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When Sixth Graders Study Neuroscience

Baylor College of Medicine is partnering with Texas school districts to create K–12 health science programs that prepare students for careers, meet workforce needs, and increase health literacy.

In a 100-year-old brick building in central Houston, Texas, a room buzzes with discussion about a possible heart disease case. Theories about the diagnosis are shared, and, before the room empties, teams of four compare their findings based on the evidence. Meetings like this happen on a regular basis in Houston—home to the Texas Medical Center, the world's largest health care hub—but this session is unique. Every member of each case team is a seventh-grade student at the Baylor College of Medicine (BCM) Academy at James D. Ryan Middle School.

The campus is one of two BCM-affiliated science, technology, engineering, math, and medicine (STEMM)–focused magnet middle schools in the Houston Independent School District (HISD). Each child at the campus takes two science courses per year: the district-mandated science course and a yearlong elective developed by BCM science education curriculum specialists. Sixth graders take neuroscience, seventh graders take scientific decisionmaking, and eighth graders take principles of bioscience. Health and biomedical sciences are also integrated into other subjects like social studies and English, as well as into field trips, competitions, and other extracurricular activities. And a full-time BCM faculty science educator at the school arranges frequent interactions between students and health professionals, medical students, and trainees to expose students to a range of possible health science career paths. Whether they are learning about nutrition during a gardening elective or receiving math tutoring from medical students, the middle schoolers at Ryan are embedded in a campus-wide focus on health education.

BCM Academy at Ryan is a product of a long-standing commitment to public, high-quality preparatory education that dates back more than 50 years. In 1972, concerned by workforce shortages in the health care sector, leadership at BCM and HISD established a high school health professions program. The first stand-alone magnet high school of its kind, the school, now called the Michael E. DeBakey High School for Health Professions, serves as a model for other programs in the United States and beyond. DeBakey, Ryan, and the BCM Biotech Academy at Rusk Middle School, another BCM-affiliated HISD campus, accept applicants through the school district's lottery-based magnet application system. With transportation provided by the district, all Houston school district children now have access to these programs.

BCM's growing network currently consists of 20 schools and pathway programs across Texas. Each

program is designed to meet community needs by preparing young people for more career opportunities while also building a trained workforce for local health care occupations. Meeting these objectives improves health literacy—ensuring that community members can find, think through, and use health information in their daily lives.

After working to expand BCM's model over the past 15 years, the four of us have come to believe that emphasizing the second "M"—for medicine, health, and biomedical sciences—in STEMM for K–12 education can be a powerful engine to support local health care, provide economic mobility, and create a culture of health literacy. We hope that BCM's model can serve as a guide for communities working toward similar goals.

Meeting the need

The National Center for Health Workforce Analysis projects that in a decade, the United States will face a workforce shortage of more than 141,000 physicians, with the greatest needs in primary care fields like family medicine and pediatrics, especially in rural locations. Nursing shortages will be even larger, with projected shortfalls of approximately 100,000 registered nurses and 250,000 licensed practical nurses. The patterns are the same for oral health, behavioral health, and allied health, which includes opticians, physical therapists, and pharmacists.

Even though demand for health care workers is expanding, across most sectors, entry-level openings for high school graduates are contracting. If students are properly prepared, they can enter health care jobs at many different levels. Although some jobs require extensive training and graduate or doctoral degrees, many occupations, such as medical records specialists, medical assistants, or opticians, need only short term certifications that can be earned within a year. Health care also offers opportunities in fields such as data science, coding, business administration, and accounting. Because health care offers multiple entry points and opportunities to advance through work placement, certifications, and other formal schooling, the field can sustain economic mobility.

Intentional pathway programs like BCM Academy at Ryan play critical roles in bringing students into these jobs. When students have opportunities to interact with learners at many levels pursuing health-related careers, develop the knowledge and skills that will prepare them for further educational or training programs, experience authentic health care settings, and hear from professionals in the field, they are able to "try on" the identities of health and biosciences professionals. These experiences help students see a more tangible side of health care professions, which makes them more likely to see a future for themselves in a related career.

Children begin forming perceptions about and interest in STEMM fields in late elementary and early middle school. Still, health and biomedical sciences topics are essentially absent from many K–12 curricula. The Next Generation Science Standards—the standards most states use as the foundation for science education content—do not include health as a "disciplinary core idea" like Earth science or physical sciences, nor do they usually include health topics such as infectious disease among essential concepts that students are expected to learn. As a result, many students encounter information related to infectious diseases, nutrition, and the immune system in just a single high school biology course. Other topics such as mental health and substance abuse prevention are embedded into physical education curricula, which vary greatly across schools, districts, and states.

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Health and biomedicine offer powerful opportunities to enrich students' learning experiences with meaning and relevance. The systemic omission of health from K–12 curricula deprives students of chances to develop critical thinking skills around health topics and learn how health and biomedical researchers tackle problems through iterative investigation, refinement, and peer review.

Health education that supports communities

The BCM approach leverages multiple collaborations to develop and sustain health and biomedical programs that are tailored to the needs of communities and schools. These joint efforts involve local and external expertise to attract resources and enhance the credibility and promotion of new programs.

The "full-school" or magnet model is defined by the US Department of Education as a public school that offers a special curriculum that attracts all types of students across school zoning boundaries. Magnet schools are developed over many years of community engagement, collaboration with elected officials, and extensive logistical planning. Even after a magnet school is established, sustaining its mission demands continuous effort, including ongoing engagement with stakeholders, curricular and extracurricular development, and culture building.

Though effective, the full-school magnet model is not feasible or practical for all communities, particularly those communities that are too small to support an entire campus dedicated to a particular concept. In these cases, we have seen alternative approaches to enable access to health information and health careers within existing campuses. A benefit of this approach is its flexibility—dedicated pathway programs can include electives for learners, short exploratory STEMM units embedded in core subject areas, STEMM extracurricular learning experiences, or any mix of these, depending on the needs of the community.

In Midland, a growing regional hub for oil production in west Texas, all four of the junior high schools have launched STEMM programs in association with BCM. Like many regions of Texas, the area has a shortage of health care workers. But local leaders were interested in pursuing a bigger goal than enrolling more students in the career and technical education courses already offered at the high school level. Backed by the support of residents, industry, local nonprofits, and school district board members, the new program seeks to prepare and attract youth to a wide range of bioscience and health careers that will benefit the region.

A local foundation provided financial support to launch the program, including funding a STEMM specialist who works across all the participating schools in a role similar to the embedded BCM educators in Houston's BCM-affiliated schools. Standing up the STEMM pathway in each school involved the support of local funders, businesses, and individuals building on awards from the Science Education Partnership Award program of the National Institute of General Medical Sciences, the only major K–12 science education funding mechanism of the National Institutes of Health, which provided funding to develop and evaluate the science and health curricula.

The efforts in Houston and Midland show that communities across the state of Texas are thinking about the challenges and opportunities in building the health workforce of tomorrow through partnerships. At the same time, there is a growing recognition of the value of building health literacy to create better health outcomes across communities. Current debates around vaccine safety, for example, highlight differences in how science and health-related information is perceived and acted upon by individuals of all ages throughout the country. The STEMM curriculum helps students to make informed decisions about their health, access and use resources, and participate in helping their communities flourish.

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The BCM model owes much of its success to its focus on changing what is possible for kids, one community at a time. Creating similar opportunities for young people in more places across Texas and other states will take many more collective, grassroots initiatives that bring stakeholders from across sectors to the table. But working at this level may have the potential to deliver more tangible results for communities than grand, national calls to improve health literacy and education in schools.

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