

Creating an infrastructure



of knowledge

Classroom curriculum educates on the importance of stormwater, water, and wastewater systems

Lara Isch

Education by utilities is integral to public understanding and acceptance of water, wastewater, and stormwater systems, along with their costs, complexity, and the processes and regulations that determine rates. When KC Water (Kansas City, Mo.) developed The

Journey of Stormwater: KC to the Sea, the curriculum was meant to be a water quality education tool. Through innovation, effective communication with stakeholders and students, and a commitment to education, the curriculum has evolved to not only teach students about the role they play in managing water quality in rivers, but also to impart the value of the infrastructure that delivers water from the river to the tap and then back to the river.

The beginning of 'The Journey'

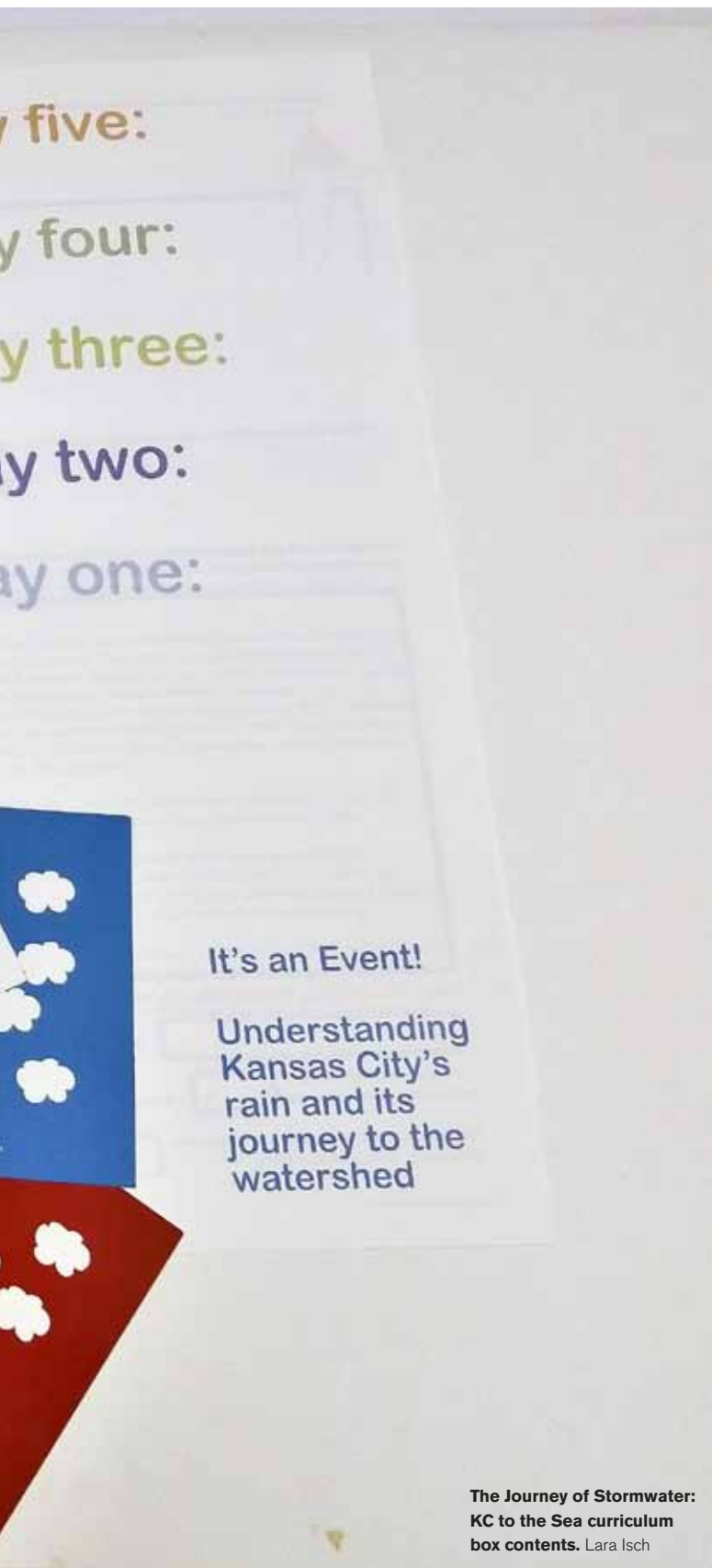
In 2003, KC Water launched its Wet Weather Solution Program and formed its Wet Weather Community Panel. The purpose of the panel, which is made up of citizens and community leaders, is to help shape a plan to manage stormwater, address sewer overflows, and work to improve water quality in the Kansas City region. With an impending federal consent decree to reduce sewer overflows in the combined and separate sewer systems and the associated rate increases, KC Water wanted to ensure that the community had a voice in shaping the direction of the overflow control plan.

One of the panel's requests was for KC Water to include dedicated funding for outreach and education to inform citizens of the water quality issues facing Kansas City and their role in the solution. The Journey of Stormwater: KC to the Sea curriculum emerged as a result. It was developed and first piloted during the 2010–2011 school year.

Meeting teacher needs

Any utility that has dealt with curriculum development and implementation had learned that it is not as simple as creating a product and handing it to a teacher or school. Teachers are required to meet standards set forth by state agencies in the timeframes dictated by their school district. However, in most Kansas City metro area school districts, teachers are given the freedom to teach concepts in the way that best resonates with them and are not always held to one curriculum or teaching tool.

Trying to get a new curriculum implemented in urban school districts that are trying to maintain accreditation, or suburban ones that have set programs and many resources at their disposal can become a full-time job. By investing in comprehensive curriculum and competent professionals, as well as being open to the ideas of diverse teachers, administrators,





Fifth grade students at Martin City Elementary School act out the Water Cycle as part of Lesson 1 of the The Journey of Stormwater: KC to the Sea curriculum. Lara Isch

and school districts, in-school education programs can help inform, educate, and empower the next generation of rate payers.

A successful education program must include a well-developed curriculum, a flexible teacher training program, education-specific staff, and a yearly review and marketing process.

The elements of the curriculum

BNIM, a local architecture firm, and Project Explore, a curriculum development company assisted KC Water in creating KC to the Sea.

The curriculum had to meet not only the needs of KC Water, but also the Missouri Learning Standards required by the Missouri Department of Elementary and Secondary Education if it was to be successfully implemented in the schools. KC to the Sea is provided free of charge to schools with Kansas City, Mo., addresses.

KC to the Sea is a 5-day program consisting of three lessons and two projects. The first day of the curriculum is taught in schools by KC Water's education staff. The remaining days are left up to teacher discretion on when and how to implement them. Any

The Journey of Stormwater: KC to the Sea curriculum

Day 1 – It's an Event

Students learn about watersheds, how many gallons of stormwater are produced during a rain event, how Kansas City's combined and separate sewer systems receive that water, where water goes once it enters the sewer systems, and how that water returns to the river to become our drinking water or the drinking water of someone downstream.

Day 2 – Dangerous Travels

Students learn how stormwater picks up pollution, both visible and unseen, and how that pollution affects our water quality. They learn how to determine point sources versus nonpoint sources of pollution and which types of pollution are regulated.

Day 3 – Cleaning Up Our Water Act

Students learn about Best Management Practices (BMPs) that governments and businesses use to clean up and slow down stormwater on their properties. They also learn about BMPs that can be implemented at home to help manage stormwater including rain barrels, rain gardens, proper fertilizer management, and keeping storm drains free of trash.

Day 4 – Those Traveling Stormwater Teams

Students create an art project depicting an Old Town (with no stormwater management) and a New Town (with BMPs and clean water) to display at their school and educate others.

Day 5 – “Walking the Talk”

Students create a public service message to teach others the importance of stormwater management and BMPs.



Kansas City public school teachers learn how to teach water pollution concepts during a teacher training session. Lara Isch

additional supplies – beyond the curriculum pack described below – requested by the teachers to assist with completion of KC to the Sea are made available on loan from KC Water or offered free of charge by request in the case of consumable items.

The curriculum as distributed to teachers includes

- a cardboard curriculum box,
- teachers guide,
- copies of student worksheets (when requested, otherwise digital copies are given),
- a set of 96 nonpoint source flashcards (set of 24 for each of 4 teams),
- a set of 20 best management practices bingo cards, and
- a flash drive with digital copies of the teacher's guide, student sheets, videos, and examples of exceptional student projects from previous years.

The box on p. 44 shows the full program schedule for the curriculum.

Teacher training program

KC Water first piloted the curriculum during the 2010–2011 school year. Six teachers participated in an educational workshop, held by the Blue River Watershed Association (BRWA), a local nonprofit watershed group, to become familiar with the curriculum and feel comfortable teaching it prior to implementation in the classroom. Based on teacher comments, KC Water refined the curriculum to make it more user friendly and to fit within the 40- to 50-minutes of most school science classes.

Year two of the program (2011–2012 school year) was funded through a U.S. Environmental Protection Agency Environmental Education Grant held by BRWA in partnership with KC Water. Teachers were recruited to participate from various public, charter, and private educational institutions throughout Kansas City. A total of 23 teachers attended a half-day educational workshop prior to classroom implementation. BRWA then sent a certified educator

from their staff to teach Day 1 of the curriculum in the classroom.

Based on feedback from the first 2 years, the program developed into its current format. Prior to classroom implementation, each teacher is required to attend a training workshop to become familiar with the curriculum and the water issues facing Kansas City. This training workshop is hosted by KC Water education staff and held at a location and time that works best for the teacher. This can sometimes require the training be completed over several days during the teacher's planning time or lunch hour.

Once the teacher is comfortable with the program, KC Water sends out its education staff to teach Day 1 of the curriculum in the classroom. Days 2 through 4 are completed by the classroom teacher. The teacher then works with their students and KC Water to determine the final public service message (Day 5) that their students will deliver and the audience they will target.

The utility of utility education staff

If a utility wants to build lasting infrastructure, they hire a competent engineer who manages a competent team to make sure that everything is done according to industry standards and up-to-date practices. Education and outreach programs must be treated with the same level of expertise.

Asking a member of a utility's engineering staff or even a general communications expert to master the politics and inner workings of the classroom environment makes as much sense as asking a teacher to design a water resource recovery facility.

KC Water employs a certified teacher to handle most of the classroom teaching, hold teacher trainings, and update the curriculum yearly to meet Missouri Learning Standards. This connection to the classroom teacher builds trust in the program, allows for better networking in the education environment, and leads to a higher level of implementation in classrooms.



Students from Fox Hill Elementary pour water in the water frame to determine how many gallons of water will run off 1-yd² during a 1-in. rainstorm. Lara Isch

Keeping it fresh

KC to the Sea is successful because it is promoted [or marketed], reviewed, and updated by the classrooms implementing it. Through input from classroom teachers, curriculum coordinators, and students alike, the program evolved from a water quality education tool into a comprehensive program that illustrates the interconnection of water, wastewater, and stormwater.

Each year, the curriculum is reevaluated to ensure it still aligns with Missouri Learning Standards. This process is completed through a review of standards on the Missouri Department of Elementary and Secondary Education website and meetings with science curriculum coordinators and school administration when possible. KC to the Sea is presented to them as a hands-on, project-based learning tool for their students. They are asked to determine which grade level education requirements they feel the curriculum fits. It is from this dialog that KC Water approaches new teachers and schools.

At the end of each school year, KC Water's education staff reaches out to teachers who participated to get their opinions and ask for ways to improve KC to the Sea. This process is completed through phone calls, e-mails, and in-person meetings to ensure that the teachers feel included in the process and not as though they are being forced to complete a canned survey.

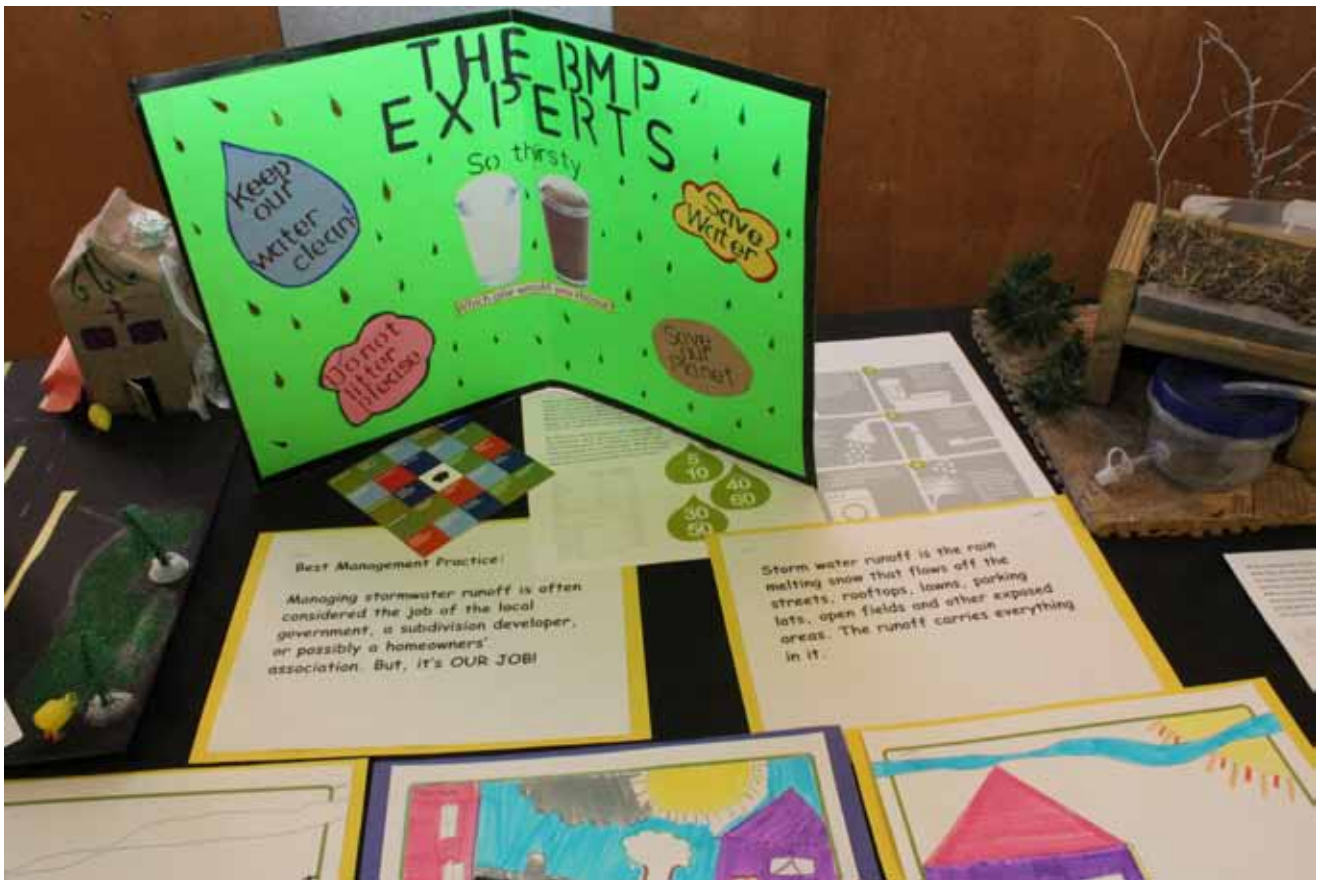
Through this dialog, teachers from various school districts

communicated that the students were interested in the water quality component, but also in the processes behind the treatment of water and wastewater and the systems that conveyed water to their homes. These surveys revealed that most students and many teachers in Kansas City were unaware the Missouri River is both the source of their drinking water and the place where wastewater effluent is discharged. As a result, the Day 1 presentation was adapted to address not only the water cycle of evaporation, condensation, and precipitation, but also the "horizontal water cycle" – the process water goes through from river to treatment to tap and back through treatment to the river.

Once the students grasped the concept that all water was reused and would continue to pass through this cycle, they more fully understood the need for water quality protection, water regulations, and infrastructure. This allowed the teachers to expand the conversation with students during the remaining lessons and the final project.

Expansive growth

Open dialogs with teachers and coordinators have allowed KC Water to grow the KC to the Sea program from reaching 300 students in 6 schools during the pilot year, to reaching more than 4000 students in 45 schools throughout 9 school districts in the 2016–2017 school year. In total, the program has reached more than 17,000 students. KC Water hopes that continuing to teach



This example from the Allen Village Charter School's Community Stormwater Science Fair shows the type of project that students complete as the Day 5 portion of the curriculum. Lara Isch

children will instill an understanding of the value of clean water and its related infrastructure in future generations for years to come.

Effective elementary and secondary education programs can help connect a utility to their community and create a generation of informed rate payers. However, to be effective, these programs must meet several conditions.

- Be developed with assistance from certified educators.
- Include program-focused staff with educational backgrounds.
- Involve local teachers, school administration, and curriculum coordinators in yearly program review and refinement.
- Be flexible to changes in grade levels, class lengths, and testing standards across multiple school districts.

KC Water intends to continue to grow the KC to the Sea program to meet changing educational needs of the utility and Kansas City area schools, with the goal of reaching all students within the city limits. Future work includes hands on learning labs at the KC Water headquarters as well as the creation of a high school curriculum.

Lara Isch is a water quality educator for KC Water (Kansas City, Mo.).

The author gratefully acknowledges the cooperation and input of 4th through 6th grade teachers and curriculum coordinators throughout the Kansas City metro area in helping to shape this water quality education program.