussion, and activities. Most of the sections also include a series of questions that the teacher can pose to the students before and after the unit takes place, in order to measure the knowledge that has taken place. The section on Methodology also talks about the responsibility of the student and his or her family to face environmental problems and to bring about solutions.

The General Directions section tells the teachers some of the basic materials they will need, such as maps and notebooks. It suggests sending a letter to the parents of the students to invite them to join in as much as possible and to encourage their children to participate.

### **Unit 1-The Water Cycle**

The general overview highlights the importance of water in nature, its role in the Koran, and its many uses. There is background information about water sources, the water cycle, dams in Jordan, and the concept of water as a publicly owned good.

The first activity teaches how people have collected and used over time. It also discusses the impact of population growth and urbanization on water supply.

The second activity in Unit 1 involves making a small replica of the water cycle by putting water in a bowl or glass, covering it, and putting it in the sun and then in the shade to see what happens. The next part involves replicating the water cycle by putting water, dirt, and seeds in a covered jar to see if and how the plants grow. In each case, students first say what they expect to see, then perform the experiment and record and discuss what they actually observe.

### **Unit 2-Household Water Use**

Unit 2 reinforces the importance of water and its scarcity in Jordan and throughout the Middle East, and then brings the issue literally home. Students measure how much water they and their families use at home and explore ways they can decrease their consumption.

In the first activity, students conduct a survey in their homes with their parents. The first section of the questionnaire addresses the student's personal use for teeth-brushing, bathing, and the like. The second section asks about "female" household tasks such as washing dishes and clothes. The final section poses questions about "male" responsibilities: washing the car, shaving, and

ensuring that there are no leaky pipes in the house.

The second activity has two parts. First, the class learns to read a water meter. Then students check their home water meters, or look at their families' water bills if they purchase water, to calculate the cost of water to the family. The students compare their families' water bills after a month of implementing water-saving measures around the house.

The next several activities present ideas for saving water in the bathroom, kitchen, and elsewhere in the house. For example, in one activity, students calculate how much water they would save if they did not let the tap run when they brush their teeth, and then multiply that amount by the number of members in their family.

### **Unit 3-Aquifers and Surface Water**

This unit introduces the concept of underground (aquifer) and surface water. Student discussion centers on the issues raised by a hypothetical conversation between two friends -- Hamid and Hamed -- from different parts of Jordan. They talk about their surrounding areas, both of which have become drier in recent years, and how they have seen birds and wildlife disappear. They talk about their fears that water might not be available in the future and discuss the difference between renewable and non-renewable water sources.

Three experiments follow to teach students about wells and aquifers, and the impact of pollution. For example, in one experiment, students place seeds and wood chips into a nylon sock, wet it, and observe what happens over the course of two days.

### **Unit 4-Pollution**

Unit 4 addresses surface water and aquifer pollution, the role that humans play in causing pollution, and ways to stop it. Unit 5 makes particular reference to the pollution in the Gulf of Aqaba, and its effect on the area's coral reefs. Students consider six suggestions to decrease water pollution, such as minimizing the use of chemical fertilizer and controlling garbage disposal.

Then the students conduct an experiment to simulate pollution by filling glasses with water, sand, and pebbles, into which they place ink, red dye, and oil to observe what happens.

### **Unit 5 - Home garden and irrigation**

The first section of Unit 5 covers plants in the home garden. Students divide into groups to work together. They learn about the water-efficient plants to use their home garden. For example, in one activity, students take three plants with different-sized leaves to see how much water each

uses. In another, they compare transpiration by plants with waxy vs. non-waxy leaves.

An additional activity shows students how to make compost for the home garden. They learn how compost can keep water from evaporating too quickly from the ground. They also observe the effect of fertilizer on evaporation levels.

The second part of Unit 5 is about canal and drip irrigation methods for agriculture. Students simulate the two methods by watering plants with a pitcher (canal) and a water dropper (drip). They carry out the experiment over the course of two weeks to see how much water is used each way. They take notes and present their results. In an additional activity, they collect rainwater at home to save for watering their garden and other uses.

### **Attachments**

The manual ends with lists of resources if teachers need additional information.

**APPENDIX B: TEACHER SURVEY**

Identification Number \_\_\_\_\_

**Jordan Water Conservation Study  
Teacher Survey**

**General Information**

1. Name \_\_\_\_\_
2. School \_\_\_\_\_ City \_\_\_\_\_
3. Are you male or female?  
\_\_\_ (1) Male  
\_\_\_ (2) Female
4. How long have you been teaching? Write your years of teaching experience below.  
\_\_\_\_\_ years
5. How old are you? \_\_\_\_\_ years old.
6. a. What subject is your teaching certification in? \_\_\_\_\_  
b. What is your job?  
\_\_\_ (1) Teacher  
\_\_\_ (2) Lab Technician  
\_\_\_ (3) Librarian  
\_\_\_ (4) Counselor  
\_\_\_ (5) Other \_\_\_\_\_  
c. What grades and subjects did you teach during the last school year?]  
  
Did you teach 8th grade Science?  
\_\_\_ (1) yes  
\_\_\_ (2) no  
  
Did you teach 8th grade Arts?  
\_\_\_ (1) yes  
\_\_\_ (2) no

Did you teach 9th grade Science?

\_\_\_ (1) yes

\_\_\_ (2) no

Did you teach 9th grade Arts?

\_\_\_ (1) yes

\_\_\_ (2) no

Did you teach 10th grade Science?

\_\_\_ (1) yes

\_\_\_ (2) no

Did you teach 10th grade Arts?

\_\_\_ (1) yes

\_\_\_ (2) no

Did you teach 11th grade Science?

\_\_\_ (1) yes

\_\_\_ (2) no

Did you teach 11th grade Arts?

\_\_\_ (1) yes

\_\_\_ (2) no

7. Have you ever taught about water pollution or scarcity before?

\_\_\_ (1) Yes

\_\_\_ (2) No

8. If yes, which grades?

\_\_\_ (1) 7th

\_\_\_ (2) 8th

\_\_\_ (3) 9th

\_\_\_ (4) 10th

\_\_\_ (5) 11th

9. How many years have you been working with eco-club?

\_\_\_ years

10. How did you become involved with the club?

\_\_\_ (1) Volunteered

\_\_\_ (2) Assigned

\_\_\_ (3) Other, specify \_\_\_\_\_

11. Did you volunteer for extra money?  
\_\_\_ (1) Yes  
\_\_\_ (2) No  
\_\_\_ (3) Did not volunteer
12. Did you volunteer for professional development?  
\_\_\_ (1) Yes  
\_\_\_ (2) No  
\_\_\_ (3) Did not volunteer
13. Did you volunteer to earn points towards promotion?  
\_\_\_ (1) Yes  
\_\_\_ (2) No  
\_\_\_ (3) Did not volunteer
14. Did you volunteer because you are interested in the environment?  
\_\_\_ (1) Yes  
\_\_\_ (2) No  
\_\_\_ (3) Did not volunteer

**General Information about the Eco-club**

15. What year was the club established?  
\_\_\_ Year  
\_\_\_ (99) Don't know
16. How often does eco-club meet?  
\_\_\_ (1) Once a week  
\_\_\_ (2) Twice a week  
\_\_\_ (3) Once every 2 weeks  
\_\_\_ (4) Once every 3 weeks  
\_\_\_ (5) Once a month  
\_\_\_ (6) Don't know
17. What are 3 main activities in eco-club?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
18. How many students are members of your club?

\_\_\_ Number of students  
\_\_\_ (99) Don't know

19. Are students screened for club membership?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
20. Do you use scientific background as a criterion to determine membership?  
\_\_\_ (1) Yes  
\_\_\_ (2) No  
\_\_\_ (3) Did not screen
21. Do you use academic average as a criterion to determine membership?  
\_\_\_ (1) Yes  
\_\_\_ (2) No  
\_\_\_ (3) Did not screen
22. How "popular" is the eco-club in your school?  
\_\_\_ (1) Everyone wants to be a member  
\_\_\_ (2) Most students want to be members  
\_\_\_ (3) Only some students want to be members  
\_\_\_ (4) It is hard to recruit students for membership
23. Approximately what percentage of club members are in the following grades:  
\_\_\_ % 7th  
\_\_\_ % 8th  
\_\_\_ % 9th  
\_\_\_ % 10th  
\_\_\_ % 11th
24. Approximately what percentage of club members study the following subjects:  
\_\_\_ % Science  
\_\_\_ % Arts  
\_\_\_ % Vocational  
\_\_\_ Not specialized yet
25. How supportive is the principal of the eco-club activities?  
\_\_\_ (1) Very supportive  
\_\_\_ (2) Somewhat supportive  
\_\_\_ (3) Not at all supportive
26. a) In the last semester, did you do any activities on water resources in Jordan?

- \_\_\_ (1) Yes
- \_\_\_ (2) No

b) If yes, what activities did you do to address this issue ?

\_\_\_\_\_

27. a) In the last semester, did you do any activities on water use and conservation in the household?

- \_\_\_ (1) Yes
- \_\_\_ (2) No

b) If yes, what activities did you do to address this issue ?

\_\_\_\_\_

28. a) In the last semester, did you do any activities on water pollution?

- \_\_\_ (1) Yes
- \_\_\_ (2) No

b) If yes, what activities did you do to address this issue ?

\_\_\_\_\_

### Teaching Philosophy

Express your level of agreement with the following statements:

29. Students learn more through discovering the answers on their own than through lectures.

- \_\_\_ (1) Strongly agree
- \_\_\_ (2) Somewhat agree
- \_\_\_ (3) Neither agree nor disagree
- \_\_\_ (4) Somewhat disagree
- \_\_\_ (5) Strongly disagree

30. I can facilitate students discovering answers on their own.

- \_\_\_ (1) Strongly agree
- \_\_\_ (2) Somewhat agree
- \_\_\_ (3) Neither agree nor disagree
- \_\_\_ (4) Somewhat disagree
- \_\_\_ (5) Strongly disagree

31. Students learn better by seeing results with their own eyes.  
\_\_\_ (1) Strongly agree  
\_\_\_ (2) Somewhat agree  
\_\_\_ (3) Neither agree nor disagree  
\_\_\_ (4) Somewhat disagree  
\_\_\_ (5) Strongly disagree
32. I can help students see results with their own eyes.  
\_\_\_ (1) Strongly agree  
\_\_\_ (2) Somewhat agree  
\_\_\_ (3) Neither agree nor disagree  
\_\_\_ (4) Somewhat disagree  
\_\_\_ (5) Strongly disagree
33. Students learn better through discussions.  
\_\_\_ (1) Strongly agree  
\_\_\_ (2) Somewhat agree  
\_\_\_ (3) Neither agree nor disagree  
\_\_\_ (4) Somewhat disagree  
\_\_\_ (5) Strongly disagree
34. I can involve students in discussions.  
\_\_\_ (1) Strongly agree  
\_\_\_ (2) Somewhat agree  
\_\_\_ (3) Neither agree nor disagree  
\_\_\_ (4) Somewhat disagree  
\_\_\_ (5) Strongly disagree
35. Students need to practice what they learn.  
\_\_\_ (1) Strongly agree  
\_\_\_ (2) Somewhat agree  
\_\_\_ (3) Neither agree nor disagree  
\_\_\_ (4) Somewhat disagree  
\_\_\_ (5) Strongly disagree
36. I can help students practice what they learn.  
\_\_\_ (1) Strongly agree  
\_\_\_ (2) Somewhat agree  
\_\_\_ (3) Neither agree nor disagree  
\_\_\_ (4) Somewhat disagree  
\_\_\_ (5) Strongly disagree

37. Involving students in discussions takes away from valuable teaching time.  
\_\_\_ (1) Strongly agree  
\_\_\_ (2) Somewhat agree  
\_\_\_ (3) Neither agree nor disagree  
\_\_\_ (4) Somewhat disagree  
\_\_\_ (5) Strongly disagree
38. Learning should be fun for students.  
\_\_\_ (1) Strongly agree  
\_\_\_ (2) Somewhat agree  
\_\_\_ (3) Neither agree nor disagree  
\_\_\_ (4) Somewhat disagree  
\_\_\_ (5) Strongly disagree
39. I can make learning fun for students.  
\_\_\_ (1) Strongly agree  
\_\_\_ (2) Somewhat agree  
\_\_\_ (3) Neither agree nor disagree  
\_\_\_ (4) Somewhat disagree  
\_\_\_ (5) Strongly disagree
40. The best way to convey information is through lectures.  
\_\_\_ (1) Strongly agree  
\_\_\_ (2) Somewhat agree  
\_\_\_ (3) Neither agree nor disagree  
\_\_\_ (4) Somewhat disagree  
\_\_\_ (5) Strongly disagree
41. Hands-on activities where all students participate requires too much preparation.  
\_\_\_ (1) Strongly agree  
\_\_\_ (2) Somewhat agree  
\_\_\_ (3) Neither agree nor disagree  
\_\_\_ (4) Somewhat disagree  
\_\_\_ (5) Strongly disagree
42. I can prepare hands-on activities for students.  
\_\_\_ (1) Strongly agree  
\_\_\_ (2) Somewhat agree  
\_\_\_ (3) Neither agree nor disagree  
\_\_\_ (4) Somewhat disagree  
\_\_\_ (5) Strongly disagree

43. Parents should be involved in eco-club activities.

- (1) Strongly agree
- (2) Somewhat agree
- (3) Neither agree nor disagree
- (4) Somewhat disagree
- (5) Strongly disagree

44. I can involve parents in eco-club activities.

- (1) Strongly agree
- (2) Somewhat agree
- (3) Neither agree nor disagree
- (4) Somewhat disagree
- (5) Strongly disagree

45. My principal supports the activities described above.

- (1) Strongly agree
- (2) Somewhat agree
- (3) Neither agree nor disagree
- (4) Somewhat disagree
- (5) Strongly disagree

### **Attitudes Toward and Beliefs About Water Pollution and Conservation Behaviors**

In the list of questions below, check the answer that best applies to you.

46. Shutting the tap while I brush my teeth is:

- (1) very good
- (2) good
- (3) neither good nor bad
- (4) bad
- (5) very bad

47. Shutting the tap while I brush my teeth will reduce my household's water bill.

- (1) strongly agree
- (2) agree
- (3) neither agree or disagree
- (4) disagree
- (5) strongly disagree

48. The persons that are important to me think that I should shut the tap while brushing my teeth.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
49. My colleagues think that I should shut the tap while I brush my teeth.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
50. My male relatives think that I should shut the tap while I brush my teeth.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
51. My female relatives think that I should shut the tap while I brush my teeth.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
52. My friends think that I should shut the tap while I brush my teeth.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
53. Access to piped water has increased water consumption at the household level.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree

54. In the past 24 hours, to brush my teeth:
- (1) I left the tap running
  - (2) I turned off the tap while brushing
  - (3) I used the tap to fill a glass of water
  - (4) I did not brush my teeth.
  - (5) My house has no tap water.

**If you were NOT trained in the water conservation curriculum, STOP HERE and Thank You!.**

**If you were trained in the water conservation curriculum, please answer the last few questions.**

### Teaching Activities

55. Were you trained in the water conservation curriculum?
- (1) Yes
  - (2) No
56. If yes, have you used the curriculum that you were trained in?
- (1) Yes
  - (2) No
  - (3) Not trained
57. Why or why not?
- 
- 

58. How supportive is the principal of the water conservation activities?
- (1) Very supportive
  - (2) Somewhat supportive
  - (3) Not at all supportive
59. Did you receive additional funds to do water conservation activities?
- (1) Yes
  - (2) No
60. How many sessions of the eco-club were devoted to water conservation during the last semester?
- Sessions
  - (99) Don't Know

## Eco-club Activities

Please tell us about your activities in the eco-club.

61. a) How was the discussion on gathering of water accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
62. a) How was the discussion on population growth and use of water accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
63. a) How was the discussion on migration to cities accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
64. a) How was the discussion on rainfall in Jordan accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
65. a) How was the replica of water cycle, without plant, activity accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all

- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
66. a) How was the replica of water cycle, with plant, activity accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
67. a) How was the questionnaire for parents on household water use accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
68. a) How was showing the class a water meter accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
69. a) How was comparing water expenditures before and after conservation efforts accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
70. a) How was the discussion on water for dish washing, teeth-brushing, leaky faucet, etc. accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all

- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
71. a) How was the activity of pouring water through earth, sand and stones accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
72. a) How was the discussion of underground water accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
73. a) How was the putting seeds and wood chips in a sock on a plate of water activity accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
74. a) How was the adding ink and oil to a glass of water to simulate pollution activity accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
75. a) How was the discussion on water pollution accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all

- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
76. a) How was the comparison of water use for 3 types of plants accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
77. a) How was the activity of the determination of how much water is lost through photosynthesis accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
78. a) How was the comparison of water loss in waxy and non-waxy leaves accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
79. a) How was building a compost to conserve earth water accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
80. a) How was the comparison of canal and drip irrigation accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all

- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
81. a) How was the collection of rain water at home accomplished?  
\_\_\_ (1) Very well accomplished  
\_\_\_ (2) Went alright  
\_\_\_ (3) Did not go well at all
- b) Would you like to do this activity in the future?  
\_\_\_ (1) Yes  
\_\_\_ (2) No

**Finally**

82. What is your overall impression of the water conservation activities?  
\_\_\_ (1) Extremely good  
\_\_\_ (2) Very good  
\_\_\_ (3) Good  
\_\_\_ (4) Poor,  
\_\_\_ (5) Very poor  
\_\_\_ (6) Terrible
83. Do you intend to use any of the following teaching techniques from the water conservation curriculum in your classes:
- Group projects?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
- Students discussing with students?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
- Involving parents?  
\_\_\_ (1) Yes  
\_\_\_ (2) No
- Hands-on activities?  
\_\_\_ (1) Yes  
\_\_\_ (2) No

84. Did implementing the water conservation curriculum increase the students' sense of responsibility toward water conservation?

\_\_\_ (1) Yes

\_\_\_ (2) No

85. Which two activities in the water use curriculum did you like best and why?

1. \_\_\_\_\_

2. \_\_\_\_\_

86. Which two activities in the water use curriculum did you like least and why?

1. \_\_\_\_\_

2. \_\_\_\_\_

87. In what ways could the Royal Society for the Conservation of Nature (RSCN) better support you in the implementation of the water use curriculum:

By providing additional training to you?

\_\_\_ (1) No

\_\_\_ (2) Yes

If yes, how?

\_\_\_\_\_

By changing the content of the curriculum?

\_\_\_ (1) No

\_\_\_ (2) Yes

If yes, how?

\_\_\_\_\_

By changing the teaching methods and activities?

\_\_\_ (1) No

\_\_\_ (2) Yes

If yes, how?

\_\_\_\_\_

By providing financial support?

- \_\_\_ (1) No
- \_\_\_ (2) Yes

88. Please list any other ways RSCN could assist you to implement the water conservation curriculum more effectively.

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***Thank You !!!!***

**APPENDIX C: STUDENT SURVEY**

Identification Number \_\_\_\_\_

**Jordan Water Conservation Study  
Student Survey**

**General Information**

Please tell us about yourself.

If you are not a member of eco-club, please indicated if you are a member of any other club:

- \_\_\_ (1) Science club member
- \_\_\_ (2) Archaeology club member
- \_\_\_ (3) Boy or Girl Scout member
- \_\_\_ (4) Other \_\_\_\_\_

12. How old are you? : \_\_\_\_\_ years old.

13. What grade are you in?
- \_\_\_(1) 7th grade
  - \_\_\_(2) 8th grade
  - \_\_\_(3) 9th grade
  - \_\_\_(4) 10th grade
  - \_\_\_(5) 11th grade

14. Are you a boy or a girl?
- \_\_\_(1) Boy
  - \_\_\_(2) Girl

15. How many people, including yourself, slept in your house last night? \_\_\_\_\_ persons

16. Are there any adult males living in your household?
- \_\_\_(1) Yes
  - \_\_\_(2) No

17. Are there any adult females living in your household?
- \_\_\_(1) Yes
  - \_\_\_(2) No

18. In the last month, did your household get water:  
through pipes?
- \_\_\_ (1) Yes
  - \_\_\_ (2) No

through trucks

\_\_\_ (1) Yes

\_\_\_ (2) No

from wells/springs

\_\_\_ (1) Yes

\_\_\_ (2) No

collected rainwater

\_\_\_ (1) Yes

\_\_\_ (2) No

19. Is there a shower in your house?

\_\_\_ (1) Yes

\_\_\_ (2) No

20. Is there a tub in your house?

\_\_\_ (1) Yes

\_\_\_ (2) No

### **Academics**

Please tell us about your course work in school.

1. In what academic orientation are you enrolled?

\_\_\_(1) Science

\_\_\_(2) Arts

\_\_\_(3) Business and training

\_\_\_(4) Vocational

2. What was your academic average in the winter of this school year? \_\_\_\_\_

3. What was your academic average in the winter of this school year in science classes only? \_\_\_\_\_

### **Eco-club**

Please tell us about your involvement in your school's eco-club.

4. Are you a member of your school's eco-club?

\_\_\_(1) Yes

\_\_\_(2) No

5. Have you ever been involved in any kind of environment-related activity before this semester?  
\_\_\_(1) Not involved  
\_\_\_(2) In school  
\_\_\_(3) Outside school  
\_\_\_(4) Not a member
6. What grade were you in when you joined eco-club?  
\_\_\_(1) 7th  
\_\_\_(2) 8th  
\_\_\_(3) 9th  
\_\_\_(4) 10th  
\_\_\_(5) 11th  
\_\_\_(6) Not a member
7. What was your reason for joining the club?  
\_\_\_(1) Interested in the environment  
\_\_\_(2) Friends were in the club  
\_\_\_(3) Liked the teacher  
\_\_\_(4) Other (describe briefly) \_\_\_\_\_  
\_\_\_(5) Not a member
8. How many club meetings did you attend last semester ?  
\_\_\_(1) All  
\_\_\_(2) Most  
\_\_\_(3) Some  
\_\_\_(4) None  
\_\_\_(5) Not a member
9. Have you had a class with your eco-club teacher before?  
\_\_\_(1) Yes  
\_\_\_(2) No  
\_\_\_(3) Not a member
10. Did you ever apply for membership in eco-club for which you were not chosen?  
\_\_\_(1) Yes  
\_\_\_(2) No

11. In the past month, have you:

listened to information about water conservation on the radio

\_\_\_ (1) Yes

\_\_\_ (2) No

seen information about water conservation on television

\_\_\_ (1) Yes

\_\_\_ (2) No

read information about water conservation in newspapers and magazines

\_\_\_ (1) Yes

\_\_\_ (2) No

discussed water conservation with friends

\_\_\_ (1) Yes

\_\_\_ (2) No

### Knowledge

1. What are the sources of water in Jordan? [Check all that apply]

\_\_\_(1) Rainfall

\_\_\_(2) Puddles

\_\_\_(3) Rivers

\_\_\_(4) Tap water

\_\_\_(5) Spring water

\_\_\_(6) Bottled water

\_\_\_(7) Ground water

\_\_\_(8) Treated sewage water

\_\_\_(9) Snowfall

2. What proportion of water on Planet Earth is suitable for human consumption?

\_\_\_(1) 1%

\_\_\_(2) 5%

\_\_\_(3) 25%

\_\_\_(4) 50%

\_\_\_(5) 75%

3. What is the main reason why the Azraq Oasis dried up?

\_\_\_(1) Overdrawing of ground water by people

\_\_\_(2) Pollution

\_\_\_(3) Animal consumption

\_\_\_(4) Too little rainfall

4. Which consumes the most water in the average household?

[Put an X next to only one answer.]

- (1) Gardens
- (2) Toilets
- (3) Clothes washing and dish washing
- (4) Bathing
- (5) Drinking

5. For each of the following statements, indicate whether you agree or disagree by checking the appropriate line.

Watering plants using a sprinkler is less expensive than using drip irrigation.

- (1) Agree
- (2) Disagree

Watering plants early in the morning is less expensive than at midday.

- (1) Agree
- (2) Disagree

The use of compost preserves water in the soil.

- (1) Agree
- (2) Disagree

The use of compost reduces excess salinity in the soil.

- (1) Agree
- (2) Disagree

6. What is the effect on the soil of overdrawing ground water?

[ Put an X next to only one answer.]

- (1) The soil dries out, making it unsuitable for growing plants requiring a lot of water
- (2) The soil salinity increases which makes in unsuitable for agricultural use
- (3) The soil alkaline level increases which makes it unsuitable for agricultural use
- (4) Fertilizers and pesticides collect in the soil, harming some plants and animals

7. What kind of water was polluted in Aqaba and what caused its pollution?

[Put an X next to only one answer.]

- (1) Surface water in Aqaba was polluted by dumping oil in the sea
- (2) Ground water in Aqaba was polluted by dumping oil in the sea
- (3) Surface water in Aqaba was polluted by excessive use of pesticides
- (4) Ground water in Aqaba was polluted by excessive use of pesticides
- (5) Ground water in Aqaba is not polluted.
- (6) I don't know.

8. What kind of water was polluted in Ghadir Al Abiad and what caused this pollution?

[Put an X next to only one answer.]

- \_\_\_ (1) Pollution of ground water in Ghadir Al Abiad was caused by industrial waste
- \_\_\_ (2) Pollution of surface water in Ghadir Al Abiad was caused by industrial waste
- \_\_\_ (3) Pollution of ground water in Ghadir Al Abiad was caused by pesticides and fertilizers
- \_\_\_ (4) Pollution of surface water in Ghadir Al Abiad was caused by pesticides and fertilizers

### **Attitudes and Beliefs**

Now we would like to know about peer opinion and water conservation in the household.

1. Suggesting to my father ways in which he can reduce his household consumption of water is:
  - \_\_\_ (1) very good
  - \_\_\_ (2) good
  - \_\_\_ (3) neither good nor bad
  - \_\_\_ (4) bad
  - \_\_\_ (5) very bad
  
2. Suggesting to my mother ways in which she can reduce household consumption of water is:
  - \_\_\_ (1) very good
  - \_\_\_ (2) good
  - \_\_\_ (3) neither good nor bad
  - \_\_\_ (4) bad
  - \_\_\_ (5) very bad
  
3. Shutting the tap while I brush my teeth is:
  - \_\_\_ (1) very good
  - \_\_\_ (2) good
  - \_\_\_ (3) neither good nor bad
  - \_\_\_ (4) bad
  - \_\_\_ (5) very bad
  
4. Suggesting to my father ways in which he can reduce his household consumption of water will reduce my household water bill.
  - \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree

5. Suggesting to my mother ways in which she can reduce her household consumption of water will reduce my household's water bill.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
6. Shutting the tap while I brush my teeth will reduce my household's water bill.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
7. The persons that are important to me think that I should suggest to my father ways in which he can reduce his household consumption of water.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
8. The persons that are important to me think that I should suggest to my mother ways in which she can reduce her household consumption of water.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
9. The persons that are important to me think that I should shut the tap while brushing my teeth.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
10. My teacher thinks that I should suggest to my father ways in which he can reduce his household consumption of water.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree

11. My teacher thinks that I should suggest to my mother ways in which she can reduce her household consumption of water.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
12. My teacher thinks that I should shut the tap while I brush my teeth.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
13. My male relatives think that I should suggest to my father ways in which he can reduce his household consumption of water.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
14. My male relatives think that I should suggest to my mother ways in which she can reduce her household consumption of water.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
15. My male relatives think that I should shut the tap while I brush my teeth.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree

16. My female relatives think that I should suggest to my father ways in which he can reduce his household consumption of water.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
17. My female relatives think that I should suggest to my mother ways in which she can reduce her household consumption of water.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
18. My female relatives think that I should shut the tap while I brush my teeth.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
19. My friends think that I should suggest to my father ways in which he can reduce his household consumption of water.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
20. My friends think that I should suggest to my mother ways in which she can reduce her household consumption of water.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree
21. My friends think that I should shut the tap while I brush my teeth.
- \_\_\_ (1) strongly agree
  - \_\_\_ (2) agree
  - \_\_\_ (3) neither agree or disagree
  - \_\_\_ (4) disagree
  - \_\_\_ (5) strongly disagree

22. My classmates think that I should suggest to my father ways in which he can reduce his household water consumption.  
\_\_\_\_ (1) strongly agree  
\_\_\_\_ (2) agree  
\_\_\_\_ (3) neither agree or disagree  
\_\_\_\_ (4) disagree  
\_\_\_\_ (5) strongly disagree
23. My classmates think that I should suggest to my mother ways in which she can reduce her household water consumption.  
\_\_\_\_ (1) strongly agree  
\_\_\_\_ (2) agree  
\_\_\_\_ (3) neither agree or disagree  
\_\_\_\_ (4) disagree  
\_\_\_\_ (5) strongly disagree
24. My classmates think that I should shut the tap while I brush my teeth.  
\_\_\_\_ (1) strongly agree  
\_\_\_\_ (2) agree  
\_\_\_\_ (3) neither agree or disagree  
\_\_\_\_ (4) disagree  
\_\_\_\_ (5) strongly disagree
25. My mother thinks that I should shut the tap while I brush my teeth.  
\_\_\_\_ (1) strongly agree  
\_\_\_\_ (2) agree  
\_\_\_\_ (3) neither agree or disagree  
\_\_\_\_ (4) disagree  
\_\_\_\_ (5) strongly disagree
26. My father thinks that I should shut the tap while I brush my teeth.  
\_\_\_\_ (1) strongly agree  
\_\_\_\_ (2) agree  
\_\_\_\_ (3) neither agree or disagree  
\_\_\_\_ (4) disagree  
\_\_\_\_ (5) strongly disagree
27. Boys should suggest to others ways to reduce water consumption at home.  
\_\_\_\_ (1) strongly agree  
\_\_\_\_ (2) agree  
\_\_\_\_ (3) neither agree or disagree  
\_\_\_\_ (4) disagree  
\_\_\_\_ (5) strongly disagree
28. Girls should suggest to other ways to reduce water consumption at home.  
\_\_\_\_ (1) strongly agree

- \_\_\_ (2) agree
- \_\_\_ (3) neither agree or disagree
- \_\_\_ (4) disagree
- \_\_\_ (5) strongly disagree

29. Boys should adopt ways to reduce water consumption at home.

- \_\_\_ (1) strongly agree
- \_\_\_ (2) agree
- \_\_\_ (3) neither agree or disagree
- \_\_\_ (4) disagree
- \_\_\_ (5) strongly disagree

30. Girls should adopt ways to reduce water consumption at home.

- \_\_\_ (1) strongly agree
- \_\_\_ (2) agree
- \_\_\_ (3) neither agree or disagree
- \_\_\_ (4) disagree
- \_\_\_ (5) strongly disagree

31. The access to piped water in Jordan has increased water consumption at the household level.

- \_\_\_ (1) strongly agree
- \_\_\_ (2) agree
- \_\_\_ (3) neither agree or disagree
- \_\_\_ (4) disagree
- \_\_\_ (5) strongly disagree

32. The main responsibility to reduce water use at the household level lies with citizens.

- \_\_\_ (1) strongly agree
- \_\_\_ (2) agree
- \_\_\_ (3) neither agree or disagree
- \_\_\_ (4) disagree
- \_\_\_ (5) strongly disagree

33. Citizens have a crucial role to play in reducing water pollution in Jordan.

- \_\_\_ (1) strongly agree
- \_\_\_ (2) agree
- \_\_\_ (3) neither agree or disagree
- \_\_\_ (4) disagree
- \_\_\_ (5) strongly disagree

### **Behavior**

1. In the past 24 hours,  
\_\_\_(1) I took a shower.

- \_\_\_(2) I bathed in a tub that was half full of water.  
\_\_\_(3) I bathed in a tub that was filled with water.  
\_\_\_(4) I did not wash myself.  
\_\_\_(5) I used a container of water when I bathed.
2. In the past 24 hours, when washing myself I let the water run until it got hot  
\_\_\_(1) Yes.  
\_\_\_(2) No, the water comes out hot immediately.  
\_\_\_(3) I did not wash myself.  
\_\_\_(4) My house has no hot water.
3. In the past 24 hours when I washed myself, I saved the cold water I let run as I waited for hot water to come on.  
\_\_\_(1) Yes.  
\_\_\_(2) No.  
\_\_\_(3) I did not get cold water.  
\_\_\_(4) I did not wash myself.
4. In the past 24 hours, to brush my teeth.  
\_\_\_(1) I left the tap running.  
\_\_\_(2) I turned off the tap while brushing.  
\_\_\_(3) I used the tap to fill a glass of water.  
\_\_\_(4) I did not brush my teeth.
5. In the past 24 hours, I washed the dishes while the tap water was running.  
\_\_\_(1) Yes.  
\_\_\_(2) No.  
\_\_\_(3) I did not wash the dishes.  
\_\_\_(4) My house has no tap water.
6. In the past 24 hours, I drank cold water from a bottle in the refrigerator in my house.  
\_\_\_(1) Yes  
\_\_\_(2) No  
\_\_\_(3) There is no refrigerator in my house.
7. In the past 24 hours, my mother let the tap run while she did the dishes.  
\_\_\_(1) Yes.  
\_\_\_(2) No.  
\_\_\_(3) I don't know how my mother washed the dishes.  
\_\_\_(4) My mother did not wash the dishes.  
\_\_\_(5) We have no tap water at home.
8. In my house there is a toilet with a bottle of water in the tank.

- \_\_\_(1) Yes.
- \_\_\_(2) No.
- \_\_\_(3) I don't know if the toilet had a bottle of water in the tank.
- \_\_\_(3) We do not have a toilet in my house.

9. In the past 24 hours, my mother kept a bottle of drinking water in the refrigerator.

- \_\_\_(1) Yes.
- \_\_\_(2) No.
- \_\_\_(3) There is no refrigerator in my house.
- \_\_\_(4) I do not know.

10. In the past 24 hours, my father let the water run while he was shaving.

- \_\_\_(1) Yes.
- \_\_\_(2) No.
- \_\_\_(3) I don't know how my father shaved.
- \_\_\_(4) He did not shave.

11. In the past week, someone in my house watered the garden in the morning.

- \_\_\_(1) Yes.
- \_\_\_(2) No.
- \_\_\_(3) I don't know when the garden was watered.
- \_\_\_(4) There is no garden in my house

12. In the past week, someone in my house watered the garden during the daytime.

- \_\_\_(1) Yes.
- \_\_\_(2) No.
- \_\_\_(3) I don't know when the garden was watered.
- \_\_\_(4) There is no garden in my house

13. In the past week, someone in my house watered the garden in the evening.

- \_\_\_(1) Yes.
- \_\_\_(2) No.
- \_\_\_(3) I don't know when the garden was watered.
- \_\_\_(4) There is no garden in my house

14. In the past week, my mother collected the clothes and washed them together.

- \_\_\_(1) Yes
- \_\_\_(2) No
- \_\_\_(3) My mother washed every day.
- \_\_\_(4) I don't know how my mother washed the clothes.

15. In the past week, my mother accumulated a full load of dirty clothes to wash in the automatic washing machine.  
\_\_\_(1) Yes.  
\_\_\_(2) No, she only accumulated half of a load to wash.  
\_\_\_(3) I don't know.  
\_\_\_(4) We do not have an automatic washing machine.
16. In the past month, I have talked with my father about water pollution.  
\_\_\_(1) Yes.  
\_\_\_(2) No.  
\_\_\_(3) I don't remember.
17. In the past month, I have talked with my mother about water pollution.  
\_\_\_(1) Yes.  
\_\_\_(2) No.  
\_\_\_(3) I don't remember.
18. In the past month, I have made suggestions to my father about ways in which he can reduce his water use at home.  
\_\_\_(1) Yes.  
\_\_\_(2) No.  
\_\_\_(3) I don't remember.
19. In the past month, I have made suggestions to my mother about ways in which she can reduce her water use at home.  
\_\_\_(1) Yes.  
\_\_\_(2) No.  
\_\_\_(3) I don't remember.
20. My mother followed the suggestions that I made about how he can reduce her water use at home.  
\_\_\_ (1) Yes.  
\_\_\_ (2) No.  
\_\_\_ (3) I did not make any suggestions to my mother about water use reduction.
21. In the past month, I have looked for ways to reduce my consumption of water at home.  
\_\_\_(1) Yes.  
\_\_\_(2) No.  
\_\_\_(3) I don't remember.

**If you were not a member of an eco-club, you are done. Thank you for completing the survey.**

**If you were a member of an eco-club, please complete the next section.**

1. How interested were you in water conservation before this semester?  
 (1) Very interested  
 (2) Interested  
 (3) Somewhat Interested  
 (4) Not Interested
  
2. How interested are you in water conservation now, after this semester?  
 (1) Very interested  
 (2) Interested  
 (3) Somewhat Interested  
 (4) Not Interested
  
3. In any of your eco-club sessions this semester, did you have group discussions with your fellow club members about Jordan's water cycle?  
 (1) We discussed it a lot  
 (2) We discussed it a little  
 (3) We did not discuss it at all
  
4. In any of your eco-club sessions this semester, did you work on activities involving the underground water?  
 (1) We worked on them a lot  
 (2) We worked on them a little  
 (3) We did not work on them at all
  
5. In any of your eco-club sessions this semester, were you encouraged to tell your family about ways to conserve water?  

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6. In any of your eco-club sessions this semester, did you work on group projects with your fellow club members involving the irrigation of home gardens?  
 (1) We worked on them a lot  
 (2) We worked on them a little  
 (3) We did not work on them at all
  
7. In any of your eco-club sessions this semester, did you have group discussions with your fellow club members about the use of water for personal hygiene?  
 (1) We discussed these things a lot  
 (2) We discussed these things a little  
 (3) We did not discuss these things at all

8. Did you learn a lot, only a little bit, or nothing at all about water conservation as a member of the eco-club?  
\_\_\_(1) I learned a lot  
\_\_\_(2) I learned a little  
\_\_\_(3) I learned nothing at all
9. How important are the things you have learned about water conservation in the eco-club?  
\_\_\_(1) They are very important  
\_\_\_(2) They are a little bit important  
\_\_\_(3) They are not important at all
10. How much do you think you will use what you learned about water conservation in your own life?  
\_\_\_(1) I will use it a lot  
\_\_\_(2) I will use it a little  
\_\_\_(3) I will not use it at all
11. Would you like to continue being a member of the eco-club next school year?  
\_\_\_(1) Yes  
\_\_\_(2) No
12. If there was one thing about the water conservation curriculum you could change, what would it be? [Choose only one answer.]  
\_\_\_(1) Meet more often  
\_\_\_(2) Meet less often  
\_\_\_(3) Different teacher  
\_\_\_(4) More group projects  
\_\_\_(5) Fewer group projects  
\_\_\_(6) More discussion  
\_\_\_(7) Less discussion  
\_\_\_(8) More activities  
\_\_\_(9) Fewer activities  
\_\_\_(10) Other (specify) \_\_\_\_\_

***Thank You !!!!***

**APPENDIX D: COMPARABILITY OF THE STUDY GROUPS**

**Teachers**

**Table A: Characteristics of Teachers by Gender and Participation Status**

Characteristic	All Teachers (N=90)	Gender		Participation Status	
		Males (n=33)	Females (n=57)	Non-Participating Teachers (n=29)	Participating Teachers (n=61)
Location of School					
Rural	59%	79%*	47%*	62%	57%
Urban	41%	21%*	53%*	38%	43%
Mean Age	33.5 years	34.5 years	33.0 years	34.2 years	33.2 years
Teaching Certification					
Science	37%	46%	32%	45%	33%
Language and Art	19%	27%	14%	10%	23%
Psychology	12%	12%	12%	7%	15%
Biology	22%	15%	26%	21%	23%
Mean Number of Years Teaching	10.2 years	10.7 years	9.9 years	10.7 years	10.0 years
Mean Number of Years Supervising Eco-Club	3.8 years	3.8 years	3.7 years	3.7 years	3.8 years
Percent Volunteered for Eco-Club	81%	88%	78%	79%	82%
Why Volunteered for Eco-Club					
Interest in Environment	91%	91%	91%	83%	95%

\* p <= .05

## Students

**Table B: Socio-Demographic Characteristics for Eco-Club Students**

Characteristic	All Students (N=671)	Gender		Participation Status	
		Boys (n=243)	Girls (n=426)	Non-Participants (n=247)	Participants (n=424)
Residence					
Rural	65%	82%*	55%*	68%	62%
Urban	35%	19%*	45%*	32%	38%
Mean Age	15.6	15.6	15.7	15.7	15.6
Mean Grade	10th	10th	10th	10th	10th
How many people slept in your house last night? (Mean)	8.8	8.5	8.9	8.9	8.7
Are there adult males living in the house?					
Yes	81%	83%	83%	84%	82%
No	17%	17%	18%	16%	18%
Are there adult females living in the house?					
Yes	80%	82%	80%	83%	80%
No	19%	18%	20%	17%	20%

\* p < .05

**Table C: Academic Profile of Eco-Club Students**

Academic	All Students (N=671)	Gender		Participation Status	
		Boys (n=243)	Girls (n=426)	Not Participants (n=247)	Participants (n=424)
Academic orientation					
Science	57%	65%	53%	51%	61%
Arts	31%	24%	35%	37%	27%
Business & training	2%	1%	3%	2%	2%
Vocational	10%	10%	10%	11%	10%
Academic average	81.6	82.2	81.2	80.3	82.3
Science academic average	82.4	82.7	82.2	81.8	82.7

No significant differences between the eco-club students existed: the students from the experimental and control groups appear to be comparable in terms of academic profile.

## APPENDIX E: SOURCES OF WATER

### Sources of Water for Student Households

Several prompted questions in the student instrument asked if, during the last month, student households obtained water from four different potential sources. Answers are summarized in the following table.

**Table A: Sources of Water for All Student Households**

Last month, did your household get water from:	Yes
Pipes	84.4%
Trucks	22.8%
Wells/springs	13.1%
Collected rainwater	22.1%

Clearly, the majority of student households obtained water from pipes. Trucks, rainwater collection systems, and to a lesser extent wells and springs, also appear to serve as important sources of water.

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## APPENDIX F: SCALE CONSTRUCTION

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### Teachers

Attitudes, beliefs and self-efficacy were measured using five-point agree/disagree scales with a midpoint meaning neither agree nor disagree. The coding system for all three scales was changed from 1 to 5 to from 2 to -2 in order to create a zero center for the mean. An exception to this is one question which is part of the attitude scale - an item about teeth brushing behavior. This question was changed to a scale of 1 to -1 because several response categories had the same relative degree of desirability.

When summed, the total possible range for the eight questions on attitudes was from 15 to -15. The summed scale created from questions about beliefs regarding interactive teaching techniques, required that the coding of three questions be reversed to accommodate the negative connotations of the statements and facilitate comparisons with other items in the scale formulated in the positive.<sup>3</sup> The possible scoring range for the nine questions comprising the summed scale of beliefs was 18 to -18. The possible range for the scale consisting of seven questions addressing self-efficacy was 14 to -14. In all instances, the higher the score the more positive the attribute, either stronger beliefs, more positive attitudes, or stronger self-efficacy.

### Students

Six questions pertaining to attitudes and beliefs were recoded from a scale of 1 to 5 (strongly agree to strongly disagree) to a scale of 2 to -2 and then added together for a possible range of 12 to -12. Fifteen questions measuring household water conservation behaviors were evaluated as to their relative positive and negative effects, then recoded to range from 2 to -3 and summed to form a desired performance scale. However, more than one answer choice in these questions could have the same score, so the possible range extended from 15 to -26. Five additional questions pertaining to social behaviors were rescaled to range from 1 to -1 and then summed for a total possible range of 5 to -5. For all summed scales, a high score meant that attitudes, beliefs, and/or behaviors were in the desired direction.

Questions pertaining to normative beliefs were combined to create one total scale. Three separate scales were also constructed according to those questions which referred to the students' perception of various referents' approval of such behaviors as: 1) suggesting water conservation techniques to their mothers, 2) suggesting water conservation techniques to their fathers, and 3) turning the tap off while brushing their teeth. The coding of scheme of these scales was also

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<sup>3</sup> Q37) "involving students in discussions takes away from valuable teaching time"; Question 40) "the best way to convey information is through lectures"; and Question 41) "hands-on activities require too much preparation"

revised to extend from 2 to -2. The two scales about mothers and fathers included six questions with total possible ranges of 12 to -12. The scale about teeth brushing behavior included eight questions for a total possible range of 16 to -16.

**APPENDIX G: PROFESSIONAL BACKGROUND AND TEACHERS' BELIEFS**

**Professional Background and Teachers' Beliefs**

**Table A: Beliefs About Interactive Teaching Techniques Compared by Teaching Experience, Teaching Certification and Eco-club Teaching Experience**

Teaching Technique	Teaching Experience (means)			Teaching Certification (means)			Eco-Club Teaching Experience (means)		
	Low 1-10yrs (n=52)	High 11-26 yrs (n=37)	<i>p</i>	Non- Science (n=35)	Science (n=53)	<i>p</i>	Low 1-3 yrs (n=50)	High 4-9yrs (n=40)	<i>p</i>
Perceived Skill	8.9	8.9	.96	9.1	8.7	.54	8.8	9.0	.74

No significant associations were found.

**APPENDIX H: PARTICIPATION, GENDER AND TEACHERS' BELIEFS**

**Table A: The Effect of Participation and Gender on Teachers' Beliefs about Interactive Teaching Techniques**

Interactive Teaching Technique	Males (n=33)		Females (n=57)		Effects		
	Non-Participants	Participants	Non-Participants	Participants	Participation	Gender	Participation by gender
GENERAL FACTORIAL ANOVA ANALYSIS							
Discussions are not too time consuming	1.4	1.7	1.7	1.7	.33	.35	.12
Learning should be fun	1.4	1.3	1.2	1.1	.67	.17	.97
Lectures are worst	-0.3	-0.1	-0.3	-0.5	.96	.48	.45
Hands-on activities	0.7	1.0	0.4	0.5	.54	.09	.68
Parents should be involved	-1.1	-1.1	-0.8	-0.7	.72	.15	.94
NON-PARAMETRIC KRUSKAL-WALLIS ANALYSIS <sup>^</sup>							
Discovering answers	1.1	1.3	1.0	.8			.48
See results with own eyes	1.1	1.8	1.7	1.8			.22
Discussions are better	1.6	1.5	1.5	1.2			.67
Practice what they learn	1.7	1.9	1.6	1.5			.16

<sup>^</sup> Means reported for information purposes only, not used in Kruskal-Wallis Test

Participation and gender were not determined in this analysis to have any significant interaction effect on teachers beliefs about participatory teaching methods.

Table B summarizes the effect of teacher participation and gender on teachers' perceived ability to implement interactive teaching techniques.

**Table B: Effect of Participation and Gender on Teachers' Perceived Self-efficacy at Implementing Interactive Teaching Techniques**

Aggregate Scale	Males (n=33)		Females (n=57)		<i>p</i>
	Non-Participants	Participants	Non-Participants	Participants	
NON-PARAMETRIC KRUSKAL-WALLIS ANALYSIS <sup>^</sup>					
Perceived Skill at Implementing Teaching Techniques	8.6	9.3	8.8	8.7	.88

<sup>^</sup> Means reported for information purposes only, not used in Kruskal-Wallis Test

**APPENDIX I: PARTICIPATION, RESIDENCE AND TEACHERS' BELIEFS**

**Table A: The Effect of Participation and Urban/Rural Residence on Teachers' Perceived Skill at Implementing Interactive Teaching Techniques (ANOVA)**

Aggregate Scale	Rural		Urban		Effects		
	Non-Participants	Participants	Non-Participants	Participants	Participation <i>p</i>	Rural/Urban <i>p</i>	Participation by Rural/Urban <i>p</i>
Perceived Skill at Implementing Teaching Techniques	8.7	8.9	9	9	0.65	.67	.90

No significant relationships were detected.

**APPENDIX J: PARTICIPATION, GENDER, RESIDENCE AND TEACHERS' BELIEFS**

**Table A: The Effect of Participation and Gender, with Residence as a Covariate, on Teachers' Beliefs about Interactive Teaching Techniques**

Interactive Teaching Technique	Males (n=33)		Females (n=57)		Effects		
	Non-Participants	Participants	Non-Participants	Participants	participation	gender	participation by gender
ANCOVA ANALYSIS WITH RESIDENCE AS A COVARIATE							
Discussions are not too time consuming	1.4	1.7	1.7	1.7	.29	.26	.11
Learning should be fun	1.5	1.4	1.2	1.1	.56	.10	.88
Lectures are worst	-0.3	-0.1	-0.3	-0.5	.97	.53	.45
Hands-on activities	0.5	0.9	0.5	0.6	.29	.49	.46
Parents should be involved	-1.1	-1.1	-0.8	-0.7	.78	.23	.90
NON-PARAMETRIC KRUSKAL-WALLIS ANALYSIS FOR RURAL TEACHERS (n=53)^							
Discovering answers	1.1	1.3	1.2	.9			.87
See results with own eyes	1.1	1.9	1.5	1.9			.09
Discussions are better	1.6	1.4	1.3	1.1			.60
Practice what they learn	1.7	1.9	1.7	1.6			.58

^ Means reported for information purposes only, not used in Kruskal-Wallis Test

No significant results were noted.

**Table B: The Effect of Participation and Gender on Teachers' Perceived Skill at Implementing Teaching Techniques for Rural Teachers Only**

Aggregate Scale	Males (n=26)		Females (n=27)		<i>p</i>
	Non-Participants	Participants	Non-Participants	Participants	
NON-PARAMETRIC KRUSKAL-WALLIS ANALYSIS ^					
Perceived Skill at Implementing Teaching Techniques	8.9	9.1	8.5	8.6	.97

^ Means reported for information purposes only, not used in Kruskal-Wallis Test

**APPENDIX K: PARTICIPATION, GENDER AND RURAL STUDENTS' KNOWLEDGE AND BELIEFS**

**Table A: Effect of Participation and Gender on Knowledge of Rural Students  
(Percent Answering Correctly)**

Knowledge Items	Boys		Girls		$\chi^2$ p-value
	Non-Participants	Participants	Non-Participants	Participants	
Source of water in Jordan -rainfall	82%	90%	81%	88%	.16
Not a source of water in Jordan - puddles	95%	88%	88%	81%	.02
Source of water in Jordan -rivers	37%	34%	34%	51%	.02
Not a source of water in Jordan - tap water	47%	62%	56%	47%	.05
Source of water in Jordan -spring water	43%	53%	35%	54%	.02
Not a source of water in Jordan - bottled water	74%	86%	93%	83%	.00
Source of water in Jordan -ground water	70%	60%	40%	74%	.00
Source of water in Jordan -treated sewage water	18%	18%	7%	30%	.00
Not a source of water in Jordan - snowfall	80%	83%	78%	82%	.75
1% Earth water suitable for human consumption	21%	51%	0%	28%	.00
Main reason Azraq Oasis dried up-overdrawing	37%	64%	45%	41%	.00
Gardens consume most water in average household	30%	33%	19%	31%	.12
Watering with sprinkler more expensive than drip irrigation	7%	7%	13%	3%	.04
Watering plants in morning less expensive than at midday	80%	90%	93%	88%	.04
Use of compost preserves water in the soil	75%	80%	84%	77%	.48
Use of compost reduces excess salinity in the soil	49%	72%	74%	66%	.00
Overdrawing increases salinity	48%	47%	40%	52%	.38
Surface water in Aqaba was polluted by dumped oil	30%	18%	22%	29%	.12

**Table B: Effect of Participation and Gender on Attitudes and Outcome Beliefs of Rural Students (Percent with Positive Attitudes/Beliefs)**

Attitude and Outcome Belief Items	Boys		Girls		$\chi^2$ p-value
	Non-Participants	Participants	Non-Participants	Participants	
Suggesting to father water conservation techniques is good	64%	61%	41%	59%	.01
Suggesting to mother water conservation techniques is good	60%	60%	48%	61%	.18
Shutting off tap when brushing teeth is good	80%	84%	72%	79%	.19
Suggesting to father conservation techniques lowers water bill	65%	74%	54%	59%	.01
Suggesting to mother conservation techniques lowers water bill	63%	67%	52%	57%	.17
Shutting tap off when brushing teeth lowers water bill	53%	59%	37%	51%	.02

**Table C: Effect of Participation and Gender on Normative Beliefs of Rural Students  
(Percent Reporting Strong Social Pressure)**

Normative Belief Items	Boys		Girls		χ <sup>2</sup> p-value
	Non-Participants	Participants	Non-Participants	Participants	
Others think I should suggest conservation techniques to dad	40%	46%	23%	28%	.00
Others think I should suggest conservation techniques to mom	34%	53%	28%	31%	.00
Others think I should shut tap	55%	57%	33%	39%	.00
Teacher thinks I should suggest conservation techniques to dad	55%	53%	34%	47%	.02
Teacher thinks I should suggest conservation techniques to mom	47%	55%	33%	52%	.01
Teacher thinks I should shut tap	48%	54%	25%	49%	.00
Male relatives think I should suggest techniques to dad	35%	43%	23%	28%	.01
Male relatives think I should suggest techniques to mom	42%	42%	27%	31%	.05
Male relatives think I should shut off tap	39%	43%	22%	29%	.01
Female relatives think I should suggest techniques to dad	43%	46%	25%	35%	.01
Female relatives think I should suggest techniques to mom	42%	52%	30%	34%	.01
Female relatives think I should shut off tap	42%	50%	24%	37%	.00
Friends think I should suggest conservation techniques to dad	33%	44%	27%	35%	.08
Friends think I should suggest conservation techniques to mom	36%	47%	25%	34%	.01
Friends think I should shut tap	34%	49%	25%	35%	.00
Classmates think I should suggest techniques to dad	27%	46%	20%	29%	.00
Classmates think I should suggest techniques to mom	29%	46%	25%	30%	.01
Classmates think I should shut tap	29%	45%	22%	33%	.00
Father thinks I should shut tap	48%	58%	40%	47%	.08
Mother thinks I should shut tap	53%	58%	40%	47%	.07

**Table D: Effect of Gender and Participation on Students' Household Water Conservation Behaviors**

Household Conservation Behavior Items	Boys (with covariate)		Girls (with covariate)		Effects (covariate residence)			
	Non-Participants	Participants	Non-Participants	Participants	Participation	Gender	Participation by Gender	
p e r s o n a l	ANOVA WITH RESIDENCE AS A COVARIATE							
	Saved cold water as it heated	-0.3	-0.4	0.0	0.0	.86	.01	.98
	Brushed teeth	1.2	1.5	1.5	1.5	.27	.09	.08
	Looked for ways to reduce	-0.3	0.7	-0.1	0.6	.00	.75	.37
	NON-PARAMETRIC KRUSKAL-WALLIS FOR RESIDENTS OF RURAL AREAS <sup>^</sup>							
	Bathing behavior	0.7	1.1	0.9	0.9			.00
	Washed dishes with tap off	0.6	0.5	1.3	1.1			.00
	Drank cold water from refrigerator	1.7	1.6	1.2	1.4			.09
	h o u s e h o l d	ANOVA WITH RESIDENCE AS A COVARIATE						
		Water bottle in toilet tank	-0.4	-0.7	-0.6	-0.6	.24	.69
Watered household garden in morning		0.3	0.2	0.3	0.4	.93	.66	.51
Household garden not watered in daytime		-0.1	0.7	0.0	0.6	.00	.95	.30
Watered household garden in evening		-0.0	0.4	-0.2	0.0	.04	.08	.39
p a r e n t a l	Mother had refrigerator water bottle	1.4	1.2	1.4	1.3	.42	.63	.82
	Father shaved with tap off	1.3	1.4	1.3	1.1	.44	.15	.14
	Mom washed clothes together	0.7	1.3	0.8	1.0	.01	.49	.06
	Mother washed full load in machine	-0.3	0.1	-0.5	-0.3	.04	.05*	.62
	NON-PARAMETRIC KRUSKAL-WALLIS FOR RESIDENTS OF RURAL AREAS <sup>^</sup>							
Mother washed dishes	1.3	1.3	1.4	1.4			.95	

<sup>^</sup> Means reported for information purposes only, not used in Kruskal-Wallis Test

**APPENDIX L: PARTICIPATION AND RURAL STUDENTS**

**Table A: Effect of Participation on Knowledge of Rural Students  
(Percent Answering Correctly)**

<b>Knowledge Items</b>	<b>Non-Participants (%)</b>	<b>Participants (%)</b>	<b><math>\chi^2</math> p-value</b>
Source of water in Jordan -rainfall	81	89	.03
Not a source of water in Jordan - puddles	91	84	.03*
Source of water in Jordan -rivers	36	44	.10
Not a source of water in Jordan - tap water	52	54	.73
Source of water in Jordan -spring water	39	54	.00
Not a source of water in Jordan - bottled water	84	84	.89
Source of water in Jordan -ground water	55	68	.01
Source of water in Jordan -treated sewage water	12	25	.00
Not a source of water in Jordan - snowfall	79	82	.32
1% Earth water suitable for human consumption	10	38	.00
Main reason Azraq Oasis dried up-overdrawing	41	51	.05
Gardens consume most water in average household	24	32	.09
Watering with sprinkler more expensive than drip irrigation	10	5	.03
Watering plants in morning less expensive than at midday	87	89	.58
Use of compost preserves water in the soil	79	79	.85
Use of compost reduces excess salinity in the soil	62	69	.15
Overdrawing increases salinity	44	50	.21
Surface water in Aqaba was polluted by dumped oil	26	24	.66

**Table B: Effect of Participation on Attitudes and Outcome Beliefs of Rural Students  
(Percent with Positive Attitudes/Beliefs)**

<b>Attitude and Outcome Belief Items</b>	<b>Non-Participants (%)</b>	<b>Participants (%)</b>	<b><math>\chi^2</math> p-value</b>
Suggested to father water conservation techniques	52	60	.10
Suggested to mother water conservation techniques	54	61	.15
Shut off tap when brushing teeth	75	81	.14
Suggest to father conservation techniques lowers water bill	59	66	.20
Suggest to mother conservation techniques lowers water bill	57	62	.38
Shut tap off when brushing teeth lowers water bill	45	55	.04

**Table C: Effect of Participation on Normative Beliefs of Rural Students  
(Percent Reporting Strong Social Pressure)**

<b>Normative Belief Items</b>	<b>Non-Participants (%)</b>	<b>Participants (%)</b>	<b><math>\chi^2</math> p-value</b>
Others think I should suggest conservation techniques to dad	31	36	.29
Others think I should suggest conservation techniques to mom	31	40	.04
Others think I should shut tap	43	47	.52
Teacher thinks I should suggest conservation techniques to dad	44	50	.22
Teacher thinks I should suggest conservation techniques to mom	39	53	.00
Teacher thinks I should shut tap	36	52	.00
Male relatives think I should suggest techniques to dad	29	35	.18
Male relatives think I should suggest techniques to mom	34	36	.79
Male relatives think I should shut off tap	30	35	.25
Female relatives think I should suggest techniques to dad	34	40	.21
Female relatives think I should suggest techniques to mom	36	42	.19
Female relatives think I should shut off tap	33	43	.03
Friends think I should suggest conservation techniques to dad	30	39	.06
Friends think I should suggest conservation techniques to mom	30	39	.05
Friends think I should shut tap	29	41	.01
Classmates think I should suggest techniques to dad	23	36	.00
Classmates think I should suggest techniques to mom	27	37	.03
Class thinks I should shut tap	25	39	.00
Father thinks I should shut tap	44	52	.10
Mother thinks I should shut tap	46	51	.30

**APPENDIX M: GENDER AND RURAL STUDENTS**

**Table A: Effect of Gender on Knowledge of Rural Students  
(Percent Answering Correctly)**

Knowledge Items	Boys (%)	Girls (%)	$\chi^2$ p-value
Source of water in Jordan -rainfall	87	85	.61
Not a source of water in Jordan - puddles	91	83	.02
Source of water in Jordan -rivers	36	44	.07
Not a source of water in Jordan - tap water	56	50	.24
Source of water in Jordan -spring water	49	47	.69
Not a source of water in Jordan - bottled water	81	87	.08
Source of water in Jordan -ground water	64	61	.57
Source of water in Jordan -treated sewage water	18	21	.50
Not a source of water in Jordan - snowfall	82	80	.65
1% Earth water suitable for human consumption	38	17	.00
Main reason Azraq Oasis dried up-overdrawing	53	42	.03
Gardens consume most water in average household	32	26	.18
Watering with sprinkler more expensive than drip irrigation	7	7	.99
Watering plants in morning less expensive than at midday	85	90	.14
Use of compost preserves water in the soil	78	80	.63
Use of compost reduces excess salinity in the soil	63	69	.15
Overdrawing increases salinity	47	47	.97
Surface water in Aqaba was polluted by dumped oil	23	26	.46

**Table B: Effect of Gender on Attitudes and Outcome Beliefs of Rural Students  
(Percent with Positive Attitudes/Beliefs)**

<b>Attitude and Outcome Belief Items</b>	<b>Boys (%)</b>	<b>Girls (%)</b>	<b><math>\chi^2</math> p-value</b>
Suggesting to father water conservation techniques is good	62	52	.04
Suggesting to mother water conservation techniques is good	60	56	.41
Shutting off tap when brushing teeth is good	82	76	.13
Suggesting to father conservation techniques lowers water bill	70	57	.00
Suggesting to mother conservation techniques lowers water bill	65	56	.04
Shutting tap off when brushing teeth lowers water bill	56	46	.03

**Table C: Effect of Gender on Normative Beliefs of Rural Students  
(Percent Reporting Strong Social Pressure)**

<b>Normative Belief Items</b>	<b>Boys (%)</b>	<b>Girls (%)</b>	<b><math>\chi^2</math> p-value</b>
Others think I should suggest conservation techniques to dad	43	26	.00
Others think I should suggest conservation techniques to mom	45	30	.00
Others think I should shut tap	56	36	.00
Teacher thinks I should suggest conservation techniques to dad	54	42	.02
Teacher thinks I should suggest conservation techniques to mom	52	44	.12
Teacher thinks I should shut tap	52	40	.01
Male relatives think I should suggest techniques to dad	40	26	.00
Male relatives think I should suggest techniques to mom	42	29	.01
Male relatives think I should shut off tap	41	26	.00
Female relatives think I should suggest techniques to dad	45	31	.00
Female relatives think I should suggest techniques to mom	48	33	.0
Female relatives think I should shut off tap	47	32	.00
Friends think I should suggest conservation techniques to dad	39	32	.11
Friends think I should suggest conservation techniques to mom	42	30	.01
Friends think I should shut tap	43	31	.01
Classmates think I should suggest techniques to dad	38	25	.01
Classmates think I should suggest techniques to mom	39	28	.02
Class thinks I should shut tap	39	29	.03
Father thinks I should shut tap	54	45	.05
Mother thinks I should shut tap	56	44	.02

**Table D: Effect of Gender on Social Behaviors of Rural Residents  
(Percent Reporting Performance of Behavior)**

<b>Social Behavior Items</b>	<b>Boys (%)</b>	<b>Girls (%)</b>	<b><math>\chi^2</math> p-value</b>
In last month, talked with father about water pollution	33	29	.40
In last month, talked with mother about water pollution	35	34	.94
In last month, suggested water conservation techniques to father	49	43	.22
In last month, suggested water conservation techniques to mother	50	58	.09

**APPENDIX N: DEGREE OF CURRICULUM IMPLEMENTATION**

**Table A: Effect of Degree of Implementation on Student Attitudes**

<b>Attitudes</b>	<b>Partial Implementors (mean)</b>	<b>Full Implementors (mean)</b>	<b>df</b>	<b>F</b>	<b>Significance of F</b>
Suggesting conservation techniques to mother	1.5	1.5	1	0.1	.79
Suggesting conservation techniques to father	1.4	1.5	1	0.7	.42
Brushing teeth with tap off	1.7	1.8	1	3.0	.08

No significant effects on student attitudes were revealed in the analysis.

**Table B: Effect of Degree of Implementation on Student Outcome Beliefs**

<b>Outcome Beliefs</b>	<b>Partial Implementors (mean)</b>	<b>Full Implementors (mean)</b>	<b>df</b>	<b>F</b>	<b>Significance of F</b>
Suggesting to mother will lead to lower water bill	1.5	1.5	1	0.01	.93
Suggesting to father will lead to lower water bill	1.5	1.6	1	0.9	.35
Shutting off tap while brushing will lower bill	1.2	1.3	1	1.7	.20

Teacher implementation did not have any significant effects on student outcome beliefs.