

# Chapter 15

## Water Conservation in Jordan: A Novel Approach to Curriculum Development

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Paramount among Jordan's national concerns is the scarcity of water. Water scarcity is so serious that the peace treaty between Israel and Jordan, signed in 1994, included Jordanian water rights. This landmark initiative addressed longstanding political tensions between the two countries, and the terms of the water section are still being argued today. Extensive mass-media coverage highlighting the agreement served to further focus the nation's attention on the water-shortage issue. Water is scarce across all of Jordan. The whole country is arid, or semi-arid, with a dearth of water for farming, grass, and even trees.

Like other tropical countries, Jordan has only two seasons, a rainy season and a dry season. The rainy season from October through April produces 85 percent of the nation's total annual rainfall. Precipitation is the predominant source of fresh water, feeding the Jordan and Zarqa Rivers and replenishing natural springs and underground pockets of water.

All known sources of water across the country are already being utilized, and those are drastically reduced by four factors. First, 92 percent of the rainfall is lost to evaporation. Second, Jordan's neighbors, Syria and Israel, have diminished water flow by building hydroelectric dams further upstream on the Jordan River. Subsequently, Jordan has become highly dependent on these countries for its water needs. Third, Jordan's population has expanded enormously due in part to successive waves of refugees from Israel and Palestine and to the fact that Jordan has one of the highest population-growth rates in the world (3.3 percent); the increased population increases demand for agricultural water as well as domestic water. Fourth, mod-

ernization and increasing expectations about quality of life have also changed domestic water behaviors.

Because the supply of water no longer meets the demand for water, conservation has become Jordan's focus. Rationing of water has become a way of life. Recently, legislation was passed that requires newly constructed homes and apartment buildings to have water-storage tanks fed by runoff rainwater in addition to piped water. But regulation and municipal management alone will not suffice to resolve Jordan's water deficit. Individual citizens need to do their part, and although Jordanians are now fairly efficient water users, additional voluntary reductions of water use are needed at the household level.

This chapter describes how GreenCOM worked with a Jordanian NGO to address this need through a tailored curriculum within Jordan's schools. The starting point was to understand, through research, popular perceptions about water scarcity: how do Jordanians perceive the water problem? Next came the design of an educational curriculum targeted on knowledge gaps revealed by this research. Importantly, the design of this strategy was carried out in an interactive way, in contrast to what most Jordanian educators had experienced before, and it was this participation that significantly contributed to increased environmental learning. Key to the strategy as well was gender sensitivity—the curriculum addressed boys and girls differently based on what the research told us about their varying perceptions about water scarcity and their different roles in domestic water use. The result has been a major increase in environmental knowledge and the development of a research-based, interactive, and gender-sensitive

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process that can be used throughout Jordan and the Middle East.

### **HOW DO JORDANIANS PERCEIVE THE WATER PROBLEM?**

To answer this question, the Royal Society for the Conservation of Nature (RSCN), a local non-profit environmental organization supported with technical assistance from the GreenCOM Project, held a series of discussions with students, teachers, and school principals in 1994. RSCN found that both boys and girls were well aware that water was an issue in the country. However, there was relatively little understanding that water scarcity was not a new issue, indeed had been a problem for centuries. In addition, there was remarkably little understanding that water scarcity was an endemic feature of a climate that is essentially arid or semi-arid.

Furthermore, men and women perceived their roles in conserving water very differently. While men and boys saw their roles as promoters of water conservation, women and girls saw their roles as implementors of conservation measures. Men more often mentioned the need for government responsibility for the issue; women were more apt to personalize conservation measures. For example, when asked for specifics, males could only state one or two ways to reduce water use in the home, often linking water reduction and conservation to those tasks that women were most likely to do anyway (e.g., washing dishes and doing laundry) and less likely to talk about their own uses of water (e.g., the garden, washing cars, shaving, taking showers). Few men talked about water loss through old and corroded pipes and leaking water tanks, one of the principal ways in which water is lost and which would normally be a man's or a boy's job to repair. In contrast, females generally offered several ways to reduce domestic water consumption linked to their own household tasks and personal use. In spite of the high rates of literacy, women's roles in Jordanian society, among both Islamic and Christian families, are largely tra-

ditional and revolve around domestic work, children and the extended family.

In general, Jordanians of both sexes believe that women care more about the environment and that women are more responsible for safeguarding the environment than men. This attitude may stem from traditional Jordanian society when women are responsible for fetching water from the wells and allocating it for household use. Women and girls also indicated a more refined sense of the kinds of water available for domestic use: grey water, which many knew could be recycled; rainwater, preferred for cooking and drinking; spring water, purchased in times of rainwater shortages for cooking and drinking; and tap water, used for washing laundry and watering the garden. It is not unusual in Jordan for women to have three separate sources of water (tap, spring, and rain), each with its own specific usage.

Many of the students, teachers, and school principals—of both sexes—believed that they have no control over the country's water supply. While they do see themselves as part of the problem, they don't see themselves as able to contribute to the solution. We found that most people believe that the national water shortage is a problem caused by a combination of government mismanagement, industry dumping, and domestic abuse; but that the solution had to come from government or industry. The students did not see themselves in the role of concerned consumer or environmental advocate, even though they belonged to environmental clubs. Although students generally were knowledgeable and aware of water problems in Jordan, *they did not feel that they could contribute to their solutions.*

### **A WATER CONSERVATION CURRICULUM**

RSCN decided to help tackle the water-scarcity problem at the household level. In an effort to instill a sense of personal control over water usage and spur Jordanian citizens to action, RSCN developed a water-conservation curriculum for its net-

work of secondary-school environmental youth clubs (eco-clubs) with assistance from GreenCOM.

RSCN had started its loosely structured school-based eco-club system several years before, and it the system had grown to include over 300 clubs. Although the clubs' initial focus was on biodiversity, RSCN became increasingly concerned about the growing urgency of the water-scarcity problem in Jordan. RSCN further recognized that its eco-club system provided a good avenue for testing new approaches to environmental education. Schools, which are single-sex in Jordan, volunteer to join the eco-club system and most students volunteer to participate in the club's activities. As a result, eco-club students and teachers are generally highly motivated, and consistently express strong interest in improving their clubs. Most participating schools are girls' schools, further highlighting the link between environment and gender by reflecting the traditionally greater interest and involvement of women and girls in environmental issues.

The curriculum RSCN developed for its eco-clubs focused on persuading students and, through the students, their family members about the need to conserve water at home. The curriculum provided examples of specific actions that households could take to reduce their personal water use. On the basis of the earlier discussions with boys and girls and their teachers, RSCN made a particular effort to highlight things that boys and men could do to personalize their commitment to water conservation. The curriculum consisted of the following five units:

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
5. Home gardens and irrigation

Because the goal of RSCN's efforts was active participation in water conservation by students and their families, the curriculum stressed interactive learning activities. Each unit included an information section with facts about the topic under study, questions to facilitate discussion, activities

for the club, and a student test to be administered before and after the unit.

Activities conducted by the clubs were then linked to a number of specific actions recommended for students and their families to perform independently at home, including:

- ◆ Placing a one-liter bottle in the toilet tank to reduce the amount of water needed to flush
- ◆ Watering the home garden in the morning or evening, not in the daytime, to reduce evaporation
- ◆ Taking showers instead of a bath
- ◆ Turning taps off while brushing teeth, washing dishes, and shaving
- ◆ Washing clothes in one large load instead of many small loads and reusing the grey water
- ◆ Repairing old water tanks and covering and cleaning cisterns, replacing corroded and leaky pipes

### **How Was the Curriculum Developed? How Were Teachers Trained?**

RSCN staff, several teachers, officials from the Ministry of Education, GreenCOM staff, and other experts in education, water, the environment, and administration came together in a participatory workshop in October 1994 to develop the water-conservation curriculum in Arabic. Although a few of the participating teachers had science backgrounds, others were trained in Arabic language, religion, and other specialties. But the contributions of the non-science teachers were vital because eco-club teachers' backgrounds vary as well—from science, to language arts, to mathematics, to religious instruction, to art.

Our approach to curriculum design placed importance on interactive discussions, hands-on experiments, and discovery processes in student learning, and the need to make topics relevant to teenagers' lives. Although these methods are widely used in many Western nations, they constituted a dramatic departure from the traditional way of teaching in Jordanian schools, where lectures are the main format.

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The content of the curriculum was based on information gathered from original interviews with students, teachers, and administrators, as well as from existing curricula from the United States and elsewhere that incorporated interactive teaching techniques. In particular, the curriculum drew on activities used in science curricula in Arizona and New Mexico, which are similar in climate and topology to Jordan.

During the curriculum-development workshop, teachers demonstrated the activities they expected students to be able to perform. In this way organizers monitored the availability of materials for the exercises, how long a given task would take, the ability of teachers to understand the curriculum concepts, and the ability of the students to perform these tasks at their grade level.

The degree of academic difficulty was pitched to a 9th grade level so that younger students would not find it too difficult nor would older students find it boring. Students in grades 8–11 could participate in the clubs.

Sensitivity to the different gender roles was emphasized throughout the design process. For example, a deliberate effort was made to include exercises and activities that would affect both genders. When advocating behavior change in the home, the curriculum included illustrations of men closing faucets while they shaved, men using drip irrigation instead of hoses in family gardens, and men washing cars with buckets rather than a hose—in addition to women washing dishes and clothing. To tailor the curriculum to both rural and urban schools, we included activities that addressed both home garden watering (urban or rural) and irrigation of agricultural land (rural).

During this same two-week curriculum-development period, all the materials, exercises, and teacher's guides were pretested with eco-clubs and their teachers. Revisions made were again pretested. Next, at two-day workshops held in January 1995, RSCN and other curriculum-development-team members trained eco-club teachers on how to use the curriculum. At the training, we gave teachers the new curriculum and a self-instruc-

tional teachers' manual that stressed the new interactive teaching methods. The participants “walked through” the teachers' manual, following the instructions step-by-step to ensure a thorough understanding of the lesson.

### **The Curriculum Worked!**

At semester's end, we compared students and teachers from a sample of eco-clubs using the new curriculum with a sample of eco-clubs not using the new curriculum. The results: the new curriculum had a significant impact on students' knowledge, attitudes, beliefs, and behaviors regarding conserving water at home. Of particular interest is the stronger effect the curriculum had on boys than on girls; boys made more suggestions to their parents about ways to reduce water consumption, such as shutting off the tap while brushing their teeth. This finding suggests that when the practice of water conservation is presented as an issue within the male domain, boys are receptive to the subject matter and can become advocates for change.

And, in general, students appear to have served as effective conduits for changing their family's water-conservation behaviors at home as well. They reported influencing the clothes-washing behavior of their mothers as well as their households' garden-watering practices.

The curriculum also appears to have influenced teachers. We found that teachers changed how they conducted their eco-clubs in terms of the content and format of the activities they carried out. Most teachers who were provided with the curriculum (60 percent) implemented a majority of the recommended activities. The curriculum seemed to motivate female teachers more strongly than male teachers: they increased both the total number of activities on water and the number of *interactive* water activities (e.g., field trips, experiments, drama presentations) used in their eco-clubs. Male teachers who got the curriculum also increased the number of *interactive* water activities they used, but did not devote more activities in their eco-clubs to water issues overall.

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Also of note were teachers' overwhelmingly positive reactions to the new curriculum. The vast majority (90 percent) indicated they would like to use the curriculum again in the future with new eco-club students.

### **LOOKING TO THE FUTURE**

What does the success of this curriculum mean for future environmental-education efforts in Jordan and elsewhere in the Middle East? We think it shows that when you develop programs on the basis of research, develop curricula in a participatory way, use interactive learning techniques, and are sensitive to gender differences, increased learning and behavior change are very likely. The extensive knowledge that RSCN gained in their interviews with students and teachers, being responsive to teachers' needs, and the implementation of an ecology-club program with gender-based considerations proved useful in improving the school-based environmental programs in a number of ways.

This process can serve as a model for new educational projects by other organizations in Jordan. Appropriate in both formal and non-formal settings, the methods used here can also be replicated and adapted to other subject areas with relative ease.

In fact, the diffusion of ideas has already begun. Even before this project ended, other divi-

sions within RSCN had used these methods to develop materials to promote tourism at park sites. RSCN education staff used the participatory-workshop model to develop a curriculum on biodiversity and conservation of species in Jordan. The participatory model was much appreciated by USAID, which recommended it to all its projects in Jordan. Subsequently, it has become a standard for other programs and projects across the country. RSCN went on to develop a series of TV spots based on the recommendations in the curriculum—one spot a month for six months highlighting a specific way citizens could conserve water. These spots were shown on prime time national TV and were widely and well received, not only in Jordan but also in neighboring countries where reception of Jordan TV was available.

Most importantly to Jordan, the curriculum represents a vital contribution to creation of a gender-sensitive dialogue about water conservation at home, empowering students and their families to recognize their roles in solving the serious water-shortage faced by their nation.

Beyond Jordan, neighboring Middle Eastern countries with similar water shortages may look to Jordan in the future for fresh ideas on water conservation. This curriculum is already in select schools in Gaza and the West Bank, and Egypt has requested and received copies of the materials.

## **BOX 15.1**

### **Curriculum Summary**

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

This unit highlights the importance of water in nature, its role in the Koran, and its many uses. Background information is provided about water sources in Jordan, the water cycle, dams, and the concept of water as a publicly owned commodity. Collection and use of water over time is outlined. The impact of population growth and urbanization on the water supply is described.

#### *Activity 1: Exploring How Water Evaporates*

*Summary:* Put equal amounts of water in two bowls or glasses and cover. Place one bowl in the sun and another in the shade and compare what happens.

#### *Activity 2: Constructing a Small Replica of the Water Cycle*

*Summary:* Put soil, water, and seeds into a covered jar to see if and how the plants grow. In each case, first write down what you expect to see, then perform the experiment and record and

discuss what you actually observed.

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

This unit reinforces the importance of water and its scarcity in Jordan and throughout the Middle East. These concepts are then brought into the home environment by presenting several ideas for saving water in the bathroom, kitchen, and elsewhere in the house.

#### *Activity 1: Water-Use Survey*

*Summary:* Conduct a survey at home with your parents to measure how much water your family uses. Record how much water you and your family use for brushing teeth and bathing. Next, determine how much water is used for “female” household tasks such as washing the dishes and the clothes. Determine the amount of water used for “male” tasks such as washing the car and shaving. Discuss with your family ways they could decrease water consumption.

#### *Activity 2: Water-Meter Reading*

*Summary:* Observe the teacher’s demonstration of how to read a water meter. Next, check your water meter at home, or look at your family’s water bills if they purchase water, to calculate the cost of water to the family each month. Compare and contrast the water bill from the month prior to implementing the water-saving measures you have learned at home, and the month after implementing these measures.

#### *Activity 3: Saving Water When Brushing Your Teeth*

*Summary:* Calculate how much water can be saved when the tap is not left running while you brush your teeth. Multiply this amount by the number of people in your family to determine the total savings for your household.

#### **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. The importance of ground cover is also stressed in this exercise. In Jordan, ground cover is often removed through gleaning activities, which allows water to evaporate faster and removes habitats of small animals.

*Activity 1: Function of Ground Cover in Retaining Moisture*  
*Summary:* Put seeds and wood chips in a nylon sock, place it on a wet plate, and observe what happens over the course of two days.

#### **Unit 4-Pollution**

This unit addresses surface-water and aquifer pollution: the role that humans play in causing pollution and ways to stop it. Particular emphasis is placed on pollution in the Gulf of Aqaba and its effect on coral reefs. Six suggestions to decrease water pollution, such as minimizing the use of chemical fertilizer and controlling garbage disposal, are offered.

##### *Activity 1: Simulating Water Pollution*

*Summary:* Fill a glass with water, sand, and pebbles. Put ink, red dye, and oil into the glass and observe what happens.

#### **Unit 5-Home Gardens and Irrigation**

This unit explores ways to reduce water use in home gardens. Water-efficient plants that can be used in gardens are identified, how compost can slow evaporation of water is demonstrated, and the effects of fertilizer on evaporation levels is examined. The unit shows how

to collect rainwater at home for use in home gardens. The advantages of drip-versus canal-irrigation methods for agriculture are also covered.

##### *Activity 1: Comparing Water Use by Three Different Plants*

*Summary:* Obtain three different plants with different-size leaves. Observe how much water is used by each plant over time.

##### *Activity 2: Comparing Waxy Versus Non-waxy Leaves*

*Summary:* Identify two plants, one with waxy and one with non-waxy leaves. Compare transpiration between the two plants over time.

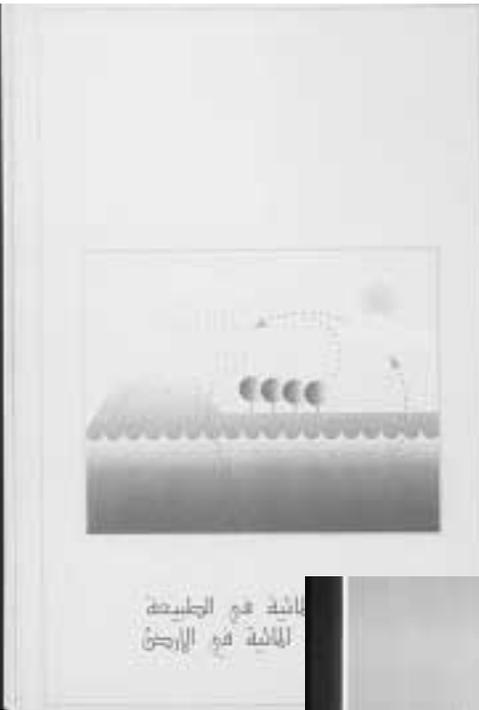
##### *Activity 3: Simulating Canal and Drip Irrigation Techniques*

*Summary:* Water one group of plants with a pitcher of water (canal method) and another group of plants with a water dropper (drip method). Observe over two weeks to see how much water is used by each. Take notes and present your final results.



**GreenCOM's approach to curriculum design promoted interactive discussions, hands on experiments. Jordan's Royal Society for the Conservation of Nature developed secondary school environmental youth clubs (eco-clubs) with the help of GreenCOM to introduce students to environmental activities.**





The Royal Society's teacher's guides were designed to be colorful and easy to use. (At left) "Water Cycle in Nature," (below) "Water Conservation at Home," and "Teachers Guide to Water Conservation Curriculum."



At the ceremonial opening to the Royal Society for Nature's Curriculum Development Workshop, the USAID/Amman mission director Tom Oliver, gave a talk (left) and panelists discussed the importance of environmental education (above).

