7-2019

# Water Education Leadership in Texas: Pathway for Students from Middle School to University Degree

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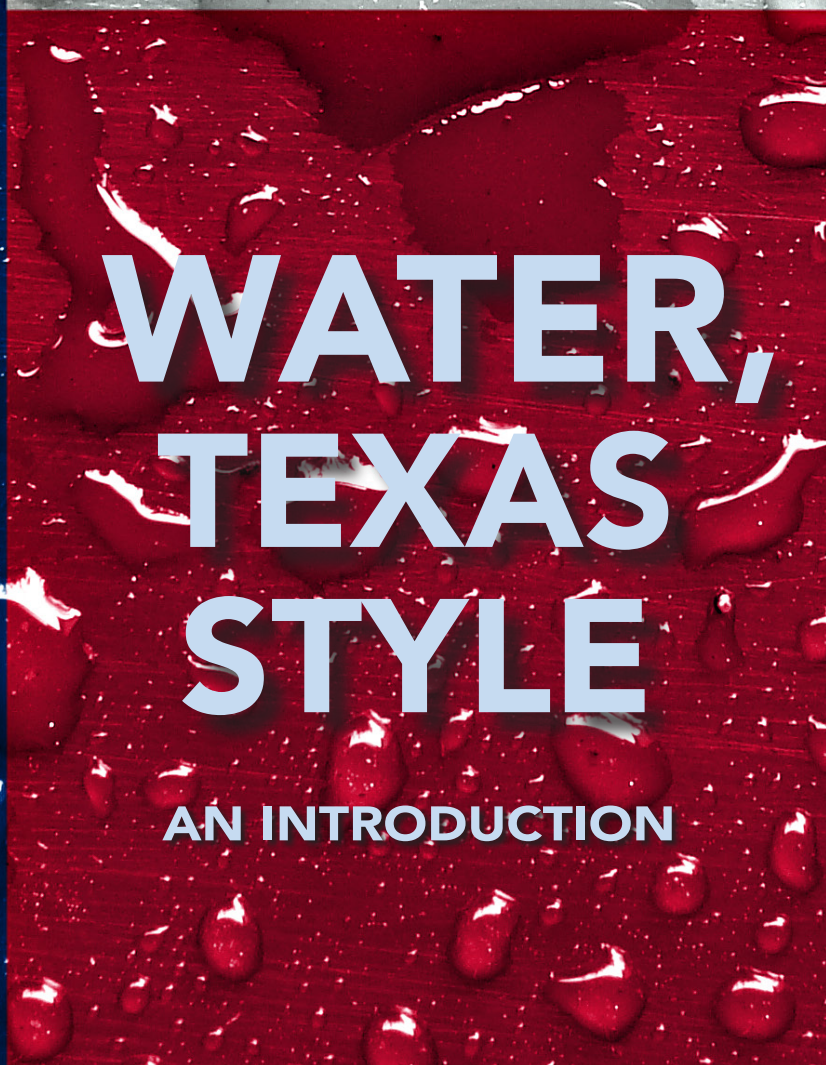
WATER RESOURCES

# IMPACT

JULY 2019
VOLUME 21 • NUMBER 4



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### ABOUT THIS ISSUE

Issue Theme: Water, Texas Style
Guest Editor: Todd H. Votteler, Ph.D., Editor-in-Chief of the *Texas Water Journal*

This issue of *Water Resources IMPACT* focuses on Texas and how the state is managing its surface water and groundwater resources, and its plans to slake the thirst of its future population. This issue reflects a number of different perspectives on many of the elements crucial to the future water needs of Texas.

After an introduction by Todd Votteler, Peter Lake examines how Texas plans for, and finances the projects needed for its growing population. Robert Mace then examines how Texas manages its groundwater under the rule of capture modified by local groundwater districts. Sara Thornton addresses the plan for Texas to build 26 new water supply reservoirs by 2070. Kathy Alexander outlines the state's regulatory efforts to encourage conservation and to provide water for the needs of the environment. Suzy Valentine explains the function of Texas' system of interstate compacts for sharing rivers with neighboring states. Gabe Collins dives into the energy/water nexus in Texas, highlighting the energy portion of the state's water demand. John Tracy discusses the extensive effort to research the future water needs of Texas. Finally, Rudy Rosen addresses the need for a growing workforce in Texas water management and how the education system can respond.

VOLUME 21 • NUMBER 4 • ISSN 1522-3175

PUBLISHED FOR:

AMERICAN WATER RESOURCES ASSOCIATION

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*Water Resources IMPACT* is owned and published bi-monthly by the American Water Resources Association, PO BOX 2663, Woodbridge, VA 22195, USA. The single copy digital purchase rate is $17.00 (USD).

*IMPACT* is a magazine of ideas. Authors, Associate Editors, and the Editor-in-Chief work together to create a publication that will inform and will provoke conversation. The views and conclusions expressed by individual authors and published in *Water Resources IMPACT*
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## SUBSCRIPTION RATES

*Water Resources IMPACT*

SINGLE DIGITAL
COPIES AVAILABLE

$17.00 (USD)

PUBLISHED BY:

The MPX Group, 7105 Medicine Lake Road,
Golden Valley, MN 55427 • 763-553-1630

PUBLISHED July 2019/AWRA



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FEATURE

# Water Education Leadership in Texas: Pathway for Students from Middle School to University Degree

*Rudolph Rosen*

**ANTICIPATED HIGH NUMBERS** of retirements and current difficulties attracting job-ready workers to fill job openings have created concerns in the water industry. Sufficient numbers of properly trained workers are needed to avoid water pollution incidents and to ensure safe drinking water and the long-term sustainability of water systems. But the challenge recruiting new water workers may start early. Work in Texas and elsewhere indicates that understanding about water is low among students and that many teachers feel deficient in their own knowledge about water and how to integrate water education into their own classroom activities.

In response to concern about inadequate water education in Texas, educators have developed a comprehensive curriculum for water science that seeks to connect students to water. The addition of flexible postsecondary education options is creating a pathway that starts in middle school and continues on through high school and beyond to a career in water. The curriculum provides for place-based and experiential classroom and outdoors educational opportunities to learn about water, with resources for teachers and students that follow Texas' extensive K-12 educational standards. Beyond high school a new model has been proposed for post-secondary training that envisions multiple routes for a high school graduate or practicing professional to combine technical training, competency-based credit and additional educational accomplishments to complete a Bachelor of Science (B.S.) or Bachelor of Applied Arts and Sciences (B.A.A.S.) degree in water.

## Middle and High School Education

Texas middle and high school science teachers have requirements to teach students about water. These requirements are contained in the Texas Essential Knowledge and Skills, generally referred to as TEKS. The TEKS impose requirements for education about water, but teachers had no comprehensive textbook or even a teacher's guide on the subject. This lack of instructional resources departed markedly from the more typical circumstances encountered by teachers of other science subjects, such as math, chemistry and physics where comprehensive textbooks and teaching guides are available to address relevant TEKS.

To provide the context for teaching students about water, including about working in the water industry, Texas university and state agency educators collaborated with educators at the Missouri Department of Conservation to create a curriculum called *Texas Aquatic Science* for middle through high school students. Why use the term "aquatic science" instead of water in Texas? Middle school water education requirements are contained in general science TEKS, while high school TEKS for water are mainly listed under categories named Aquatic Science and Environmental Systems. The curriculum's name comes from its alignment with TEKS, many of which are found in the category Aquatic Science.

Released in 2015, *Texas Aquatic Science* includes a suite of learning materials entirely available on-line that take science students through the world of water, from headwaters to oceans and molecules to ecosystems.

Instruction is anchored by the peer-reviewed textbook *Texas Aquatic Science* published by Texas A&M University Press. The textbook is available at any major bookseller and on-line free of charge (texasaquaticscience.org). Also free and available on-line are an 800-page teachers guide, teaching supplements and over 125 specially produced videos for home school and classroom learning.

The curriculum uses place-based materials and real-life Texas examples to illustrate principles of water science and emphasizes experiential activities. A network of over 65 certified learning centers throughout Texas enables teachers to take entire classes outdoors to complete investigations linked to the curriculum.

The textbook features a series of career summaries and images intended to help students picture themselves working in water. The curriculum and associated materials are now top internet results for searches on "aquatic science," including "aquatic science curriculum-book-videos-careers-images" making this resource valuable to students interested in water who live outside of Texas.

## Educated Workforce for Water Security

Texas water industry leaders meeting in a series of planning sessions in 2015 and 2016 identified a general failure of postsecondary degree-granting institutions to deliver job-ready graduates to meet future water industry needs. Their findings, reported in an article published in 2017 by the *Texas Water Journal*, add to nationwide concern over high rates of retirement eligibility and difficulties finding and attracting trained workers to fill job

openings. Industry fears were confirmed by a U.S. Government Accountability Office report released in January 2018 on water workforce readiness and by a bill introduced in the U.S. Senate in the same month to establish a water infrastructure workforce development program to help maintain water security nationwide.

## Post-Secondary Education Model

University educational models are not ones that bend easily to disruptive change. Current incentives are driving universities to focus on theoretical training. A new model proposed for water education in Texas would buck that trend for the sake of helping ensure Texas' water security. Details were listed in a paper published in November 2018 by the *Texas Water Journal* titled, "Water security for Texas: A post-secondary education pathway for water workforce readiness." The model pathway will equip graduates with practical scientific and operational training along with relevant post-secondary degrees that will position them for the jobs of today and tomorrow.

The model envisions multiple routes for a high school graduate or practicing professional to combine options for training and education to complete a B.S. or B.A.A.S. degree. (Figure 1).

Access to a combination of distance education, extension education, mobile laboratories, competency-based education credits, industry training, community colleges and regional universities will ensure local opportunities for training and degrees for students throughout Texas. The model also addresses requirements for licensing and long-term employment of graduates. It includes an option for the first two years of academic work to be completed at a community college and the last two years at a four-year degree granting regional university. Practicing industry professionals who have completed certifications and training through industry, government, or university extension programs will be able to earn competency-based credit toward a degree at a participating community college or university. Internships or work-study arrangements in water-related industries will be compulsory for students without prior relevant experience.

## Conclusion

Connecting students to water while they are in middle and high school is thought to be a key to making a connection to the importance of water and possibly stimulating high school graduates to consider technical training or a post-secondary degree in water. To take these students forward,

Texas leaders in water education have advocated better alignment of existing technical training and degree programs. This alignment is considered an essential ingredient to building a pathway to careers in water. (Figure 2)

The post-secondary model relies on a mix of rigorous science and practical applied industry readiness training. Promoters of this model hope that early introduction to careers in water provided by *Texas Aquatic Science* will help students take this pathway to future employment in the water industry. It should be attractive to students seeking a clear path for a position in the water industry and long-term professional growth potential. It should also be attractive to practicing water professionals seeking a relevant university degree to enhance their own professional advancement opportunities. ■

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Figure 1. Options to obtain a B.S. or B.A.A.S. water degree. (Illustration from the article 'Water Security for Texas: A Post-Secondary Education Pathway for the Water Workforce' published in the *Texas Water Journal*.)

Figure 2. A water worker from careers in the textbook *Texas Aquatic Science*.